

# CHEMICAL ENGINEERING WORLD

www.cewindia.com

## Pumps and Valves



# Technology For High Vacuum Processing

*Trial Plants  
Available  
At Works*

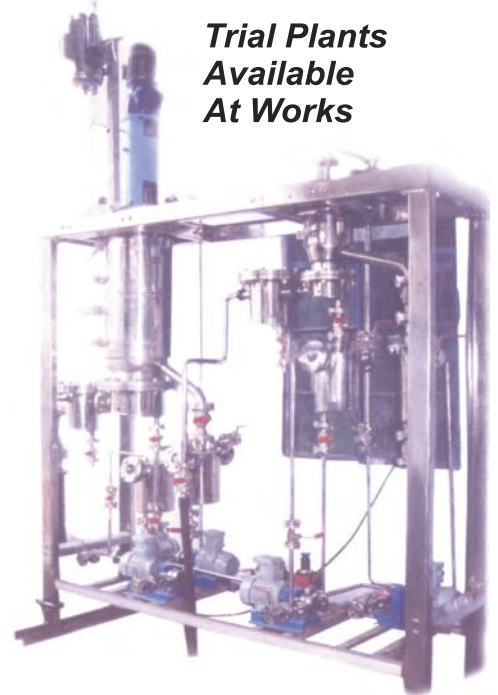
## High Vacuum Molecular Distillation Plants

(Centrifugal and wiped film types)

- Evaporation areas – 0.1 sq. mtr to 10 sq. mtrs
- Process Vacuum upto 0.0001mbar
- M.O.C. SS 316, Titanium, Hastelloy, Carbon Steel

### Applications :

- Pharmaceuticals, Bulk Drugs, Perfumery,
- Flavours, Essential Oils, Fine Chemicals.



## Waste Oil Re-refining Plants & Projects By Thin Film Evaporation

- Approved by N.R.D.C., Govt. Of India – New Delhi
- Approved by Central Road Transport Corporation – Pune
- Meeting the requirements of Ministry Of Environment
- Several projects established in India and exported to advance countries

### Capacities :

- Throughput : 100 litres per hour to 2,000 litres per hour.



ATOMIC VACUUM COMPANY (EXPORTS) • CHEMVAC ENGINEERS

Banglow C-6, "BANGANGA" Govandi Station Road.  
Opp. USV Limited, Mumbai 400088: India  
Tel/ fax: 0091-22-25563525, Tel: 0091-22-25570244

Factory: W-145 & 146, MIDC Industrial Area,  
Taloja-410208, Navi Mumbai-India.  
Phone: 0091-22-27412940

# HI-TECH™

## APPLICATOR

a Global Trusted Brand

www.ptfeindia.com

# INTRODUCING FIRST TIME IN INDIA

CORROSION RESISTANT  
SEAMLESS LINING IN  
COMPLEX SHAPES AND  
LARGE DIAMETER  
EQUIPMENTS



## FLUOROFIT®

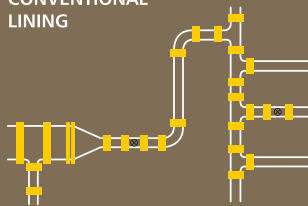
COMPLEX SHAPE SEAMLESS LINING



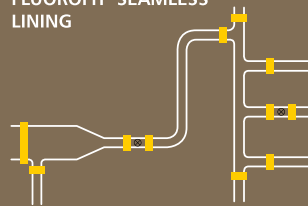
### FLUOROFIT® ADVANTAGE

- Seamless Lining in Complex Shapes
- Full Vacuum Resistance Even in Bigger Sizes
- No Welding Seams or Adhesives
- Reduction of Flange Joints & Leakage Points
- Reduction of Costs & Weight
- Conductive Lining Option Available
- Reduced Residual Tension
- FDA Compliant

INSTALLATION WITH  
CONVENTIONAL  
LINING



INSTALLATION WITH  
FLUOROFIT® SEAMLESS  
LINING



ACHEMA2018



11 - 15 June 2018  
Frankfurt am Main, Germany  
www.chema2018.com

HALL 9.0 STAND F57



Teflon® Diamond logo and Teflon® are registered trademark of The Chemours Company FC, LLC used under licence by HI-TECH APPLICATOR

**PTFE LINED SYSTEMS™**  
VALVES | PIPES | FITTINGS | COATINGS

| PTFE | PFA | FEP  
| ETFE | PVDF | ECTFE  
| PP | HDPE | PEEK | PA11/12

## HI-TECH APPLICATOR

1102-B, Phase-3, G.I.D.C. Ind. Estate, Vatva, Ahmedabad - 382 445, Gujarat, India.

P : +91-079 2583 3040 | 2589 1740 | F : +91-079 2583 3461 | E : hitech@ptfeindia.com

\*HI-TECH OVAL LOGO, PTFE LINED SYSTEMS & FLUOROFIT ARE REGISTERED TRADEMARK OF HI-TECH APPLICATOR



**CHEMICAL ENGINEERING WORLD**  
RNI REGISTRATION NO. 11403/66

**Chairman** Maulik Jasubhai Shah  
**Publisher & Printer** Hemant K. Shetty  
**Chief Executive Officer** Hemant K. Shetty

**EDITORIAL**

**Editor** Mittravinda Ranjan (mittra\_ranjan@jasubhai.com)  
**Editorial Advisory Board** D P Misra, N G Ashar, Prof. M C Dwivedi  
**Contributing Editors** P V Satyanarayana, Dr S R Srinivasan, R B Darji, R P Sharma  
**Sub Editor** Bernard Rapose (bernard\_rapose@jasubhai.com)  
**Design Team** Arun Parab, Shankar Joshi

**Subscription Team** Dilip Parab  
**Marketing Co-ordinator** Brenda Fernandes  
**Production Team** V Raj Misquitta (Head), Arun Madye

**Place of Publication:**

**Jasubhai Media Pvt Ltd**  
210, Taj Building, 3<sup>rd</sup> Floor, Dr. D. N. Road, Fort, Mumbai 400 001,  
Tel: +91-22-4037 3636, Fax: +91-22-4037 3635

**SALES**

**General Manager, Sales** Amit Bhalerao (amit\_bhalerao@jasubhai.com)  
Prashant Koshti (prashant\_koshti@jasubhai.com)

**MARKETING TEAM & OFFICES**

**Mumbai** **Godfrey Lobo / V Ramdas**  
210, Taj Building, 3<sup>rd</sup> Floor, Dr. D. N. Road, Fort, Mumbai 400 001  
Tel: +91-22-4037 3636, +91-22-4213 6400  
Fax: +91-22-4037 3635  
E-mail: godfrey\_lobo@jasubhai.com, v\_ramdas@jasubhai.com

**Ahmedabad** 64/A, Phase 1, GIDC Indl Estate, Vatva, Ahmedabad 382 445  
Tel: +91-79-49003636/627, Fax: +91-79-25831825  
E-mail: sales@jasubhai.com

**Vadodara** 202 Concorde Bldg, Above Times of India Office, R C Dutt Road, Alkapuri, Vadodara 390 007  
Tel: +91-79-49003636/627, Fax: +91-79-25831825  
E-mail: sales@jasubhai.com

**Bengaluru** **Princebel M**  
Mobile: +919444728035  
E-mail: princebel\_m@jasubhai.com

**Chennai / Coimbatore** **Princebel M / Yonack Pradeep**  
1-A, Jhaver Plaza, 1<sup>st</sup> floor, Nungambakkam High Road, Chennai 600 034  
Tel: +91-44-43123936  
Mobile: +919444728035, +919176963737  
E-mail: princebel\_m@jasubhai.com, yonack\_pradeep@jasubhai.com

**Delhi** **Priyaranjan Singh / Suman Kumar**  
803, Chiranjeev Tower, No 43, Nehru Place, New Delhi - 110 019, Mobile: +919818148551  
Tel: +91-11-46745555, Fax: +91-11-26427404  
E-mail: pr\_singh@jasubhai.com, suman\_kumar@jasubhai.com

**Hyderabad** **Princebel M / Sunil Kulkarni**  
Mobile: +919444728035, +919823410712  
E-mail: princebel\_m@jasubhai.com, sunil\_kulkarni@jasubhai.com

**Kolkata** E-mail: industrialmags@jasubhai.com

**Pune** **Sunil Kulkarni**  
Suite 201, White House, 1482 Sadashiv Peth, Tilak Road, Pune 411 030  
Tel: +91-20-24494572, Telefax: +91-20-24482059  
Mobile: +919823410712  
E-mail: sunil\_kulkarni@jasubhai.com

**Subscription Rate (per year with effect from 1<sup>st</sup> April 2013):**

Indian - ₹ 1620; Foreign - US\$ 180

**Student Concessional Rate: ₹ 800; Price of this copy: ₹ 150**

The Publishers and the Editors do not necessarily individually or collectively identify themselves with all the views expressed in this journal. All rights reserved. Reproduction in whole or in part is strictly prohibited without written permission from the Publishers.

**Jasubhai Media Pvt. Ltd.**

**Registered Office:** 26, Maker Chambers VI, 2<sup>nd</sup> Floor, Nariman Point, Mumbai 400 021, INDIA.  
Tel.: 022-4037 3737 Fax: 022-2287 0502  
E-mail: sales@jasubhai.com

# CHEMICAL ENGINEERING WORLD

**VOL. 53 | ISSUE NO. 08 | AUGUST 2018 | MUMBAI | ₹ 150**

**NEWS**

**Industry News** 06

**FEATURE**

**Vacuum technology in the chemical industry** 22  
Pfeiffer Vacuum GmbH, Germany

**More Than One Valve Or Pump Choice for Every Application** 30  
Todd Loudin, President/CEO North American Operations, Flowrox, Inc

**Selection of Correct Non Return Valve in a Piping System for Larger Benefits** 36  
Dinesh Upadhyay, Sales Director-India, CRANE ChemPharma & Energy, Flow Solutions, India

**Failure of Double Wall Jacketed Piping in Refineries: Causes and Prevention** 44  
S Chidambaram, Officer Inspection and Metallurgy Inspection Department  
Numaligarh Refinery Limited

**Sizing and Selecting the Proper Metering Pump** 48  
Tom O'Donnell, Director - Business Development, Neptune Chemical Pump Company & PSG  
Ravi Prasad, Director of Sales, PSG India

**MARKETING INITIATIVE**

**ARC's Sixteenth India Forum Focuses on Digitization** 52

**Choose the Right Type of Vacuum Pump** 53

**PRODUCTS** 58

**EVENTS** 70

**PROJECT UPDATE** 71

**BOOK SHELF** 73

**AD INDEX** 74

**Disclaimer:** The Editorial/Content team at Jasubhai Media Pvt Ltd has not contributed to writing or editing "Marketing Initiative." Readers would do well to treat it as an advertisement.



Printed and published by Mr Hemant K. Shetty on behalf of  
Jasubhai Media Pvt. Ltd., 26, Maker Chamber VI, Nariman Point, Mumbai 400 021 and printed at  
The Great Art Printers, 25, S A Brelvi Road, Fort, Mumbai 400 001  
and published from 3rd Floor, Taj Building, 210, Dr. D N Road, Fort, Mumbai 400 001.  
Editor: Ms. Mittravinda Ranjan, 3rd Floor, Taj Building, 210, Dr. D N Road, Fort, Mumbai 400 001.



# A SMARTER WORKFLOW WITH A SOLUTION THAT THINKS AHEAD

**GRUNDFOS  
iSOLUTIONS**

A SMART SOLUTION  
FOR YOU



## INTELLIGENT SOLUTIONS POWERED BY WATER

In the new era of intelligent performance, it's time to think beyond individual components to intelligent solutions that consider the entire system. Powered by a deep understanding of water, GRUNDFOS iSOLUTIONS uses intelligent pumps and components to enable full system integration in order to analyse, manage and predict water. This means you get real-time monitoring, remote control, fault prediction and system optimisation to make your workflow easier and smarter than ever.

Discover more at [grundfos.in](https://grundfos.in)

be  
think  
innovate

**GRUNDFOS** 

## Ministry of C&F Allocates ₹ 40 crores for Setting up Plastic Park in Uttarakhand

Ministry of Chemicals and Fertilisers (C&F) chaired by Shri Ananthkumar, Union Minister for C&F and parliamentary affairs recently inaugurated Centre for Skilling & Technical Support (CSTS), first Central Institute of Plastics Engineering & Technology (CIPET) centre at ITI Building, Doiwala, Dehradun. This CIPET centre ranks 32nd in the list of centres around the country.

Addressing the gathering comprising of dignitaries to include Guest of Honour, Chief Minister of Uttarakhand, Shri Trivendra Singh Rawat, and Member of Parliament, Haridwar, Dr. Ramesh Pokhriyal Nishank, Shri Ananthkumar noted that plastics constitute over 50% of the basic inputs – right from a small plastic spoon to finding its application in automobiles, aerospace and advanced biomedical equipment manufacturing. “Wherever there is a requirement for plastic, the technical manpower trained at CIPET will find employment,” he asserted. “1500 students would be admitted in the first year itself at CIPET centre in Dehradun, which would be increased to 2500 in the second year and scale to 3000 in the next consecutive year.”

With support from the State Government, B.Tech courses in plastic engineering will soon commence in the near future. “Till 2014, 23 centres of CIPET were functioning that were training around 40,000 students, now CIPET is developing 1,00,000 technicians per year and in the last 4 years the total number has crossed 2.5 lakhs,” the Minister added. To celebrate 50 golden years of CIPET in 2018, the number of CIPET centres across the country will be increased to 50 before the end of this year.

Taking into consideration increasing use of plastics and the environmental sustainability issue, the Government aims to bring biodegradable plastics to common use soon. It has further proposed setting up of another CIPET centre in Uttarakhand and allocated ₹ 40 crores for establishing a plastic park in the State at Sitarganj. Among other units, the park would house plastic waste recycling unit within to address concerns regarding increase in generation of plastic waste in the State and provide employment opportunities for over 5000 people in the region.

“On graduating from CIPET centre, an average salary of a technician will be around ₹ 30,000,” Shri Trivendra Singh Rawat added. A total project cost of ₹ 51.32 crore has been incurred on setting up of the CIPET: CSTS at Dehradun, as per the 50:50 funding arrangement agreed upon by the Government of India and the Government of Uttarakhand to support development and progress in the region.

## Full Realisation of PCPIR Developments in India will Create Employment Opportunities for 33.96 lakh persons: Shri Rao Inderjit Singh

In a written reply to a question posed in Lok Sabha, Minister of State for Planning (IC) and Chemicals & Fertilizers, Shri Rao Inderjit Singh shed light on the status of implementation of Petroleum, Chemical and Petrochemical Investment Regions (PCPIRs) projects in India. He informed, according to Detailed Project Reports (DPRs), the projected investment on full realization of PCPIRs is ₹ 7.63 lakh crore and employment generation (both direct and indirect) is expected for around 33.96 lakh persons.

As per the policy resolution, a PCPIR is a specifically delineated investment region with an area of around 250 square kilometres. With four PCPIRs in

the nation namely - Dahej (Gujarat), Vishakhapatnam–Kakinada (Andhra Pradesh), Paradeep (Odisha) and Cuddalore and Nagapattinam (Tamil Nadu), Singh provided project implementation status detail for each of these projects. Dahej PCPIR: The state of Gujarat committed to investing ₹. 85,928 crore for setting up of PCPIR at Dahej with development plan sanctioned and environment regulatory approvals received last year. The anchor tenant project i.e. ONGC Petro additions Limited (OPaL)'s cracker stands commissioned in March 2017. It will create employment opportunities for 1.32 lakh persons.

Andhra Pradesh PCPIR: ₹ 43,744 crore has been invested by the Andhra Pradesh government in setting up of this PCPIR. While the draft master plan and environmental impact assessment study stands completed, on full-project completion it will create employment for 1.11 lakh persons.

Paradeep PCPIR: Actual investment made in the Paradeep project is ₹ 45,000 crore with an employment opportunity for 38,000 persons. The draft master plan and environmental impact assessment stands completed. The anchor project at the PCPIR i.e. Indian Oil Corporation Limited (IOCL)'s refinery stands commissioned in February 2016.

Tamil Nadu PCPIR: District level notification has been issued by the Government on Tamil Nadu PCPIR notifying the delineated PCPIR area in the Cuddalore and Nagapattinam Districts as a Local Planning Area, under Tamil Nadu Town and Country Planning Act 1971. The project stands at an investment of ₹ 8100 crore and actual employment for 13,950 persons is generated.

Singh also explained the role of central and state governments in implementation of the PCPIR projects during addressal.

## Government Launches PARIVESH on World Biofuel Day

Celebrating World Biofuel Day on August 10, Prime Minister Narendra Modi launched “Pro Active and Responsive facilitation by Interactive and Virtuous Environmental Single Window Hub (PARIVESH)” and unveils a booklet on National Policy on Biofuels 2018. The day has been observed since 2015 to spread awareness about the importance of non-fossil fuels as an alternative to conventional fuels and highlight various efforts made by the Government in the biofuel sector.

Several dignitaries graced the launch to include Nitin Gadkari, Union Minister of Road Transport & Highways, Shipping, and Water Resources; Shri Ramvilas Paswan, Union Minister of Consumer Affairs, Food and Public Distribution; Shri Radha Mohan Singh, Union Minister of Agriculture and Farmers Welfare, Dr. Harsh Vardhan, Union Minister of Science & Technology, Earth Sciences, and Environment, and Dharmendra Pradhan, Union Minister of Petroleum & Natural Gas, Skill Development & Entrepreneurship were present.

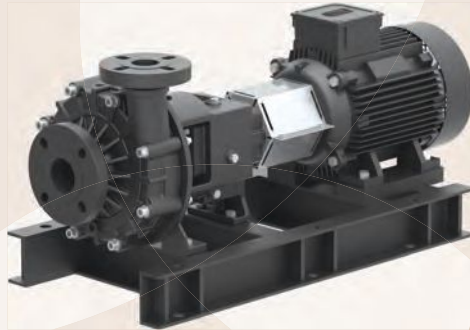
The day reaffirms the Government's commitment to increase farmers' income and improve the environment. Minister of Petroleum & Natural Gas, Dharmendra Pradhan assured that several steps have been taken have been taken to improve the supply of ethanol for the blending programme, which has resulted in supplies jumping from 38 crore litres in 2013-14 to about 141 crore litres in the ongoing season.

The Government notified that the new National Policy on Biofuels-2018 envisages a target of 20 per cent blending of ethanol in petrol by 2030. The policy has thus widened the scope of raw material for ethanol procurement.





• Stainless Steel End Suction Pumps



• Polypropylene, PVDF & Noryl Pumps



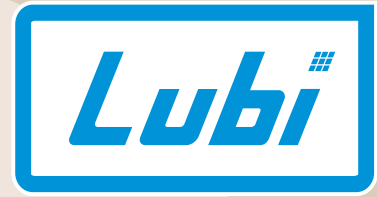
• Polypropylene & Nylon Hand Pumps



• Drum Pumps



• Drum Mixers



Passion for Pumps



**50+**  
YEARS OF  
PUMPING TRUST

**LUBI INDUSTRIES LLP**

Near Kalyan Mills, Naroda Road, Ahmedabad - 380 025, Gujarat, India. | Tel: +91 79 30610238 | Fax: +91 79 30610300  
Email : [indsales@lubipumps.com](mailto:indsales@lubipumps.com) | Website : [www.lubipumps.com](http://www.lubipumps.com)

*Pump it up with Lubi®*



Sustainable Pumping Solutions

MA05-03



## New Managing Director for LANXESS in India



Neelanjan Banerjee

Neelanjan Banerjee succeeds Jacques Perez as the Country Representative and Managing Director of Lanxess in India w.e.f September 1, 2018. He will assume these tasks in addition to his current function as head of the Advanced Industrial Intermediates business unit (BU All) in India. Banerjee joined LANXESS in 2006 as head of the former Basic Chemicals business unit and the Saltigo business unit in India. Banerjee follows Jacques

Perez, age 56 years, who will take over new responsibilities as Managing Director of LANXESS Holding UK Unlimited and Country Representative of LANXESS in the United Kingdom. Born in France, he has also held the position of Chief Financial Officer (CFO) of LANXESS India Private Limited since 2013.

"On behalf of the entire Board of Management, I would like to thank both Jacques Perez and Neelanjan Banerjee for their excellent work and outstanding contributions to the company so far and wish them every success in their new roles" said Rainier van Roessel, Member of the Board of Management at LANXESS AG, commenting on the development.

## Covestro strengthens its global film production

Covestro intends to significantly expand its global film production to meet the growing demand in all regions. In particular, capacity expansions are planned at Map Ta Phut, Thailand, Guangzhou, China, South Deerfield, USA, and Dormagen, Germany. The total investment of more than 100 million euros also includes the expansion of the associated infrastructure and logistics. According to current planning, over 100 new jobs will be created worldwide for the operation of the new plants. The high-quality semi-finished products are used in the automotive, medical technology and security card industries, amongst others.



Dr. Markus Steilemann,

"With this capacity expansion, we are investing in promising technologies and applications," says Dr. Markus Steilemann, CEO of Covestro. "The innovative high-tech materials offer solutions for future challenges and deliver their contribution to making the world a brighter place." "We want to expand our global film production as quickly as possible to meet the growing demand in the regions," explains Michael Friede, global head of the Coatings, Adhesives and Specialties segment. "With modern and efficient production facilities, we want to offer our customers growth opportunities and strengthen them in their competitive environment."

One of the new production facilities is being built in Map Ta Phut in Thailand and is scheduled for completion by the end of 2019. It is based on modern co-extrusion technology. At the Guangzhou site in

China, the focus will initially be on converting the existing co-extrusion line. The first new capacities are to be available there as early as mid-2019. In a second phase, capacity is also to be expanded there. In South Deerfield, Massachusetts, measures to increase efficiency and quality are already being implemented.

Covestro is also building new co-extrusion lines in Dormagen, which are scheduled for completion in the fourth quarter of 2020. Only a year ago, the company commissioned a new production line there for high-quality, multilayer flat films, including infrastructure and logistics facilities. "With these expansions we create the conditions to meet customer requirements more flexibly and quickly. Our tailor-made products enable versatile applications in various industries," says Dr. Thorsten Dreier, global head of the Specialty Films business.

## New orders cement Topsoe's leading position in ammonia in India



TechnipFMC has awarded Topsoe a contract for license and basic engineering for two gas-based ammonia plants for Hindustan Urvarak and Rasayan Ltd (HURL). The two fertilizer complexes in Sindri and

Barauni will each comprise 2,200 MTPD ammonia and 3,850 MTPD urea plants and will be realized by TechnipFMC, France, along with their consortium partners L&T Hydrocarbon Engineering, India.

"We need the best available technologies to fulfill our vision of growth, efficiency, and national self-sufficiency. Technip has offered Topsoe's ammonia technology which is considered one of the best technologies in the market and therefore, we are looking forward to a urea/ammonia plant which shall turn out to be one of the most energy-efficient, having reliable and safe operations," said Mr Arun Kumar Gupta, Managing Director, HURL. He adds, "The HURL projects at Sindri and Barauni not only show the commitment and support of the Indian Government, NITI Aayog (National Institution for Transforming India), the Department of Fertilizer under the Indian Ministry of Chemicals and Fertilizers, but also the three promoter companies, all well-known in the area of mega-project management."

"We are extremely pleased to be able to continue our long-standing support of the Indian Government's efforts towards self-sufficiency in urea production and as a consequence: food security. Our world-leading ammonia technology and catalysts are the basis for three out of the four fertilizer plant revival projects in India right now," says Amy Hebert, Executive Vice President and Deputy CEO, Topsoe.

The two new plants are part of the Indian government's revival plans for the fertilizer sector to ensure Indian self-sufficiency in urea fertilizers. In 2015, Topsoe was awarded the ammonia technology license, basic engineering, technology, and catalysts for an ammonia plant for the Ramagundam Fertilizer Project. This 2,200 MTPD ammonia plant is also a revival project scheduled to begin operation in the fourth quarter of 2018.



## Etanorm SYT - Takes the heat, day in & day out

Rely on the experts at KSB. The new generation of Etanorm SYT, heat transfer fluid and hot water pumps offer maximum operating reliability and cover all possible applications.

Your benefits at a glance :

- Reliable operation ensured by highly effective venting with VenJet® optional SIC/SIC plain bearings and confined gaskets
- Double mechanical seal in tandem arrangement for particularly high demands
- Replaceable casing wear rings facilitate servicing and dismantling



Etanorm SYT

KSB Pumps Ltd. • Mumbai-Pune Road, Pune 411018 (India) Tel. • +91-20-27101000 Fax • +91-20-27426000 • [www.ksbindia.co.in](http://www.ksbindia.co.in)

► Our technology. Your success.

Pumps ■ Valves ■ Service



## **BPCL to go ahead with setting up new refinery**

State-run Bharat Petroleum Corp Ltd (BPCL) has been given green nod for setting up a second generation ethanol plant in Odisha that would entail an investment of ₹ 747.46 crore, according to a senior government official. The ethanol bio-refinery with a capacity of 100 kilo litre per day (KLPD) will be set up at Bauslingha village in Bargarh district in an area of 58.44 acres.

The project is in line with the government's national bio-fuel policy, which mandates 5 per cent blending of ethanol with petrol. Total project cost is estimated to be ₹747.46 crores and will create 200 direct and about 1000 indirect job opportunities when the facility becomes operational. BPCL will use Lignocelluloses biomass, an attractive feedstock to produce renewable fuels, particularly ethanol.

---

## **Ethanol blending of petrol saved Rs 4000 crores last year**

Ethanol has not only helped the farmers but has also saved the country's wealth. Last year, ethanol blending of petrol has saved about Rs.4000 crores in foreign exchange that would have been spent on imports. The target of the government is to increase this savings to ₹ 12000 crores in the next four years. Moreover, in the next four years we can make ₹ 20000 crores just by producing ethanol from sugarcane. With this saving and an alternative to sugarcane,

the sugarcane farmers will be ensured of a permanent solution to their recurrent problems. Ethanol is saving money. Besides, it will also reduce the toxic gases that generate from petrol.

---

## **DNV GL issues world's first solar plant project certificate to CLP's Veltoor Solar Power Project in India**

DNV GL, issued the world's first project certificate for photovoltaic (PV) power plants to CLP India's Veltoor Solar Power Project in Telangana, India. The project is owned by SE solar Ltd (SPV of Suzlon Energy Ltd and CLP India). The ever-increasing demand for reliable, affordable and low carbon electricity has driven a global upsurge in renewable energy resources.

In 2016, India's Ministry of New and Renewable Energy has announced the world's largest renewable energy expansion programme, with the stated aim of reaching 175 GW of green power generation by 2022, including 100 GW of solar power. India is making good progress on these goals, increasing solar capacity by 370 per cent in three years, making solar its fastest growing energy source.

The solar project by CLP India Veltoor in the southern Indian state Telangana is one of the larger solar projects in the country. This 100-MW plant, was developed by SE solar Ltd (SPV of Suzlon Energy Ltd and CLP India) and commissioned in phases starting mid-2017 and supplies energy to the Telangana Southern Power Distribution Company Limited.

The certificate confirms all relevant safety features of the solar park and demonstrates the technical compliance of the project with the globally recognized standards.

Certification of a PV power plant project according to the specification implies the overall evaluation of the asset including its design basis, design, grid code compliance, manufacturing process, transport and installation, commissioning and optionally in-service phases. Each of these phases will be closed with a statement of compliance after successful completion. The

specification includes detailed description of each phase and is guiding through the certification process. The Veltoor park highlights the global nature of modern solar projects, employing PV panels from China, solar tracking technology from the USA, and an electrical system from Europe as well as services from numerous local contractors.

Paulo Rocha, Chief Operating Officer of CLP India has said, "We are keen to expand our solar portfolio in India with projects that deliver value for our shareholders and our customers. Ensuring the highest quality is key to that strategy, but it is a real challenge in such an international project, especially as there was no global standard for PV parks when we started. We felt project certification was the ideal way to guarantee quality at every stage in the project, and DNV GL was the only certification body that could provide a complete guideline to achieve that."

---

## **Atal Innovation Mission, NITI Aayog & MyGov launches "Innovate India Platform"**

R Ramanan, Mission Director, Atal Innovation Mission and Shri.Arvind Gupta CEO, MyGov today launched the "#InnovateIndia Platform", a collaboration between the Atal Innovation Mission and MyGov, a citizen centric platform of the Government of India. The #InnovateIndia portal will serve as the common point for all the innovation happening across the nation. Launching the platform, Mission Director, Atal Innovation Mission said that the #InnovateIndia MyGov-AIM portal creates the much-needed innovations platform for registering both grassroots and deep-tech innovators at a national level. Those searching for a critical innovation can leverage the portal advantageously for the benefit of the economy as well as national social needs."

According to the press statement, the platform will be open to all Indian citizens. The users can View, comment, share, and rate the innovations crowdsourced on the #InnovateIndia platform. The users can view the leaderboard which is calculated based on the votes on each innovation. Citizens can share their/ organizations/someone else's innovation on the platform by login to the MyGov website and on various social media platforms. The citizens can access the platform on <https://innovate.mygov.in/innovateindia>.

"India has been a very innovation-oriented society, but our challenge has been a structured approach to innovation, capturing them and building an ecosystem to take them global. The current government initiative to capture and support innovation from ground up, is aimed at creating a structured ecosystem to encourage, enhance and develop India's innovative character", said Arvind Gupta, CEO MyGovIndia.

---

## **Solid Waste Management Projects in 97 Ganga Towns**

A meeting was held between Union Minister for Water Resources, River Development & Ganga Rejuvenation and Union Minister of State for Housing & Urban Affairs along with other concerned officials in the month of July to review the Solid Waste Management (SWM) projects in 97 Ganga towns in the States of Uttarakhand, Uttar Pradesh, Bihar, Jharkhand, and West Bengal. The authorities have decided to continue pursuing the respective State Governments for taking up SWM projects as required. A total of 63 projects are sanctioned for River Front Development and development of Ghats and Crematoria at an estimated cost of ₹ 1197 Cr. Out of these 24 projects are completed and other projects are at various stages of implementation. 97 towns along river Ganga have been identified for solid waste management.

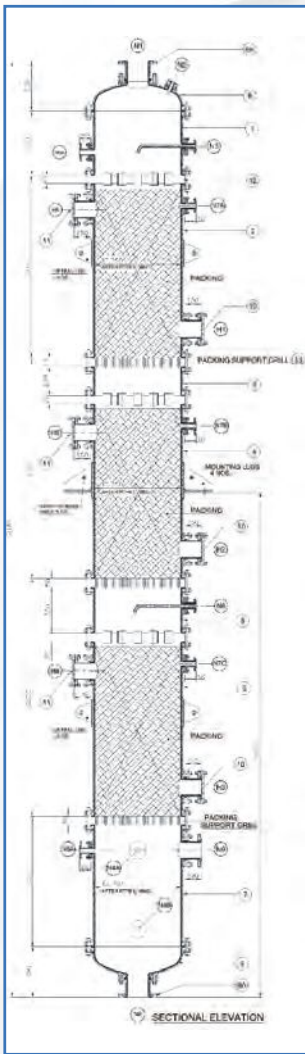


## MANUFACTURE

LINED PIPING SYSTEMS, COLUMNS, TANK, VESSELS, SCRUBBER AND REACTOR,  
(CUSTOMIZED PRODUCTS FOR CORROSIVE MEDIA APPLICATIONS)

## LINING MATERIALS

PTFE / PFA/FEP/ PVDF / PP / HDPE



### Why to consider Resistotech® for lined piping, column and equipment's:

- One of the largest fluoro polymer processor having sizes capabilities from 25 DN ( 1" ) to 1250 DN ( 50" ), Liners in various thickness as per application (Lined Piping System, Vacuum Piping, Columns and Tanks), Liner manufactured length 25 DN to 300 DN in 6200 mm and above all sizes 3200 mm
- Cost effective solution provider as our biggest production capacity help us for cost economics with better quality
- Successful installation under full vacuum operations for lined piping systems and columns.
- 90° Elbow upto size 24" are manufactured in single piece construction
- Resistotech® make all PTFE Liners are well suitable to use for FDA applications, We do provide compliance certification as per US FDA 21 CFR 177.1550
- 100% Liners are tested as per requirement of ASTM F1545 & test carried out Elongation, Tensile, Roller, Light & Boroscope
- Bellows / Expansion has uniform thickness throughout all convolutions cross section and uniformity in convolutions using special grades polymer for offering maximum life cycle.

**RESISTOTECH INDUSTRIES PRIVATE LIMITED**

C-11, MIDC Sinnar, Nashik - 422103, Maharashtra, India.

## STEER inducts industry expert Subba Bangera into Board of Directors



Steer, creator of advanced materials platform technology that effectively transforms and functionalises materials in the field of plastics, pharmaceuticals, food & nutraceuticals, biomaterials and biorefining, announces the induction of Subba Bangera, Chairman, Active Biz Solutions Pvt Ltd, into the company's Board of Directors, with effect from July 27, 2018. Bangera is designated as Vice-Chairman, Steer ,

and will be responsible for steering the growth of the company from the long-term perspective through strategic advice, guidance and critical interventions apart from enhancing the operational efficiency.

He is also the Representative Director of Steer at the prestigious Plastics Machinery Manufacturers' Association of India (PMMAI), the apex body for the plastics equipment manufacturing business in the country. Commenting on the appointment, Dr Babu Padmanabhan, Managing Director & Chief Knowledge Officer, Steer said, "We are delighted to have a person of Bangera's repute and calibre on the Board of Directors. With 45+ years of rich experience in setting up processing & machine building plants, he enjoys great reputation in the Indian plastics industry, as a thought leader, known for his highly-valued advice on organisational growth and business expansion."

His expertise is in research, sourcing and selling raw material, equipment

Bangera is a highly-respected personality in the plastics manufacturing industry having chaired several national and international conferences and seminars. He also teaches in various management colleges as a guest faculty. He advises companies on Lean manufacturing to raise

---

## Procurement functions must reframe their role to respond to disruptive forces: Roland Berger Study

Virtually all industries have new issues to contend with. From e-mobility to the Industrial Internet of Things (IIoT), 5G and digitalization, the list is almost endless. These disruptions lead to the emergence of new products, services and business models in the blink of an eye. In this volatile environment, procurement plays a crucial role across all industry verticals. But the function needs to free itself of legacy structures and reframe its activities. The steps necessary for this procurement transformation are highlighted in the new Roland Berger study "Procurement endgame – The future of procurement in times of digitalization and disruption".

Procurement in the automotive industry today has to deal with buying batteries, managing strategic partnerships for the connected car and sourcing new types of software. Indeed, procurement departments across all verticals are confronted with new parameters, whether they're in engineering, banking and insurance or chemicals and pharmaceuticals. The changes, often driven by digital technologies, have very different impacts on different industries. "If companies don't have ready responses to the disruptive forces in their industry that will work for new products, services and business models, or if they are unable react fast, they are putting their market position at risk," says

Oliver Knapp, Senior Partner at Roland Berger. Procurement has a key role to play as companies strive to successfully master the disruption that stretches far beyond the simple digitalization of procurement. "This is a unique opportunity," explains Knapp. "Procurement can and must reposition itself and redefine its role as a partner creating value in the company."

For a company to stay competitive, the procurement function needs to reframe its role and be mindful of two areas in particular, as Oliver Knapp advises: "The new demands on procurement resulting from the disruptive trends and the digitalization of the function itself absolutely must feed into the company's procurement strategy." With the advancement of digital innovation in procurement, it's not only operational processes but also complex tasks that are being automated. The necessary transformation can be effected in a gradual process.

The first thing to do is to consider the underlying conditions, in other words the industry-specific trends, corporate strategy and the company's individual success factors.

This step also involves analyzing what the procurement function needs to be doing in the company in the future and how much time they have left to pull off the transformation. "Tackling digitalization in isolation or disregarding the latest market trends will only lead to failure. A successful transformation depends on a thorough consideration of all factors that can influence the business," says Knapp.

Building on this, a number of scenarios can be developed covering aspects such as what the organization and role of procurement and the supplier network should look like, and how much capacity will be freed up as a result of digital standardization. The different factors need to be weighted individually to suit the company and assessed in terms of the possibilities available. The remaining steps are all about realizing the scenarios and strategic measures. If procurement functions don't quickly adapt their performance to the disruptive trends in the marketplace, companies will lose their ability to compete.

---

## Himachal Pradesh Government Expresses Interest to FAGMIL for Setting Up White Cement plant in North India

The Government of Himachal Pradesh recently expressed interest to FCI Aravali Gypsum and Minerals India Limited (FAGMIL), by issuing a Letter of Intent (LoI) to grant mining lease for setting up of white cement plant in North India to cater to the demand from the region. With only two operational white cement plants in the region currently, an MoU when entered between FAGMIL and the Government of Himachal Pradesh will establish the first PSU white cement plant in the country.

A pre-feasibility study has been conducted by the National Council for Cement and Building Materials, Ballabgarh (Haryana) on 108 hectares of land leased near Village Nohra Dhar, Tehsil Sangrah, and District Sirmour (Himachal Pradesh) for setting up of this manufacturing facility.

The plant will incorporate latest state-of-the-art, eco-friendly manufacturing technologies with an installed capacity of 1000 TPD. It will contribute to direct and indirect employment generation in the region around 200 to 3000 respectively. This upcoming project will be a landmark development in Nohra Dhar and nearby areas of Himachal Pradesh.



# SHANBHAG & ASSOCIATES

Total Pumping Solutions  
Authorised Distributor for India

## MAGNETIC DRIVE PUMPS



## DRUM / CONTAINER PUMPS

DRUM PUMPS FOR  
VISCIOUS LIQUIDS



## SOLID BLOCK AODD PUMPS



## SANITARY LOBE PUMPS



## MOTORISED D D PUMPS



## TWIN SCREW PUMPS-HYGIENIC

HYGHSPIN



## PERISTALTIC PUMPS LAB & INDL. DUTY



## FLOWMETERS



## VERT. SUBMERSIBLE PUMPS



## SHANBHAG AND ASSOCIATES

B-50 Nandbhuvan, Mahakali Caves Road, Andheri (E), Mumbai 400 093,  
Tel: +91-22-40365700 / 40365711  
E-mail: info@shanbhags.com Website: www.shanbhags.com



Regional Offices at Bangalore, Baroda, Chandigarh, Chennai, Delhi, Hyderabad.  
Dealers at: Aurangabad, Chennai, Goa, Indore.



## Innovative limit value displaying simplifies process monitoring



LiquiSonic becomes more user-friendly and intuitive for concentration and density measurement in process liquids by sonic velocity. In addition to the numeric concentration, density and temperature

displaying, the visualizing of limit value ranges is available from now on. That simplifies the monitoring of an approximation to critical values. Users can identify the segment in the measuring range where the current value is settled on and get an overview quickly. When approximating the borders of the measuring range, the arrow turns into yellow signalling a warning. A range excess is shown by a red arrow. The LiquiSonic controller display allows up to three value ranges at the same time. This applies for each one of the up to four sensors, which can be connected to a control unit. Another benefit is the customizability of the measuring ranges. By using the intuitive menu, every critical value can be adjusted separately. Of course, an automatic reaction of the LiquiSonic system to the approximation or excess of the limit values to the process control system, i.e. via Profibus, is possible. This allows users to react to process changes completely automatic and in a matter of seconds what causes more safety and an optimal process control. Additionally, the digital outputs of the controller can be used to address optical warning signals in the production hall entirely automatic. The new limit value displaying does not influence any of the other functions of the LiquiSonic controller. It is a very useful supplement, makes the LiquiSonic system more intuitive and creates added value in the process.

## Cabinet Approves Agreements to Implement Fertilizer Revival Projects at Gorakhpur, Sindri, and Barauni

The Union Cabinet chaired by Prime Minister Shri Narendra Modi has approved the proposal to provide land on lease to Hindustan Urvarak & Rasayan Limited (HURL), which is a joint venture enterprise of NTPC, IOCL, CIL and FCIL/ HFCL incorporated in June 2016 to implement the fertilizer revival projects at Gorakhpur, Sindri, and Barauni.

The government has also agreed to provide Concession Agreements & Land Lease Agreements for the revival of Gorakhpur & Sindri units of Fertilizer Corporation of India Limited (FCIL) and Barauni unit of Hindustan Fertilizer Corporation Limited (HFCL) by HURL. The revival of Gorakhpur, Sindri and Barauni units of FCIL/HFCL will ensure substantial investment in the fertilizer sector.

These units will act as anchor customer for the Jagdishpur-Haldia Pipeline (JHPL) gas pipeline being laid for development of critical infrastructure in Eastern India.

The revival of these fertiliser units will facilitate creation of job opportunities in the region, augment indigenous production of urea to enhance self-

reliance and provide significant boost to the economy of the state/region. Lease Deeds are to be signed with HURL by FCIL/HFCL to set up the fertiliser projects at these three locations, with land to be leased for a period of 55 years.

The cabinet has further authorized Inter-Ministerial Committee (IMC) to approve Substitution Agreements and other such agreements, if any to be signed between FCIL/HFCL and HURL. The tri-partite agreement thus authorised will enable HURL, a lenders' representative for the specific project to obtain finances as may be required after lenders' syndication is completed for each of these projects.

HURL is also being granted with an Interest Free Loan (IFL) equivalent to the interest during construction (IDC) component of ₹422.28 crore, 415.77 crore and 419.77 crore for Gorakhpur, Sindri and Barauni projects respectively. The total value of the IFL sanctioned for ₹1257.82 crore will be disbursed during the first three years to cover only the interest accrued during the scheduled period of construction. Any escalation costs incurred otherwise, during construction owing to time or costs overrun will be borne by the joint-venture company.

The repayment of loan will be spread over a term period of 11 years, with a moratorium period of three years for disbursement of funds during construction and the repayment phased over the next eight years.

## EWM AG moves Skills and Knowledge Centre for Welding Technology to new location

EWM AG has opened a skills centre with a size of roughly 2,000 square meters for all matters related to arc welding in Austrian Eberstalzell. With the move to the new building right on motorway A1, the welding technology manufacturer, which has been active in the alpine republic for more than 30 years, establishes a basis for further sustainable growth.

EWM had already opened its own location in Austria in 2006 in order to be closer to customers and ensure quick and reliable support. "The brand-new building at our convenient location in Eberstalzell was a once-in-a-lifetime chance for us to set up and organise our premises in accordance with our needs," explains Heinz Stephan, Director of EWM Austria. "In doing so, we placed the greatest importance on as high as possible an equipment standard and the sustainability of the building. As a result, we can fulfil both our customers' existing expectations and those which can be expected to arise in the next few years." EWM has invested around 3.5 million euros in the new building on the Greenfield site. From this moment,

the globally active welding technology manufacturer has 400 square metres of office space, a fully equipped warehouse and individual areas for service and application technology with a size of roughly 250 sq metres each in Eberstalzell.

Overall, EWM has doubled its warehouse space with the new building and thereby increased its already impressively high availability and delivery capacity yet further. The welding technology manufacturer delivers standard items within a maximum of two days, for example. EWM has also integrated an area for service and repairs into the new building. Housed here, among other things, are the latest-generation welding torch testing devices, shearing lift tables and a workbench for the repair of long hose packages.

# VALVE SOLUTIONS FOR CORROSIVE APPLICATIONS



Manufacturer of PFA/FEP/PTFE Lined & Plastic Valves,  
Pipes & Pipe Fittings



## WCB OR CF8/CF8M + PFA/FEP/PVDF/ETFE & PPH LINED VALVES, LINED PIPES AND FITTINGS

### LINED VALVES

SIZE RANGE : 1/2" - 24"



### LINED PIPES AND FITTINGS

SIZE RANGE : 1/2" - 24"



#### VADODARA

##### CORPORATE OFFICE

946, GIDC, Makarpura,  
Vadodara - 390 010. INDIA  
Phone: +91-265-2649248, 2632628  
Fax : +91-265-263737 9  
Email : sales.baroda@polyvalve.com

##### FACTORY

5 to 12 PR Industrial Estate,  
Por GIDC - Kashipura Road,  
Moje : Kashipura - 391 243,  
Dist. Vadodara. INDIA  
Phone: +91 70434 30467/777 , 70430 20707

#### MUMBAI

ISO 9001:2008



##### THANE

207, Orion Business Park, Next to Cine Max, Kapurbawdi,  
Ghodbunder Road, Thane (W) - 400 607. INDIA.  
Phone: +91 22 2589 6422, 2589 6524 /25  
Fax : + 91 22 2589 4221  
Email : sales.thane@polyvalve.com



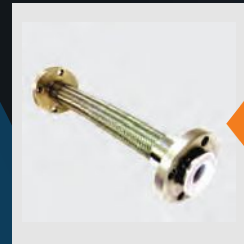


PTFE Bellows

PP/PVDF/PTFE  
/FEP/PFA  
Lined Pipes & Fittings



# QUALITY REDEFINED



PTFE Lined  
Chemical Transfer  
Hoses

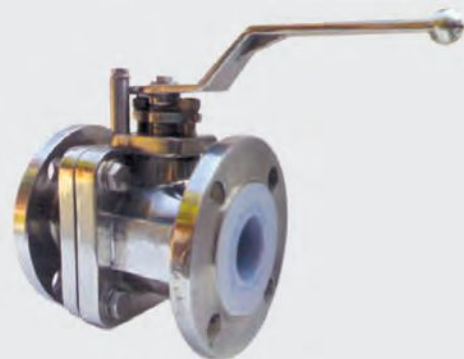


## Delivering value through innovation and technology.

FEP/PFA Lined Ball  
Check Valves



PFA/FEP/PVDF  
Lined Ball Valves



PP/PVDF/FEP/PFA  
Double Window  
Sight Flow Indicators



- Market leader in lined pipe systems and valves
- 25 years of experience with more than 400 customers
- Process equipment and machinery installed as per Overseas Collaborator's Design
- Patented Thermalok process – the most reliable method for lining pipes
- Proprietary process to produce an optimized PTFE liner
- Cast fittings with oversize bore are lined using unique isothermal melt processable technology
- Teflon Licensing Partner for India – to offer Teflon grade PTFE/PFA/FEP lined piping equipment
- Lined products designed to withstand full vacuum applications at 200° C

### Horizon Polymer

Lined Piping Systems | Lined Valves | Sight Flow Indicators |  
Bellows & Hoses | Special Lined Products | Fittings



Chemours Co FC LLC – Delaware appoints Horizon Polymer as  
TEFLON® Licensing Partner For India Under Trademark license  
agreement to promote and sell PTFE/PFA/FEP Lined Piping products  
using TEFLON® PTFE/PFA/FEP Fluoropolymer.

TEFLON® and TEFLON® diamond brand logo are registered trademarks of The Chemours  
Company FC, LLC used under license by Horizon Polymer Engineering Pvt. Ltd.



## GIS Technology on Ganga Cleaning Projects

National Mission for Clean Ganga (NMCG) is using Geographic Information System (GIS) technology for improving planning, execution and monitoring of projects as well as providing platform for central repository of all data related to Ganga river basin including Sewage Treatment Plant (STP) / Common Effluent Treatment Plant (CETP), water quality monitoring location, afforestation, ghats and crematorium, river front development. This assists NMCG in improving its effectiveness in pollution abatement and river rejuvenation work.

Government of India is supplementing the efforts of the state governments in addressing the pollution of river Ganga by providing financial assistance to the states. Government of India has approved Namami Gange Programme in May 2015 for conservation of river Ganga with total outlay of ₹ 20,000 Crores. Namami Gange Programme is an umbrella programme which integrates previous and currently ongoing initiatives by enhancing efficiency, extracting synergies and supplementing them with more comprehensive & better coordinated interventions.

The amount spent by NMCG since its inception i.e. from Financial Year 2011-12 to 2018-19 till June 30, 2018 is ₹ 4,322.37 crore. Under Namami Gange Programme, a total of 221 projects have been sanctioned at a cost of ₹ 22,238.49 crore. Out of these 221 projects, 58 projects have been completed and 95 projects are under implementation.

## Environment & Skill Development Ministries Sign MoU to train one lakh RAC Service Technicians



*The exchange of MoU between two Ministries*

Emphasising that India is being globally lauded for its green initiatives and commitment to environment and climate change, Union Minister for Environment, Forest and Climate Change, Dr. Harsh Vardhan today said that Skill India is an endeavour by the Government to act as a catalyst in bringing about a change by skilling, up-skilling and re-skilling technicians to bring down the emission of harmful greenhouse gases. The Minister pointed out that our nation is now being seen as a trailblazer in clean and green energy under the able leadership of the Prime Minister, Narendra Modi.

"I feel privileged and honoured to be a part of the launch of this unique project and we must ensure its efficient implementation and monitoring", Dr. Harsh Vardhan said. The Minister pointed out that even prior to the signing of the Memorandum of Understanding today, MoEF&CC has already launched a Green Skill Mission, adding that under the Mission, within the next three years, training will be imparted to 5 lakh 86 thousand persons. He added that courses to provide skill development to scientists and technicians have also been drawn up in the Ministry of Science and Technology. Dr. Harsh Vardhan quoted the example of Andhra Pradesh Government, which has started the

process of providing skill development in the leather industry to about 10, 000 persons at a cost of ₹ 30 crore.

Addressing the gathering, Union Minister for Skill Development and Entrepreneurship (MSDE), Dharmendra Pradhan invited the leaders of the industry to invest in equal measure in the initiative to skill technicians. "I urge the industry to make equal contribution towards training of such technicians so that we further strengthen our industries and our youth. The focus on skill development should be as much as we have on research and production today", he added.

Pointing out that the Prime Minister's attempt at enhancing the training skills has been made a part of the skill eco system, the Minister stated that this is great example of the Ministries working together to make the New India of our dreams. He also underlined that it is imperative that the two Ministries work in close conjunction with the respective Sector Skill Councils to identify the new age job roles which are relevant to the market today. The Minister also emphasised the need to map their demand and co-create a curriculum and pedagogy to ensure a robust skill training ecosystem and its outcome in terms of the productive workforce that India will have.

Earlier, a Memorandum of Understanding was signed between the Ministries of Environment, Forest and Climate Change and Skill Development and Entrepreneurship. The MoU was exchanged by the Joint Secretaries in both the Ministries to jointly undertake upskilling and certification of 100,000 RAC service technicians on good servicing practices and knowledge of alternative refrigerants to ozone-depleting chemicals. The project will be funded under the Skill India Mission - Pradhan Mantri Kaushal Vikas Yojana (PMKVY).

Since India is party to the Montreal Protocol on Substances that Deplete the Ozone Layer, the country is in the process of phasing out Ozone Depleting Substances (ODS) and in the future, even non-ODS gases with high global warming potential will be phased down.

The alternative refrigerants have issues like flammability and toxicity concerns. As a result, skill training for technicians is of paramount importance, not only for improving employment opportunities, but also in educating them about safety requirement, energy efficiency and refrigerant leak minimisation.

## India & South Korea to collaborate in Research & Innovation

Dr. Harsh Vardhan, Union Minister for Science and technology, Government of India and You Young Min, Minister, Minister of Science & ICT have signed three memorandums of understanding (MOUs) during conclusion of the fourth India-Korea Science and Technology Ministers Steering Committee Meeting. These include programme of cooperation from 2018 -2021 , establishment of future strategy group and cooperation in the field of biotechnology and bio-economy.

The Press Information Board (PIB), Government of India has released the statement by the Ministry of Science & Technology about establishing Indo Korean Centre for Research and Innovation (IKCRI) in India to cooperate in the field of research, innovation, entrepreneurship and facilitating technology transfers. Two countries will further enhance cooperation in the areas of Artificial intelligence, Internet of Things focused on agriculture, energy, water and transportation and Semiconductor electronics

# Engiplas



## Excellence In Corrosion Resistance



PTFE, PFA, FEP, ETFE, PVDF, XLPE

SiC Heat Exchangers | Roto - Seamless Lining | Lined Tanks Vessels & Columns | Nutch, Bag and Cartridge Filter | Pipes & Fittings | PTFE Bellows | Full Vacuum to 20 Bar | Full PH Range | - 50 Deg c to 220 Deg c



[www.engiplas.com](http://www.engiplas.com) | [sales@engiplas.com](mailto:sales@engiplas.com)

India representative: Gemini associates | Tel: +91 987 1532918 | [geminiasociates@hotmail.com](mailto:geminiasociates@hotmail.com)



# Vacuum technology in the chemical industry

For many economic sectors, the chemical industry is an indispensable supplier of raw materials. The automotive industry, mechanical engineering, plastics, foodstuff, glass, or building materials industries, for example, are all reliant on substances that are produced by the chemical industry. Plastics or synthetic resins, which are used as the basis for coatings or foams, play by far the most important role. These are employed in a countless number of end products that we use daily. Vacuum technology is crucial for a large part of these applications in the chemical industry.

**P**olycondensation is a chain reaction of small molecule compounds, or monomers. The functional groups of the monomers involved generally react by losing water and becoming long-chain molecules, or polymers. Accordingly, only monomers with at least two functional groups can create chains or networks. The product that is formed at the end of the polycondensation depends on the number and types of functional groups of the reacting monomer. During this process, vacuum technology is used in order to prevent unwanted byproducts of polycondensation. In polymer chemistry, polycondensation is one of the most important processes. It is used to produce plastics such as polyethylene terephthalate (PET), polyethylene or polycarbonate in large quantities. Adhesives are also produced with polycondensation as well as brake pads for automobiles.

Vacuum conditions in the medium vacuum range between 1 and 10 mbar are an essential part of the polycondensation process, especially in the production of high-quality plastics. Together with temperature, vacuum technology steers the complete polycondensation process and significantly affects the resulting end product. Even the smallest fluctuations in pressure during the reaction can lead to damage of the end product or even render it unusable. The thermal load is reduced by vacuum during the process, especially with temperature-sensitive materials. Without vacuum, the production of certain plastics would not be possible; they would burn.

High-quality plastics such as PET, which the food industry uses to manufacture, among other things, millions of beverage bottles, must fulfil strict quality requirements. Those include a long life span and low diffusion in order to avoid leakage of carbon dioxide, for example. Vacuum technology guarantees high quality in the production of these plastics. In order to generate the necessary vacuum



conditions, a multi-stage combination of Roots and liquid ring pumps is usually used. These must be exactly matched to fit the special requirements of the specific application. In the production of plastics, products that tend to stick and bake on to things are the order of the day. When configuring a vacuum system, it must thus be ensured that no process components leave deposits in the vacuum pumps. With its extensive product portfolio, Pfeiffer Vacuum offers diverse solutions that can be individually adjusted to suit the requirements of your specific application. The aforementioned combination of Roots pumps – in normal and gas-cooled versions – with liquid ring pumps has established itself as a reliable solution. Especially this combination of liquid ring vacuum pump and gas-cooled Roots pump contributes significantly to the stability of the process. Besides numerous advantages for the chemical industry, liquid ring vacuum pumps also carry a crucial disadvantage in their use. This is based on their dependence on a liquid, which can lead to the pump not being able to reach the specified pressure or pumping speed in case of contamination or temperature fluctuations. These variations can be compensated by the gas-cooled Roots pump, as this pump principle is self-regulating. This is based largely on the formula:

$$p \text{ (pressure)} \times V \text{ (volume)} = \text{constant}$$

The ratio between inlet and outlet pressure determines how much cold gas from the heat exchanger is fed into the hot gas inside the pump. In this way, any differential pressure could theoretically be realized. Limiting factors are the size of the heat exchanger and the power of the engine. Both are specifically coordinated for each application

## Vacuum distillation

Distillation serves to separate liquid mixtures of substances into their pure starting substances.

This can be achieved by simple heating at atmospheric pressure, as is done with alcohol distillation.

But not all substances can withstand high temperatures. With some mixtures, it can lead to chemical reactions or to disintegration of one or more individual substances. For all these applications, distillation under vacuum is vital. Unlike distillation at atmospheric pressure, vacuum distillation occurs under lowered pressure. This allows for evaporation already at lower temperatures. The basis for this is the vapour pressure curve of the respective substance. Water, which begins



# Ross Mixers and Blenders Favoured By Industry Leaders

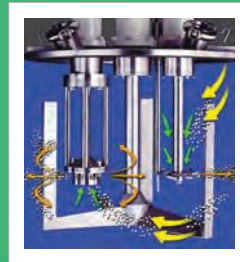
Planetary Mixers



High Shear Mixers



Multi Shaft Mixers



For over a century, Ross has been helping customers achieve their production and manufacturing goals. Simply shifting to Ross mixers and blenders can lead to a significant boost in production and operating efficiency.



Ross Vertical  
Blender Dryer



Ribbon Blender



Pressure Reactor Vessels



Speciality Fabricated Vessels



## Ross Process Equipment Pvt. Ltd

An ISO 9001:2008 Company

Plot No. D- 233/3, Chakan Industrial Area, Phase II, Village- Bhamboli, Tal. Khed  
Dist. Pune - 410 501 Phone: +91 2135 628400/01/02/03 Fax: +91 9595090311  
Email: mail@rossmixers.in Website: www.rossmixers.in

BOOST PROCESS  
EFFICIENCY

juice

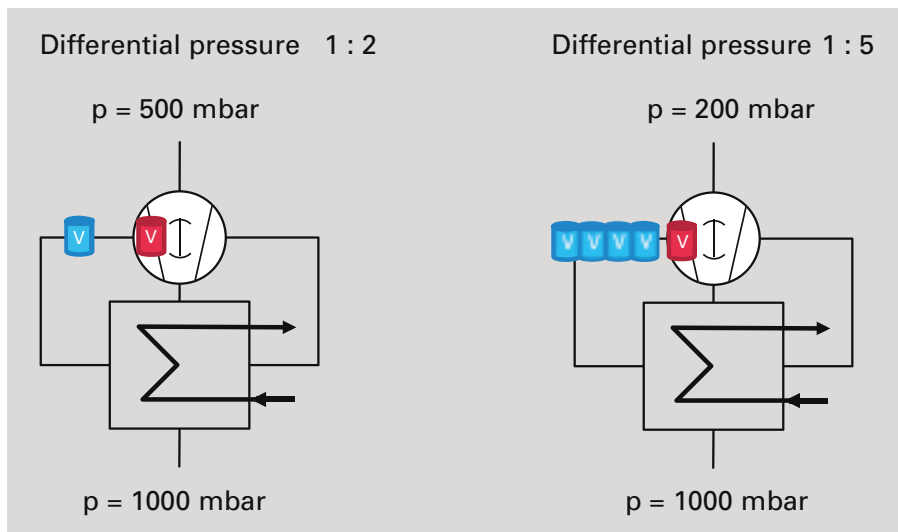


Figure 1: Functional principle of gas-cooled Roots pumps – illustration of the automatic regulation in relation to the differential pressure.

to boil at 100°C under atmospheric pressure, can already boil at lower temperatures in a vacuum, for example at 90°C and approximately 800 mbar.

This makes it possible to carefully separate heat-sensitive materials from each other or those who would begin to break down at high temperatures. Vacuum distillation, for example, is used for separating oils, fatty acids, esters or monoglycerides. One of the most important areas of application is the processing of crude oil. During the refining process, the long-chain hydrocarbons of crude oil are separated with the aid of vacuum distillation. In this process, the mixture is heated in a container. A vacuum is generated at the condenser. With so-called short path distillation, medium vacuum conditions in the area of 1 mbar are created. In this way, the evaporation temperature is reduced significantly. If the pressure selected is even lower, the process is called molecular distillation. In this case, the mean free path length is greater than the distance between the vaporizer and condenser. This means that at a distance of approximately six centimeters between the vaporizer and the condenser, a pressure of  $10^{-3}$  mbar is needed – and with an even larger distance, lower pressure is required, accordingly.

For short path and molecular distillation, Pfeiffer Vacuum offers a large selection of suitable vacuum equipment. In practice, Roots pumping stations with liquid ring pumps have established themselves as the ideal solution. Depending on the number of Roots

piston stages, a pressure of  $10^{-3}$  mbar can be reached without great effort. The liquid ring pump can also be operated by using the substance which is to be distilled. This way, none of the distillate can be contaminated with the pump's operating fluid.

One example is the processing of rolling oil. The oil contaminated by the rolling operation is reprocessed through distillation. For this, three-stage Roots pumping stations, consisting of two Roots pumps and one liquid ring vacuum pump, are used. As the operating fluid for the liquid ring pump, the rolling oil to be distilled is used. At a pressure of around 1 mbar, only the rolling oil evaporates and can be condensed out

again in the liquid ring pump. In this way, contaminants are removed and the rolling oil can be used again. Depending on the application, dry backing pumps can be used instead of the liquid ring pump.

### Polyisocyanates and vacuum

Polyisocyanates are highly reactive organic compounds. They are divided into aliphatic and aromatic polyisocyanates. Aliphatic polyisocyanates act as cross-linkers between two-component polyurethane, which is used to make coatings and foams.

Polyurethane is used to produce a multitude of different end products. The targeted hardening of the substance at room temperature and the use of a special coating device allows for adjustment of the hardening period for the individual application. In this way, coatings in a production system, for example, can simply be mixed right when they are really needed. Polyurethane created with the use of polyisocyanates plays a large role in numerous production processes. As a foam, for example, it is used for furniture upholstery, as mattress foam, carpet backing material, cleaning sponges, or filter material. Polyurethane as a foam is also used in vehicle construction, for example as a soft covering for handles, interior panelling, steering wheels or arm rests.

As a component in coatings and varnishes, polyurethane is characterized by good adhesive properties and high resistance against solvents, chemicals, and atmospheric influences. These are used in many

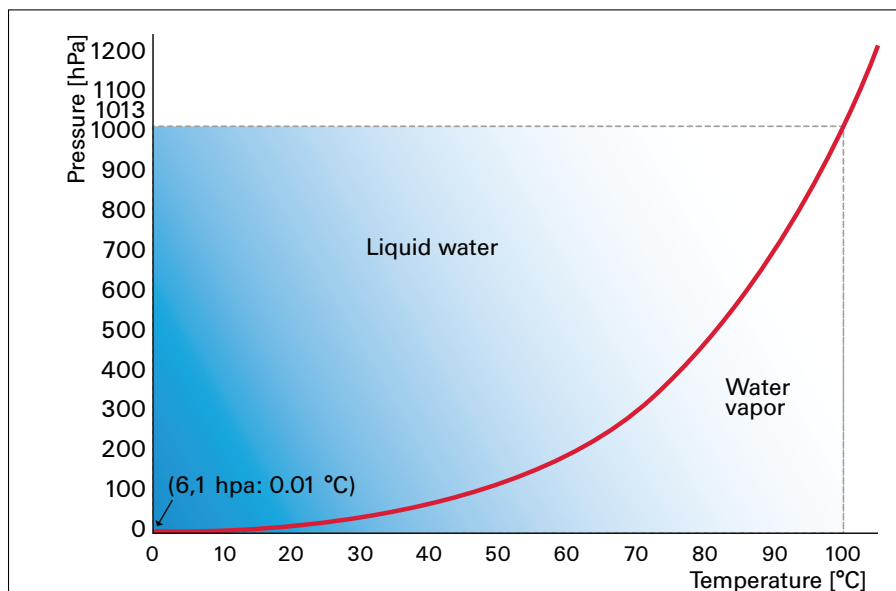
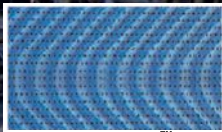


Figure 2: Separating and insulating low-molecular components through distillation.

# Excellence in Separation Technology



Static Mixer



MellapakPlus™



Rings



MVG™ Trays



Mellaplate™ Coalescer



KnitMesh V-Mister™

LEADING TECHNOLOGY AT YOUR SERVICE

Sulzer India offers the widest range of High Performance Column Internals customized specifically to suit your plant requirements. We offer complete solutions to your various needs-capacity enhancement, efficiency improvement or even energy optimization. Your choice is never limited with the range of Sulzer India products:

- MellapakPlus™ range of Structured Packings
- MVG™ and Shell proprietary Trays
- Rings for Random Packed Columns
- Separator internals for 2 phase & 3 phase separators
- Static Mixers

for more information, visit our pages at [www.sulzer.com](http://www.sulzer.com)

An ISO 9001, ISO 14001 & ISO 18001 Company

## Baroda

Tel. :91 26 5234 2194  
Email : [sales.baroda@sulzer.com](mailto:sales.baroda@sulzer.com)

## Chennai

Tel. : +91 44 2431 2436  
Fax : +91 44 2435 7276  
Email : [sales.chennai@sulzer.com](mailto:sales.chennai@sulzer.com)

# SULZER

## Sulzer India Pvt. Ltd.

Gat No. 304, At Kondhapuri  
Taluka Shirur, Dist. Pune  
Pune 412 209  
Phone +91 2137 304 000  
Fax +91 2137 304 777

## Delhi

Tel. : +91 11 2629 4771  
Fax : +91 11 2629 4226  
Email : [sales.delhi@sulzer.com](mailto:sales.delhi@sulzer.com)





Figure 3: Areas of application of polyurethane in the automotive sector,

applications, including floor coatings, textiles, leather, various materials in shoe manufacturing and in motor vehicle interiors. Especially in the last area of application, polyurethane has become indispensable.

Vacuum technology is also extremely important for the production of polyisocyanates. Following the production of the isocyanate, a multi-stage distillation process ensures the highest possible concentration. Medium vacuum conditions of up to 0.05 mbar are required for this.



Figure 4: Three-stage pumping station for distillation processes

The production of polyisocyanates takes place in potentially explosive areas. For this reason, system operators often use vacuum products that are certified according to ATEX directive 2014/34/EU. In order to cover all aspects of quality and safety in the process operation, exact configuration according to the specific requirements of the respective application is necessary.

Gas volume flows are calculated based on material data and flows in the process. These serve as parameters for selection of the appropriate vacuum pumps. Important requirements include, besides safety, the durability and reliability of the vacuum technology used. Pfeiffer Vacuum offers complete ATEX-certified vacuum systems for the production of polyisocyanates. Most processes require a multi-stage construction of the vacuum system. The experts at Pfeiffer Vacuum developed, for example, a six-stage system for a large German chemical corporation consisting of five Roots piston stages and one liquid ring stage. At different stages of the process, different gas inflows are to be taken into consideration. The system was created according to the customer's specifications and fulfilled all individual parameters.

**Vacuum solutions for the chemical industry**  
In order to create the necessary vacuum conditions for different applications, Pfeiffer Vacuum offers a full, comprehensive range

of customer-specific solutions. Especially with regard to applications in the chemical industry which require a pressure of <30 hPa, the Roots pumping stations of Pfeiffer Vacuum's Oktaline have established themselves as ideal solutions.

Depending on the required pumping speed and ultimate pressure, different pumping stages can be built in. They are available in gas-cooled or standard air-cooled versions as well as in different materials, for example, spheroidal graphite cast iron or stainless steel. Specific coatings and coupling types are also available and can be combined for individual requirements. Liquid ring, rotary vane, screw, and gas-cooled Roots pumps can be used as backing pumps. Furthermore, ATEX-certified Roots pumps are also available for use in potentially explosive environments. From conception to implementation, the experts at Pfeiffer Vacuum develop individual solutions together with customers from all different areas of the chemical industry. These solutions are exactly designed for the requirements of the individual application. ■

**Pfeiffer Vacuum GmbH**  
Headquarters Germany  
T +49 6441 802-0



## Reliable & High-Quality Pumps & Pumping Solutions

The DESMI ROTAN® gear pumps are commonly used for paints, resins and coatings.

A leading paint factory manager states:

*"ROTAN® pumps have for decades been used in many of our plants. The ED model was chosen due to its magnetic coupling. A magnetically coupled design, which has no rotating seals, ensures less downtime and lower operating costs. Every pump in our new facility is magnetically coupled, and thus we have eliminated the problems associated with packed glands and mechanical seals."*

Please do not hesitate to contact us in case you need more information about our pumps and pumping solutions.



PROVEN TECHNOLOGY  
[www.desmi.com](http://www.desmi.com)

DESMI India LLP  
IP Nadergul, Sy No.519, Nadergul Village, Saroor  
Nagar Mandal,  
Hyderabad – 501510  
☎ 91- 8790122223  
Email: [srai@desmi.com](mailto:srai@desmi.com)

# DESMI

# More Than One Valve Or Pump Choice for Every Application

With hundreds of different types of valves in the industry today and thousands of manufacturers globally how do you know which is the best product for your process? Chances are that there may be several good alternatives that could serve you well with a high mean time between failure (MTBF). But the solution is not always 100 per cent clear. The reason there is not a one size fits all. Solution is that every process has variables. The variables can be numerous and certain types of valves will perform better in one set of variables than another. It is often not as simple as just the pressure, temperature and the medium.

**P**ressure, temperature and medium are excellent starting points though. But what about other variables?

Other factors that may impact your valve selection may be:

- Specific gravity of medium
- Percent solids
- Vertical valve installation
- Isolation required in both flow directions
- Minimum, normal and maximum flow
- Manual, pneumatic, electric or hydraulic
- Supply air pressure provided
- Size of valve
- Threaded Connections
- Velocity of flow
- Percent solids
- Horizontal valve installation
- Isolation required in only one direction
- Concentrations of chemicals contained
- Required tightness of valve
- Voltage of electricity provided
- Pipeline material in which the valve be installed
- Flanged connections

The valve manufacturer or representative who asks a high number of questions and requires specific information will probably be the ones that you should trust. By capturing as much information as possible hopefully leads to less headaches and troubles for the owner.

Acceptable MTBF varies from process owner to process owner and also in various

applications. In some brutal processes, a valve that needs to be repaired every six months may be acceptable. In certain processes, if a valve fails or needs repair every 10 years then that valve can be considered poor quality or the wrong choice for the application. If your process is clean and non-corrosive you may choose from a wide variety of inexpensive ball valves. Even when there are corrosive chemicals, you still choose a ball valve with different alloys that are able to survive in corrosive chemicals. Ball valves are produced by the thousands and are widely utilized in a high number of industries.

## Dealing with Abrasive Mediums

What choices do process owners have when they have an extremely abrasive slurry? The valve selection quickly becomes more limited. Of course the owner can decide to standardize and stick with a ball valve or similar. However, by doing so they are likely to face frequent repairs or replacements of that valve. If the slurry is 35 per cent solids, lime slurry, or 60 per cent minerals slurry then the options for a valve with long MTBF becomes even more limited. For instance, lime slurry is unique slurry utilized in a multitude of industries such as chemical processing, mining, pulp and paper, power production, iron and steel, and many more. Lime causes many troubles for various types of valves because it combines the abrasive aspect of the slurry as well as the tendency to scale inside the pipeline and on stationary surfaces. Lime does not dissolve in solution but rather is a suspended solid. It is necessary to keep lime slurry in motion or the particles will settle out of solution and

create more process problems. Valves that have areas for material accumulation will likely have problems dealing with lime slurry. For instance, with a ball valve, the metal ball will become coated with a build-up of scale and this scale will be dragged through the Teflon seats when the valve is opened or closed. This action will begin to destroy the Teflon seats and the valve's ability to continue to close tightly. Also the body cavity area of the ball valve will collect build-up that will force operating torques continuously higher. This can lead to the valve actuator stalling and ball valve stem breakage.

In slurries containing minerals of up to 60-80 per cent solids, a standard valve will not be likely to survive the abrasive nature of the medium. So process owners might consider different alternatives than their standard valves. Two types of valves that are suited for abrasive slurries are rubber-lined knife gate valves and pinch valves. Pinch valves utilize a rubber sleeve that lines the entire inside of the valve body. This rubber sleeve completely isolates the internal moving components during normal operation. In most On/Off applications the valve sleeve is 100 per cent full bore and has no areas for material accumulation. A pinch valve is also one of the only self-cleaning valves available. Any material build-up on the interior of the rubber sleeve is cleaned when the valve is closed. The rubber sleeve is flexed with each opening and closing thus breaking up scale and the build-up material is flushed downstream. Also, having all moving components of the valve isolated from the process medium insures smooth trouble-free operation.



# Best Quality BWRO Membranes ever in Water Industry

Solutions for a Sustainable Future

## TM720D series

- Most consistent regular BWRO membrane in Water Industry
- Low operating cost membrane
- Gives lowest permeate TDS at low operating pressure
- Nominal salt rejection of 99.8%
- Minimum salt rejection of 99.65%
- Negligible performance drop, even after multiple CIP cycles
- 34 mil spacer for 400 sq ft membrane helps reduce fouling
- Available in 440 sq ft as well
- 4 inch membrane model also available (TM710D)
- Can work up to 600psi, 45 degree C and 2-11 pH range

## TMG20D series

- Most consistent low energy BWRO membrane in Water Industry
- Low operating cost membrane
- Gives lowest permeate TDS at low operating pressure
- Nominal salt rejection of 99.7%
- Minimum salt rejection of 99.5%
- Negligible performance drop, even after multiple CIP cycles
- 34 mil spacer for 400 sq ft membrane helps reduce fouling
- Available in 440 sq ft as well
- 4 inch membrane model also available (TMG10D)
- Can work up to 600psi, 45 degree C and 2-11 pH range

### TORAY INTERNATIONAL INDIA Private Limited

Tower 3, East Wing, 6th Floor, Equinox Business Park,  
Lal Bahadur Shastri Marg, Kurla (W), Mumbai - 400 070, India.  
Phone : +91-22-6123 0400 | bharat@toray-intl.in | www.toraywater.com

*Distributed in India and Bangladesh by :*

### Jay Water Management Pvt. Ltd.

“Jay House”, Stadium Circle, Navrangpura, Ahmedabad - 380 009, India.  
Phone : +91-79-26561051- 55  
E-mail : info@jaywater.com | Website : www.jaywater.com



Figure 1. Flowrox PVE pneumatically-operated pinch valve



Figure 2. Flowrox SKW Rubber Lined Knife Gate



Figure 3. Flowrox LRD Rotary Disc Valve

Rubber-lined slurry knife gates also use rubber sleeves to combat extreme wear caused by abrasion. Many rubber-lined knife gates incorporate a flushing port on the bottom of the valve. This allows built-up material to be pushed out the bottom of the valve to allow for trouble-free operation. With scaling and highly sticky medium, the process owner might be wise to use a Teflon-coated knife gate to prevent and allow easy release of any scaling material on the gate. In a large majority of mineral-based slurries the Teflon-coated knife is not required. A secondary seal in the valve body helps to clean the gate of material build-up.

Another unique valve is a rotary disc valve. This product operates similar to a knife gate valve with a linear operation of the closing mechanism. However, instead of a metal gate used for closing, it utilizes a rotating disc. The disc rotates in a circular fashion on every opening and closing. The advantage is that the sealing surface is constantly being rotated so that the slurry does not continuously impact a single location every opening and closing. The disc secures tightly into a wedge upon closing and can incorporate rubber and polyurethane sealing in the seating area. This type of valve is suited for extremely

high-pressure slurries up to 1,500 psig and higher temperatures.

Pumps like valves face the same types of challenges. Pump selection can be much more costly compared to valves if the incorrect pump is chosen. Pumps are dynamic and a working piece of machinery. If the pump is not running then the process is not flowing. Selection of a pump with a low MTBF may result in numerous process stoppages per year and costly maintenance and repairs. Similar to the above discussion of valves, which pump should you choose when dealing with abrasive and high per cent solid slurries?

There are multiple alternatives but let's examine a few well-known styles. The first highly-utilized type is centrifugal pump. They are very good for slurries up to approximately 40 per cent solids. In most cases these pumps will have rubber-lined internals and rubber-lined impellers. Certain manufacturer's do in fact manufacture and sell pumps for slurries up to 50-60 per cent solids. However, process owners may learn that by pumping such thick slurries with this style of pump may increase repair frequency and repair costs quite substantially.

Progressive cavity pumps can be a viable alternative as well. This type of pump can vary substantially regarding the per cent solids it can handle and is greatly influenced by the nature of the medium being pumped. For instance, with a waste water sludge this type of pump can handle between 8-20 per cent solids. However, if the medium is homogenous then it may be capable of up to 65 per cent solids. One key downside to a progressive cavity pump is that it cannot be allowed to run dry or damage will occur to the rotor and stator. New designs incorporate even-wall stator technology and 2D and 3D rotor geometry. These newer designs can result in up to 17 per cent greater hydraulic efficiency and more pressure produced per stage. The result is progressive cavity pump that runs at lower RPMs resulting in less wear and greater pressure produced in a smaller footprint. One other new advancement is the ability to change the mechanical seal without disassembling the rotor and stator or the motor and frame. This can save numerous maintenance hours and allow a mechanical seal to be removed and replaced in approximately one hour without removing the pump from its location.

The final pump product that is capable of very abrasive mediums up to 80 per cent



# ADHESIVE & SEALANT EURASIA

Adhesives, Sealants, Manufacturing and  
Application Equipment Exhibition

## 25-27 OCTOBER 2018

### Istanbul Expo Center

[www.aseurasia.com](http://www.aseurasia.com)

Media Partners



Organizer



THIS FAIR IS ORGANIZED UNDER SUPERVISION OF TOBB (THE UNION OF CHAMBERS AND COMMODITY EXCHANGES OF TURKEY)  
IN ACCORDANCE WITH THE LAW NO. 5174



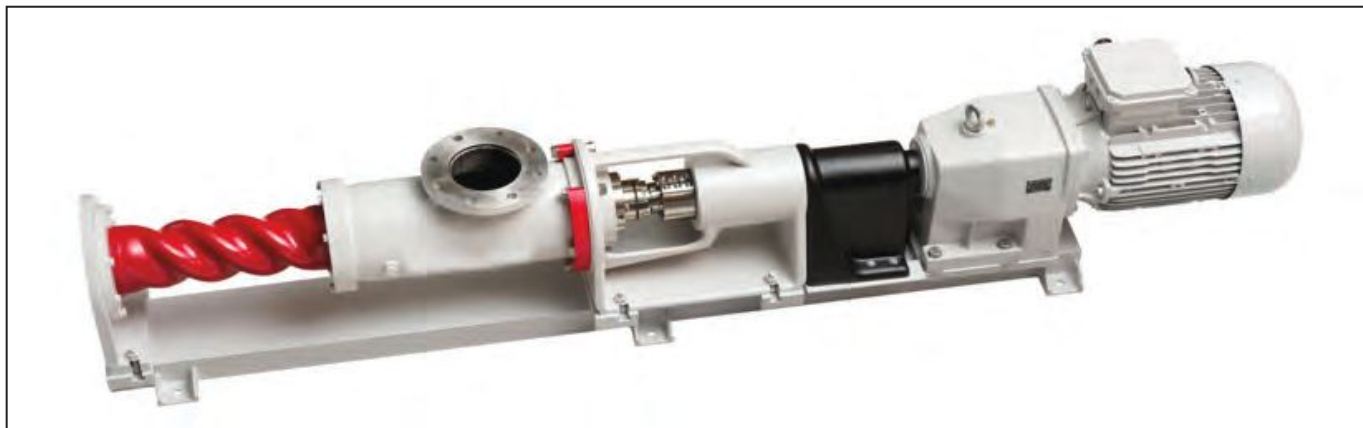


Figure 4. Flowrox C Series PC pump with Ever-Wall Stator and 3D Geometry Rotor and Removable Mechanical

solids is the peristaltic pump. This style of pump can run dry for extended periods without damage to pump. By pumping 80 per cent solids, a massive amount of water can be eliminated when trying to move mineral-based slurries. If a process owner moves a significant amount of minerals or slurries then the entire process plant can be downsized by pumping 80 per cent solids versus 30 per cent solids. A peristaltic pump also has the ability to perform suction lift applications. The nice feature of a peristaltic pump is that the only two normal wear components are the rubber hose and a small amount of glycerin in the housing.

It is important to mention that not all peristaltic pumps are similar. One style incorporates two metal shoes that compress the rubber hose. This style generates a significant amount of heat and requires a massive amount of glycerin in the pump housing to dissipate the heat

that is generated. Also, this older shoe style design compresses the hose twice per revolution, which results in early hose failure.

New peristaltic designs incorporate a single roller that rolls over the rubber hose only once per revolution. This design eliminates the requirement for massive amounts of glycerin in the pump housing. Also, since the rubber hose is only compressed once every 360 degree revolution, the hose typically lasts 2-5 times longer than shoe design peristaltic pumps. The single roller design allows peristaltic pump availability to be significantly greater than old designs

**Conclusions**

When dealing with abrasive process mediums, users may have to invest more time and effort to find the best products to survive in these processes. The time spent trialing various products may reap some significant rewards. Process downtime and



Figure 6 Flowrox LPP-T Rolling Peristaltic Pump

frequent costly repairs can be minimized. Certain types of valves and pumps can result in repair costs in excess of \$100,000 per year. As technology advances there may be better alternatives that can eliminate or severely minimize these costs. When dealing with slurries of an abrasive nature, total cost of ownership (TCO) can have an extreme impact on the operating cost bottom line. ■

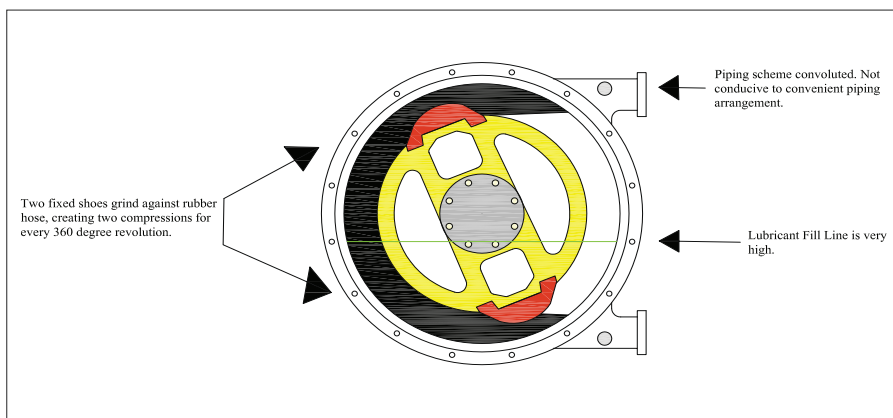


Figure 5. Shoe design Peristaltic Pump.



**Todd Loudin**  
 President/CEO North American  
 Operations  
 Flowrox, Inc  
 E-mail: Todd.Loudin@Flowrox.com

# LOUVER TYPE MIST COOLING SYSTEM

For

## CHILLERS

A Superior Alternative to Cooling Tower



▲ Louver Type MCS

**Assured Approach of 1°C to WBT.  
Guaranteed Power Saving with Small Foot Print...  
Not a miracle, a reality!**

### Other Superior Features of LTMCS

- NO FILLS / NO FINS, NO FANS
- Zero Maintenance due to all Non-moving parts, Choke-less Nozzle design and Special non-corrosive MOC
- Extremely easy operation
- Life of more than 15 to 20 years

Over 300  
installations

### Typical case study data of a 1200 TR Chiller

Sr. No.	Parameter	Cooling Tower (Induced Draft)	LTMCS
1	Wet Bulb Temperature	29°C	29°C
2	Chilled Water Temp in °C (Assumed)	5°C	5°C
3	Supply Temp. from CT /LTMCS	33°C	30°C
4	Approach to WBT	4°C	1°C
5	<b>ΔT for Chiller</b>	<b>28°C</b>	<b>25°C</b>
6	Chilled Water Compressor Motor Kw for 1200 TR	720	643
7	Energy Saved in %	-	10.7%
8	<b>Energy Saved in Kw</b>	-	<b>77 Kw/Hr</b>
9	Total Running Hours per Annum	8640	8640
10	<b>TOTAL POWER SAVED PER ANNUM</b>	-	<b>6,65,280 Kw</b>



*Mist Resonance Engineering Pvt. Ltd.*

Regd Office : 'Anandi', 1304-1/7, Shukrawar Peth, Bajirao Road, Pune - 411 002. INDIA.

Tel : (+ 91 20) 2447 2726 / 2447 1184 ■ Fax : (+91 20) 2447 4972

E-mail : mistcreation@gmail.com ■ mistcool@vsnl.com ■ Website : www.mistcreation.com



## ■ Technical Article

# Selection of Correct Non Return Valve in a Piping System for Larger Benefits

For several decades, Swing Check valves have been largely used in industries to act as Non Return valve in a piping system. However in a sophisticated piping system, it is substantial to select the valves not only functioning as return valve but considering the consequences it can have in the entire piping system safety and in overall cost. End user can advantage significantly by understanding the capabilities, limitations, advantages & disadvantages of the check valve they employ. The article scrutinizes three types of Check valves - Swing Check Valve, Dual Plate Check Valves and Axial Check valves. In order to find the best fit for a given application, several operating parameters need deliberation. All these may not be imperative for a given application but they all play a role in the selection process.

The use of check valves in a piping system is a very common practice, most piping systems depend on fluid moving equipment to energise the media, the protection of such equipment e.g. Pumps and compressor from back flow must be carefully planned in any piping system and Check valves (Non return Valves) are frequently utilised for this purpose. Though these are relatively simple devices from functional standpoint, they are often installed without adequate consideration of their performance characteristics and without proper understanding of the limitation of various designs available. For many decades, Swing Check valves have been predominantly used in industries to act as Non Return valve in a piping system. However in a sophisticated piping system it is important to select the valves not only functioning as return valve but considering the consequences it can have in the entire piping system safety and in overall cost. End user can benefit greatly by understanding the capabilities, limitations, advantages & Disadvantages of the check valve they employ. Often decisions are made on past references

and to some extent on marketing. It should however always will be remembered that more often than not, no two piping systems are identical and the Check valve that is adequate for one application may not be suitable for another necessitating valve modification or in some instances a totally different valve design. For simplicity in this article, we will examine three types of Check valves - Swing Check Valve, Dual Plate Check Valves and Axial Check valves. In order to find the best fit for a given application, several operating parameters need consideration. All these may not be important for a given application but they all play a role in the selection process.

The main Criteria's one need to consider while selecting the right type of check valves are:

- Initial Cost
- Maintenance Cost
- Pressure loss and Energy Cost
- Non Slam Behaviour
- Flow characteristics
- Fluid compatibility

**Initial Cost:** It is the factor of cost user needs to incur in procuring the valve from supplier and cost which he needs to incur in the installation of valve. Now if we compare Swing Check valves V/s Dual Plate check valves weight for 12" size there is difference of almost 30% part of this material saving is consumed in precision machining and lapping to achieve high level of performance over a longer run. Normally sizes 6" and above of Dual plate valve will cost lesser than Swing Check valve. Higher the size and material grade higher is the saving in product. Now in installation also you need lesser supporting structure for Dual Plate due to lesser weight and you need fewer numbers of fasteners to clamp Dual plate with adjacent pipe flanges. So on both counts Dual Plate check scores better over Swing Check. Noz check is a high end valves used for specific application and is costlier to both Swing Check and Dual Plate Check Valve.

**Maintenance Cost:** It is safe to say that more moving parts in a valve more is the maintenance cost. Swing Check valves if not chosen correctly which is often the case can cost heavily due to immature failure on account of fatigue and slamming. It is important to choose the correct size matching with flow rate, one study points out that almost in 70% cases swing check valve is found oversized causing partial opening resulting into

Often decisions are made on past references and to some extent on marketing. It should however always will be remembered that more often than not, no two piping systems are identical and the Check valve that is adequate for one application may not be suitable for another necessitating valve modification or in some instances a totally different valve design.



# TURKCHEM

International Chemical Industry Exhibitions



8<sup>th</sup> International Fine and Specialty Chemicals,  
Commodity Chemicals, Petrochemicals and  
Chemical Intermediates Exhibition

[www.chemshoweurasia.com](http://www.chemshoweurasia.com)



8<sup>th</sup> International Laboratory, Test- Measurement  
Equipments, Auxiliary Materials and  
Lab Consumables Exhibition

[www.chemlabeurasia.com](http://www.chemlabeurasia.com)



8<sup>th</sup> International Chemical Process and  
Automation Industry, Packaging, Recycling,  
Logistics, Labor Safety and Environmental  
Technologies Exhibition

[www.chemtecheurasia.com](http://www.chemtecheurasia.com)

**8- 9- 10 NOVEMBER 2018**  
**ISTANBUL EXPO CENTER**

Media Partner



Supporter



In Cooperation with



Organiser



THESE FAIRS ARE ORGANIZED UNDER SUPERVISION OF TOBB

(THE UNION OF CHAMBERS AND COMMODITY EXCHANGES OF TURKEY) IN ACCORDANCE WITH THE LAW NO.5174

chattering and slamming besides high pressure drop. On other side for Dual plate it is important that valve is chosen from proven manufacturer who has strict control in design and quality as it is spring which is the heart of valve if not chosen correctly may fail prematurely and can cause disruption in operation besides needing a replacement thus adding to the cost of maintenance. Nozzle check valve though has the spring but it works on compression mode unlike torsional mode in Dual plate check valve thus chances of spring failure is minimal. Crane Fluid handling associated with invention of Dual Plate check valves (Mission Valves) has experience in selecting the springs from proven source which are tested for millions and millions of cycle to perform.

**Pressure Loss & Energy Cost:** Pump or compressors needs to generate the discharge to overcome static and frictional loss of given piping system. While static head is the difference in elevation between the source and highest point of service. The frictional loss is caused by roughness in the pipe and loss by valves and fittings. Valve body geometry dictates the general flow area through the valve and some valves restrict the flow are to below 80% of pipe area thus causing huge head loss, 2nd design of closing member also plays an important role in head loss of valves, if disc swings or rotates out of the flow path can induce lower loss another important factor is special contour and shapes to fully open at low fluid velocity and create a smooth path through the valve thus inducing lower loss.

In correctly engineered Swing Check valve Disc is normally moves out of flow path when in fully open condition but reality is different as in almost 70% cases it is found that it is never 100% open and thus never moves out of flow path fully. Its Disc is heavy and not engineered to open at low fluid velocity. In Dual Plate check valves Plates shape is engineered to achieve smooth path and are also much lighter in weight thus fully opening at low fluid velocity, Highly engineered

Dual Plate Check valves use PTFE/ Graphite Sleeve and Long leg Springs to make movement of plates frictionless and highly smooth thus reducing frictional loss to a higher degree

Same is the case with Noz check rather in smaller sizes pressure loss is lower than Dual plate and Swing Check valves.

Pressure loss is normally measured by CV flow coefficient which is defined as the amount of water in gallons per minute that will pass through a valve with a 1PSI pressure drop, hence more efficient the valve greater is the CV value. Another coefficient used for calculation of head loss is resistance coefficient Kv which is defined as

$$K_v = 890 \frac{d^4}{C_v \sqrt{H}}$$

D: Diameter of valve in inch , CV: Flow coefficient of Valve  
 H = Kv V<sup>2</sup>/2G                      Kv: Resistance coefficient      V: Fluid Velocity in Ft/Se  
 G: Gravity in ft/Se<sup>2</sup>  
 H: Head loss feet of water column.

The lesson here is while it is important to consider Kv value between type of valves, the head loss between various suppliers of a given valve type does not typically produced significant change in system operation. As head loss is a clear function of fluid velocity so flow condition can affect the valve head loss. Further the velocity may affect the open position of valve. Swing check valve may require between 4-8 Ft/Se of velocity to be forced fully open by the flow. If the valve is not fully open the head loss can be significantly higher than the published head loss, even double. Hence the minimum full open velocity should be used when sizing and computing head loss for swing check valve. The head loss from various valves can be converted into annual energy cost related to electrical power needed by the

Pump or compressor to overcome the additional head loss from the valve with the equation

**Flow Characteristics;** Water hammer and its associated problem of surge pressure, vibration and shock can have serious consequences in a piping system conveying fluid, if check valves are chosen without proper consideration to their dynamic performance. They can be a major contributor to the aforementioned problem. Dynamic performance is a term used to describe how a check valve performs under various pump shutdown situation and normally illustrated by a plot of reverse velocity V/s deceleration (dv/dt). All check valve permit some degree of reverse flow prior to closure in a

pump shutdown situation and it is sudden reduction of this backflow to zero which yield a rising surge in pressure, this can be coupled with a pressure drop on the upstream side ,resulting in the formation of vaporise cavities ,compounding the water hammer phenomena and Slamming. The higher the revers velocity, the higher is the surge pressure developed and the higher the impacting force generated upon valve closure. Therefore it is important to minimise the reverse velocity, as the surge pressure generated and impact force may damage the pipe system and excessive noise may be created

Slamming relates more specifically to the valve itself and depends upon the right type of check valve selection. Valve slam occurs after a pump or compressor stops when forward flow decelerates, reverse

$$A = \frac{1.65 Q H S_g C_U}{E}$$

A: Annual energy Cost ion \$ per year, Q: Flow rate in Gallon per minute  
 H : Head Loss in Ft of water, S<sub>g</sub>- Specific Gravity ( for water 1) , C : Cost of electricity \$/ KWH U : usage percent X100 ( 1 equal to 24 Hrs per day), E : Efficient of Motor ( Usually 80%)



## SUBSCRIBE NOW

# CHEMICAL ENGINEERING WORLD

The Official Organ CHEMTECH Foundation it is India's premier technology magazine for chemical process industry professional. This highly reputed monthly publication provides novel insights on the dynamics of Indian and global process industries.

## Subscribe NOW !

Sr. No.	Period of Subscription	Yearly Subscription (in ₹)	% Discount	Amount to be paid (in ₹)	Amount You Save (in ₹)	Please Tick the box
1	1 year	1800	10%	1620	180	
2	2 year	3600	25%	2700	900	
3	3 year	5400	40%	3240	2160	

### Please fill up the contact details

First Name .....

Last Name .....

Company Name .....

E-mail .....

Mailing Address .....

City .....

Pin Code .....

State .....

Contact Number .....

### PAYMENT OPTIONS

Cheque : Please send your cheque in favour of "JASUBHAI MEDIA PVT LTD".

### BANK TRANSFER

Beneficiary: JASUBHAI MEDIA PVT.LTD

Bank: HDFC Bank Ltd

Branch: Marine Drive

Address: 143, Ground Floor, Soona Mahal,  
Marine Drive, Mumbai-400021

Bank Account No.: 12122020002057

IFSC Code (NEFT/RTGS): HDFC0001207

All the above complete field along with cheque should reach us at:

Jasubhai Media, 3<sup>rd</sup> Floor, Taj Building,  
210 Dr D N Road, Fort, Mumbai-400001.

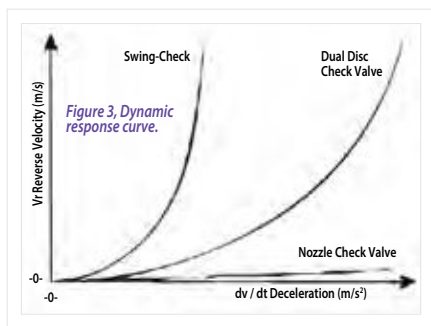
Tel: 022-4037 3636 Fax: 022-4037 3635

Email ID: dilip\_parab@jasubhai.com

Web: www.cewindia.com





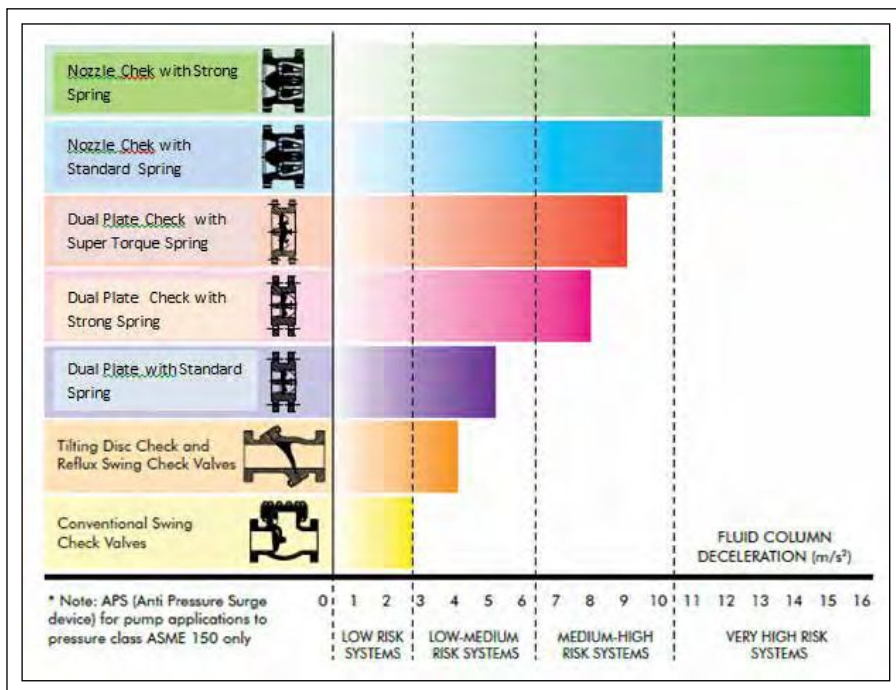


and accelerate back. The check valves must close quickly before the reverse velocity is too high, in order to minimize the surge pressure and protect the line. Extensive research has been conducted into the dynamic response of all check valves and it has been found that slam can be reduced by improving dynamic response of valve. This is achieved by ensuring that

- The Disc has low inertia and friction
- The travel of Disc is short
- The closure of the disc is assisted with springs

On all above parameters Axial Check (Noz Chek) scores high over Swing type and Dual Plate type, another feature this valve has is maintenance free as spring is centrally guided and spring force is on compression unlike in Dual plate check valves where spring force is torsional

As clearly visible Swing check has a poor response to changes in a fluid movement in a pipeline, Spring loaded Wafer Check Valve such as crane Duocheck using a maximum torque independent springs has a better response whereas a system which requires a very fast response Axial ( Nozzle )check provide excellent response time ,the reason is moving components are of lower mass



.have a shorter distance to travel and use of properly size spring is helpful.

In making a decision on what type check valve to use, on basis of dynamic performance, following guidelines can be useful

It should be noted that because the Nozzle check valves has the best dynamic performance, this does not mean it has to be selected for all liquid application . It is more suitable for very rapid deceleration rates specifically in incompressible flow.

**Fluid Compatibility:** Line media is critical for selection of type of check valve, Normally most type will handle clean media and will need special attention if suspended solid concentration is on higher side, If the valve has a straight smooth flow path, the potential for clogging is greatly

reduced, with this mind Dual Plate or nozzle Check valves should not be used for the media containing high solids

Now that the types of check valves and their performances are understood, one needs to apply rational process for specific application that satisfies System parameters. There is no single Check valve that is best for all application. Every Piping systems and Installation will require different weights to be given to selection criteria to arrive best suited type of check valves ■

Swing Check	Dual Plate Check	Axial Check
Low Inertia	Low Inertia	Low Inertia
Minimal Travel	Minimal Travel	Minimal Travel
Mechanical Assistance	Mechanical Assistance	Mechanical Assistance
No	Yes	Yes
No	No	Yes
No	Yes	Yes

**Author's Details**



**Mr. Dinesh Upadhyay**  
Sales Director- India  
CRANE ChemPharma & Energy  
Flow Solutions, India  
Email: dupadhyay@cranecpe.com

# Brilliant technology Italian quality

## Saurus939:

The vacuum pump made to live longer. Unique in reliability, performance and consumption.

Fit and forget!



## Criox® System:

patented rotary vacuum dryer/powderer with motor-driven lump breaker units

## Planex® System:

multi-patented paddle vacuum dryer with ZeroFriction® planetary movement eccentric agitator



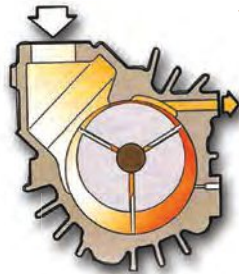
## CosmoDry® System:

paddle vacuum dryer with concentric agitator, fitted with a shaft dismountable in sections



marketing@italvacuum.com  
www.italvacuum.com

**Italvacuum Agent: Vacuum Drying Technology India LLP, Mr. Jayant Joshi - B 102 Shubh Sarita, Appasaheb Sidhaye Marg Nr Shrikrishna Nagar, Borivali East - Mumbai 400 066 - Phone No 9820047858/9819982801 - info@electromechengineering.com**



## VACUUM SOLUTIONS

*Toshniwal*



### APPLICATIONS

**Pick and place, bottle filling, filtration & solvent recovery, vacuum impregnation, vacuum packaging, vacuum drying, heat treatment, general engineering, distillation, freeze drying, oil purification, research & development.**



Roots pumping system



Centralised vacuum system



Roots pump with condensor  
(for solvent recovery)



Oli lubricated vacuum pump

### Toshniwal Instruments (Madras) Pvt. Ltd.

267, Kilpauk Garden Road, Chennai - 600 010. India / Tel: +91 44 26448983 / 8558

Email: sales@toshniwal.net / Web: www.toshniwal.net

**Branches : Bangalore, Delhi, Hyderabad, Kolkata, Mumbai, Vadodara**

# Failure of Double Wall Jacketed Piping in Refineries: Causes and Prevention

The application of double wall jacketed pipeline in sulfur recovery units of refinery plays a major role in productivity of sulfur. The sulfur content in crude oil may contain 0.22 wt% as obtained by detailed assay report. This sulfur has been extracted from various hydrocarbon processing units as sour water. Further the sour water processed in sulfur recovery unit to produce sulfur in solid powder form. The molten sulfur condenses via sulfur condensers to produce solid sulfur. The molten sulfur transferred to double wall jacketed pipeline and its failure case study is discussed. An improper design results in internal and external corrosion of internal core pipe deteriorate the pipe within five years. Root cause is analyzed and possible ways to mitigate similar failures is suggested.

The double wall pipeline is utilized in petroleum refineries and chemical process industries for maintaining liquid sulfur in melting temperature or not below sulfur condense temperature within internal pipe or similar fluid services in similar piping. The low pressure steam supplied within external pipe transfers heat to internal pipe through its wall thickness. Heat transfer depend wall thickness, corrosion scale deposit on inner and outer surfaces of internal pipe, steam temperature, sulfur temperature and material of pipe. One such jacketed pipeline was failed during service is discussed in this short technical paper. The inner pipe contains molten liquid sulfur and outer pipe contains low pressure steam. The nominal pipe size of inner pipe and outer pipe is 50 mm and 75 mm respectively. Both the pipes were made up of ASTM SA106 Grade B carbon steel with design pressure of 0.9 kg/cm<sup>2</sup> and design temperature of 250 deg C. The pipelines were operated at 0.11 kg/cm<sup>2</sup> pressure and 160 deg C temperature. Frequent failures were observed on double wall piping system and new pipes were installed. It constitutes major breakdown of units and loss of revenue. The insulation was provided for complete double wall piping network. The failure was confirmed by pressure drop within internal pipe due to molten sulfur clogging resulted in reduction of pipe area for fluid to flow. No external steam leakage was observed. This short review paper discusses the causes, analysis and prevention of failure.

## Failure Causes and Analysis

A 2 inch inner pipe weld with 3 inch outer steam jacket pipe carries liquid sulfur from coalescer gas vessel to sulfur locks. The location of failure is observed on cross connection of double wall pipe shown in figure1. A 2 inch inner pipe of 5.54 mm thickness has corrosion allowance of

3 mm. The inner pipe wall thickness reduces and fails due to corrosion. However, it is difficult to determine a failure due to internal or external corrosion. Both the corrosion may have occurred possibly for cross connection failure. The failure pattern is due to poor design subsequently resulted in metallurgical prone corrosion failure.

**External Corrosion on Inner Pipe:** The low pressure steam condensate traps within external pipe could not able to drain since non availability of separate drain line. The absence of wear plate on inner pipe further erodes eventually.

**Internal Corrosion on Inner Pipe:** The forged cross connection pipes were not used during erection and instead cross connection fabricated locally from sub-standard pipes by unqualified welders or fabricators was observed initially for fabricating T-joint from records and documents. This may lead to non uniform inner surface of internal pipe particularly at weld joints location conducive for stagnant molten sulfur deposits. This sulfur deposited in stagnant locations further build up deposits and alters the localized electrochemical reactions of internal pipe at those sulfur deposited area locations. This localized electrochemical alterations attack the inner surface wall on or near the weld joint. Further reactive process gas agents like hydrogen sulfide present in liquid sulfur increases deterioration of internal pipe. After internal pipe perforates, the steam from outer pipe enters into internal pipe through perforated area, mixed with molten sulfur. A mixing cools liquid sulfur suddenly and solid sulfur formed subsequently clogged the internal pipe completely. These have been indicated by pressure gauges installed in those piping as action of sudden pressure drop which was noted.

**Internal Corrosion of Outer Pipe:** No leakage of steam from outer jacketed pipe was reported. Prior history confirms no such leakage observed till now from construction.

**Welding Procedure and Non Destructive examination during and after Fabrication**

The welding of failed cross connection was fabricated as mentioned below. All the weld joints were fabricated by fillet weld and no other joint design (single v groove) were used.

1. Welding one end flange into inner pipe
  2. Guide strip of equal circumference were divided for fillet joint between inner and outer pipe
  3. Welding wear plate into inner pipe where steam impinges an external surface of inner pipe
  4. Welding remaining section of inner pipe to outer pipe
  5. Welding outer pipe to inner pipe on remaining three flange connections
  6. Performed liquid penetrant test and hydro test on inner pipe at 3.0 kg per sq.cm
  7. Liquid penetrant and hydro test were conducted on outer pipe at 12.0 kg per sq.cm
- It was observed that no defects were found from fabrication during initial welding construction. No significant observations were recorded during initial fabrication.

The fillet root pass welded with E70XX series welding rod and no post weld heat treatment was done. The pre heating before welding was maintained at 150 deg C to avoid hydrogen dissolution in welded joints. This may cause hydrogen embrittlement of fillet welding. The hot and subsequent passes were welded by E-60XX series welding rods.





Semi Automatic Filling Machine  
RH-FM100-FFS



**Precise  
and Pure**

**FEATUERS**

- \* Automatic Bottle feeding, Peristaltic/ Piston Pump Filling and screw capping Rotary conveyor system
- \* Micro controller based control circuits
- \* Membrane Keypad with Menu driven LED
- \* No Bottle No Filling and Suckback facility

**RAVEL HITEKS PVT. LTD**

150-A Electronics Industrial Estate, Perungudi, Chennai - 600 096. T.N.

Ph : 91-44-24961004/0825/3241/3251, Fax : 044-42049599,

email : sales@ravelhiteks.com Web site : www.ravelhiteks.com



**ADVERTISE TO EXPAND**  
your reach through

**Chemical**  
Products Finder



**PharmaBio**  
World



**OffshoreWorld**



**CHEMICAL**  
ENGINEERING WORLD



For Details Contact:

Jasubhai Media Pvt. Ltd.

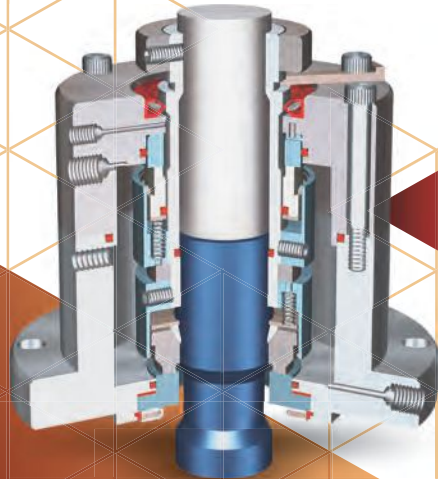
Taj Building, 3<sup>rd</sup> Floor, 210 Dr D N Road, Fort, Mumbai - 400 001

Tel: 022-4037 3636, Fax: 022-4037 3635

Email: industrialmags@jasubhai.com



# YOUR FAITHFUL COMPANION



**FOR  
GLASS - LINED  
REACTORS**



SEALS OF INTERNATIONAL CLASS  
STATE-OF-ART MANUFACTURING  
SOLUTIONS... NOT MERELY PRODUCTS



PUMP & AGITATOR SEALS FOR OIL & GAS,  
REFINERIES, PETROCHEMICALS, PHARMA PLANTS,  
POWER STATIONS, PULP & PAPER

EXPORTS ACROSS THE GLOBE



**HI-FAB ENGINEERS PVT. LTD.**

1103/B, WESTERN EDGE II, Kanakia Spaces, Borivali (E)  
Mumbai - 400 066. INDIA

Tel.: +91-22-40766555 Fax.: +91-22-40766556

email : info@hi-fab.com website : www.hi-fab.com

MUMBAI | BARODA | CHENNAI | HYDERABAD | INDORE  
| PUNE | VAPI | BANGALORE | DELHI | KOLKATA

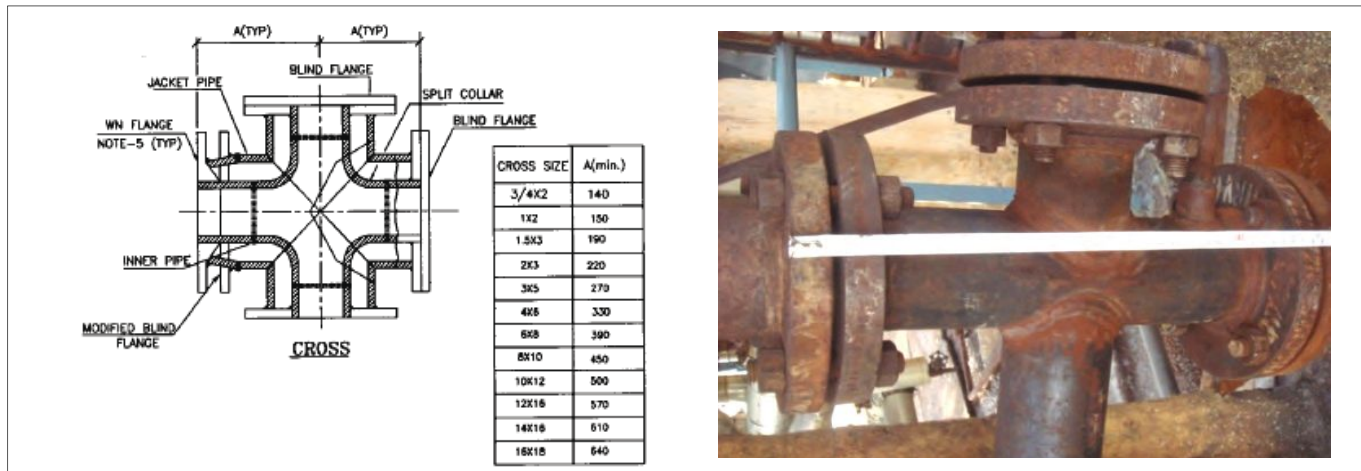


Figure 1: Shows cross connection of jacketed double wall piping in sulfur recovery units and its geometric features

**Discussion**

The phenomenon of failure is due to inadequate condensate draining of steam on external jacketed pipe and sharp edge of inner core pipe at cross junction. Inadequate draining causes cavitation damage on external surface of inner core pipe where condensate impinges. Also inner cross connection having sharp edges acting as stress raisers and it leads to sudden changes in flow pattern of molten sulfur resulted in localized erosion corrosion. Cumulative effect of aforementioned mechanisms may results in failure of jacketed pipe. The condensate drain line was not provided separately in an external pipe design and it is considered design defect. Therefore both internal and external corrosion contributes metallurgical prone effect on material corrosion in inner pipe due to design deficiency. The failed portion did not confirm to any standard specification. The standard cross connection is shown in figure 1 which has design for smooth laminar molten sulfur flow pattern in internal pipe at cross connections. However, right shown figure were not constructed as per design shown in left figure and pressure drop was found in the right shown cross connection figure which was failed.

**Recommendations to avoid Failure**

- An inner bar shall be fixed during fit up fabrication for maintaining proper concentricity between inner core and outer jacketed pipe. It may lead to uniform load distribution on effective area of welded joint between inner and outer pipe.
- The wear plate shall be installed on inner core pipe. This certainly avoids the inner

pipe from erosion since steam impinging on external surface of inner core is severe.

- The condensate drain lines shall be provided on outer jacketed pipeline as a provision for draining the condensate available in steam. Otherwise condensate trapped within jacketed pipe gradually settles inside shell and corrode further an inner pipe.
- Before taking shut down of steam jacketed lines, the condensate trapped within shell shall be drained out completely.
- Proper guide strip shall be provided on inner pipe for uniform steam distribution to avoid process fluid concealing.
- The venting holes shall be provided on outer pipe to empty out residual water.
- The cross connection edge corners shall be provided with smooth surfaces such that smooth laminar flow may occur on cross connections. The maximum the smooth minimum the damage on inner core pipe.
- Hydro test shall be carried out for every 5 years on internal pipe and outer jacketed pipe which assure structural integrity.
- The inner pipe shall be flushed properly to remove stagnant sulphur deposits if any present which further avoids under deposits like active sulphur agents and prevent from under deposit corrosion.
- Low pressure steam in outer jacketed pipe shall be shut off when the jacketed lines are shut down.
- Construction of steam jacketed lines shall be conformance international and national code standard specifications
- Epoxy internal coated inner pipe shall be used for inner core pipe which exhibits corrosion resistance at 150 deg C for molten liquid sulfur.

**Conclusions**

The cross connection pipe clogged with sulfur deposits were analyzed and it is observed inner core pipe failed at fillet weld joint between inner core pipe and external jacketed pipe. It is concluded as design defect and further recommendations were provided to improve the design of those pipelines. Improved design pipe cross connection were replaced after this failure and author experiences no leakage was obtained even after 5 years. No pressure drop was observed in those piping systems. ■

**References**

1. ASME Boiler and Pressure Vessel code, American Society of Mechanical Engineers ASME Sec IX, USA
2. SME Boiler and Pressure Vessel code, American Society of Mechanical Engineers ASME Sec II A, USA
3. ASME Boiler and Pressure Vessel code, American Society of Mechanical Engineers ASME Sec V, USA
4. ASME Code for Pressure Piping, American Society of Mechanical Engineers ASME B31.3, USA

**Author Details**



**S Chidambaram**

Officer Inspection and Metallurgy  
 Inspection Department  
 Numaligarh Refinery Limited  
 Contact: chidambaram.s@nrl.co.in



# SURAJ

India's Leading Manufacturers of  
Stainless Steel

Seamless Pipes, Tubes, 'U' Tubes, Flanges & Fittings with Electropolishing.



Fast response, Guaranteed Quality. In a large Stock & Production Range.

Deliver Customized Near Net Shape & Finish with Smaller to Large Quantity.

All Required Testing Facility Available In-house.

We are Supplying under all Customer & Third Party Inspection Agencies.



**SURAJ LIMITED**

Serving World Wide Oil, Gas & Power Industries

**REGD OFFICE :** "SURAJ HOUSE", OPP, USHMANPURA GARDEN, ASHRAM ROAD, AHMEDABAD - 380 014 GUJRAT (INDIA)  
PHONE : 0091 - 79 27540720, 27540721 | FAX NO : 0091 - 79 27540722 | E-mail : suraj@surajgroup.com

**MUMBAI OFFICE :** 311/317, BLOCK NO 3, 1ST FLOOR, KANJI MANSION, S.V.P ROAD, MUMBAI - 400 004 (INDIA)  
PHONE : 0091 - 22 23891649, 66362534 | FAX NO : 0091 - 22 23854979 | E-Mail : surajm@surajgroup.com

[www.surajgroup.com](http://www.surajgroup.com)

*Progress is Life*

**Cole-Parmer®**  
scientific experts

*The Next-Gen, Best-in-Class*

## Cole-Parmer® Latex & Nitrile Gloves

Perfectly Engineered for Pharmaceutical Applications



Request Your  
Free Sample  
Glove Today!

- From Laboratory Bench to Production Floor, we've a Glove for You
- Choose from Sterile, Non-Sterile Latex and Nitrile Gloves
- Size ranging from S to XL and length from 9.5" to 18"
- Manufactured under strict GMP, complying with ISO, EN and ASTM standards



Contact for Placing Orders/Sampling Requests:

☎ 022-6139-4444

✉ [response@coleparmer.in](mailto:response@coleparmer.in)

For More Details, Visit:

🌐 [www.coleparmer.in](http://www.coleparmer.in)



## ■ Technical Article

# Sizing and Selecting the Proper Metering Pump

In process application, large amounts of chemicals are used during daily operations and the volumes of chemicals are large and very precise, with exact amounts delivered according to strict injection schedules. Thus the pressures - from very high to very low - for injecting the chemicals should be governed precisely. Metering pumps have—whether mechanically, hydraulically or electronically actuated—raised to the fore as a technology of first choice for the injection of chemicals in processing and agricultural applications, but within the realm of metering pumps there are many different styles and modes of operation. The article explains the different metering-pump technologies and illustrates how the user should select the proper size and style depending on the injection application for which the pump will be tasked.

A typical process application can consume large amounts of chemicals during daily operations. While the volumes may be large, though, they must also be very precise, with exact amounts delivered according to strict injection schedules. The pressures—from very high to very low—that the chemicals are injected at must also be governed precisely. This demand for precise flow rates at predetermined schedules and pressures requires the use of a very specific pumping technology, one that can ensure successful, reliable adherence to the injection schedule and fluid volumes.

Metering pumps have—whether mechanically, hydraulically or electronically actuated—risen to the fore as a technology of first choice for the injection of chemicals in processing and agricultural applications. Today's metering-pump technology can be easily set to deliver exact volumes according to a set schedule, and at varying pressures.

But within the realm of metering pumps there are many different styles and modes of operation.

### Know the Variables

When determining which metering pump is the best option for a chemical-injection application there are a number of variables that must be taken into consideration, including:

- Flow Rate:** Metering pumps should never be oversized, meaning that determining the exact flow rate that is required for the application is of paramount importance. With that in mind, a metering pump should be sized so that the maximum expected flow rate is 85 to 90 per cent of the pump's capacity, which will leave room for additional capacity, if needed.
- Materials of Construction:** Metering pumps are available in a variety of materials, most commonly 316 stainless steel, C-20 stainless steel, PVC and Kynar PVDF. When selecting a metering pump's materials of construction, the corrosion, erosion and solvent action of the chemical must be taken into consideration. For example, solvent-based chemicals may dissolve plastic-headed pumps, while acids and caustics may require stainless-steel models. The effects of erosion must also be considered when the chemical takes the form of abrasive slurry.
- Chemical Makeup:** Chemicals come in many formulations, from extremely thin to highly viscous, while they can also be classified as a slurry or off-gas when transferred. Standard metering pumps are typically able to handle clear liquids with viscosities ranging from water-like to 1,500 cPs. Chemicals with viscosities that approach 5,000 cPs or have light suspensions will require special liquid ends. Those with viscosities up to 20,000 cPs or that contain up to 10 per cent solids will require special diaphragms, while ones that automatically vent accumulated gas will need their own variety of liquid ends.
- Driver:** Drivers, which can be powered by electricity, water, gas, air or the sun, must be selected according to the utilities that are available. Driver selection must also take into account any environmental hazards that may be found in the operating area, with the operator realising that pumps used in remote locations may not be able to be inspected as often as those in controlled environments.
- Environment:** Determine if the pump will be operating indoors or outdoors. If used outdoors, the pump must be sheltered from direct sunlight. Any pumps that will be used in freezing temperatures can only pump fluids that will not freeze at that temperature.
- Method of Control:** The operator must know how the pump will be used, either manual continuous operation, on/off operation of operation that is governed by a process signal.

When all is said and done, method of control may be the most important variable when choosing a metering

www.libertyvalves.com

**LIBERTY<sup>®</sup>**  
**VALVES**

**IBR** | **FIRE SAFE**  
CERTIFIED | APPROVED



NO.1016 QEY71



- API 6D / API 600 Licensee
- Gate, Globe, Check & Plug Valves
- Fire Safe approved Ball Valves as API 6FA Standard
- IBR approved Valves

- Ball, Butterfly & Plug Valves with Pneumatic Actuators & Solenoid Valves
- Glandless Piston Valves for Steam & Thermic Fluid Application
- Three Way, Four Way Ball Valves
- Jacketted Ball Valves

**LIBERTY VALVES PRIVATE LIMITED** | Mfgs. & Exporters of all type of Industrial Valves

Office & Work : 15 & 16, Jinaam Industrial Estate, Near Dhumal Nagar, Waliv Road,  
Vasai (East), Dist. Thane - 401 208, INDIA. | Tel.: +91 82912 67641/42/43/44 | E-mail: sales@libertyvalves.com

# ADVERTISE TO EXPAND

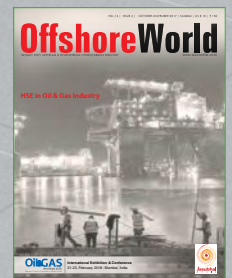
your reach through

**CHEMICAL**  
ENGINEERING WORLD

**PharmaBio**  
INSIGHT INTO THE PHARMACEUTICAL AND BIOTECH INDUSTRIES  
World

**Chemical**  
Products Finder

**OffshoreWorld**



**JASUBHAI MEDIA PVT. LTD.**

Taj Bldg., 3<sup>rd</sup> Floor, 210, Dr. D. N. Road, Fort, Mumbai-400 001  
Tel.: 91-22-40373636, Fax: 91-22-40373635  
E-mail: industrialmags@jasubhai.com



**Metering pumps have long set the standard in chemical-injection applications, but only if the operator selects a model that addresses all of the many operational variables.**

pump, so let's take a closer look. Many styles of metering pumps allow their flow rate to be adjusted manually through the use of a micrometer dial. Adjusting this dial changes the pump's stroke length and allows the pump to be operated anywhere between 10 per cent and 100 per cent of its rated flow capacity. Metering pumps with micrometer dials may also feature a variable speed drive that allows adjustment of the pump's stroke speed. Utilising the two in unison can allow additional adjustability or turndown capabilities over the range of the drive, depending on the pump's stroking speed. For example, a pump operating at 75 strokes per minute (spm) would produce a 5:1 turndown ratio on speed with the variable speed drive and a 10:1 turndown ratio on stroke length via the micrometer dial.

Flow rates can also be controlled automatically by a process signal and through the implementation of electric or pneumatic positioners that can adjust the stroke length, which will deliver a full 10:1 turndown ratio. In this method of control, the number of doses will remain constant with the size of each dose reduced, resulting in doses that are uniformly distributed in a constantly flowing line.

Metering pumps that use a variable speed drive will deliver a turndown ratio that is determined by dividing the pump's stroke speed by its minimum operating speed. A variable speed drive will enable the pump to inject a dose of the same size on each stroke, but since the stroke speeds will change, the doses themselves will be less frequent. Additionally, it is not practical to use a variable speed drive on motor-driven pumps that normally operate at speeds less than 100 to 150 spm since slowing the motor causes each stroke to take longer to complete from start to finish. However, electronic metering pumps, which are pulsed by a solenoid, can operate at less than one spm because

the timing of each stroke from start to finish is uniform at every stroking speed.

**Planning a Metering-Pump Installation**

So now that all of the variables have been identified and reviewed, it's time to design the pumping system, keeping in mind any location or environmental concerns that may be present. For best results, the system's design should originate from the liquid source or feed tank and work its way to the injection point while keeping in mind that metering pumps will be able to 'push' against great pressures but will struggle to 'pull' over longer distances.

This means that suction lift should be limited to no more than four feet (1.2 meters) and that a foot valve should be used in top-mount installations. Flooded suction is always preferred in a metering-pump installation as it makes the pump easier to prime, but the length of the flooded suction should be limited to six or seven feet (1.8 to 2.1 meters). And, as with all pump installations, adequately sized lines should be used and piping runs should have minimal bends, elbows

or other design characteristics that may restrict or limit flow.

Other components of the installation to consider include:

- **Suction Piping:** The traditional rule of thumb is to use suction piping that is one size larger than the pump's suction connection, though it is acceptable to use piping that is the same size as the suction connection if the metering pump will be operating at a slow speed when transferring low-viscosity chemicals. Generally, do not use hard piping that is smaller than 1/2" in diameter or that is smaller than 3/8" in diameter for low-flow applications that use plastic tubing.
- **Discharge Piping:** The size of discharge piping is not as critical as that of suction piping, but the piping must be suitable for the discharge pressure. Typically, matching the pipe size to the discharge connection should be sufficient to ensure proper and reliable operation.
- **Suction Strainer:** A suction strainer should always be used as it will prevent foreign matter from entering the pump's ball checks.







spikes that may be caused under these acceleration circumstances and, in the case of high-volume pumps, reduce piping harmonics.

- **Injection Quills/Check Valves:** An injection quill that is installed at the pump's injection pump will serve as a check valve while providing better dispersion of the chemical. In low-pressure applications, an injection quill that incorporates a corporation stop, which allows the injection quill to be inserted or removed without having to drain or shutdown the system, will improve efficiency and overall performance.

### Conclusion

In process or agricultural applications where precise, reliable, efficient injection of chemicals is critical to optimising performance, metering pumps have been proven over the years to deliver the required method of operation. However, knowing that requiring a metering pump is not nearly enough to ensure that the best pump will be chosen for the job. A long list of important variables must be considered, along with an array of pump components that will help optimise performance, if deployed appropriately. Successful chemical injection via metering pump will only be achieved if all variables are taken into consideration and system installation adheres to suggested protocols. ■

- **Flanges/Unions/Compression Fittings:** At least one of these must be installed at the pump's suction and discharge ports in order to more easily facilitate maintenance procedures.

- **Isolation Valves:** Large-port, quick-opening isolation valves should be placed at both the suction and discharge ends of the installation as a way to ease maintenance operations. Ball valves are usually the best choice for this operation, while needle valves should not be used because their design will cause the creation of a flow restriction.

- **Calibration Column:** Because metering pumps very often feature pulsed flow at low volumes a draw-down calibration column is the most accurate and convenient method to measure pump performance, provided that the liquid in the column draws down smoothly and stops precisely at the end of each suction stroke. A tall, thin column should be used to ensure ease of reading and reporting accuracy. Calibration columns can also be helpful in determining if any wear has occurred or dirt has accumulated in the pump's check valves; if the liquid in the column 'bounces,' that may indicate that the valves are worn or dirty.

- **Relief Valve:** Though the metering pump may be constructed with an internal relief valve, it is recommended that an external relief valve also be installed. The external relief valve should be set at 50 psi (3.5 bar) or 10 per cent above the maximum operating pressure, whichever is greater. Any

chemical that flows through the relief valve is piped back to the feed tank. Using transparent tubing for the relief valve will allow the operator to observe any returned fluid and identify any impurities. When piping the relief valve's return to the suction side of the installation, the return must be upstream of the pump's isolation valve so that the flow path will not become blocked.

- **Back-Pressure Valve:** This component is only necessary when the installation does not produce adequate back pressure and the pump does not contain a built-in back-pressure device. Back-pressure valves are also required when a system has a low-pressure injection point that is hydraulically lower than the feed tank.

- **Pressure Gauge:** If this optional device is installed, a diaphragm seal must be used if the pump is to be transferring chemicals that are corrosive to stainless-steel gauge parts, or are viscous or contain particles that could clog the Bourdon tube within the gauge. The pressure gauge should be sized 30 per cent to 50 per cent larger than the maximum expected pressure that is produced by the system.

- **Pulsation Dampener:** Pulsation dampeners are most commonly required in systems that feature long discharge lines where fluid acceleration during the pumping process can adversely affect the pump's maximum pressure capacity or relief-valve setting. The pulsation dampener will minimise the pressure

### Authors' Details

#### Tom O'Donnell

Director - Business Development  
Neptune Chemical Pump Company & PSG  
Email: Tom.ODonnell@psgdover.com

#### Ravi Prasad

Director of Sales  
PSG India  
Email: sales.psgindia@psgdover.com

# ARC's Sixteenth India Forum Focuses on Digitization

**A**RC Advisory Group's sixteenth India Forum for the process and discrete industries, titled Digitizing and Securing Industry, Infrastructure, and Cities from July 5-6, 2018, Bangalore, India attracted over 250 delegates. Last year the core theme was digital transformation; this year we've moved to the next level of how digitization can help industries, infrastructure and cities grow in a secure, collaborative environment. That digitization is an imperative to succeed in a competitive world is a given; but the transition must be well strategized and charted. The transition aspect of digitization was discussed through extensive networking among delegates, end users, and solution providers.

## The backdrop

Today, companies are digitizing business processes and exploiting the increasing convergence between operational technology (OT) and information technology (IT), and engineering technology (ET) on the plant floor. Governments around the world are supporting manufacturing growth initiatives. And these emerging business models allow manufacturers to collaborate

more effectively. Information-driven digital enterprises leverage new technologies to achieve agility and sustain a competitive edge. All these were discussed at the ARC India forum. This two-day forum was structured to disseminate information and technology effectively and provide end users, solution providers and decision makers an opportunity to network and get an overall view of the market and its requirements.

The session topics covered industry and infrastructure moving towards digitization; automation trends, cybersecurity; smart technologies and smart cities; and several end user experiences. On both days there were lively and thought provoking question and answer sessions with the speakers.

## Forum proceedings

G. Ganapathiraman, Vice President and General Manager, ARC Advisory Group, India welcomed the delegates; and for the lighting of the traditional lamp he invited the global sponsors on stage. Later, he called the silver, industry association, and media sponsors on stage for a photo session. This

was followed by the keynote presentations, which set the tenor for the forum.

The success of our forum is largely due to the tremendous support we received from our Sponsors: Global Sponsors: Bentley Systems, Mitsubishi Electric, Siemens, Wind River; Silver Sponsors – AVEVA, Emerson, and STEAG; Global Logo Sponsor: Inmation

Industry Association Sponsors – AIA and CIO Forum

Media Sponsors – A&D, CED, Chemical Industry Digest, Chemical Engineering, Chemical Engineering World, Electronics Media, IED Communications, Industrial Automation, Industrial Products Finder, IIoT World, Infrastructure Today, OffshoreWorld, Power, Reliability Web.com, The Record, and Uptime.

## Summing up

ARC's forum drove home the point that in a connected world automation and keeping abreast of new technologies catalyzes industrial growth. The time has come to migrate from the old to the new - digital, collaborative enterprises mark the way ahead. Reactive analysis/maintenance is obsolete - the spotlight is on predictive and preventive analysis.

Across industries there is a deluge of information and data - and those who can extract the right information at the right time will succeed in a competitive environment. Challenges abound, but suppliers who believe in collaborating and resolving end user pain points will thrive; at the other end of the spectrum, proactive and flexible end users who adopt new technologies will surge ahead. ■

For details Contact :  
**Sharada Prahladrao**  
 Editor & Public Relations Manager  
 ARC Advisory Group, India



# Choose the Right Type of Vacuum Pump

The need to operate under vacuum is wide-spread throughout the chemical process industries (CPI).

Distillation, drying, flash cooling and evaporation, stripping, freeze drying, impregnation, etc, are some among the unit operations processes that frequently take place at less than atmospheric pressure.

## What is Vacuum?

Vacuum is any system of reduced pressure, relative to local (typically atmospheric) pressure, achieved through a vacuum system, which are commonly used to:

- Remove excess air and its constituents
- Remove excess reactants or unwanted byproducts
- Reduce the boiling point
- Dry solute material
- Create a pressure differential for initiating transport of material.

In many process industries the overriding concern is the amount of vacuum (degree of evacuation) required. In the below article we will talk about the 6 (six) major types of vacuum producing devices namely:

- Steam Ejectors
- Water Ring Vacuum Pumps
- Piston Vacuum Pumps (Rotary and Reciprocating)
- Rotary Vane (Oil Type – Semi Dry) Vacuum Pumps
- Dry Screw Vacuum Pumps
- Mechanical Vacuum Boosters

All the above type of pumps has uses in different and specific processes with varied levels of vacuum and displacement requirements. Each of them has its own set of attractions and drawbacks.

## Steam Jet Ejector Systems

These have been considered as work horses and have been the most widely used vacuum producers over the last few decades. This works on the principle of converting the energy of motive fluid (which may be the same as or different from process fluid) into velocity (kinetic energy) as it flows through a relatively small converging – diverging nozzle. This lowered pressure of the motive

fluid creates suction in a mixing chamber, into which the process fluid is drawn. The process fluid thus mixes and becomes entrained in the motive fluid stream.

This mixed fluid then passes through a converging – diverging diffuser, where the velocity is converted back to kinetic energy. Hence, the resultant pressure is higher than the suction pressure of the ejectors.

Depending on the degree of vacuum required, ejectors usually come in a series configuration with various stages attached (called a multi-stage unit). Usually the backing work is done by water ejectors/steam ejectors and front end stages are known as steam boosters.

Barometric leg (direct contact type) condensers are installed in the intermediate stages.

Steam ejector technology however, is a conventional/old technology now and has many discredits attached to it as per the present day scenario.

## Advantages

- 1) Low investment cost.
- 2) No moving parts, hence less maintenance. However, the nozzle needs to be replaced periodically for optimum performance.
- 3) High vacuum capability at high suction loads.

This is obtained by increasing the flow of steam into ejectors.

## Disadvantages

- 1) The biggest drawback is that it requires a steam source to operate. Steam generation requires boiler installations/enhanced capacity of boilers.
- 2) Cost of steam generation due to increased cost of fuel makes it economically unviable.
- 3) Unlike the rotary vacuum pumps, steam ejectors require longer start-up time.
- 4) In case of power failure (very common in developing countries) the vacuum consistency cannot be maintained.
- 5) Leads to increased loads on ETPs. Any low boiling media mixes with the steam/water of ejector/condenser and enhances the load.
- 6) Continuous problems with the pollution control boards.
- 7) Recovery of solvents cannot be obtained leading to monetary loss at most of the operating units.
- 8) High operating cost due to many allied equipment's being involved.

## Water/Liquid Ring Vacuum Pumps

LRPs are cool. In the cylindrical body of the pump, a sealant fluid under centrifugal force forms a ring against the inside of the casing. The source of that force is a multi-blade impeller whose shaft is mounted eccentric to the ring of liquid. Because of this eccentricity, the pockets bounded by adjacent impeller blades (also called buckets) and the ring increase in size on the inlet side of the

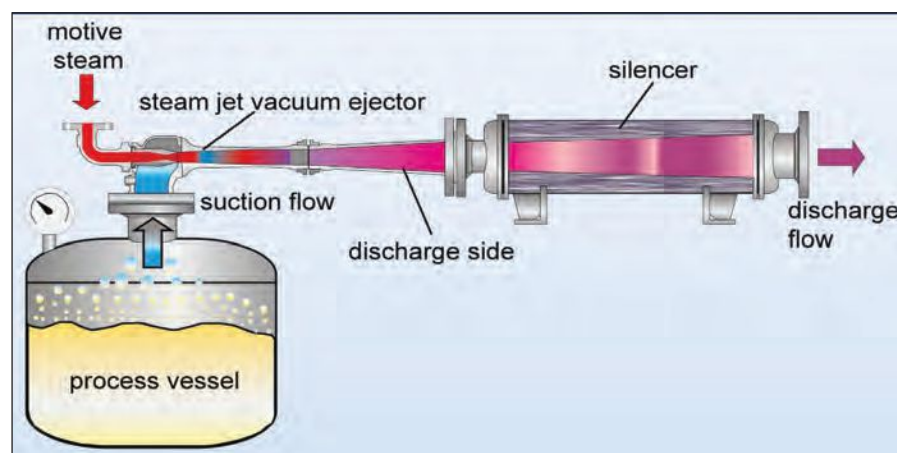


Figure 1: Steam jet ejector





Figure 2: Water ring vacuum pump + vacuum booster.

pump, and the resulting suction continually draws gas out of the vessel being evacuated. As the blades rotate towards the discharge side of the pump, the pockets decrease in size, and the evacuated gas is compressed, enabling its discharge.

A continuous flow of fresh sealing liquid is supplied to the pump via the sealing-liquid inlet.

In the case of the two-stage liquid ring pump, the discharge from the first stage does not discharge to atmosphere. Instead, the first stage discharges through the manifold leading to the second stage as well as through a discharge port located in the intermediate plate between the first and second stage impellers. The process repeats itself allowing deeper vacuum and finally discharges into the atmosphere.

The ring of liquid not only acts as a seal; it also absorbs the heat of compression, friction and condensation.

Popular liquid choices include water, ethylene glycol, mineral oil and organic solvents.

#### Advantages

- 1) Can perform as both vacuum pump as well as direct contact condenser.
- 2) Low purchase price as compared to dry type vacuum pumps/systems.
- 3) Has high vapour handling capacity. All process carry overs mix with the sealing water and are pumped out of the discharge.

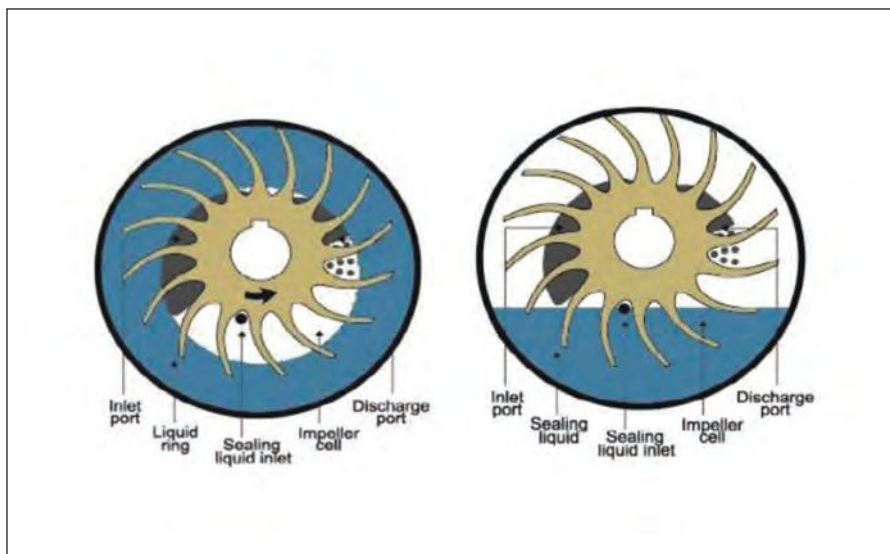


Figure 3: Water/liquid ring vacuum pump.

- 4) Assembly, disassembly and maintenance is easy due to robust structure.
- 5) Very useful in specific applications.
- 6) With minor modifications Everest team has also used oil as sealing fluid instead of water for specific process applications. This is known as "OIL-SYST" pump.
- 7) High reliability for long term sturdy operation.

#### Disadvantages

- 1) Efficiency is low. Around 30 per cent at vacuum level of 70-80 Torr. Around 50 per cent for a good pump.
- 2) With usual liquid media as CT water, ultimate vacuum is restricted to 100 Torr in a double stage configuration and around 60 Torr in a single stage configuration.
- 3) Relatively higher operating cost as compared to other rotary vane or dry vacuum pumps.
- 4) Operations normally result in high amount of effluent/hazardous waste being generated, which has high treatment cost as well as issues with the pollution boards.
- 5) Solvent recovery for low boilers is not possible as it mixes with the sealing fluid leading to monitory loss at some places.

Everest also offers complete skid-mounted vacuum systems with water ring vacuum pumps as backing units. These skids are coupled with mechanical

vacuum boosters for obtaining the desired process results.

#### Piston Type Vacuum Pumps (Rotary and Reciprocating):

##### Rotary Piston

A rugged type of vacuum producing device is the rotary piston vacuum pump. Its piston is attached to a cam that is mounted eccentrically to the main bore of the vacuum pump cylinder.

At the start of the cycle, the volume between the piston and the cylinder increases as the shaft rotates the piston cam assembly. Gas is drawn in through a channel in the piston, until volume is at its maximum. At that point, the pocket becomes sealed from the inlet as the inlet channel in the piston closes off. Lubricating oil helps seal the clearances. The shaft then further rotates the piston and cam assembly, in a way that compresses sealed-off gas against the pump cylinder and the discharge valve. The discharge valve opens when the gas pressure is slightly above atmospheric. The gas and lubricating oil is then forced out and cycle repeats itself.

This technology has also been around for ages and finds use in applications when the process load is dry and contains only NC (non-condensable) gases. Contamination of the process cannot be avoided with this design. Furthermore, even liquid carryover can lead to damage of the pump internals.

##### Reciprocating

Operation of reciprocating motion is done by the power source (ie, electric motor).

## Marketing Initiatives

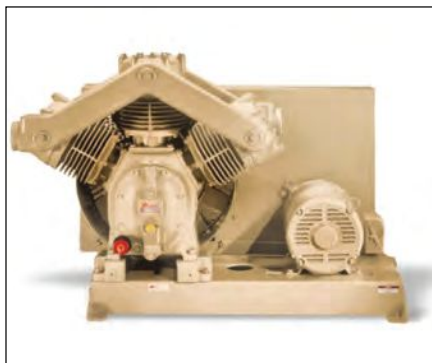


Figure 4: Reciprocating piston ring vacuum pump

Power source gives rotary motion to crank; with the help of connecting rod we translate reciprocating motion to piston in the cylinder (ie, intermediate link between connecting rod and piston). When crank moves from inner dead centre to outer dead centre vacuum is generated in the cylinder.

Everest has been manufacturing and supplying various vacuum systems with reciprocating piston vacuum pumps in combination with vacuum boosters. These systems find major applications in speciality processes like:

- waste oil re-refining
- menthol and aromatic industries
- some volatile applications.

### Advantages

- 1) Minimum vibrations, due to balanced designs.
- 2) Rugged design, fostering long life.
- 3) Option of cheaper pumps as compared to other types of sophisticated pumps available.

### Disadvantages

- 1) Cannot handle liquid carryovers. Even minimum quantity can lead to contamination of sealing oil.
- 2) Discharge gas is usually contaminated with oil.
- 3) Solvent recovery is not possible, due to oil contamination.
- 4) Some of the designs of such pumps are noisy.
- 5) Reciprocating pumps require frequent maintenance.
- 6) Ultimate vacuum achieved is coarse. Have to couple for series with boosters in fine vacuum applications.

### Rotary Vane Vacuum Pumps

The standard lubricated rotary vane pump is a single stage pump with an integral, closed-

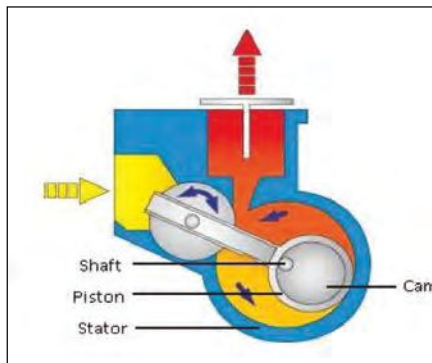


Figure 5: Rotary piston vacuum pump

loop oil-circulation system. The construction is heavy-duty and compact.

Typical vane life is 50,000 hours. The pump rotor is mounted eccentrically in the pump cylinder. As the pump rotor turns, inlet air is trapped between the rotor and vane segments (see #1 in the diagram below). This creates increasing cell volume on the inlet port side, creating vacuum. Since the rotor is located eccentric to the pumping chamber, the volume between the rotor, vanes and housing decreases and increases as rotor spins. Air is compressed and discharged into the exhaust box as rotation continues. See #3 in the diagram below.

Air passes through several stages of internal oil-and mist eliminators to remove 99.9 per cent of the lubricating oil from the exhaust. oil is then returned to the oil reservoir.

### Features of the Everest Rotary Vane Vacuum Pumps

- an automotive spin-on oil filter (for large size pumps)
- a built-in inlet anti-suck back valve that prevents the pump from rotating

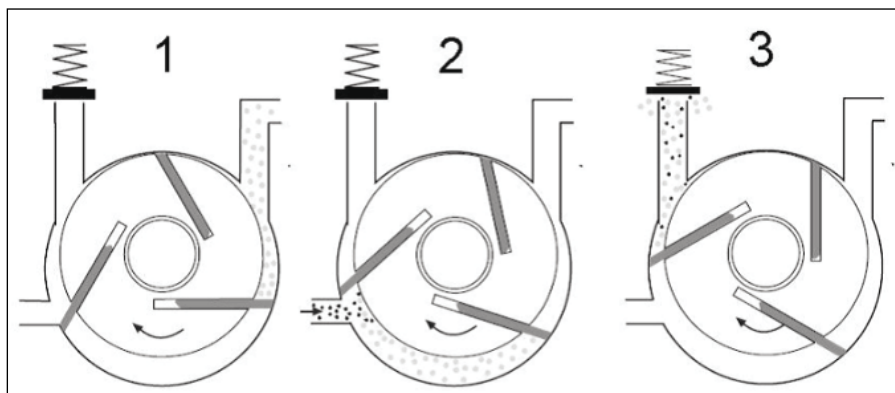


Figure 7: Rotary piston vacuum pump



Figure 6: Reciprocating piston pump + booster vacuum pumping systems

backwards when shut-down with vacuum remaining in the process and prevents the rotor housing from flooding with oil

- A built-in gas ballast valve
- Vanes are of carbon fibre.
- Everest offers complete skid-mounted rotary vane pump + vacuum booster combination systems "Super Vane" Series.
- It is available in both configurations (single and double stage)

### Advantages

- 1) Can attain high vacuum levels. EMVO Series of Everest pumps can go up to 0.5 mbar for the industrial range.
- 2) Reasonable price when compared to dry counterparts.
- 3) Available in different capacities (ranging from 6 m<sup>3</sup>/hr – 630 m<sup>3</sup>/hr).
- 4) Wide acceptance across various applications in the industry.

### Disadvantages

- 1) Cannot handle liquid carryover.
- 2) Frequent contamination of oil, when low boiling solvents are present.

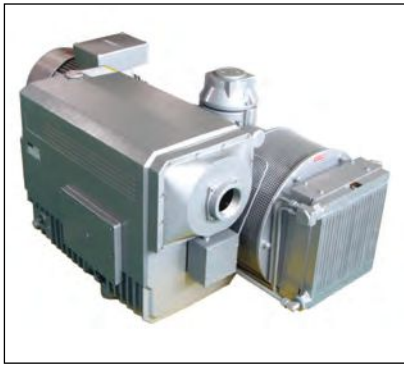


Figure 8: Dry screw vacuum pumps

- 3) Solvent recovery is not possible hence not much recommended in applications related to chemical and pharmaceutical process.
- 4) Has wide application in clean processes (Packaging, Pick n Place Applications etc). Not too widely accepted in dirty applications.

Some companies are now referring this technology as SEMI DRY vacuum Pumps. The fact remains that vapour does come in contact with the lubricating oil and hence increases the chances of contamination.

### Dry Screw Vacuum Pumps

Two parallel bearing-supported, intermeshing screw rotors having opposite threads synchronously and contact less counter-rotate in a cylindrical housing that tightly encloses them, and together form a multi-stage dry screw vacuum pump. Due to of the counter-mesh of the two rotors (screws), the volumes sealed in each thread are advanced along the rotors to the outlet. When a displacement volume reaches the outlet opening, the pressure is equalized with the atmosphere. This means that atmospheric air flows into the displacement volume and is then discharged again as the rotor turns. This pulsing gas flow generates a high level of dissipated energy and heats the pump. The dissipated energy can be minimized by means of internal compression.

Everest screw vacuum pumps are designed to ensure that the differential temperature remains intact and is optimized for operation. This internal compression is achieved by reducing the thread pitch in the direction of the outlet. The gaps between the housing and the rotors, as well as between the rotors relative to one another, determine



Figure 9: Dry screw vacuum pumps

the ultimate pressure, which a screw pump can attain. The geometry and the gap configuration which results when the rotors engage with each other also significantly influence the ultimate pressure.

The dissipated energy that is generated by the pulsating gas flow heats the pump on the outlet side hence, cooling is required at precisely this location. The gap between housing and rotors is a function of the temperature differential between the warmer rotors and the cooled housing. The amount of heat produced and the temperature are a function of the inlet pressure range. Temperatures are lowest at high inlet pressures (nearly atmospheric), as virtually no compression work is performed here and the displaced air transports sufficient heat out of the pump. In addition, the high gas flow also prevents oscillation of the gas in the last stage.

During operation at ultimate pressure ( $p < 1$  hPa), the oscillation of the atmospheric

air produces higher temperatures at the outlet area, since no gas is passing through the pump and therefore no heat is being transported out of the pump.

SuperScrew (Everest) pumps are dry screw pumps with internal compression. The screw rotors have a symmetrical geometry with Hybrid Combined Variable Pitch. This is the 3<sup>rd</sup> and latest generation of dry screw vacuum pumps.

These pumps are such designed that a slit is made in the discharge end to ensure the temperature does not rise beyond a certain level. The FEP plate has cooling water along with a provision of "Thermostatic Water Temperature Control Valve" for optimum functionality.

This results in lower power consumption, quiet operation, uniform temperature distribution within the pump and low cooling water consumption. This makes these pumps extremely cost-effective, in spite of their robust design and suitability to run operator-free by following simple operating procedures.

These pumps have been the best technology available in field of vacuum pumps especially for process industries but did not gain much popularity owing to the high capital cost as well as that of consumables and spares.

Everest, being the first and only indigenous manufacturer of this technology with state-of-the-art machinery, as well as developing a strong vendor base both from within and

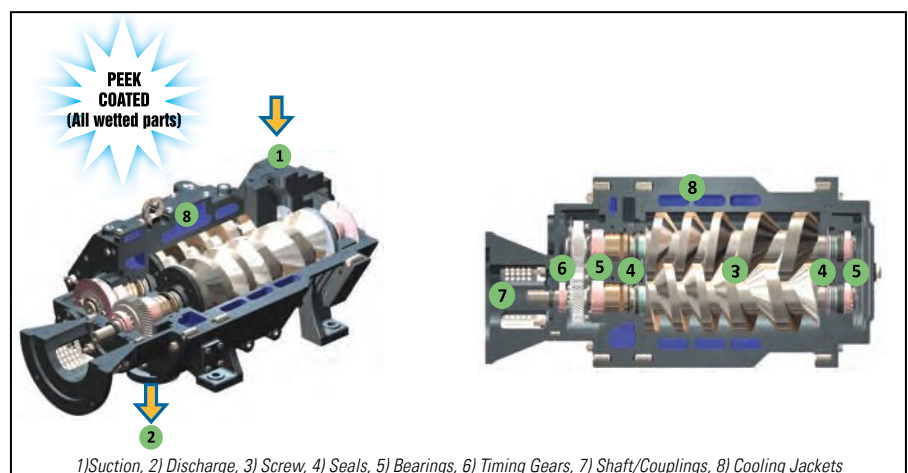


Figure 10: Sectional view of Everest SuperScrew Series Dry Screw Vacuum Pump



## Marketing Initiatives



Figure 11: Anti-corrosive dry screw vacuum pumping systems

outside the country has managed to bring down the price and improve quality through value engineering and strict process controls.

### Advantages

- 1) Hybrid combined variable pitch design. 3 generation of screw pumps.
- 2) Can attain high ultimate vacuum levels ( $7.5 \times 10^{-3}$ Torr).
- 3) Top suction and bottom discharge, leading to easy gravitational flow of process vapours and solvents out of the pump.
- 4) Internals are PEEK-coated. Peek has great chemical compatibility and high adhesive strength with the base metal.
- 5) Effective gas purge system is supplied along with Everest range of dry screw vacuum pumps.
- 6) Special and advanced design of mechanical seals extremely robust with minimum failure rate.
- 7) Both sides (suction and discharge end) of the pump are oil-lubricated. This ensures effective performance even at high temperatures.
- 8) Temperature control valves are given along with the vacuum pump for maintaining the cooling water flow inside the pump.
- 9) Capability of substantial amount of solvent recovery.
- 10) High-efficiency. screw pumps usually provide 95-100 per cent volumetric flow rate even at vacuum levels of 1 Torr.
- 11) Trouble-free performance.

### Disadvantage

- 1) Relatively high capital cost.
  - 2) Utilities are required for smooth operation (like water and  $N_2$ ).
- Everest offers special Series of anti-corrosive

dry screw vacuum pumps. This range has Ni-Peek coating and comes with Hastalloy mechanical seals along with PTFE-coated pipelines and valves. This is meant for harsh and corrosive solvent/vapours and keeps running where all others stop.

### Mechanical Vacuum Boosters

Vacuum boosters manufactured by Everest are being extensively used in chemical and process industry to boost the performance of the backing pumps, in low-pressure range, where conventional vacuum pumps have poor volumetric efficiency. Everest vacuum boosters are capable of moving large quantity of gas at low pressures, with far smaller power consumption than for any other equipment now available. The internals of a booster are totally free of any sealant fluid, and therefore the pumping is dry. Also because of the vapour compression action by the booster, the pressure at the inlet of the backing pump is relatively high, resulting in higher volumetric efficiency and low back streaming of sealing fluid. They act as dynamic one way valve and are used in series with a variety of backing pumps to achieve higher speeds and lower ultimate pressures. Since the rotors in a booster rotate within the casing with finite clearances, no lubrication of the internals is required and the pumping is totally oil-free.

Everest twin lobe mechanical vacuum booster pumps offer desirable characteristics, which make them the most cost-effective and power-efficient option.

Vacuum boosters have two basic advantageous characteristics:

- 1) Boosting the vacuum of any backing pump, thereby resulting in reduction of process temperature.
- 2) Boosting up the displacement of the backing pumps, thereby resulting in reduction of process time.

These are driven with a directly flanged electric motor of high-efficiency (FLP or NFLP Type) and is supplied without a mechanical bypass. Usually a VFD is recommended along with the boosters for various advantageous features.

Vacuum boosters are considered to be the most energy efficient pumps in their range as once coupled with any backing pump they result in increasing process efficiency drastically.

### Advantages

- 1) Dry vacuum pump does not use any process fluid.



Figure 12: Mechanical vacuum boosters

- 2) Can pump vapour and gas with equal ease.
- 3) Results in reducing power consumption.
- 4) High pumping capacities, even at low pressures.
- 5) Can be used for high range of working vacuum (from 100 Torr down to 0.001 Torr).
- 6) Very low frictional losses, resulting in lower power consumption.
- 7) Everest has two series of boosters running at 1,500 and 3,000 rpm respectively.
- 8) Discharge pressure is higher than at suction, resulting in low back-streaming of prime pump fluid and effective condensation at high discharge temperature.
- 9) Low capital and maintenance costs.
- 10) Robust process performance. (average life is 15 years).

### Disadvantages

- 1) Requires special clearance in case of sticky fluids.
- 2) Metallurgy (MOC) available is CI/SG iron. ■



**Daksh Malhotra**

Director - Marketing & Business Development

Everest Blower Systems Pvt Ltd  
B-44 Mayapuri Indl Area, Phase I  
New Delhi 110 064  
Tel: 011-45457777

E-mail: daksh@everestblowers.com

## Point Level Safety Switch



The Drexelbrook Safety IntelliPoint RF represents a significant advance in RF admittance reliability that addresses applications requiring safety instrumented functionality (SIF). The SIL IntelliPoint offers a full line of measurement probes to fit any process application where Safety Overfill Protection is required. This premium point level switch was designed to perform in the most challenging operating environments with extreme reliability while

meeting API 2350 Overfill Protection Standards. The IntelliPoint RF level transmitter's range of features and functions make it suitable for use in safety-related systems with requirements for functional safety for SIL2 (SIL3 with redundant switch). It is certified in accordance with IEC61508-2 and has worldwide hazardous area approvals (FM, FMc, ATEX and IECEx-Pending). IntelliPoint's electronics sense changes in the probe that simulate contact with the media or a floating roof, providing users with a method to ensure proper working performance without having to climb into the tank, and it automatically recognizes and ignores coatings to prevent false alarms.

For details contact:  
AMETEK Drexelbrook  
205 Keith Valley Road  
Horsham, PA 19044, U.S.A.  
Tel: 215-674-1234, Fax: 215-674-2731  
E-mail: [drexelbrook.info@ametek.com](mailto:drexelbrook.info@ametek.com)

or Circle Readers' Service Card 01

## Liquid-Liquid Coalescer

The EVERSEP range of liquid-liquid coalescers is a family of specially designed equipment to optimize the coalescence of droplets and thereafter to separate these coalescer droplets into their respective phases.

Evergreen has at its disposal a large number of configurations of coalescers for the myriad requirements of its customers. These include standard mesh pads, cokinits of materials of differing surface energies, elements of specialty micro fibres, parallel plate assemblies, etc. A modern coalescer assembly allows a capacity increase of 50-200% of conventional gravity settlers. The removal rates or efficiency levels achievable are an outlet stream quality with a dispersed phase concentration of 20-200 ppm in the continuous phase and vice-versa. These values refer to the free amount of liquid (over and above the solubility limits). The design of a coalescer is a blend of science and art. Trace impurities, pH changes, presence of surfactants and solids and various other factors can dramatically alter coalescer performance. In view of the above, Evergreen Technologies Pvt Ltd strongly recommend a laboratory test followed by pilot plant trials or onsite slip stream testing before installing a full size commercial unit.

For details contact:  
Evergreen Technologies Pvt Ltd  
3-D, Maker Bhavan-2  
18 New Marine Lines  
Mumbai 400 020  
Tel: 022-22012461, 22012706, 61566969  
Fax: 91-022-22010024  
E-mail: [info@evergreenindia.com](mailto:info@evergreenindia.com)

or Circle Readers' Service Card 02

## High Shear Rotor-Stator Mixer



The Batch Model high shear rotor-stator mixer design consists of a single stage rotor that turns at high speed within a stationary stator. As the rotating blades pass the stator, they mechanically shear the contents.

The batch model can be either permanently mounted to a vessel or suspended over a vessel on a portable lift. The mobile configuration offers the flexibility to use a single mixer in multiple vessels. It also allows the user to vary the position of the stator to process a variety of materials.

The rotor-stator of the batch model is generally positioned 2-3 head dia off the bottom of the vessel, and slightly off centre. To ensure adequate suspension of heavier solids, the rotor-stator generator may be positioned in the centre of the vessel.

Interchangeable rotor-stator combinations provide unlimited flexibility to adapt to a variety of product formulations.

The Inline Models are supplied in many sizes and MoC from 1/2 through 100 HP.

For details contact:  
Ross Process Equipment Pvt Ltd  
Plot No: D-233/3, Chakan Indl Area  
Phase II, Village: Bhamboli, Tal: Khed  
Dist: Pune, Maharashtra 410 501  
Tel: 02135-628400, 628401, 628402, 628403  
E-mail: [mail@rossmixers](mailto:mail@rossmixers)

or Circle Readers' Service Card 03

## Spray Balls



Cipriani Harrison's fixed/static spray balls are made from SS-316L are highly polished and have 2.5" and 3.5" dia balls. They come standard with a slip-pin connection for 1" and 1.5" size tubing. They are available in four different spray patterns for cleaning all types of tanks and process equipment. Cipriani Harrison's rotary

spray balls are made from SS-316L and are highly polished and are suitable for 1" and 1.5" ISO/DIN pipe. Four different spray patterns are available for cleaning all types of vessels.

For details contact:

Cipriani Harrison Valves Pvt Ltd  
Sub Plot No: 2, B/s Maregin Ipx Ltd  
Nr Phase IV, GIDC Estate  
V U Nager, Anand, Gujarat 388 121  
Tel: 02692-235082, 235192  
Fax: 91-02692-236385  
E-mail: info@harrisonengineers.com

or Circle Readers' Service Card 04

## De-dusting Tunnel/Booth



The de-dusting tunnel/booth system is used to remove the loose particles/dust present on the receiving materials, which will be brought into the warehousing area before they are transferred into the quarantine area.

Vehicle arrives and docks at receiving bay. An operator starts the de-dusting chamber's blowers first and then conveyor by pushing the buttons on the pushbutton

station. Loose material (one at a time) is manually loaded on to the conveyor. The material passes through the de-dusting chamber and on the exit side. These are again manually retrieved from the conveyor for further movements.

For details contact:

Viswakarma Engg  
Jagat Khana, PO Manhali  
Tehsil: Nalagarh, Dist: Solan  
Himachal Pradesh 174 101  
Tel: 01795-265318  
Fax: 91-01795-265319  
E-mail: vishwakarma.hp@gmail.com

or Circle Readers' Service Card 05

## High Speed Fold Up Doors



When it comes to the external doorway openings, for medium and large dimension openings, fold up doors are the best alternative. Avians doors are characterized by their well-conceived design and high-quality components to withstand extreme climate conditions and wind loads.

Moving speed of fold up doors is 1 to 1.5 m/sec and wind carrying capacity is up to 110 km/hr specially designed stiffeners in the curtain give high stability and a good wind load.

Incorporated with optical safety edge sensors with auto-opening feature to avoid damages arising from accidents. Rapid action doors have advanced feature control to integrate a variety of safety features. Their drives are inbuilt with special anti-drop device and additional electromagnetic brake to prohibit free-fall of the door in any worst scenario.

Lifting belts are used to guarantee the opening and closing of high speed PVC doors, which are directly connected to the winding tubular shaft and are powered by side mounted motor.

The lowered curtain is completely extended down; while at open door the curtain is folded up in sections parallel to each other that safeguard the wear and tear of components. The door curtain is fitted with horizontal reinforcements at a regular interval.

Used for controlling environmental conditions inside the factory.

For details contact:

Avians Innovations Technology Pvt Ltd  
Gat No: 60/61, Dehu-Moshi Road, Chikhali  
Pune, Maharashtra 412 114  
Tel: 020-71400600  
Fax: 91-020-71400654

or Circle Readers' Service Card 06



### Multi-point Full Body Bottom Cake Discharge



The pharma and fine chemicals manufacturing sectors have to face the challenge of impurities below PPM (parts per million) levels. A clean centrifuge is a must.

ACE offers full dome opening machines in its entire range of basket sizes.

The simplicity of the bottom discharge arrangement is also taken care of. The multi-point full body bottom cake discharges without sweepers, the hydraulic scraper, the cake sensor, the zero speed interlock, the safety switches, the anti-vibration tripper, the DIN pressure test for air-tight operation, nitrogen purging with oxygen analyser, the GMP version, are all a part of the ACE bottom discharge centrifuge.

For details contact:  
 ACE Industries (India) Pvt Ltd  
 118 Alpha Indl Estate  
 Marol Military Road, Andheri (E)  
 Mumbai 400 059  
 Tel: 022-42258000  
 E-mail: ace\_centrifuges@yahoo.co.in

or Circle Readers' Service Card 07

### Separation of Powders & Liquid Slurries



The Finex Ultima offers large movements in capacity, accuracy, noise levels and upgradeability over spring separators. These high performance separators offer a cost-effective solution to any requirement, including sizing, scalping, safety screening, dewatering, and grading or product recovery.

It improves product quality through accurate particle size separators; increases productivity with higher capacities, and improves operator health and safety by lowering noise levels. They are available in sizes 750, 1,000, 1,200 and 1,500 mm.

For details contact:  
 Russell Finex Pvt Ltd  
 A-1201 Rustomjee Adarsh Regal  
 Adarsh Vihar Complex  
 Off Marve Road  
 Malad (W), Mumbai 400 064  
 E-mail: sales.rfsf@russellfinex.com

or Circle Readers' Service Card 08

### Multi-vane Inlet Distributor



The FXIntSep VID is a device used in horizontal and vertical separators where there is a requirement for good flow distribution with minimum shear and pressure drop.

In horizontal vessels the FXIntSep VID is suited to both end entry and top entry

by means of an elbow directed towards the head. Benefits of this device compared with simpler deflectors include reduced agitation and hence improved 2 and 3 phase operational performance, more stable control and reduced foaming.

For details contact:  
 Fenix Process Technologies Pvt Ltd  
 K 6/1 Malini, Erandwane Co-op Hsg Scty  
 Nr Mangeshkar Hospital  
 Opp: Sevasadan School, Erandwane  
 Pune, Maharashtra 411 004  
 Tel: 020-65008772  
 Fax: 91-020-25458454  
 E-mail: info@fenix.in

or Circle Readers' Service Card 09

### Solids Removal



Much work has been performed on the development of sand or sludge removal systems from separators over many years. However, no single sand jet system has evolved as clearly superior; rather there are a number of design features to choose from depending on the characteristics and nature of the problem. Fenix makes its sand jetting systems based on a wide range of features to ensure that the sand deposits can be fluidised and hence drained satisfactorily in the most economic way.

For details contact:  
 Fenix Process Technologies Pvt Ltd  
 K 6/1 Malini, Erandwane Co-op Hsg Scty  
 Nr Mangeshkar Hospital  
 Opp: Sevasadan School  
 Erandwane, Pune  
 Maharashtra 411 004  
 Tel: 020-65008772  
 Fax: 91-020-25458454  
 E-mail: info@fenix.in

or Circle Readers' Service Card 10

### Filter Integrity Testing Machine



HTY-FT221 filter integrity test instrument is a specially crafted instrument which is a result of in-depth experience of

the manufacturer in filters. It is computerised, intelligent and a high sensitivity precision analytical instrument. It is specially designed for membrane and cartridge filter.

Features variety of standard functions including forward flow test, bubble point test, water intrusion test, combined forward flow and bubble point test; display the time and date; automatic self-test; automatic control the sustain time and testing time; stores and print the results of the current test, etc; display the record data by graph to show the changes of the gas flow by time changes; system with on screen 3 layer password protected; system with in-built style printer; etc.

For details contact:

Shreedhar Instruments  
 16 Shreeji Krupa Society, Opp: MGVCL Circle Office  
 Next to GMERS Medical College  
 Gotri Road, Vadodara, Gujarat 390 023  
 E-mail: sales@shreedhargroup.com

or Circle Readers' Service Card 11

### Retractable Dock Shelters



The retractable PVC front panels dock shelter is the most popular. They are available for dock level installation or for ground level installation for the protection of doors without dock.

The front panels are made of high resistance black PVC reinforced with double

weaving of polyester that works like spring in order to seal the vehicles of different shapes.

Side and top panels are of standard yellow PVC, bright at the inside with the day light, inset into the throats of the perimeter frame.

Retractable steel framework is supplied with hinged arms to provide a shelter which if struck by misaligned vehicle easily retracts behind the bumper face without any damage to the shelters.

For details contact:

Gandhi Automations Pvt Ltd  
 Chawda Comml Centre, Link Road  
 Malad (W), Mumbai 400 064  
 Tel: 022-66720200  
 Fax: 91-022-66720201  
 E-mail: sales@geapl.co.in

or Circle Readers' Service Card 12

### Booster Pumps (CMB Series)



The CM booster pump is one of the highly efficient booster pumps offered by Grundfos. Combined with a high efficiency motor this innovative horizontal multi-stage centrifugal pump is designed to cover a wide range of applications.

Its built-in thermal protection enables the pump to handle liquid temperatures ranging from 20°C to 120°C. CM booster pump's electro-coated cast iron parts with corrosion and wear-resistant SS components along with dry running protection gives this pump a long life. CM booster pumps with pressure controller for constant water pressure is ideal when space is a constraint near overhead tanks and can also be installed inside homes. It is also supplied with pressure tank in which the pump will start when the water pressure drops below the pre-set level and stops once the pressure reaches the pre-set level. CM boosters makes minimal sound even when the auto On-Off feature is continuously under operation.

Available in many variants like CMB Pressure Manager 1, CMB Pressure Tank, CMB with Pressure Switch, etc, these pumps can be used for pressure boosting for home and gardening, supplying water from shallow wells and many more

For details contact:

Grundfos Pumps India Pvt Ltd  
 118 Rajiv Gandhi Salai  
 Thoraipakkam  
 Chennai 600 097  
 Tel: 044-45966800  
 Fax: 91-044-45966969

or Circle Readers' Service Card 13

**Liquid Analysis**



Liquiline is the platform for all liquid analysis applications. It forms the basis of their ultra-modern transmitters, samplers and analysers.

Liquiline CM44 is the most flexible transmitter for all Memosens sensors. It measures twelve different

parameters and allows up to eight sensors to be connected. Liquiline CM44 is available as a field device and also for mounting in control cabinets and on DIN rails.

For details contact:  
 Endress+Hauser (India) Pvt Ltd  
 7B, 7<sup>th</sup> Floor, Godrej One  
 Pirojshanagar, Vikhroli (E)  
 Mumbai 400 079  
 Tel: 022-30236100  
 Fax: 91-022-30236219  
 E-mail: info@in.endress.com

or Circle Readers' Service Card 14

**Liquid Analysis**



Liquiline is the platform for all liquid analysis applications. It forms the basis of their ultra modern transmitters, samplers and analysers.

Liquiline M CM42, the two-wire transmitter for the parameters pH/ORP,

conductivity and oxygen, impresses with reliable data transmission and easy operation. It can be used in all areas of process automation including hazardous areas and hygienic applications.

For details contact:  
 Endress+Hauser (India) Pvt Ltd  
 7B, 7<sup>th</sup> Floor, Godrej One  
 Pirojshanagar, Vikhroli (E)  
 Mumbai 400 079  
 Tel: 022-30236100  
 Fax: 91-022-30236219  
 E-mail: info@in.endress.com

or Circle Readers' Service Card 15

**Submersible Pumps**



In today's water parched world, it has become strenuous for local water bodies to be able to provide a steady supply of water. The concept of rainwater harvesting in buildings has been the need of the hour. To help buildings with their rainwater delivery systems Grundfos has excellent dewatering systems. One of the prime examples would be the DWK and the DPK pumps.

Grundfos DWK and DPK are submersible pumps designed for dewatering and drainage applications. The cast-iron construction and the hydraulic design contribute durability and high efficiency. The differences between the DWK and DPK pump ranges lie in the discharge arrangement and the installation type.

The DWK range of submersible pumps combines durable performance with ease of installation. With a solid cast iron construction and narrow design this pump range is ideal for pits, temporary or fixed installation, or in situations where effective dewatering is needed. In cases where there is a presence of abrasives like sand or where power supply is limited, the DWK pumps prove to be ideal.

DPK pump variant comes with a long-life motor, which helps in bringing down the maintenance costs; circuit operates independently and is responsible for providing the necessary protection against overheating of the motor; SS, high-chrome impeller helps ensure an increased lifetime

For details contact:  
 Grundfos Pumps India Pvt Ltd  
 118 Rajiv Gandhi Salai  
 Thorapakkam  
 Chennai 600 097  
 Tel: 044-45966800  
 Fax: 91-044-45966969

or Circle Readers' Service Card 16



### Revolving Check Weigher



Check weigher RCW100 uses the state-of-the-art technology weigh cell (EMFC) to achieve greater accuracy in dynamic weighing for aerosol, cans, vials, etc. The system provides 100 per cent online weighing, ensuring compliance with

international standards of pharma, food, chemical and cosmetic industries. Check weigher RCW100 also improves production line profitability through significant reduction in product give away. The entire system is made from SS and designed for easy removal for cleaning purposes.

For details contact:

Technofour Electronics Pvt Ltd  
 Gat No: 3 (PT), 5 (PT), 243 (PT), Kasurdi (Kheba)  
 Khed Shivapur-Saswad Road  
 Post: Khed Shivapur, Tal: Bhore  
 Dist: Pune, Maharashtra 412 205  
 Tel: 02113-305200, 305246  
 Fax: 91-02113-305250  
 E-mail: pcsales@tepl.co.in / teplinbox@gmail.com

or Circle Readers' Service Card 17

### Snubber Valves



Excel Metal & Engg Industries offers wide range of instrumentation fitting and valves for use in diverse range of industries and are capable to provide their customers with best possible solutions to meet their various requirements.

The production process followed is of higher standards with its modern production and quality assurance facilities where due attention is paid at every level with max resource utilization.

Excel Metal & Engg Industries offers snubber valves in SS, brass, MS, etc; 1/8 to 1 in size; pressure rating up to 3,000 PSI; temperature rating up to 200°C.

For details contact:

Excel Metal & Engg Industries  
 177/181 JT Bldg, 3<sup>rd</sup> Kumbharwada Lane,  
 Mumbai 400 004  
 Tel: 022-23892476, 66394004  
 Fax: 91-022-23884109  
 E-mail: info@excelmetal.net / excelmetal@mtnl.net.in

or Circle Readers' Service Card 18

### Submersible Pumps



In today's water parched world, it has become strenuous for local water bodies to be able to provide a steady supply of water. The concept of rainwater harvesting in buildings has been the need of the hour. To help buildings with their rainwater delivery systems Grundfos has excellent dewatering systems. One of the prime examples would be the DWK and the DPK pumps.

Grundfos DWK and DPK are submersible pumps designed for dewatering and drainage applications. The cast-iron construction and the hydraulic design contribute durability and high efficiency. The differences between the DWK and DPK pump ranges lie in the discharge arrangement and the installation type.

The DPK range of submersible drainage pumps provides surface water drainage, combining installation flexibility and high-pressure capabilities with reliability and ease of service. The DPK range presents a surprisingly compact design, considering the pressure capabilities on offer. Together with the solid cast-iron construction and available installation options, the DPK range is perfect for drainage pit applications.

DPK pumps has an in-house motor protection that provides protection against overheating; double mechanical seal provided in the oil chamber of this pump ensures a trouble-free operation; auto coupling/ring stand aids in easy installation of the pump in submerged conditions

For details contact:

Grundfos Pumps India Pvt Ltd  
 118 Rajiv Gandhi Salai, Thoraipakkam  
 Chennai 600 097  
 Tel: 044-45966800  
 Fax: 91-044-45966969

or Circle Readers' Service Card 19

### Continuous/Online Air Particle Counter



The Met One 6000 Series remote airborne particle counter offers accurate and reliable continuous particle monitoring. With an array of communication and mechanical installation options, the Met One

6000 is easy to integrate with any facility monitoring system. These features also reduce downtime for instrument removal and reinstallation during routine calibration and preventative maintenance cycles. Built with long life laser technology, the Met One 6000 offers industry leading diagnostic features that reduce troubleshooting time and related downtime costs.

For details contact:

Shreedhar Instruments  
16 Shreeji Krupa Society  
Opp: MGVC Circle Office  
Next to GMERS Medical College  
Gotri Road, Vadodara  
Gujarat 390 023  
E-mail: sales@shreedhargroup.com

or Circle Readers' Service Card 20

### Air-to-Air Heat Exchanger

APPIDI Energy Recover Units (ERU) heat recovery is a plate or rotary type air-to-air heat exchanger designed to provide max energy efficiency in ventilated systems where heated or cooled air is let out and outdoor air is let in. In applications where ventilation is required or recycling of the same air is not allowed, energy recovery wheels or plate heat exchangers are used to recover the energy from exhaust air. This reduces the initial investment in HVAC equipment and minimises operating cost.

Since HVAC equipment is typically the largest source of energy consumption in commercial buildings, ERU investments are economically justified for outdoor at makeup. In new HVAC installation, ERUs also allow ventilated systems to be sized with smaller compressors, lowering initial costs of the HVAC package.

For details contact:

APPIDI Technologies Pvt Ltd  
Survey No: 123  
Jeedimetla Village  
Qutbullapur Road  
Hyderabad, Telangana 500 055  
Tel: 040-65863942  
E-mail: sales@appiditech.com

or Circle Readers' Service Card 21

### Centrifugal In-line Pumps



The CR pump range from Grundfos is one of the most extensive in-line pumps on the market that can match all customer requirements. With many innovative features unique to Grundfos, CR pumps provide superior reliability and the lowest possible cost of ownership to customers.

By manufacturing their own motors, Grundfos ensures maximum performance in all its pumps. The Grundfos motor IE3 efficiency is extremely silent and resilient. They are also available in the self-regulating MGE configuration, featuring an integrated frequency converter meeting IE5 efficiency.

The pump houses a specially designed cartridge seal that increases reliability, ensures safe handling and enables easy service and access.

Shaft seal solutions configurations come in a wide choice of materials which allows for a better temperature handling. The temperatures can range from -40°C to 180°C.

Pump efficiency is maximized by state-of-the-art hydraulic design and carefully crafted production technology.

The CR is available in four different materials: titanium, stainless steel AISI 316 and stainless steel AISI 304, and AISI 304/cast iron.

For details contact:

Grundfos Pumps India Pvt Ltd  
118 Rajiv Gandhi Salai  
Thoraipakkam  
Chennai 600 097  
Tel: 044-45966800  
Fax: 91-044-45966969

or Circle Readers' Service Card 22

## Air Shower



Air shower is designed to supply Class 100 HEPA filtered air at high velocity helps remove particulate matter from the personnel entering into the clean room. Air shower works as partial clean equipment installed at the partition between the clean room and non-clean rooms to

shower the personnel or matter before entering the clean area. This unit helps to remove dust effectively and maintains the normal working status. Air shower is available in various standard dimensions, also their cabinet can be custom engineered to fit any size. These units are available in powder coated mild steel/SS-304 or combination of both.

For details contact:  
 Vishwakarma Industries  
 Plot No: 136/H1, Phase II, GIDC  
 Vapi, Dist: Valsad, Gujarat 396 195  
 Fax: 91-0260-2450404  
 E-mail: vishwakarma\_vapi@hotmail.com

or Circle Readers' Service Card 23

## Pressure Relief Valve



CORTEC, a leading manufacturer of high quality API chokes, valves and manifolds offers its new CRV26 pressure relief valve (PRV). The CRV26 PRV is a product of the CORTEC Fluid Control division of CORTEC, which provides a complete line of high-

end valves designed and manufactured according to specific project specifications. CRV26 PRV is engineered to protect drilling systems against the dangers of over-pressurization and is the first of its kind to be rated to 10,000 PSI systems. The CRV26 PRV is suitable for frac system relief, mud pump relief and managed pressure drilling (MPD) and is compatible with API 6A and NACE MR0175 requirements.

For details contact:  
 CORTEC Fluid Control  
 208 Equity Blvd  
 Houma, LA 70360, U.S.A.  
 Tel: +1 985-223-1966  
 Fax: 985-223-1936  
 E-mail: sales@uscortec.com

or Circle Readers' Service Card 24

## Integrated Granite Motion Systems



Machine components such as bearings, encoders and drive mechanisms are engineered and assembled directly on the granite base and bridge structures in an Integrated Granite Motion (IGM) system. Therefore, IGM systems are distinct from traditional stage-on-granite systems where discrete positioning stages and components are used in the system design. Aerotech IGM systems are custom-engineered to fit the unique and specific needs of your application or process.

IGM systems can be designed with mechanical or air bearings, ball-screw or linear-motor drives, and a variety of feedback elements ranging from encoders to laser interferometers. Additional axes of motion, such as rotary, lift or piezo stages, or even galvanometer scanners, can be integrated on to the IGM axes, all of which can be controlled from Aerotech's A3200 unified control platform.

IGM and traditional stage-on-granite systems each offer distinct advantages and the choice of which to use depends largely on your application or process, as well as its technical and commercial requirements. IGM systems can have higher stiffness than a stage-on-granite solution because the IGM system has fewer parts in the structural loop, resulting in higher accuracy and better dynamic performance. IGM systems can be more compact due to the more integrated nature of machine components and granite. This provides for the possibility of smaller Abbe offsets and better machine positioning accuracy. In addition, it is simpler to optimize axis design parameters such as travel length and payload capacity because each axis of an IGM solution is engineered and built directly into the main granite structure.

For details contact:  
 Aerotech, Inc  
 101 Zeta Drive  
 Pittsburgh, PA 15238-2811  
 U.S.A.  
 Tel: +1 (412) 967 6854  
 E-mail: jbala@aerotech.com / smclane@aerotech.com

or Circle Readers' Service Card 25



**Ribbon Blender**



Ribbon Blender is available in Standard cGMP and customised models with SS-304/316/316L contact parts.

The container shape and the mixing stirrer give continuous movement resulting in better quality mixing and blending.

Ribbons are designed in such a way so as to provide both radial and linear motion for a complete homogenous mixing.

Various types of ribbon blenders such as pressure, double spiral, etc, are available.

It has a modern PLC with manual operating system.

Available in batch capacities ranging from 50 to 5,000 kg, as per client's requirements, depend on bulk density.

For details contact:  
 IPEC Engg Pvt Ltd  
 Plot No: 5175, GIDC, Ankleshwar  
 Gujarat 393 002  
 Tel: 02646-221175  
 Telefax: 91-02646-225175  
 E-mail: md@ipecegg.com / marketing@ipecegg.com

or Circle Readers' Service Card 26

**Deep Freezer Door**



Designed specifically to provide a perfect solution where temperature control is critical and safety concerns are at a premium. The high operating speed combined with an excellent seal optimises the internal traffic flow and provides energy saving.

Internal heating system provided within the guide prevents ice formation even during intensive cooling. It is suitable for both

positive and negative temperature, operating temperature range +5 to -35°C.

It has special double curtain construction with insulation, heavy duty motors 400 V three-phase, opening speed up to 2.5 m/s with inverter system. Size is up to 4,500 x 5,000 mm (W x H).

For details contact:  
 Gandhi Automation Pvt Ltd  
 Chawda Commercial Centre  
 Link Road, Malad (W), Mumbai 400 064  
 Tel: 022-66720200, 66720300  
 Fax: 91-022-66720201  
 E-mail: sales@geapl.co.in

or Circle Readers' Service Card 27

**Solar Pumps**



Grundfos has always been a forerunner in developing sustainable pump solutions that not only protect our water resources, but also save on the energy consumed by the pumps. To do so, they have developed pumping systems that are capable of utilizing renewable energy to operate.

They are: SQFlex Pumps: Submersible Pumping System The SQFlex system is an environmentally-friendly water supply system developed by Grundfos. With its built-in electronics and protections, the pump is compatible with both DC and AC power supply without requiring an external inverter. The solar submersible SQFlex pumps are fitted with a permanent magnet motor, which enables the efficient use of solar energy.

The SQFlex pumps can be adapted to any water supply need according to the conditions of the installation site as it is very light weight and flexible with regard to the energy supply and performance.

Smart Solarz is a solar powered self-priming pump, which is manufactured for domestic purposes. It comes in play where the power supply is erratic. It is extremely lightweight and easy to install. Also to prevent corrosion, the wet parts of the pump are made of food grade engineered polymers. These pumps are best suited for houses and buildings, who have a max of two additional floors apart from a ground floor, making it ideal for farmhouses, beach houses and can also be used in rural and semi-urban areas.

It operates with solar panels of 250 W / 36 V (open circuit) and has a 150 W \ 24 V BLDC motor.

For details contact:  
 Grundfos Pumps India Pvt Ltd  
 118 Rajiv Gandhi Salai, Thoraiakkam  
 Chennai 600 097  
 Tel: 044-45966800  
 Fax: 91-044-45966969

or Circle Readers' Service Card 28

### Bio-safety Cabinet



Biological safety cabinet Class II Type A2 provide personnel, environmental and product protection. Air flow is drawn around the operator into the front grill of the cabinet, which provides personnel protection. In addition, the downward laminar flow of HEPA filtered air provides product protection by minimizing the chance of cross-contamination along the work surface of the cabinet.

Because cabinet air has passed through the exhaust HEPA filter, it is contaminant-free (environmental protection).

For details contact:  
 Vishwakarma Industries  
 Jagat Khana, Nalagarh-Roopar Road  
 PO Manjholi  
 Tehsil: Nalagarh, Dist: Solan  
 Himachal Pradesh 174 101  
 Tel: 01795-265318  
 Telefax: 91-01795-265319  
 E-mail: vishwakarma.hp@gmail.com

or Circle Readers' Service Card 29

### External Gear Pump



ZPD gear pumps were specifically designed for dosing applications, oil hydraulics and process technology. Due to different types of toothing and modules, the medium is being delivered with low pulsation, so that exact dosing requirements can be realized the best possible way. By doing

so, volumetric efficiency values of over 90% are achieved with characteristic curves largely independent of the operating point. That means that the dosing quantity can be set precisely through the pump speed. It finds application in dosing technology, process engineering and technology, lubricating oil supply and system technology.

For details contact:  
 Bedaflow Systems Pvt Ltd  
 W-7, Sector-11  
 Noida, Uttar Pradesh 201 301  
 Tel: 0120-43299 - 90  
 Fax: 91-0120-43299 - 20  
 E-mail: info@bedaflow.com

or Circle Readers' Service Card 30

### NORDAC LINK Field Distributor



This drive control for flexible installation close to the motor is available as frequency inverter (up to 7.5-kW) or motor starter (up to 3-kW) and provides what it takes to make fast commissioning, simple operation and maintenance possible. All modules, components and connections are combined using simple plug connectors. In addition to the high plug-in capability, integrated maintenance switches and switches for manual operation ensure a high level of user-friendliness. The field distributor can be freely configured for any application and is compatible with all common bus systems. The inverters are suitable for horizontal, inclined and vertical conveyors and provide lifting gear functions as well as STO and SS1 safety functions according to EN 61800-5-2.

As standard, NORDAC LINK field distributors are equipped with a high performance PLC, which reduces the load on the higher level controller and carries out autonomous control tasks. The freely programmable PLC processes data from sensors and actuators and if necessary initiates a sequence control and communicates drive and application data to the control centre and networked components. NORD drives can be easily integrated into I40 systems using the existing bus structure. The networked drives can pre-process status data with the integrated PLC and communicate via the control system or directly into the secure Cloud. NORD DRIVESYSTEMS has tested the possibilities of Cloud connection in its own application test area. From the Cloud, the data are available all over the world for evaluation and analysis. With this, NORD supplies intelligent drive technology as well as innovative maintenance and service concepts for digitalised production in Industry 4.0.

For details contact:  
 Getriebebau NORD GmbH & Co. KG  
 Getriebebau-Nord-Straße 1  
 22941 Bargteheide/Hamburg  
 Germany  
 Tel: +49 45 32 / 2 89 -0  
 Fax: +49 45 32 / 2 89 -22 53  
 E-mail: pl.muthusekhar@nord.com / Joerg.Niermann@nord.com

or Circle Readers' Service Card 31

## Mist Shower Booth



Mist shower booth supplies a fine, low volume misting fog intended to affix loose powder on the surface of the occupant's protective clothing (PPE). This helps prevent any hazardous particulate from becoming airborne when degowning. Mist shower booth is installed at exit of clean room where hazardous product like onco drugs, hormonal injectable, strile products and likewise. The misting booth is a contamination control device for the

respiratory protection from inhalation of these hazardous products to the operator during th degowning process.

For details contact:

Vishwakarma Industries  
Jagat Khana, Nalagarh-Roopar Road  
PO Manjholi  
Tehsil: Nalagarh, Dist: Solan  
Himachal Pradesh 174 101  
Tel: 01795-265318  
Telefax: 91-01795-265319  
E-mail: vishwakarma.hp@gmail.com

or Circle Readers' Service Card 32

## Ball Valves



Cipriani Harrison's ball valves are made from forged SS-304L and SS-316L, are highly polished and come standard with TFM PTFE seats and FDA EPDM O-rings. These valves have a three piece full port design and are fully drainable. Available in sizes 1/2" – 4" with sanitary clamp,

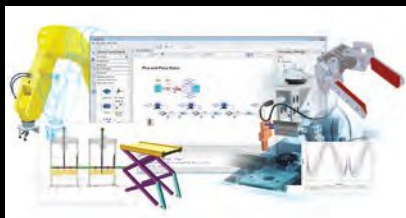
Butt-weld or I-line end connections as standard. It is available with or without purge (flush) port and either manually or pneumatically controlled via a horizontal or vertical actuator.

For details contact:

Cipriani Harrison Valves Pvt Ltd  
Sub Plot No: 2, B/s Margin Impex Ltd  
Nr Phase IV, GIDC Estate  
V U Nager, Anand, Gujarat 388 121  
Tel: 02692-235082, 235182  
Fax: 91-02692-236385  
E-mail: info@harrisonengineers.com

or Circle Readers' Service Card 33

## Tools for Developing Digital Twins



Maplesoft offers a MapleSim, the advanced system-level modeling tool. From digital twins for virtual commissioning to system-level models for complex engineering design projects, the latest release provides new tools for developing digital twins, in addition to greater connectivity with other modeling tools and expanded modeling scope.

MapleSim is used across wide applications and industries, including the creation of physics-based digital twins for virtual commissioning. Identifying the optimal motor size required to drive a mechanism is one of the most important goals of simulation with digital twins, and MapleSim 2018 provides tools that make this task easier. The new 1-D Motion Generation App allows engineers to create motion profiles that adhere to defined velocity and acceleration constraints. They can define the desired motion of the joints, and then run the simulation to discover the torques and forces required to create that motion. This information can then be used to correctly size the motors, ensuring optimum performance at minimal cost.

MapleSim is a natural environment for modeling multi-domain systems that supports the rapid creation and testing of initial concepts. With MapleSim, engineers can try out more ideas in less time, identify and prevent unexpected interactions between different domains and generate computationally efficient models. New features in MapleSim 2018 further enable this work with more connectivity options and increased modeling scope. MapleSim 2018 provides greater toolchain connectivity with the ability to import models from even more software tools. With the expanded FMI support, engineers can import models defined using FMI 2.0 Fixed-Step Co-Simulation, as well as FMI Model Exchange. Other improvements include enhanced Modelica support for easy access to more 3<sup>rd</sup> party component libraries inside MapleSim. In addition, the MapleSim Heat Transfer Library from CYBERNET offers improved tools for studying heat transfer effects and preventing overheating, while the MapleSim Hydraulics Library from Modelon and MapleSim Pneumatics Library from Modelon add-ons can both now take into account temperature effects during simulations. MapleSim is available in English, Japanese, and French.

For details contact:

Maplesoft  
615 Kumpf Drive  
Waterloo, ON N2V 1K8  
Canada

or Circle Readers' Service Card 34



## M Pumps



Shanbhag and Associates is the sole, authorised, national distributor for M Pumps, an Italian manufacturer of seal-less, magnetic driven pumps. M Pumps is a unit of the Mischiatti Group and has been manufacturing magnetic driven pumps for over 25 years now. The

seal-less, magnetic driven pumps are offered in centrifugal, peripheral, sliding vane, self-priming, centre-line mounted, inline and vertical pump versions. M Pumps manufactures these pumps in metallic, non-metallic and lined constructions. It finds application in oil and gas, chemical, pharma, industrial refrigeration, offshore platform, electronic and galvanising, and nuclear plant areas amongst others. M Pumps is an ISO 9001 and ISO 14001 certified company manufacturing to API 610 and 685 as well as non-API pump Standards. To safeguard the pumps the company also offer dry-running protection, temperature monitors on rear casing and ATEX certification as options for many models as optional features. Contact Shanbhag with fluid details and your pump requirements. Their national sales and service network will application engineer your pump requirements. With M Pumps they can offer a good quality pump at a competitive price for your difficult applications.

For details contact:  
 Shanbhag & Associates  
 B-50 Nandbhuvan Indl Estate  
 Mahakali Caves Road, Andheri (E), Mumbai 400 093  
 Tel: 022-40365700, 40365711, Fax: 91-022-40365712  
 E-mail: info@shanbhags.com

or Circle Readers' Service Card 35

## AODD Pumps



Shanbhag & Associates is the authorised national distributor for the entire range of

Dellmecco Products with an all India sales and service network. The range of Dellmecco Pumps includes solid block AODD pumps in PE, PTFE in conductive and non-conductive housings from 1/4" to 3"; SS, CI, PTFE, coated and aluminium housing AODD pumps from 3/4" to 3"; hygienic, zero hold-up SS-316L AODD pumps from 1/2" to 2.5"; jacketed and high-pressure AODD pumps for applications such as filter press; AODD pumps for powder transfer. The pumps internals are available in EPDM or with chemically bonded TFM diaphragms and ball valves. Dellmecco pumps find applications in industries such as pharma, paint, chemical, clay and ceramics, electroplating/surface treatment, food, dairy and beverages, automotive, glass and fibreglass, oil and gas, marine/shipbuilding, metal and steel treatment, effluent-treatment, aircraft, etc. Dellmecco AODD pumps are absolutely lube-free; non-stalling in operation and corrosion-free. Air valve body is available in corrosion-free engineered plastics. There are fewer moving parts and commonly used spares across models and sizes.

For details contact:  
 Shanbhag & Associates  
 B-50 Nandbhuvan Indl Estate  
 Mahakali Caves Road, Andheri (E), Mumbai 400 093  
 Tel: 022-40365700, 40365711, Fax: 91-022-40365712  
 E-mail: info@shanbhags.com

or Circle Readers' Service Card 36

## Peristaltic/Hose Pumps



Shanbhag & Associates is the authorised, national distributor for the entire range of BOYSER hose pumps. They have introduced BOYSER laboratory and industrial peristaltic/hose pumps manufactured for the past 25 years by Bombas Boyser SL of Spain. A tubular element inside the casing is compressed by the rotary action of the rotor and its corresponding rollers or shoes; it recovers its initial shape creating a vacuum, thus suctioning the fluid into the hose. The fluid gets into the cavity formed by the rollers that press the tube and is gently pushed to the outlet by the following roller. Therefore, the pump is a positive displacement volumetric pump with exceptional features. Tubes are available in NR, NBR, EPDM, thermoplastics (Norpren, Hypalon, Chemsure, Silicone and Tygon) and food-grade (NR-A, NBR-A). End connections are available in SS, PP, PVDF in threaded, TC and flanged options. Casing can be provided HALAR coated to prevent damage in case of hose leaks. Hose leak detector, vacuum for suction are optional features

avail. Features suction lift of up to 9 metres and can even run dry without damage; seal-less and silent in running; reversible rotation; resistant to abrasion and corrosion; dosing application of  $\pm 1\%$  accuracy; easy to maintain and consumes less power compared to AODD pumps of similar application. Pump can deliver pressures to 15 bar. Dosing is accurate within  $\pm 1\%$  when compared with metering pumps and AODD pumps. BOYSER pumps find application in continuous chemical charging, transfer and dosing of chemicals, viscous liquids, sludge, lime slurry, mortar, filter press feed, clay slurry, carbonates, slurries, kaolin, paints, glues, inks, latex, pigment, oils, detergents, acids, peroxides, milk products, mayonnaise, meat products, fruit juices, etc.

For details contact:  
 Shanbhag & Associates  
 B-50 Nandbhuvan Indl Estate, Mahakali Caves Road, Andheri (E), Mumbai 400 093  
 Tel: 022-40365700, 40365711, Fax: 91-022-40365712  
 E-mail: info@shanbhags.com

or Circle Readers' Service Card 37

## IFAT India

**Dates:** 15-17 October 2018

**Venue:** Bombay Exhibition Centre, Mumbai

**Event:** India's leading trade fair for water, sewage, solid waste and recycling will again open its doors for everyone in Mumbai. IFAT India is an ideal platform to network with industry leaders and business partners in the environmental technology sector from across the globe.

For details contact:

Messe Muenchen India Pvt Ltd

INIZIO 507 & 508, 5<sup>th</sup> Floor

Cardinal Gracias Road, Opp: P&G building

Chakala, Andheri (E)

Mumbai 400 099

Tel: 022-42554744

E-mail: enquiry@ifat-india.com

## India Chem 2018

**Date:** 4<sup>th</sup> – 6<sup>th</sup> October 2018

**Venue:** Bombay Exhibition Center, Mumbai

**Event:** The largest event of Chemicals and Petrochemical Industry in India, in its 10th edition i.e. India Chem 2018 would be organized from 4-6 October 2018 jointly by the Department of Chemical and Petrochemicals, Government of India and FICCI. The Indian chemical industry is at the threshold of rapid growth with the Government of India providing an atmosphere of support and encouragement. India's vibrant chemical and petrochemical industry plays a significant role in the economic development of our country. In terms of volume, the Indian chemical industry is the 6th largest in the world and the 3rd largest in Asia with the size worth USD 108.4 Billion.

For details contact:

Girish Ahuja

Senior Assistant Director, FICCI

Tel: 91 11 2335 9734

Email: Girish.ahuja@ficci.com

## INTERNATIONAL

## Chemspec Europe 2018

**Dates:** 25-27 September 2018

**Venue:** Telus Convention Centre, Calgary, Canada

**Event:** This event is aiming to showcase the latest innovations and modern technology of pipeline products and services. Exhibitors from the top pipeline companies are engaged in showcasing the products to the global market from this renowned event. International Pipeline Exposition involves the best 200 exhibitors from the whole world, who showcase the products that are approved by high skilled professionals. The event is also best known for its economical products, which the visitor find very helpful and also this factor increases the demand and popularity of the event.

For details contact:

DMG: Events London

25<sup>th</sup> Floor, Millbank Tower, 21-24 Millbank\ London, U.K.

Tel: +(44)-(1737)-855474/761941

3<sup>rd</sup> International Conference on Chloro Alkanes

**Date:** 29 November, 2018

**Venue:** India Habitat Centre, New Delhi

**Organisers:** Jasubhai Media Pvt Ltd & Eurochlor.

**Event:** Chlorinated alkanes have been under the scanner due to the developments in the regulatory frameworks. Manufacturers have realized the need to enhance the efforts in the field of technology & research to improve product quality and develop innovative processes. One day conference will highlight global trends in CA business, regulatory status, substance evaluations, risk assessments, product benefits and global cooperation.

For details contact:

Jasubhai Media Pvt Ltd

Taj Bldg, 3<sup>rd</sup> Floor

210 Dr D N Road, Fort

Mumbai 400 001, India

Tel: 022-40373636 (Board), Fax: 91-022-40373635

E-mail: sales@jasubhai.com

## Chemtech World Expo 2019

**Date :** February 20<sup>th</sup> - 23<sup>rd</sup>, 2019

**Venue :** Bombay Convention & Exhibition Centre,  
Goregaon (East), Mumbai, India

**Event :** CHEMTECH World Expo 2019 will create a common platform to bring the entire ecosystem of the chemicals manufacturing and the allied services providing sectors for 27th time in India. The event is for equipment, services or developing processes for the Chemical and Process industries. The evolution and the growth of Indian chemical and related industries has been both reflected and catalyzed by CHEMTECH.

The interactive Exhibition and Trade Fair pioneered by Chemtech has become the event that the chemical industry comes together. Concurrent events include EPC World Expo, Industry Automation & Control World Expo, Bio Pharma, Pumps Valves & Fittings World Expo; and international conferences on Refining & Petrochemicals and Specialty Chemicals.

For details contact:

Vaishali Pednekar

Senior Executive – Conference

Tel: +91-22-4037 3619

Email: vaishali\_pednekar@jasubhai.com

## New Contracts/Expansions/Revamps

The following list is a brief insight into the latest new projects by various companies in India.

### CHEMICALS

**Songwon Industrial Co Ltd** a specialty chemicals company of South Korea has launched its new pilot plant in Panoli (Gujarat), thereby strengthening the organisation's overall specialty chemicals development capability. Built on Songwon's Indian site with all the necessary main unit operations, the new plant is equipped with the most up-to-date technologies and materials for producing a wide range of chemicals for a broad spectrum of applications - from one kilo up to several hundred kilo samples. To reinforce the organisation's position in existing areas of business and enhance its ability to enter new areas, the new pilot plant will be supported by the Songwon's strong local R&D team in Panoli, as well as its central technology innovation center located in Maeam, Korea.

### MINING

**KIOCL** will revive mining in Karnataka, after the State granted the company a lease of over 474 hectares at Devadaru hills in Ballari. KIOCL had suspended mining in the eco-sensitive Western Ghats following a Supreme Court directive in 2006. Once approvals are given, it would invest ₹ 1,500-crore in a pellet plant and also a unit to enrich iron ore from the mines. After suspension of mining, KIOCL had shifted to operating 3.5-million tonne per annum pellet plant in Mangaluru. Last year, it produced 1.46-million tonnes, utilising half its capacity, as against almost nil production in the previous year. International agencies have already implemented pilot projects by bringing high grade iron ore from South America, Iran and other parts of the world and utilising KIOCL's facility, have taken away pellets facilitating better utilisation of its plant capacity and profitability utilising its manpower. The company's blast furnace unit having a capacity of 216,000-tonnes of pig iron which was put under suspension since 2009 has been taken for repair and the unit is ready for operation for producing foundry grade pig iron adding towards its profitability in the coming financial year. The firm earned a profit of ₹ 47.93 crore in FY17 as against a loss of ₹ 80.15-crore the previous year. Revenues grew 353 per cent to ₹ 929.36-crore from ₹ 205.57-crore in the previous fiscal.

**JSW Energy**, part of the Sajjan Jindal-led JSW Group, is believed to be in the race for buying out the thermal power assets of Monnet Power and Jindal India Thermal Power Ltd (JITPL) in Odisha. Monnet Power's 1,050-MW coal-based power plant near Angul was in advanced stage of commissioning. Monnet Power's parent company, Monnet Ispat & Energy had won the Mandakini coal block in Odisha in competitive bidding, it surrendered the block later on grounds of economic unviability. Monnet Power had accumulated debt in excess of ₹ 5,000-crore. Though lenders had earlier denied a haircut in JSW Energy's prospective deal to acquire majority equity in Monnet Power, the Sajjan Jindal-owned firm is still believed to be in the hunt for the asset. Besides Monnet Power, JSW Energy is also eyeing takeover of BC Jindal controlled JITPL's 1,200-MW coal-based plant at Derang near Angul. The first unit (600-MW) of the 1,200-MW plant had begun commercial operations and started power supplies to the Odisha grid. But, coal paucity and absence of firm linkages had caused disruptions in the operations of the power plant. This project has been completed at a cost of ₹ 7,537-crore which includes a debt component of ₹ 5,900-crore. JITPL has power purchase agreements (PPAs) with Odisha's Gridco Ltd, Kerala State Electricity Board and Tata Power Trading Corporation. Apart from JSW Energy, JITPL also had competing offers from Adani Power and Singapore's SembCorp. The

valuation of the prospective deal is not known. JSW Energy refused a comment on the status of its takeover plans of Monnet Power and JITPL. NLC India (formerly Neyveli Lignite Corporation) which is in the hunt for buying out power assets, is understood to have shown interest in the 700-MW Odisha plant of Hyderabad-based Ind-Barath Power Infra Ltd (IBPIL). The power plant located at Sahajbahal, near Jharsuguda, has commenced commercial operations. Though the exact size of the potential deal is not known, the valuation could be anywhere in the range of ₹ 5,000-5,500-crore. In August last year, NLC India had floated an Expression of Interest (EoI) from companies owning coal and lignite-based power projects, for a possible acquisition. NLC India's installed thermal power capacity is 3,240-MW. It runs a 10-MW solar power unit and wind power assets with a capacity totalling 37.5-MW.

**Western Coalfields** has received the environment clearance for its ₹ 263-crore expansion project in Nagpur district, Maharashtra. The proposal is to enhance the production capacity of the Gokul open-cast mine to 1.875-million tonnes per annum (MTPA) from the existing 1-MTPA. The mine, located in 767.17-hectare, has a mineable reserve of 14.50-million tonnes. The clearance to the project is subject to certain conditions. Total cost is estimated to be ₹ 263-crore. Among the conditions specified, the company has been asked to get 'Consent to Operate' certificate from the State Pollution Control Board for the existing production capacity of 1-MTPA and also the 'Consent to Establish' for the proposed capacity of 1.875-MTPA prior to enhancing the production capacity. With regard to transportation of coal, the company has been asked to carry out by covered trucks and take mitigative measures to control dust and other fugitive emissions all along the roads by providing sufficient numbers of water sprinklers. The company has been informed to adopt controlled blasting techniques to control ground vibration and flying rocks. It has also been told to implement a progressive afforestation plan covering an area of 376.04-hectare at the end of mining. Of the total quarry area of 231.73-hectare (on floor) and 291.21-hectare (on surface), the backfilled quarry area of 115.39-hectare should be reclaimed with plantation and there will be no void left at the end of the mining operations. The land after mining should be restored for agriculture purpose.

**Singareni Collieries Co Ltd (SCCL)** the State-owned coal mining giant, has initiated preparations to start Koyagudem Opencast Project-III (KOC-III) in Lingala Koyagudem coal belt of Godavari valley coalfield in Tekulapally mandal soon. The extractable reserves in the KOC-III are estimated to be around 111.98-million tonnes as against the estimated geological reserves of 146.81-MT. The KOC-III project is expected to produce around 3.6-million tonnes per annum, SCCL sources said.

In pursuit of its aggressive growth strategy, the SCCL has drawn up ambitious plans to open 31 coal mines including 20 OCPs and 11 underground mines in the next five years. It presently has 30 underground mines and 16 OCPs spread across the vast Godavari valley coalfield spanning Bhadradi-Kothagudem, Khammam, Karimnagar, Adilabad and a few other districts in the State. The company has set a coal production target of 66.06-million tonnes for the current fiscal. The company is aiming to set new benchmarks in coal production, dispatches and overburden removal besides enhancing the coal production capacity to around 900-lakh tonnes by 2020-2021, SCCL sources said. The SCCL has reportedly obtained the mandatory forest clearance from the Central government agencies concerned for the KOC-III. The project envisages use of 1,158-hectares of forest land and 448-hectares of non-forest land.



The upcoming KOC-III, which is surrounded by the Koyagudem OCP-II, is expected to augment coal production in Yellandu area of the SCCL. Preparations are on to commence the works on removal of 17 lakh cubic meters of overburden at the KOC-III to commence coal production in the project SCCL. The KOC-III has already obtained all the mandatory approvals from the Central government agencies concerned. The project is likely to be opened soon.

## OIL & GAS

**Kochi-Mangaluru Natural Gas Pipeline Project** would be completed by this October-November, according to Dharmendra Pradhan, Union Minister for Petroleum, Natural Gas, Skill Development and Entrepreneurship. He said that Mangaluru is very much there in the new bidding round for city gas distribution (CGD). There would be a new executor for the CGD in the city in the next three months. The single initiative will create new techno economic eco system in Mangaluru, the Minister said and added that the fertilizer plant, refinery, petrochemicals and other industries in the city are eagerly waiting for LNG supply. The LNG terminal in Kochi was completed six years ago. However, the desired pipeline was not there. Works are on the fast track to lay the pipeline, and the local governments in Kerala and Karnataka are cooperating in the matter, he said.

**The National Agricultural Cooperative Marketing Federation of India (Nafed)** will set up a bio-CNG plant in Delhi's Azad Mandi, said Minister for Petroleum and Natural Gas Dharmendra Pradhan. Speaking at the Delhi Energy Dialogue-2018 organised by Ashden India Collective. He said, The Nafed plant will use agricultural and vegetable waste of the mandi produce CNG. Indraprastha Gas will buy the bio-CNG produced. He said public sector oil marketing companies, particularly Indian Oil, are procuring bio-fuel across the country at a competitive market price. I can visualise ₹ 1 lakh crore of new business across the country in bio-fuel and bio-CNG industry, he added. Pradhan said he had met the Chief Economist of BP earlier this week who told him that India is currently the third largest primary consumer of energy after the US and China. In comparison to any developed economy and as a very upcoming economy, our per capita energy consumption is very low. Global experts are predicting that the CAGR growth of energy consumption in India over the next 25 years will be at 4 per cent, he said. The nearest competitor will be China with a 1.5 per cent growth. By 2030, we will be surpassing China's consumption. Our incremental energy requirement will be equal to the entire Europe's energy consumption, he added.

## CEMENT

**Chettinad Cement Corporation Pvt Ltd and KCP Ltd** of Tamil Nadu are planning to invest ₹ 1,350-crore and ₹ 531-crore respectively to establish their new units in the State of Andhra Pradesh. The State investment promotion board headed by Andhra Pradesh Chief Minister N Chandrababu Naidu has cleared six investment proposals, including these two, involving a total investment commitment of ₹ 3,303-crore. According to the government, Chettinad will set up a cement grinding unit on 75-acres and a manufacturing plant on 1,000-acres of land in Vizag and Guntur districts respectively. The mega project will start production in March 2019. KCP Ltd will be setting up a unit on 100-acres of land in Krishna district with the first phase scheduled to start operations in a year's time. The cement industry in South India in general, and in Telangana and Andhra Pradesh in particular, is facing a huge capacity overhang with an installed base of around 150-million tonnes against a total demand of around 60-million tonnes. An additional 20-million tonnes goes to the neighbouring markets in the eastern and western parts of the country from here, according to the industry representatives. The two Telugu-speaking States together possess more than 30 per cent of the country's

limestone reserves, making them attractive destinations for cement companies. Among the other major investment proposals, Hyderabad-based Rain Group, which also has cement manufacturing operations, has expressed interest in establishing a calcined petroleum coke plant, cement grinding unit, an R&D facility and a waste heat recovery power plant at Achutapuram SEZ in Visakhapatnam district, the government said. The company proposes to invest ₹ 1,096-crore in these projects.

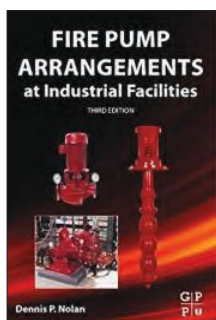
## FERTILIZER

**Hindustan Urvarak and Rasayan Ltd (HURL)** will award projects for the first of its three gas-based fertilizer plants before the year-end. HURL is the joint venture between NTPC Ltd, Coal India Ltd, Indian Oil Corpn, Fertiliser Corpn of India Ltd and Hindustan Fertiliser Corpn Ltd. The JV was assigned the responsibility of reviving three fertiliser plants at Gorakhpur, Sindri of FCI, and Barauni of HFCL in June 2016. Indian Oil Chairman who is also the Chief of the Joint Venture, said, Our target is to commission all the three plants in 2020. We have got the environmental clearance for all the three plants that are located in the same areas. Area clearing and pre-project activities are going on. We have got the tenders, we have lined up the consultant. We have got the tenders for EPC contractors and the technology selection will also be in their scope. We have shortlisted technologies. We have opened the tenders and evaluation is going on. The task for setting up of these three fertilizer plants have been entrusted to three Maharashtra Public Sector Companies on equal cost-sharing basis. An official statement had said that it was proposed to install an ammonia plant of 2,200-tonne per day and urea plant of 3,850-tonne per day at each of these units at Gorakhpur, Sindri and Barauni at an estimated cost of ₹ 6,000-crore for each unit. The total project cost was estimated at ₹18,000-crore for the three plants, the statement added. But, crude oil refiner IOCL, power generator NTPC, and coal miner CIL are not known for setting up fertilizer plants.

## ENERGY

**India Yamaha Motor** has installed 1,100-kW rooftop solar power plant at its manufacturing facility near Chennai at a cost of ₹ 5-crore. With this, the Chennai plant's total solar capacity has increased to 1,450-kW. The company has plans to increase the total rooftop solar capacity to 3,500-kW by the year-end. The new rooftop installation will reduce CO<sub>2</sub> emission to the extent of 1,600-tonnes/year. Yamaha has partnered with Mahindra Susten for installing the rooftop solar panels. Yamaha has partnered with Amplus Solar for installation, operation and maintenance of solar power system at its Surajpur plant. This is one of the largest rooftop solar power plants with total capacity of 6,200-kW. This project was commissioned in two phases. Phase I was inaugurated in January 2016 with generation capacity of 4,000-kWp and Phase II was commissioned in October 2017 with generation capacity of 2,200-kWp. Recently under Phase II, 105-kW capacity solar power plant was installed in the car parking area inside the plant premises and 47 cars can be parked under the solar power plant which is also capable of meeting the future requirement of charging battery-operated cars. This particular area has a power generation capacity of 500 units per day.

**The Indian Wind Turbine Manufacturers Association (IWTMA)** announced that the wind industry is poised to meet the Government's target of 60-GW ahead of the 2022 deadline. The domestic wind market is on a growth path in the competitive bidding regime and there is an increased demand for clean energy, which has now become a reliable, affordable and mainstream source of energy. The industry has regained momentum and there is a clear business visibility of 10-12 GW even before the start of this financial year with announcement and plan of bids by the Ministry of New and Renewable Energy (MNRE).



### Fire Pump Arrangements at Industrial Facilities

**Author:** Dennis P Nolan

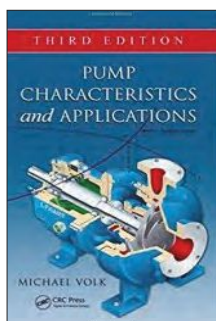
**Price:** \$123.69

**No of pages:** 256 pages (Paperback)

**Publisher:** Gulf Professional Publishing (3<sup>rd</sup> Edition)

**About the book:** Fire Pump Arrangements at Industrial Facilities, 3<sup>rd</sup> Edition delivers a practical reference from an author with a successful professional career in fire protection and loss prevention engineering in the oil and gas industry. While most regulatory standards are left to interpretation and try to cover multiple industries in one location, this book focuses on the equipment, standards

and operations specific to the petroleum industry, covering quality controls, pump drivers and scheduled maintenance and audits so the equipment remains in safety compliance. Enhanced with new sections on human factors, case studies for modelling fire accidents and a look at recent events that have further shaped the safety and testing of fire pumps, the book provides the engineer and manager with a critical oil and gas resource for every aspect of firewater pumps.



### Pump Characteristics and Applications

**Author:** Michael Volk

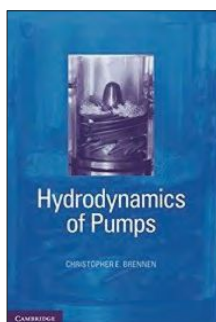
**Price:** \$89.11

**No of pages:** 516 pages (Hardcover)

**Publisher:** CRC Press (3<sup>rd</sup> Edition)

**About the book:** Providing a wealth of information on pumps and pump systems, Pump Characteristics and Applications, 3<sup>rd</sup> Edition details how pump equipment is selected, sized, operated, maintained and repaired. The book identifies the key components of pumps and pump accessories, introduces the basics of pump and system hydraulics as well as more advanced

hydraulic topics, and details various pump types, as well as special materials on seals, motors, variable frequency drives and other pump-related subjects. It uses example problems throughout the text, reinforcing the practical application of the formulae and analytical presentations. It also includes new images highlighting the latest generation of pumps and other components, explores troubleshooting options, and incorporates relevant additions into the existing chapters.



### Hydrodynamics of Pumps

**Author:** Christopher E Brennen

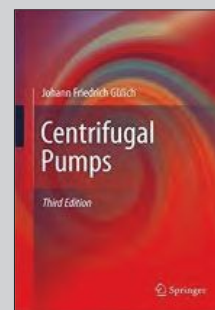
**Price:** \$42.99

**No of pages:** 304 pages (Paperback)

**Publisher:** Cambridge University Press (1<sup>st</sup> Edition)

**About the book:** Hydrodynamics of Pumps is a reference for pump experts and a textbook for advanced students exploring pumps and pump design. This book is about the fluid dynamics of liquid turbomachines, particularly pumps. It focuses on special problems and design issues associated with the flow of liquid through a rotating machine. There are two characteristics of a liquid that lead

to problems and cause a significantly different set of concerns than those in gas turbines. These are the potential for cavitation and the high density of liquids, which enhances the possibility of damaging, unsteady flows and forces. The book begins with an introduction to the subject, including cavitation, unsteady flows, and turbomachinery as well as basic pump design and performance principles. Chapter topics include flow features, cavitation parameters and inception, bubble dynamics, cavitation effects on pump performance, and unsteady flows and vibration in pumps - discussed in the three final chapters. The book is richly illustrated and includes many practical examples.



### Centrifugal Pumps

**Author:** Johann Friedrich Gülich

**Price:** \$252.00

**No of pages:** 1,116 pages (Hardcover)

**Publisher:** Springer (3<sup>rd</sup> Edition)

**About the book:** This book gives an unparalleled, up-to-date, in-depth treatment of all kinds of flow phenomena encountered in centrifugal pumps including the complex interactions of fluid flow with vibrations and wear of materials. The scope includes all aspects of hydraulic design, 3D-flow phenomena and partload operation, cavitation, numerical flow calculations, hydraulic forces, pressure pulsations, noise, pump vibrations (notably bearing housing vibration diagnostics and remedies), pipe vibrations, pump characteristics and pump operation, design of intake structures, the effects of highly viscous flows, pumping of gas-liquid mixtures, hydraulic transport of solids, fatigue damage to impellers or diffusers, material selection under the aspects of fatigue, corrosion, erosion-corrosion or hydro-abrasive wear, pump selection and hydraulic quality criteria. As a novelty, the 3<sup>rd</sup> Edition brings a fully analytical design method for radial impellers, which eliminates the arbitrary choices inherent to former design procedures. The discussions of vibrations, noise, unsteady flow phenomena, stability, hydraulic excitation forces and cavitation have been significantly enhanced. To ease the use of the information, the methods and procedures for the various calculations and failure diagnostics discussed in the text are gathered in about 150 pages of tables which may be considered as almost unique in the open literature. The text focuses on practical application in the industry and is free of mathematical or theoretical ballast. In order to find viable solutions in practice, the physical mechanisms involved should be thoroughly understood. The book is focused on fostering this understanding which will benefit the pump engineer in industry as well as academia and students.

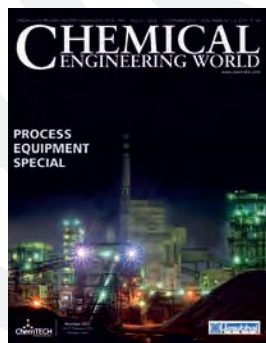
Sr. No.	Client's Name	Page No	Sr. No.	Client's Name	Page No
1	Atomic Vacuum Company (Exports)	Inside Cover I	13	Mist Resonance Engg Pvt Ltd	35
2	Cole-Parmer India	47	14	Nirmal Industries	Inside Cover II
3	Desmi India LLP	29	15	Ravel Hitek Pvt Ltd	45
4	Gemini Associates	21	16	ResistoTech Industries Pvt Ltd	11
5	Grundfos	5	17	Ross Process Equipment Pvt Ltd	23
6	Hi-Fab Engineers	45	18	Shanbhag & Associates	15
7	Hi-tech Applicator	3	19	Sulzer India Pvt Ltd	27
8	Horizon Polymer Engineering Pvt Ltd	18 & 19	20	Suraj Ltd	47
9	Jay Water Management Pvt Ltd	31	21	Toshniwal Instruments (Madras) Pvt Ltd	43
10	KSB Pumps Ltd	9	22	UNP Polyvlaves (India) Pvt Ltd	17
11	Liberty Valves Pvt Ltd	49	23	Vacuum Drying Technology India LLP	43
12	Lubi Industries LLP	7	24	Chemtech World Expo 2019	Back Cover

# ADVERTISE TO EXPAND your reach through

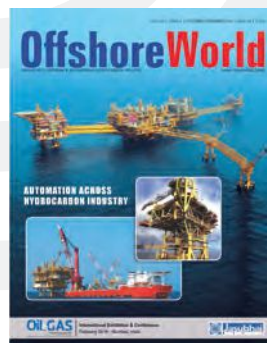
**PharmaBio**  
World



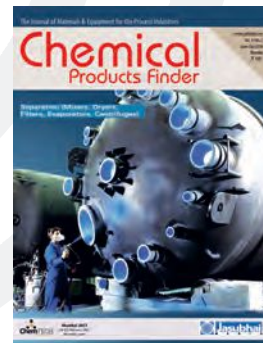
**CHEMICAL**  
ENGINEERING WORLD



**OffshoreWorld**



**Chemical**  
Products Finder



**For Details Contact**

**Jasubhai Media Pvt. Ltd.**

Taj Building, 3<sup>rd</sup> Floor, 210 Dr D N Road

Fort, Mumbai - 400 001

Tel: 022-4037 3636, Fax: 022-4037 3635

Email: [industrialmags@jasubhai.com](mailto:industrialmags@jasubhai.com)







- Pioneering Pressure Regulating Solutions since 1973
- Presence in Middle East, Indian Subcontinent, Asia Pacific, Far East, Africa & Europe
- High quality and fast delivery of customised solutions with great value for money
- Approved vendor with Petroleum Development Oman, SABIC, Takreer, Gasco, KOC & Engineers India Limited
- International Quality Certifications  
PED 97/23/EC Compliance (CE marking)  
EN 334 & 14382 Certification  
ASME U & R Stamp Certification
- Proficient technical support & prompt after-sales support



#### PRODUCTS FOR PROCESS INDUSTRIES

- Wide Range Of Self-Actuated Pressure Control Valves
- High Pressure Reducing Stations with Safety Shut-Off and Manifold
- Continuous Nitrogen Blanketing & Purging System for Centrifuge
- Low Pressure Nitrogen Blanketing System & Tank Protecting Devices
- Breather Valves, Flame Arrestors
- Pilot Operated Relief Valves, Thermal Relief Valves & Safety Relief Valves

#### SOLUTIONS FOR NATURAL GAS SECTOR

- Gas Pressure Regulators, Slam Shut Valves & Creep Relief Valves
- Natural Gas Conditioning Systems
- City Gate Stations (CGS)
- District Regulating Stations (DRS)
- Industrial Pressure Regulating Stations (IPRS)
- Meeting and Regulating Stations (MRS) For Commercial & Industrial Applications
- Fiscal and Secondary Orifice / Diaphragm / RPD / Turbine / Ultrasonic Based Metering Skids Compliant to AGA Standards With Flow Computer RTU SCADA Options
- Gas Pre-Heater / Dryers / Odoriser Unit
- Scrubbers & Filters

First Floor, Samridhi, L.B.S. Road, Mulund (W),  
Mumbai - 400 080. INDIA. Ph.: +91-22-67746200, 91-22-25608668  
Fax: +91-22-25682771. Email: info@nirmalindustries.com  
Website: www.nirmalindustries.com

*Nirmal* <sup>TM</sup>  
INDUSTRIAL CONTROLS PVT. LTD.  
Expertise that delivers

# Process Industry's Gateway to Indian Market

20-21-22-23

**Chemtech**  
 FOUNDATION  
 Inspiring Intelligence • Igniting Innovation



Ministry of Chemicals & Fertilizers,  
 Department of Chemicals and  
 Petrochemicals, Government of India

Supported by



## 29<sup>th</sup> International Exhibition and Conferences

20-23, February 2019

Venue: Bombay Exhibition Centre, Goregaon (East), Mumbai, India

Concurrent Events:



### Exhibitors - CHEMTECH + Biopharma World Expo 2019

- Refining & Petrochemical products
- Biotechnologies
- Chemical & Pharma Processing Equipment
- EPC Services
- Automation Technologies
- Environment Solutions
- Water & Wastewater Treatment Technologies
- Pumps & Valves
- Pipes & Fittings
- Packaging Solutions
- Material Handling Systems
- Analytical & Laboratory Technologies
- Consulting Services
- Equipment Fabricators

### Exhibitors - Specialty Chemicals World Expo 2019

- Agrochemicals Intermediates
- Adhesives & Sealants
- Agrochemicals & Crop Protection
- Bulk Drugs & Intermediates
- Enzymes
- Colorants, Dyes & Pigments
- Cosmetics & Personal Care Ingredients
- Hygiene & Cleaning Chemicals
- Laboratory Chemicals
- Surfactants
- Water Treatment Chemicals
- Catalysts
- Electronic Chemicals
- Flavours & Fragrances
- Contract Manufacturers

### Facts & Figures 2017



Organised by: **Jasubhai Media Pvt Ltd**

Taj Building, 3<sup>rd</sup> Floor, 210, Dr. D N Road, Fort, Mumbai – 400 001, INDIA.

Tel: +91-22-4037 3636, Fax: +91-22-4037 3635, Email: sales@jasubhai.com

Delhi Office: 803, Chiranjiv Tower, 43, Nehru Place, New Delhi - 110 019, India.

Tel: 91-11-4674 5555, Fax: 91-11-2642 7404

[www.chemtech-online.com](http://www.chemtech-online.com)

Supported by

