

# CHEMICAL ENGINEERING WORLD

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

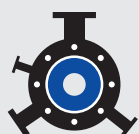
**APPLICATOR**

a Global Trusted Brand

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

## INTRODUCING FIRST TIME <sup>IN</sup> INDIA

**CORROSION RESISTANT  
SEAMLESS LINING IN  
COMPLEX SHAPES AND  
LARGE DIAMETER  
EQUIPMENTS**



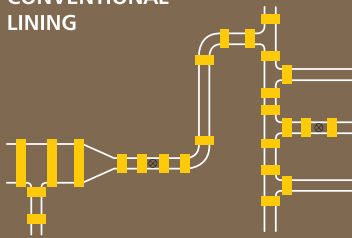
**FLUOROFIT®**  
COMPLEX SHAPE SEAMLESS LINING



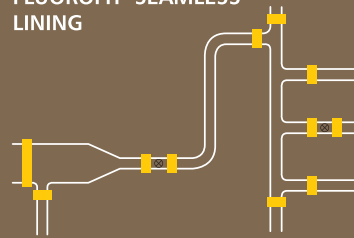
### FLUOROFIT® ADVANTAGE

- 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 Complaint

INSTALLATION WITH  
CONVENTIONAL  
LINING



INSTALLATION WITH  
FLUOROFIT® SEAMLESS  
LINING



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](mailto:hitech@ptfeindia.com)

**Peristaltic.**

**No tube.**

**Longer life.**



## Qdos<sup>®</sup> Conveying Wave Technology<sup>™</sup>

An evolution in long-life chemical metering

**Contact us**

info@wmftg.in

+ 91 7030176600 / + 91 7030162233

www.wmftg.in



# CORIOLIS MASS FLOW

High-precision mass flow measurement and control of liquids and gases

## INCREDIBLE ACCURACY

Measure NIST-traceable flows with  $\pm 0.2\%$  of reading accuracy down to 0.08 grams per hour.

## SUPERIOR VERSATILITY

Ideal for applications with unknown fluid compositions and external vibration.

## RELIABLE DURABILITY

Resistant to corrosive fluids, IP67 rating, with operating pressures up to 4000 PSIA.



Our application engineers will specify the best CODA-Series instrument for your application. Contact us today.

## ALICAT SCIENTIFIC INC.

C/O. Halma India Pvt. Ltd. A-147, Road No. 24,

Wagle Industrial Estate, Thane West, Thane - 400607, Maharashtra, India

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

Email ID: [info-in@alicat.com](mailto:info-in@alicat.com)

Contact No.: +91-99300-47455



# Reliable and Efficient Solutions for Chemical, Petrochemical, Refinery and Power Industries

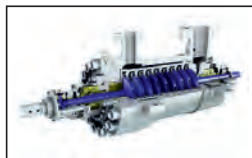


Barrel Casing Pump

MellapakPlus™

Rings

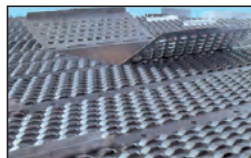
Static Mixer



GSG Barrel Pump



HiPer TwinLine™ Separator



MVG™ Trays



Field Services

## World Leader in Separation Technology & Innovative Pumping Solutions with Engineered Application

### Sulzer Chemtech

Leading Player in field of Separation & Process Technology, mixing and Process plants

Phone +91 2137 304 000

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

### Sulzer Pumps

State-of-the-art-engineered and configured pumping solutions for performance reliability

Phone +91 22 3913 0525

**SULZER**



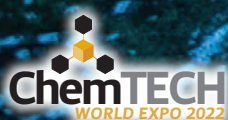
CHRONICLING PROCESS INDUSTRY INNOVATIONS SINCE 1966

VOL.56 | ISSUE 9 | SEPTEMBER 2021

# CHEMICAL ENGINEERING WORLD

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

**FILTRATION & SEPARATION**



ChemTECH World Expo 2022  
22-25 February 2022  
Bombay Exhibition Center  
Goregaon (East), Mumbai, India





# Technology For High Vacuum Processing

## 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.



***Trial Plants  
Available  
At Works***

## 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**

www.atomicvacuum.com

e-mail:atovac@vsnl.com

Cell: 9820032171 (K.R. Sharma)

# SEMI-FINISHED PRODUCTS

AND TANK LINING SYSTEMS  
MADE OF PE, PP, PVDF,  
ECTFE, FEP AND PFA

Outstanding chemical resistance

For extreme temperatures  
(-200 °C up to +260 °C)

Easy to clean, maintenance free

For lining of dual-laminate, loose  
and bonded tanks, fixpoint linings



HOT GAS WELDING



PFA FIXPOINT LINING



     
@agruworld  
www.agru.at



**CHAIRMAN**

Maulik Jasubhai Shah

**PUBLISHER & CEO**

Hemant K. Shetty

**EDITOR**

Mittravinda Ranjan

**CREATIVES**

Arun Parab

**GENERAL MANAGER SALES**

Prashant Koshti

Amit Bhalerao

**BRAND MANAGER**

Sudhanshu Nagar

**SALES**

Godfrey Lobo

Priyaranjan Singh

Chandahas M Amin

Yonack Pradeep

Sunil Kulkarni

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, 2nd Floor,  
Nariman Point, Mumbai 400 021, INDIA.

Tel.: 022-4037 3737 Fax: 022-2287 0502

E-mail: sales@jasubhai.com

**PUBLISHED BY:**



## AD INDEX

|   |    |
|---|----|
| AGRU Plastic Technology Pvt. Ltd.....     | 7  |
| Alicat Scientific INC.....                | 3  |
| Aspentech .....                           | 9  |
| Atomic Vacuum Co (Exports) .....          | 6  |
| Evergreen Technologies Pvt. Ltd.....      | 19 |
| Fenix Process Technologies Pvt Ltd .....  | 27 |
| GMM Pfaudler Ltd.....                     | 17 |
| Hatch India.....                          | 11 |
| Hi-Tech Applicator .....                  | 1  |
| Horizon Polymer .....                     | 15 |
| N. K. Filter Fabrics .....                | 25 |
| SEW Eurodrive .....                       | 21 |
| Sulzer India Pvt Ltd.....                 | 4  |
| UNP Polyvalves.....                       | 23 |
| Vacuum Drying Technology India LLP .....  | 13 |
| Watson Marlow Fluid Technology Group..... | 2  |

# **BEYOND** OPTIMIZE™ | 21

## **New Insights in Engineering and Production Optimization**

Extend your OPTIMIZE™ 21 experience and join us for the Beyond OPTIMIZE webinar series, designed for operational leaders and practitioners within capital-intensive industries.

Featuring NEW use cases and implementation stories from industry-leading companies!

Registration is FREE so sign up today  
<http://tiny.cc/beyondoptimizewebinar>

Scan the QR code to register:



# CONTENTS

## FEATURES

### Techno-Economics of Sludge Dewatering 60



**Dr. Sachin Jadhav**

Assistant Professor of Chemical Engineering,  
Department of Chemical Engineering,  
Institute of Chemical Technology, Mumbai



**Prof. Bhaskar Narayan Thorat**

Director & Professor of Chemical Engineering  
Institute of Chemical Technology, Institute of Chemical  
Technology, Mumbai-IOC Odisha Campus, Bhubaneswar

### DesaliTec™ Closed-Circuit Reverse Osmosis 66



**Michael Boyd**

Senior Regional Sales Manager  
DesaliTec



**Ajay Bajaj**

Regional Account Manager  
CCRO – India and Sub-Continent

## IMPACT FEATURE



42

**Extend your Possibilities Introducing Sanicro®  
825 Bar & Hollow Bar**



50

**Filtration and Separation in a Pneumatic  
Conveying System**



56

**Corrosion protection with AGRU ECTFE**



58

**A Standardized Weighing Workflow for  
Innovation in Lubricating Oils**

## AD INDEX

8

## NEWS

14

## PROJECTS UPDATES

35

## PRODUCTS

73



# + Innovations PneuCalc



## Design software for pneumatic conveying systems

Need help with designing or troubleshooting pneumatic conveying systems?

PneuCalc is the only software application that can optimize your design while avoiding pitfalls. Better design systems in a fraction of the time!

Improperly designed conveying systems or process changes can wreak havoc on production lines with blockages in the system, irregular feed rates, or premature equipment wear.

Understanding how the system parameters influence the behavior of conveyed material is key to efficient and reliable pneumatic handling of bulk materials.

Make smart design choices!



Comprehensive



Analyze



Time saving



Intuitive



Cost effective



Robust



Let PneuCalc help you reach production capacity and improve your bottom line!

Save time and download a free demo today.

[pneucalc.com](http://pneucalc.com)

# HATCH

# India: Huge Opportunity for Technologies Across the Energy Spectrum

**Chemtech**  
FOUNDATION  
Inspiring Intelligence - Igniting Innovation

## International Integrated Energy Show

# Oil Gas & Power.IE

25-27 October, 2021

DIGITAL  
MEDIA KIT



BOOK YOUR  
EXHIBITOR DASHBOARD

**Oil&GAS**  
.IE 2021

**Refining  
& Petro**  
CHEMICALS .IE 2021

**GAS**  
WORLDTECH  
.IE 2021

**POWER**  
.IE 2021

**INLAND  
PORTS & LOGISTICS**  
.IE 2021

**SURFACE ENGINEERING  
& Corrosion Control.IE 2021**

## Leadership for Oil Gas & Power. IE 2021



**Mr. R K Srivastava**  
Director (Exploration) &  
Director (Offshore) Addl. Charge,  
ONGC Ltd and Chairman,  
Oil & Gas World.IE 2021



**Mr. Pankaj Kumar Goswami**  
Director (Operations),  
Oil India Ltd and Co-Chair,  
Oil & Gas World.IE 2021



**Mr. E S Ranganathan**  
Director Marketing,  
GAIL (India) Ltd. and Chairman,  
Gas World Tech. IE 2021



**Dr. SSV Ramakumar**  
Director (R&D), IndianOil  
Chairman, Refining &  
Petrochemicals World.IE 2021



**Mr. U K Bhattacharya**  
Director (Projects), NTPC &  
Chairman, Power World.IE 2021



**Mr. S K Moitra**  
Former Director Onshore,  
ONGC & Convener,  
Oil & Gas World.IE 2021



**Mr. Rajeev Mathur**  
President Growth & Policy,  
Cairn India & Convener, Gas  
World Tech.IE 2021



**Mr. A. K Jha**  
Former CMD & Director  
Technical, NTPC & Convener,  
Power World.IE 2021



**Mr R P Pandey**  
ED - CES (Onshore), ONGC  
Head- Advisory Committee, Surface  
Engineering & Corrosion Control. IE 2021



**Mr K L Batra**  
Advisor, Chugoku Marine Paints &  
Convener, Surface Engineering &  
Corrosion Control. IE 2021



**Mr Sanjay Chowdhury**  
Business Head Protection, Berger paints -  
Technical Committee Head, Surface  
Engineering & Corrosion Control. IE 2021

Click and MEET more than **150 exhibitors** during the three days of  
**Oil Gas & Power.IE 2021- REGISTER TODAY**

### Platinum Partners



### Gold Partners



### Silver Partner



### Bronze Partner



### Support Partners



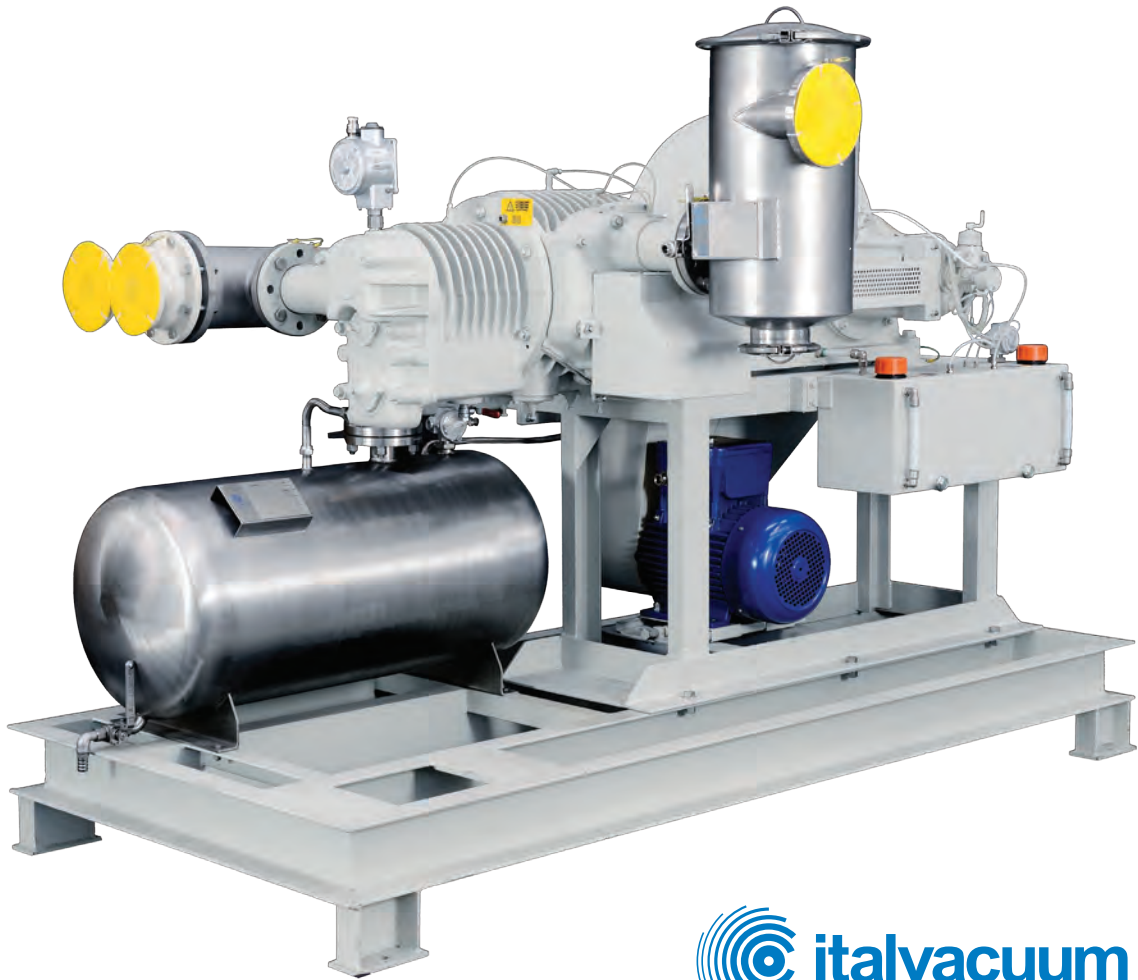
## Jasubhai Media Pvt Ltd

Taj Building, 3<sup>rd</sup> Floor, 210, Dr. D N Road, Fort, Mumbai - 400 001, INDIA. **Tel:** +91-22-4037 3636, **Email:** sales@jasubhai.com  
Ahmedabad / Vadodara - 09820544904 | Bangalore - 09892644177 | Chennai - 09176963737 | Delhi - 09818148551  
Hyderabad / Pune - 09822209183, 09823410712 | Mumbai - 098331 04834, 098202 52953, 096643 60902

Follow us



# When others stop, Saurus939<sup>®</sup> carries on.



## Saurus 939<sup>®</sup>

Vacuum pump available in single and double stage model, with one or two roots.

**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](mailto:info@electromechengineering.com)



### Italvacuum S.r.l.

via Stroppiana 3, 10071 Borgaro T.se (TO) IT  
[www.italvacuum.com](http://www.italvacuum.com)



Planex<sup>®</sup>  
System



CosmoDry<sup>®</sup>  
System



Criox<sup>®</sup>  
System



Bi-Evolution<sup>®</sup>  
Dryer



Multispray<sup>®</sup>  
Cabinet Dryer



## Sabic Collaborates With Indian Oil Corporation Limited to Reduce Emissions from Diesel Engines



Janardhanan Ramanujalu, Vice President & Regional Head, SABIC South Asia & ANZ

**New Delhi, India:** SABIC, a global leader in diversified chemicals, in collaboration with India's leading oil marketing company, Indian Oil Corporation Limited (IOCL) will provide Technical Grade Urea (TGU) to manufacture AUS-32 (Aqueous Urea Solution) used in diesel vehicular systems to reduce NO<sub>2</sub> emission by over 70% to meet the stringent norms of Bharat Stage VI vehicles.

The collaboration supports the Indian automobile industry in reducing greenhouse gas emissions to meet the Bharat Stage VI (BS-VI) standards, which regulates vehicular emissions in India.

Superior quality and high purity of TGU made by SABIC can help oil marketing companies deliver fine quality solutions to their customers without compromising on the diesel exhaust fluid quality.

Talking about the collaboration, **Janardhanan Ramanujalu, Vice President & Regional Head, SABIC South Asia & ANZ**, said, "Bharat Stage emission norms moved from BS IV to BS VI which threw up many challenges for the automotive industry. Our high quality solution fits perfectly in meeting the emission norms in collaboration with the oil industry. We take pride in collaborating with IOCL and considering it a major step towards keeping India at par with the rest of the world regarding vehicular emissions."

Sanjay Singh, Head, Agri Nutrients India Business, SABIC, said, "As part of our commitment towards sustainability, SABIC has invested in Saudi Arabia-based facilities to produce high-quality TGU meeting the global benchmark for reducing vehicular emissions. The arrangement with IOCL will support a sustainable transition to and compliance with BS-VI standards for all diesel vehicles, reducing air pollution and helping meet the larger climate goals."

SABIC also supplies TGU to other leading manufacturers of AUS-32 in India to support the Indian automobile industry in meeting BS-VI standards. As per the BS-VI standards, all heavy diesel vehicles with 2000 cc engine capacity or more will require a Selective Catalytic Reduction (SCR) converter to use AUS-32 solutions by reducing nitrogen oxide emission by more than 70%.

SABIC's collaboration, especially with IOCL, will make the AUS-32 solutions readily available in the market and can be refilled by heavy diesel vehicles on the go and is a viable process.

# India's Largest Processor of FLUOROPOLYMERS



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.

## Horizon Polymer Eng Pvt. Ltd.:

204, Sumer Kendra, Pandurang Bhudhkar Marg, Worli, Mumbai - 400018. India

Contact: +91 22 24965031-36 | Fax: +91 22 24961073

Email: [vp@horizonpolymers.com](mailto:vp@horizonpolymers.com)



## Apna.co collaborates with AkzoNobel India Limited to Connect Painters with Hyper-Local Opportunities



Nimit Parikh, Founder and Chief Executive Officer  
apna

**New Delhi, India:** India's largest professional networking and jobs platform for the rising workforce of India has signed an MoU with AkzoNobel India Limited to provide a dedicated online platform for painters, paint contractors and allied workers.

Under this alliance, apna will onboard painters linked to AkzoNobel on its platform with the aim to provide access to hyper-local job opportunities. This collaboration shall support painters with career information, soft skilling programs, and networking with fellow professionals, opportunities to showcase their work and do knowledge sharing. With the expansive reach of apna, the program is expected to benefit lakhs of painters and paint contractors.

All the youth undergoing vocational training in decorative paints at AkzoNobel Paint

Academy will be facilitated with curated online training, live & recorded webinars on professional networking and community engagement by the apna platform to raise awareness among the painters and paint contractors. Additionally, apna will also facilitate AkzoNobel dealers and distributors to hire skilled workers directly from the app.

Nimit Parikh, Founder, and Chief Executive Officer, apna, said, "We are delighted to partner with AkzoNobel India Limited, a global leader in this domain. Together we will contribute to India's accelerated growth journey. This is a first-of-its-kind opportunity provided by our platform dedicated to delivering strategic benefits to this section of the rising workforce. With the lockdown of the pandemic years left behind, we believe that it is the right time to invest in new skilling programs in this domain. We see this partnership going a long way in contributing to the enhancement of lives of our aspiring workforce."

Rajiv Rajgopal, Managing Director, AkzoNobel India said, "AkzoNobel is committed to its 'People. Planet. Paint' approach to sustainable business worldwide. Delivering shared value for everyone, in our ecosystem and the broader community is the cornerstone of AkzoNobel Cares. COVID-19 has accelerated the need for digital outreach across all sections of society. In these unprecedented times, AkzoNobel's MoU with apna.co aims to fast-track enhance employability of the painting community across India. We are confident that apna's specially crafted professional programs will enhance the learning, professional networking & new job opportunities for the painting workforce."



# Mavasphere® Spherical Dryer

## 4<sup>TH</sup> GENERATION PATENTED DRYING TECHNOLOGY

The Mavasphere® Spherical Dryer is a multipurpose dryer used in the drying of Chemical & Active Pharmaceutical Ingredients in compliance with cGMP and FDA guidelines.

The Mavasphere® provides excellent drying performance over a wide range of filling capacities with a good turn down ratio.



**INDIAN PATENT\***  
**271494**

### KEY FEATURES AND ADVANTAGES



Reduction in drying  
time upto 1/10<sup>th</sup>



Consistent drying efficiency  
irrespective of working volume



Maximum working  
handling capacity (80%)



Available from 100 ltr to  
6000 ltr working volume

\*Infringement of patented technology  
will result in legal action

**[www.gmmpfaudler.com](http://www.gmmpfaudler.com)**

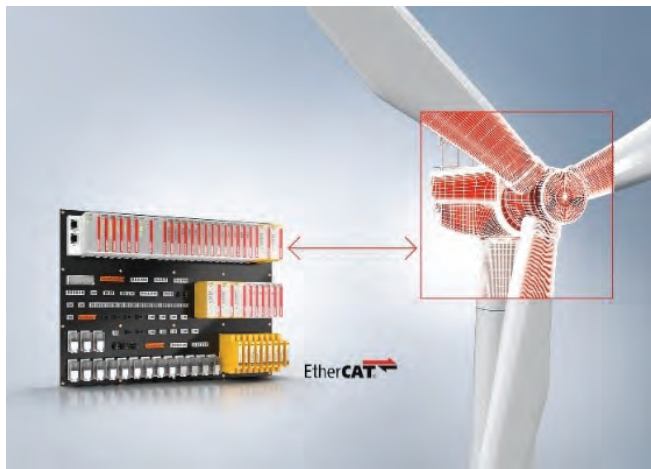
[sales@gmmpfaudler.com](mailto:sales@gmmpfaudler.com) | 022 66503900

— click on ad for more details —

**GMM Pfaudler**   
Defining the standard

Apna's vertical communities will mine new networking, collaborating and job discovery opportunities for the talented workforce in the painting industry. Through this partnership, a large section of the unorganised workforce across India will get a professional and credible digital identity for the first time, which in turn will boost their employability. Both AkzoNobel and apna have collaborated to create more meaningful opportunities for skilled professionals and deliver strategic benefits through the technology platform present in 28 Indian cities.

## Ethercat Plug-In Modules Minimize Space Requirements and Wiring Effort in Wind Turbines



**Verl, Germany:** At this year's Husum Wind from September 14-17, 2021 Beckhoff will be demonstrating its many years of know-how and its broad product range for the wind power industry. Among the highlights is a control cabinet optimized in terms of space requirements and wiring effort, which is only possible using the EtherCAT plug-in modules from the EJ series. In the displayed control cabinet, the I/O level is realized with the EtherCAT plug-in modules and a

highly compact, application-specific signal distribution board with a wiring level from stock and preassembled cables. The EtherCAT plug-in modules are based electronically on the well-known EtherCAT I/O Terminals and offer the same broad variety of signals. Their electromechanical design enables them to be plugged directly into an application-specific signal distribution board which distributes the signals and the power supply to individual application-specific connectors, in order to connect the controller to further system modules. Elaborate manual wiring of single wires is replaced by simply plugging in prefabricated cable harnesses.

Many of the other components that would otherwise be installed separately in the control cabinet are housed as compact plug-in modules on the board, e.g. relays, fuses or surge voltage protection equipment. This means that the space requirement in the control cabinet is significantly reduced, particularly in series production with mid to high quantities, also lowering costs. Another crucial advantage is the minimized risk of incorrect wiring.

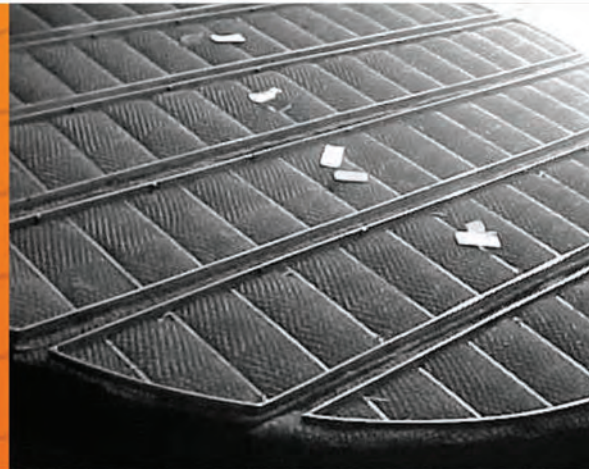
With its broad portfolio of PC-based control technology Beckhoff is also appearing at this year's Husum Wind as a long-standing automation partner of the wind power industry. Our focus will be on the ongoing integration of all plant and system functions: everything from operational management to pitch control; converter, gear unit, and brake control; wind farm networking; and hydrogen technology as a bridging technology to energy storage.



# FOR A POLLUTION FREE TOMORROW

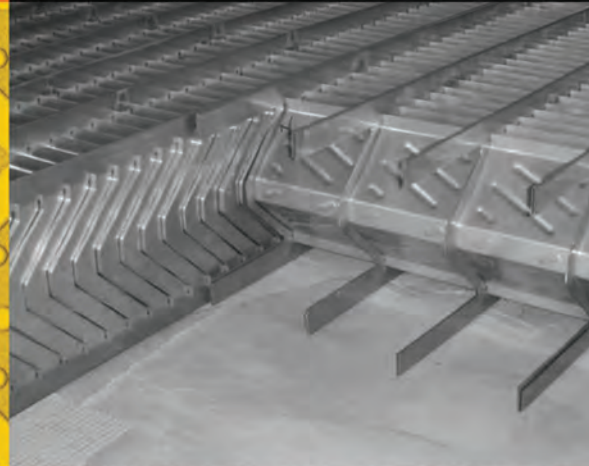
MESH MIST ELIMINATORS

**EVERMESH**



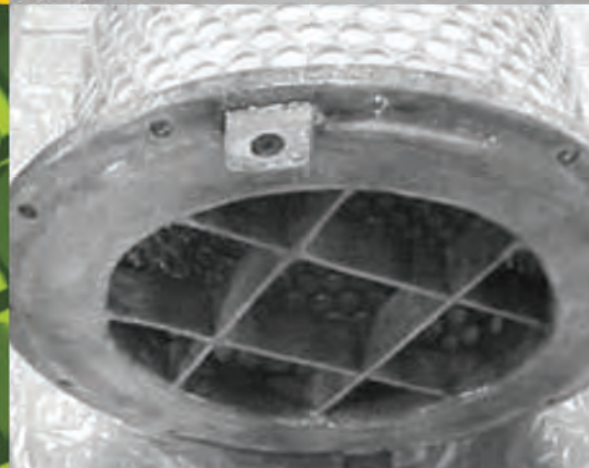
VANE MIST ELIMINATORS

**EVERON**



FIBRE BED MIST ELIMINATORS

**EVERFIBRE**



IMPROVES PRODUCT PURITY | REDUCES POLLUTANTS  
IDEALLY SUITED FOR

ABSORPTION AND DISTILLATION TOWERS | SCRUBBERS | KNOCKOUT DRUMS | EVAPORATORS |  
CHEMICAL, PETROCHEMICAL AND FERTILIZER PLANTS | ALL PROCESS PLANTS



## Go Green with Evergreen

3-D Maker Bhavan 2, 16 New Marine Lines, Mumbai - 400 020  
91 22 2201 2461 / 2706 [info@evergreenindia.com](mailto:info@evergreenindia.com)  
[www.evergreenindia.com](http://www.evergreenindia.com)



## Aramco Announces Major Expansion of its Industrial Investment Program



**Dhahran, Saudi Arabia:** Aramco announced a major expansion of its industrial investment program, Aramco Namaat, with the signing of 22 new Memoranda of Understanding (MoUs) and 1 joint venture (JV) agreement focused on capacity building in four key sectors: sustainability, technology, industrial and energy services, and advanced materials.

Namaat means [collective] growth in Arabic and the program aims to tap into the vast opportunities available in Saudi Arabia to create new value, and drive economic expansion and diversification.

Aramco Chairman, H.E. Yasir Al-Rumayyan, said: "Aramco continues to be at the forefront of enabling and enhancing the Kingdom's industrial, technology and sustainability infrastructure through large-scale investments and key partnerships, such as IKTVA and, by extension, Namaat. Such initiatives help further drive economic growth and diversification, ensure greater reliability of energy supply, effectively localize the

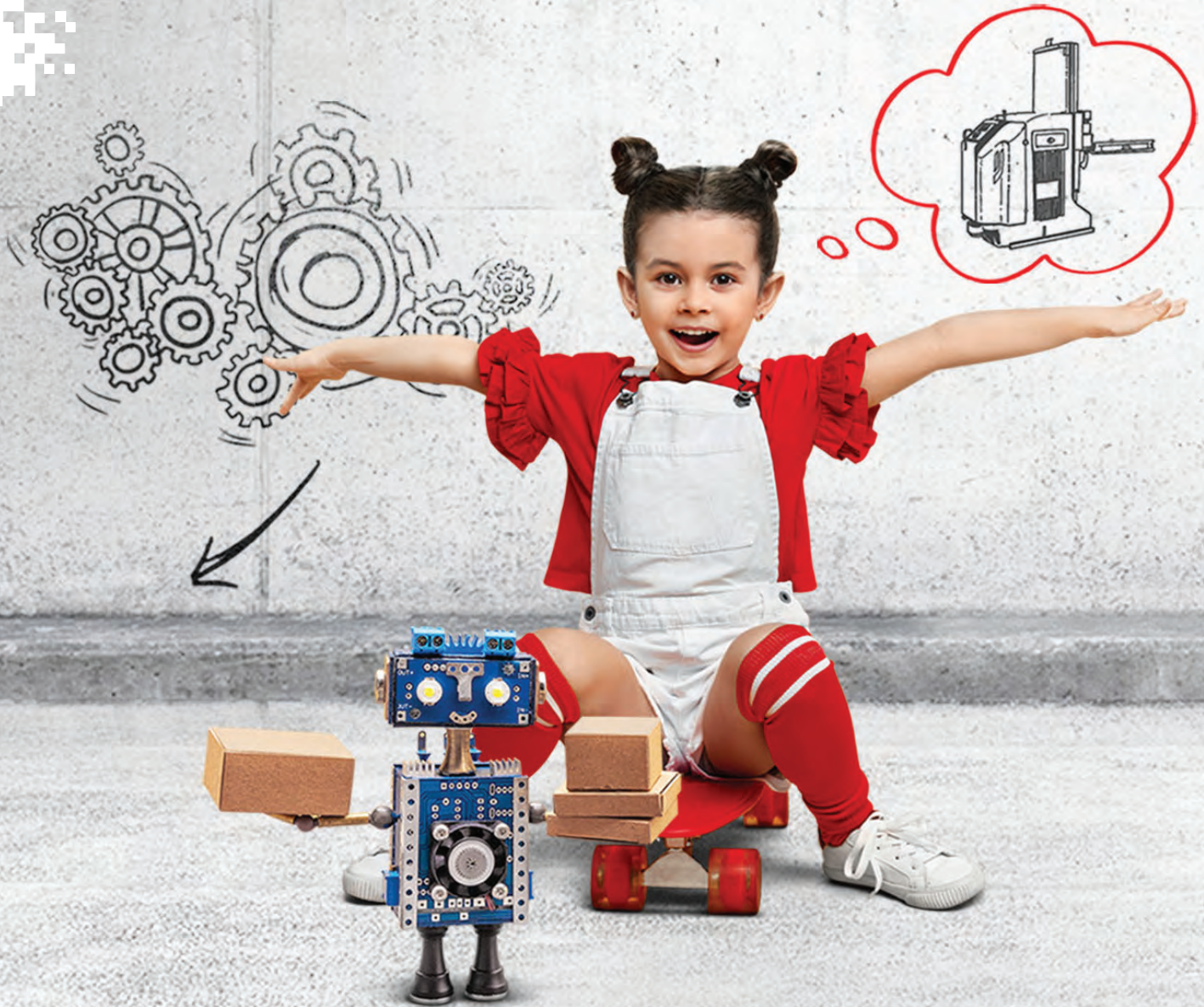
industrial supply chain, and create better jobs and skillsets."

Aramco President & CEO, Amin H. Nasser, said: "Namaat offers our partners significant opportunities to participate in Aramco's long-term growth strategy and play a vital role in the Kingdom's expanding energy and chemicals supply chain. The benefits for everyone involved are multiple as well as mutual and I am proud that Aramco continues to be a catalyst at the heart of the Kingdom's transformation, harnessing its expertise and resources to champion new markets and growth sectors. We believe these exciting target sectors offer significant opportunities for all the current and prospective parties involved."

The 22 new MoUs signed under the Namaat program include: SOLVAY – an MoU with the goal to pursue the development of advanced Non Metallic Materials and localization of a composite value chain; DHL Supply Chain - an arrangement to evaluate the feasibility of establishing a local industrial logistics and procurement hub serving Saudi Arabia and MENA region.; VEOLIA – Exclusive MOU to confirm the commercial feasibility of establishing a world-class integrated waste management company, alongside a strategic IK stakeholder; Air Liquide & Haliburton & PIF, Baker Hughes & PIF, Linde & Schlumberger & PIF – three separate non-binding MoUs to evaluate Carbon Capture & Sequestration (CCS) opportunities and potential partnerships, AIC Steel, GSW, McDermott, Seyang and Sendan, and NARMEL - five separate MoUs on modular construction; Samsung Engineering, Hyundai and Saipem - three separate MoUs on



# TOMORROW'S MOBILE MATERIAL HANDLING; ONLY A SMART CHOICE AWAY!



BOLDITALIC/SEW/MMH/21

## Say goodbye to traditional conveying systems!

Switch over to the MAXOLUTION® suite of AGVs, RGVs and EMS. SEW has proprietary and leading edge technologies in each of the relevant areas of power supply, vehicle management, navigation, segment control, safety and communication.

Our customised system solutions offer reliability, flexibility, space saving potential, low maintenance needs and the ability to communicate and carry out instructions seamlessly. The core technology is developed in-house and the peripheral components are sourced from reputed suppliers, providing you a complete system from a single source.

Make the next big move in mobile material handling, to drive in a hassle-free tomorrow.

**SEW**  
**EURODRIVE**  
Driving the world

### Range of Applications:

Automated Guided Vehicles (AGV) | Rail Guided Vehicles (RGV)  
Electrified Monorail Systems (EMS) | Power Management



© +91 96866 24322  
Email: [marketing@seweurodriveindia.com](mailto:marketing@seweurodriveindia.com)  
[www.seweurodriveindia.com](http://www.seweurodriveindia.com)



Engineering, Procurement and Construction; Elion and Green Groves – two separate MoUs to evaluate the feasibility of localizing nature-based solutions; Honeywell – an MoU with the goal to establish a JV that will develop and implement next-generation digital solutions that will improve efficiency, sustainability and enable operational excellence of industrial facilities; Gulf Modular Industry (GMI) - MoU to validate the feasibility of developing and using non-metallic applications in the modular building manufacturing process in the building and construction sector, Armorock - MoU to validate the feasibility of developing and using non-metallic polymer concrete applications in the building and construction sector, Shell AMG Recycling & United Company for Industry - a trilateral MoU on Metals Reclamation and Catalyst Manufacturing, AVEVA – an MoU with the goal to establish a strategic alliance to localize development and deployment of various digital technologies including Artificial Intelligence (AI), Machine Learning (ML), and Digital Twin; and Baosteel - an MoU to conduct an engineering study and develop plans needed to build, own and operate an integrated steel plate manufacturing facility in Saudi Arabia. As a result of Aramco's continuous support of the industrial ecosystem, a JV agreement between SeAH and Dussur to localize stainless steel seamless tube and pipe manufacturing has materialized.

Aramco Senior Vice President of Technical Services, Ahmed Al-Sa'adi, said: "Through Namaat, we are attracting world-class partners who share our goal of continuous industrial development. These partnerships illustrate Saudi Arabia's significant appeal to

international companies and pave the way for new innovations in materials, processes and solutions. Leveraging a range of finance, funding, tax and regulatory incentives available through the government's Shareek program, we aim to drive competitive advantage and achieve benefits for the environment, our business, our partners and for the wider energy and chemicals sector."

## Grundfos Enters into Agreement to Acquire Leading Water Technology Company MECO



Grundfos+MECO - SM

**Bjerringbro, Denmark:** Grundfos, a global leader in advanced pump solutions and water technologies, has entered into an agreement to acquire Mechanical Equipment Company, Inc. (MECO). Based in the United States, MECO is a world leader in the industrial water treatment market with manufacturing and sales offices in the United States as well as international offices in Singapore and Ireland. The company has a strong presence in water treatment, and a global leading position in water purification for the pharmaceutical market, owing to its proprietary vapour compression technology, deep application knowledge and experience, and proven ability to offer reliable solutions to customers.



# VALVE SOLUTIONS FOR CORROSIVE APPLICATIONS



## UNPPolyvalves

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



## LINED VALVES



### CASTING OPTIONS AVAILABLE

ASTM A216 GR. WCB  
ASTM A351 GR. CF8/CF8M  
ASTM A494 GR. 4A (CD3MN)  
HESTALLOY C - 276

### LINING OPTIONS AVAILABLE

PFA, FEP  
PVDF  
ETFE (TEFZEL)  
ANTISTATIC PFA (CONDUCTIVE)

SIZE RANGE : **MANUAL VALVES** : ½" to 24" | **ACTUATED VALVES** : ½" to 24"



### VADODARA - OFFICE & FACTORY

5 to 12 PR Industrial Estate, Por GIDC - Kashipura Road,  
Moje : Kashipura - 391 243, Dist. Vadodara. INDIA  
Phone: +91 70434 30467/77, 70430 20707  
Email : sales.baroda@polyvalve.com

### MUMBAI - 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  
Email : sales.thane@polyvalve.com

[www.polyvalve.in](http://www.polyvalve.in)  
[www.polyvalve.com](http://www.polyvalve.com)

This acquisition, which is pending regulatory approvals, will further expand Grundfos' water treatment capabilities and strengthening Grundfos' position as a leading global provider of water treatment solutions that address the world's water and climate challenges and improve the quality of life for people. When completed, it will represent the second such transaction since November 2020, when Grundfos acquired EUROWATER, one of the leading suppliers of decentralized water treatment equipment and solutions in Europe.

"We see Grundfos and MECO as a perfect fit and we are thrilled with the prospect of acquiring MECO. MECO is a highly respected water treatment company with a formidable, focused skillset and portfolio of water treatment solutions. This acquisition is about much more than superior technology. Grundfos and MECO are founded on similar values, and we share a deep commitment to innovation and sustainability as well as a genuine care for our customers and employees. Together, we will leverage our combined experience and skills to create even better solutions for our customers," said Ulrik Gernow, Group Executive Vice President and Chief Commercial Officer at Grundfos.

"The prospect of joining the global Grundfos family is something that I am very excited about. Grundfos is the ideal new owner for our company. I see an exceptionally solid match grounded in common values, our common customer-centric approach, and ambitions to make a significant difference in the field of water. As part of the Grundfos Group, we will continue strengthening our ongoing innovation, providing value-added services to customers, as well as our commitment to

offering high-quality products designed with sustainability in mind," says George Gsell, CEO at MECO. The transaction is expected to close during autumn 2021, subject to regulatory approvals.

## Boosting Tubing Manufacturing - SCHOTT Invests In Further Melting Capacities



Groundbreaking in Jambusar

**Mumbai, India:** SCHOTT, a global leader in pharmaceutical glass manufacturing, is investing a total of 70 million euros in the expansion of its Indian tubing site in Jambusar, Gujarat, following several million investments in the last years. "Against the backdrop of the growth trend in the Indian pharmaceutical business and the pandemic, we want to commit to secure the supply of pharma glass," explains Dr. Patrick Markschläger, Executive Vice President of SCHOTT's Business Unit Tubing. "The increase of over 30 percent in the facility's overall Indian production capacity is at the same time a commitment to supporting the government's vision of India becoming a global pharmaceutical hub," adds Pawan Shukla, Managing Director SCHOTT Glass India, during the groundbreaking event at the site.

The additional tank is scheduled to go into





# N. K. FILTER FABRICS



FBD BAG



CENTRIFUGE BAGS



FILTER PRESS MEDIA



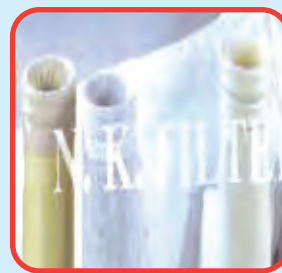
STAR FILTER BAGS



LIQUID FILTER BAGS



BELLOW 100°C - 750°C



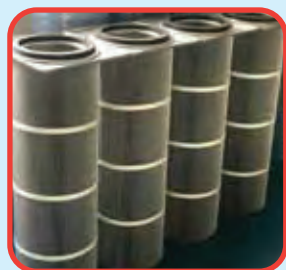
DUST COLLECTION BAGS



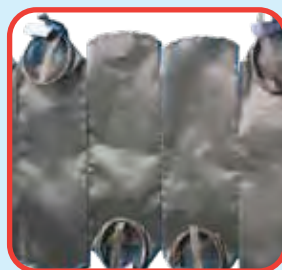
## N.K. MULTI-TECH FILTERS PVT. LTD.



DIN TYPE CARTRIDGE



PLEATED CARTRIDGE  
FILTER



SS WIRE MESH  
INDUSTRIAL FILTER BAG



3 LOCK CARTRIDGE



AIR FILTER  
FLANGE TYPE

**Mfrs of Woven and Non-Woven Filter Bags & Air Filters.**  
**We Serve with Assured Purity**

- Pharmaceutical Industry
- Chemical Industry
- Dyes and Pigment Industries
- Flour Mills
- Geo Tubes for Soil Erosion
- Ceramic Tiles and Insulators
- Steel Plants
- Cement Industry
- Fertilizer Industry
- Dust and Air Handling Units and Many More Industries...Similarly



AIR FILTER BOX/  
CHANNEL TYPE

For Further Details Please contact:

F4 / 101,102, 103 & 104, Bhumi World Industrial Estate, Mumbai Nashik Highway, Opp Tata Amantra,  
Pimplas Village, Bhiwandi, Thane - 421302,

Tel: 02522-672426 / 2427, Mobile: +91 9820530152, Email: [info@nkfilter.com](mailto:info@nkfilter.com) / [sales@nkfilter.com](mailto:sales@nkfilter.com)

Website: [www.nkfilter.com](http://www.nkfilter.com)



operation at the beginning of 2023, with the second one following a year later. The expansion in Jambusar will create new jobs for around 225 employees and is part of a more than 1 \$ billion strategic investment program of SCHOTT through 2025, leveraging the global pharma tubing and packaging business.

SCHOTT has been a frontrunner in the fight against COVID-19 and provided pharmaceutical glass for primary packaging to fill billions of COVID-19 vaccines worldwide. In India, almost all approved vaccines are packed in FIOLAX® glass made by SCHOTT. With additional melting tanks and production lines, SCHOTT intends to ensure that this Asian manufacturing hub can adequately supply high-quality pharma glass for the Indian pharma industry and neighboring countries.

26

## Leading Brake Pad Manufacturer Reduces Energy Consumption with Compressed Air Solution

**Coimbatore, India:** ELGi Compressors Europe, a subsidiary of ELGi Equipments Limited, one of the world's leading air compressor manufacturers, has provided a turnkey solution to a global brake pad manufacturer based in Hartlepool, United Kingdom. ELGi, together with its authorised channel partner Compressors and Pipework Systems (CAPS), replaced the existing compressed air system resulting in improved operational efficiency, reduced site air pressure by 0.5 bar and an approximate 3.5% decrease in energy consumption. The brake pad manufacturer sought to modernise their compressed air system due to reliability

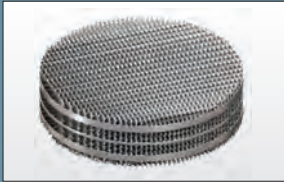
issues that led to increased maintenance costs and downtime. ELGi's team conducted a site audit to evaluate the compressed air needs and developed a tailor-made solution for the British manufacturer. CAPS' proposal comprised four new ELGi air compressors (two EG132 Premium and two EG160 VFD Premium), two highly efficient refrigerated air dryers, high-quality aluminium pipework and oil-water-separators. The customer immediately realised a reduction in energy consumption and a much smoother running system with no interruptions or unexpected downtime.

"At ELGi, our definition of Always Better is closely coupled with our vision: Always be the choice everywhere. We pride ourselves on addressing our customer's needs with comprehensive and tailor-made compressed air solutions," said Steven Coombs, Area Sales Manager. "Partnering with CAPS in this game-changing installation helped us provide our customer with the lowest life cycle cost through reduced maintenance requirements and energy savings."

"Our efficient air compressors and air dryers are accompanied by best-in-class warranty eliminating unexpected repair costs due to breakdowns," said Mark Gowing, Service & Aftermarket Manager – UK and Ireland. "At ELGi, we reaffirm our commitment to reliability by providing customers with robust warranty agreements and, in this case, the maintenance team will benefit from a service plan covering all associated service work on the compressed air system."

The robust design of the EG-Series compressor range enables operations at

# Leading the world of Filtration + Separation



**Structured Packing**



**Static Mixer**



**Random Packings**



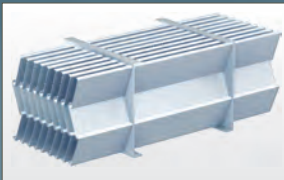
**Distillation Trays**



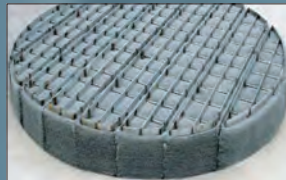
**Vane Inlet Device**



**Pusher Centrifuge**



**Vane Pack**



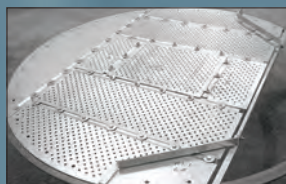
**Wiremesh Mist Eliminator**



**Liquid Distributors**



**Chevron Type Mist Eliminator**



**Double Skin Perforated Baffle**



**Column / Tower Internals**



**Sand Jet Assembly**



**Plate Pack**



**Multibeam Support**

Fenix® is a leader in process technologies, offering a wide range of engineering services and process equipment solutions that serves the refining, chemicals and petrochemical industries.

Fenix designs and manufactures a large variety of separator internals FXIntSep used in the Oil & Gas industry. Many of these have uses in other industries but some have been developed specifically for processing of natural gas and petro-crude. Our range of design services to support your front-end engineering including process simulations, internals selection and vessel sizing and optimisation. In addition we offer CAD drafting and 3D plant layout design. Our state-of-the-art manufacturing plant spread across 50,000 sqft. enables us to provide related products like structured packing, mixers, trays, internals and various mass transfer equipments. We also provide facilities for Pilot Plant Trials & case studies.

**DISTILLATION | EXTRACTION | ABSORPTION | EDIBLE OIL REFINING  
BIODIESEL | USED OIL RE-REFINING | OIL & GAS | ENVIRONMENTAL**

**Fenix Process Technologies Pvt. Ltd.**

K-6/1, Malini, Erandwane Co-op. Society,  
Nr. Deenanath Mangeshkar Hospital, Pune - 411 004. India  
Tel. No.: +91-8237008770 / 72 / 73 Email: info@fenix.in Url: www.fenix.in





extreme temperatures – from cold to hot and from dry to extremely humid conditions, leading overall to higher reliability of the compressed air system across Europe. ELGi's high-efficiency air ends are equipped with in-house developed -V profile rotors, with the 4/5 lobe combination, designed to run at low rotor speeds. This unique design reduces pressure losses, and together with the OSBIC (oil separation by impact and centrifugal action), 3-stage separation provides best-in-class oil contamination reduction (<1ppm) and excellent energy efficiency.

## Smart Industry Conference 2021 Concludes Next Course in Shaping Industry 4.0

28

**Fredersdorf, Germany:** The Ethernet POWERLINK Standardization Group, in collaboration with B&R Industrial Automation, ABB Robotics, Utthunga, and Tata Technologies, held a virtual conference titled 'Smart Industry Conference 2021'. The sixth edition of the flagship conference was designed to benefit the Indian manufacturing companies that are shaping Industry 4.0. Frost

& Sullivan was the knowledge partner of the conference. The one-day virtual conference was held on August 19, 2021 and was attended by more than one hundred delegates. Attendees from across the manufacturing ecosystem witnessed various topics covering technology, innovation, and open communication standards. The core agenda of the conference was to look beyond the cutting edge to inspire the Indian manufacturers and construct the next level of Industry 4.0.

Through its keynote address, three presentations, and one panel discussion, the conference provided a platform for the challenges and solutions of smart industry implementation. The conference focused on the journey of digital transformation towards smart, connected devices with security, analytics, and cloud solutions. Rahul Sharma, Director of Industrial Practice at Frost & Sullivan, delivered the keynote on "Trends and technologies shaping the Indian manufacturing ecosystem," which focused on the pre-paredness of Indian manufacturers and readiness of consumers to adopt the various digital mediums. He also spoke on the sustainability perspective for manufacturing

transformation in India, noting that sustainability should be the most significant theme of any organization. According to Sharma, sustainability needs to be seen on four dimensions – People, Partnership, Process, and Planet – and the mark of a sustainably matured





## 30<sup>th</sup> International Exhibition and Conferences 22-25 February 2022

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

### Concurrent Events



### Scope for CHEMTECH + Biopharma World Expo 2022

- 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

### Scope for Specialty Chemicals World Expo 2022

- 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 - CHEMTECH WORLD EXPO 2019

|            |              |           |           |            |             |
|------------|--------------|-----------|-----------|------------|-------------|
| <b>612</b> | <b>18962</b> | <b>18</b> | <b>85</b> | <b>923</b> | <b>2150</b> |
| EXHIBITORS | VISITORS     | COUNTRIES | SPEAKERS  | DELEGATES  | STUDENTS    |

## Benefits for Exhibitors

- ✓ **Business Interactions:** Meet over 800 exhibitors from across the entire value chain of the chemical process industry
- ✓ **Strategic alliances:** Interact with the entire supply network across the Chemical, Pharma & Biotechnology sectors from a single location
- ✓ **Market analysis:** Evaluate the Indian consumption market and get feedback with over 25,000 visitors walk-ins over 4 days

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



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](mailto:sales@jasubhai.com)

Supported by



Ahmedabad / Vadodara - 09820544904 | Bangalore - 09892644177 | Chennai / Coimbatore - 09176963737  
Delhi - 09818148551 | Hyderabad / Pune - 09822209183, 09823410712



organization successfully interweaving digital transformation strategy with sustainability.

Well-received by the delegates, the event's panel discussions focused on the connected ecosystem and digital strategies and the way forward for the Indian manufacturing industry to become competitive in the new business environment. The panel discussion topic was addressed by panelists Vinay Rajagopal, ISV, IoT & Embedded Technology Lead, Red Hat; Guruprasad S, Associate Vice President, ABB; and Jhankar Dutta, Managing Director, B&R India.

The panelists discussed that the businesses' new realities have made stakeholders revisit their operations, supply chain, and customer engagement strategies. Advanced automation, robotics, and the latest Industrial IoT technologies are unfolding new opportunities for factories to become more innovative and profitable. The discussion helped identify easy ways to optimize processes, improve productivity, and make shopfloors smart. Identifying low-hanging fruits and harnessing them at the right time will be crucial to achieving industry goals. The panelists agreed that the connection between machines, processes, and people is essential to build a digital culture supported by a data-driven model. But with the looming threat of cyberattacks and data breaches, prioritization of cybersecurity is crucial to preventing profound business impacts. Well defined strategies, targeted preparation and alignment with industry standards are the needs of the hour.

The conference also hosted several technology presentations, including

"Democratizing manufacturing via OPC UA" by Smitha Rao, Co-founder and OPC Expert, Utthunga Technologies and connected manufacturing and its significance in a digital world" by Niraj Tyagi, HEAD COE MES Enterprise Solutions, Tata Technologies, amongst others. The presentations covered the topics of connected factories, implementation possibilities, and solutions, stressing the critical aspects of automation, digitalization, m2m communications, interoperability, big data analytics, and new business models. The conference concluded with a presentation titled "New era in real-time industrial communication for smart factories" by Ranjithkumar, B&R, heralding the next phase of unified real-time communication invading the shopfloor to prepare for the digital future.

The conference served as an ideal platform for understanding the latest technology trends and helped draw a roadmap for Indian manufacturers to become globally competitive. With an exciting lineup of topics and knowledge exchange, delegates received helpful guidance on the practical application of these state-of-the-art technologies in all the key sectors.

The 6th edition of Smart Industry Conference was designed to benefit the Indian manufacturing companies that are shaping the Industry 4.0.

## Yokogawa Releases OpreX Multi-Sensing Remote I/O VZ20X Analog Sensing Unit



**Tokyo, Japan:** Yokogawa Electric Corporation announces that it has developed the OpreXTM Multi-Sensing Remote I/O as an addition to its OpreX Components lineup. OpreX Multi-Sensing Remote I/O devices accurately obtain data from multiple sensors, convert it to a digital format, and transfer it to a higher-level system for monitoring. The first model is the VZ20X Analog Sensing Unit, which is being released for sale on August 31 in 64 countries and regions in the Asia-Pacific and the Middle East. The smallest-in-class VZ20X is a high-speed, high-precision, and highly noise-resistant device that is capable of simultaneously collecting data from analog sensors on up to 120 channels. With a height and width less than that of a typical business card and weighing less than 200g, it is suitable for installation wherever space is at a premium, including on production equipment.

Leveraging such characteristics and the capabilities of Yokogawa's AI technology, users of the VZ20X will be able, for example, to detect when an abnormality is likely to occur on a production line so that condition-based maintenance (CBM) can be performed at a suitable time. The VZ20X is also able to accurately collect data needed for the development of components such as the on-board batteries used in electric vehicles (EVs),



OpreXTM Multi-Sensing Remote I/O VZ20X Analog Sensing Unit

plug-in hybrid vehicles (PHVs), and fuel cell vehicles (FCVs).

The need for a compact, high-speed, and high-precision device capable of simultaneously collecting data from multiple sensors

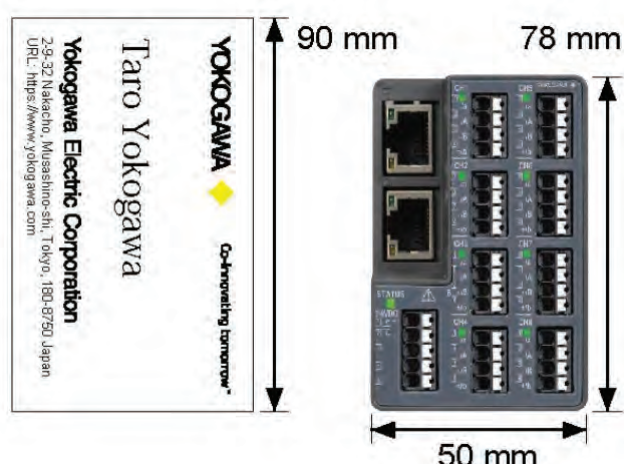
While unmanned transport vehicles, advanced automation, and other such technologies are increasingly being used to reduce labor costs at logistics and production facilities, there are still many areas where equipment and processes are managed using analog technology. Detecting early signs of deterioration in such facilities is a challenge, and failures can lead to unplanned shutdowns and reduced operating rates. With CBM, there is an increasing need for compact devices that can be easily retrofitted to existing facilities and solutions to enable the rapid and accurate



collection and digitalization of event-driven data from multiple locations.

The world is seeing innovation in the automotive technologies used in EVs, PHVs, FCVs, and other vehicle types. To ensure high-quality outcomes in the development of components such as automobile batteries and in the conduct of environmental and performance tests, it is important to obtain highly reliable data. As such, it is necessary to simultaneously collect data from multiple sensors at high speeds and with a high level of precision.

### Features



Shorter and narrower than a business card and weighing less than 200g, the VZ20X is suitable for installation in tight spaces. As well as minimizing the need for the reconfiguration of existing production equipment, it is ideally sized to be mounted on unmanned transport vehicles and other vehicle types for the running of battery performance assessments, performance of preventive maintenance, etc.

Easy connection of devices using push-in connections and

High-speed, high-precision, multi-channel

synchronization, and high noise resistance

High-speed: Analog input signals can be sampled at 1 millisecond (0.001 seconds) intervals.

High precision: Synchronization accuracy of  $\pm 100$  microseconds (1 microsecond = 1 millionth of a second), measurement accuracy of  $\pm 0.05\%$ , temperature measurements accurate to within  $\pm 0.16^\circ\text{C}$  or less, and voltage measurements accurate to  $\pm 1\text{mV}$

Multi-channel synchronization: With each module having 8 channels, a maximum of 15 units can be connected, enabling simultaneous measurement across up to 120 channels.

High noise resistance: Input channels are insulated from each other, so data can be accurately measured even in a noisy environment.

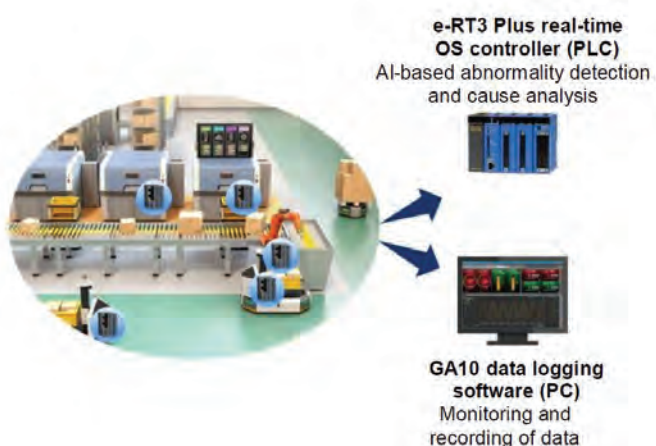
A single module can accept a wide range of analog inputs including DC voltage signals, unified signals, resistance signals, and temperature signals from sensors such as thermocouples (TC) and 3-wire/4-wire resistance temperature detectors (RTD). By accommodating inputs from a variety of analog sensors, it

facilitates the monitoring and control of a wide range of variables including voltage, temperature, humidity, pressure, and vibration. Transport and logistics, automobiles and machinery, electronic devices, energy and materials, food and agriculture.

Obtaining precise data from multiple sensors and forwarding it to higher-level systems that perform monitoring

CBM of facilities in production and logistics sites.

Testing at R&D institutes: performance assessment tests in product development processes and safety and reliability tests in product quality inspection processes



Manufacturing plants: Monitoring and recording of data, Monitoring of vibration, temperature, and other variables for overhead hoists, unmanned transport vehicles, machine tools, etc.

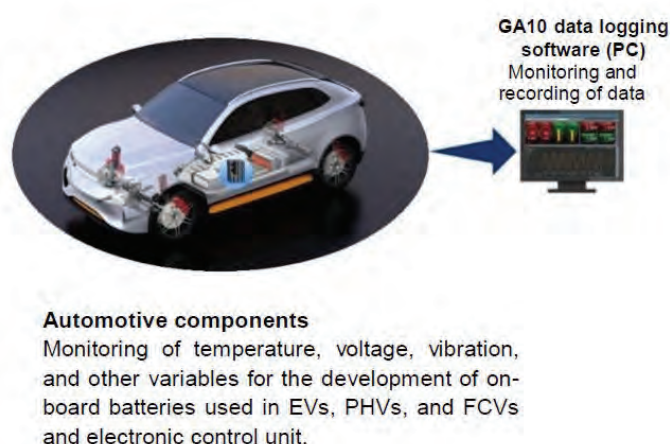
Maintenance of production/logistics facilities  
Extremely compact and light, the module can easily be mounted on unmanned transport vehicles, production lines, and the like. When used together with the GA10\*1 data logging software and the e-RT3 Plus real-time OS controller, this device not only facilitates high-precision data gathering and monitoring but also is able to utilize Yokogawa's proprietary AI technology to perform abnormality detection and cause analysis. This leads to

Monitoring of vibration, temperature, and other

variables for overhead hoists, unmanned transport vehicles, machine tools, etc.

reduced downtime and improves operational efficiency.

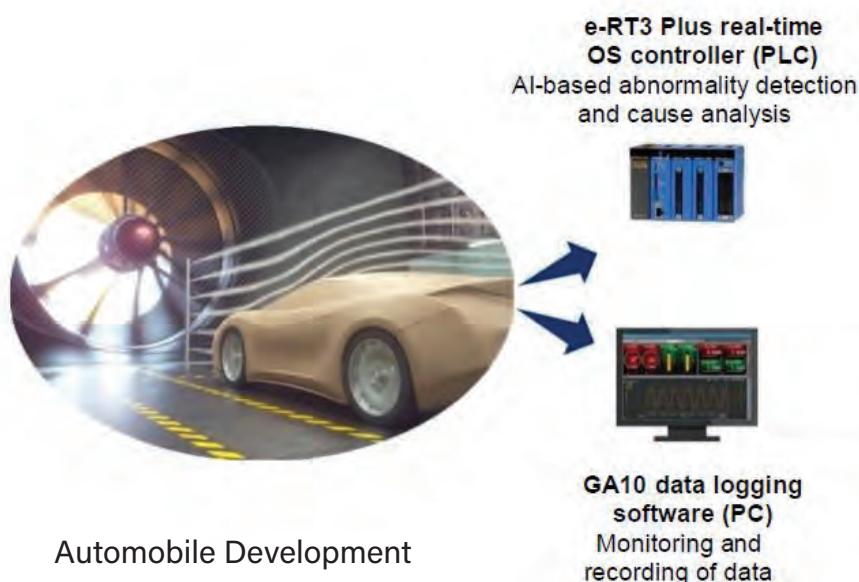
\*1 A PC-based data logging application that utilizes an Ethernet network to collect and



record data from devices throughout factories and other facilities

Development of components such as on-board batteries for EVs, PHVs, and FCVs

When used in combination with the GA10 software, the module enables the fast





and precise collection and monitoring of synchronized data from multiple channels that is needed to ensure high quality outcomes in the testing and development of automobile components. Furthermore, thanks to its excellent noise resistance, this product is able to accurately gather data even when the device under test, such as an inverter (power converter), is a noise source.

This module ensures quality outcomes in endurance and environmental tests by enabling the synchronized and highly precise collection and monitoring of data on variables such as temperature, humidity, pressure, and dew point that impact the vehicle operating environment . ■

# CHEMICAL ENGINEERING WORLD

Dynamic Platform  
to  
Connect with Chemical  
Industry Ecosystem

Direct Reach  
to  
**>200,000 Readers**  
across  
**>25 countries**

[sales@jasubhai.com](mailto:sales@jasubhai.com)

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



## Government of Odisha Approves Industrial Projects of Arcelor Mittal Nippon Steel India

The 103rd meeting of the State Level Single Window Clearance Authority (SLSWCA) held under the chairmanship of the Chief Secretary of Odisha, Suresh Chandra Mahapatra (IAS) approved 10 industrial projects worth INR 2171.82 crore that would generate employment opportunities for over 5,242 persons.

The projects approved by the panel were from diverse sectors like Steel, Food Processing, Cement, Chemical Renewable energy and Tourism. The committee has approved the proposal of My Home Industries Pvt. Limited (MHPL) to set up a 3 MTPA Cement Grinding unit at Badchana, Jajpur with an investment of INR 650 crore, which will generate potential employment opportunities for over 750 persons.

An expansion project of L N Metallica Limited's existing plant got the SLSWCA nod. It will set up 0.112 MTPA MS Billets, 0.112 MTPA TMT/ Structure/ MS Strip, 0.04 MTPA Ferro Alloys, 0.1 MTPA Sponge Iron, 0.6 MTPA Iron ore Beneficiation, 0.4 MTPA Pellet, 0.112 MTPA MS/GI Pipe and 23 MW CPP against an investment of INR 205 crore to be set up at Sripura, Jharsuguda, which will generate potential

employment opportunities for over 571 persons.

The SLSWCA gave a nod to Arcelor Mittal Nippon Steel India Limited to set up a Riverine Jetty at Udayabata, Jagatsinghpur against an investment of INR 150 crore, which will generate potential employment opportunities for over 280 persons. Similarly, it has approved the proposal to set up a 360 KLPD Ethanol, 120 KLPD Extra Neutral Alcohol(ENA), 10 MW Cogeneration Plant along with a bottling unit for ENA by Mash Bio fuels Pvt Ltd at an investment of INR 258.05 crore, which will generate potential employment opportunities for over 300 persons. This food processing plant will be set up at Panimura, Tarabha in Sonapur district.

The panel has cleared a project of Vibrant Spirits Pvt Ltd to set up 100 KLPD Ethanol along with 5 MW Co generation Plant in Bargarh at an investment of INR 100 crore, which will generate potential employment opportunities for over 2,250 persons.

The panel has approved a cement plant project by Ramco Cements Limited to expand its existing plant with the addition of a cement grinding capacity of 0.9 MTPA at Haridaspur in Jajpur at an investment of INR 190 crore, which will generate potential employment



opportunities for over 60 persons.

To further boost the renewable energy sector, the state government has decided to extend financial incentives for the Electric vehicle(EV) manufacturing industries, buyers, along with various tax waivers for the next five years. Such progressive action plans along with the time-bound implementations will reinforce Odisha's position as the topmost investment destination in the country.

### **L&T Construction Awarded Contract for its Water Effluent Treatment Business**

The construction arm of L&T has secured a significant order for its Water & Effluent Treatment business in India. The business has won an order from a state-utility organization to implement rural water supply projects providing Functional House Tap Connections (FHTC) under the Jal Jeevan Mission.

The business has been entrusted to implement rural water supply projects to provide potable water to 800 villages. The scope comprises Tube Wells, Pump Houses cum Chlorination Rooms, Overhead Tanks, Treatment Systems, Solar Plants, Rising Main & Distribution Pipeline Network, Staff Quarters, Individual House Connections, etc.

including allied Electromechanical & Automation works.

In addition to this order, the business is executing Water Supply Schemes in several rural areas, across various states.

### **CM Naveen Patnaik Inaugurates the Extended Alumina Refinery of Utkal Alumina at Kashipur, Rayagada**



Naveen Patnaik, Hon'ble Chief Minister of Orissa

Hon'ble Chief Minister Naveen Patnaik inaugurated the expansion of the existing Alumina refinery of Utkal Alumina located at Kashipur, Rayagada. Situated at the tribal hinterland of Odisha, the expansion unit by the Aditya Birla group

is built with an investment of INR 1500 crores will improve the refinery's annual capacity by 0.5 MT to 2 MT alumina production.

For this new unit, more than 500 people are being employed through direct and contractual roles. Reportedly, Aditya Birla group employs more than 12,000 people in Odisha, which accounts for more than 10% of its global workforce. Addressing the gathering, the Hon'ble Chief Minister said, " I am particularly happy that investors in Odisha are expanding their existing projects in Odisha even after the impact of COVID-19. This shows that our economy is bouncing back from the impacts of the pandemic and we are back on the path of sustained growth and development."

He further added, "Odisha's association with the Aditya Birla group has been a fruitful and prosperous one. The Aditya Birla group has been a key player in the industrial growth story of Odisha with their presence spanning across sectors like metals, mining, cement, financial services, fashion and retail. The group has contributed significantly to healthcare, education, sustainable livelihood and other community engagement programs in Odisha as part of their CSR activities. The inauguration is a testament to the long-standing relationship between the Aditya Birla group and Odisha."

The dignitaries present in the virtual ceremony were, Captain Dibya Shankar Mishra, Hon'ble Minister of Energy, Industries, MSME, Odisha; Mr. Jagannath Saraka, Hon'ble Minister, ST & SC Development, Minorities & Backward Classes Welfare, Odisha; Chief Secretary, Odisha; Principal Secretary, Industries; Collector, Rayagada; Mr. Kumar Mangalam Birla, Chairman, Aditya Birla Group and Mr. Satish Pai, MD, Hindalco.

The active participation of Odisha based industries including the Aditya Birla Group in the Corporate Social Responsibility (CSR) activities have been phenomenal. Odisha is an industry upcoming state. The number of companies investing in the state has been phenomenal last couple of years and such investments will transform the lives across the state.

### **Minor Incident at Barauni Refinery all Personnel are Safe**

An incident of a furnace blow-up took place at IndianOil's Barauni Refinery at Begusarai district in Bihar. This incident happened during the lighting up of the burner in one of the furnaces of the AVU-1 unit, causing minor injuries to people working in the vicinity. There has been no fire or any death, and the injured are entirely out of danger.

The planned shutdown of the Barauni



refinery has been on since 20th August 2021. The cause of the incident is now under technical investigation. The refinery operations of the other units remain unaffected. The Refinery authorities have assured that everyone inside and outside the refinery premises is entirely safe. Senior officials from District Management, including the SDM and DSP, visited the spot and described the situation entirely under control.

As soon as the incident was reported, the Refinery's Emergency Disaster Response Management System was activated, ensuring prompt action. The 19 injured persons were immediately provided first aid and then admitted to the Refinery Hospital and nearby Glocal Hospital for timely medical treatment. Of the 19 injured, 11 have already been discharged after first aid, and the condition of the remaining are stable. Among those injured were 5 refinery employees and 14 contract workers.

IndianOil is fully committed to the safety of its employees, contract workers and people living in and around the refinery.

### **L&T Commissions Expansion Project of Utkal Alumina Refinery**

The Metallurgical and Material Handling (MMH) business of Larsen & Toubro has commissioned the 0.5 MTPA (Million

Tonnes per Annum) expansion project of Utkal Alumina International (UAIL), a wholly owned subsidiary of Hindalco, the metals flagship company of the Aditya Birla Group. The plant is located at a remote location at Kucheipadar, near Tikiri in Odisha's Rayagada district. With this expansion, the alumina production capacity of the refinery has been upgraded from 1.5 MTPA to 2 MTPA.

The expansion project was recently inaugurated by the Honourable Chief Minister of Odisha, Naveen Patnaik. MMH has executed several Alumina Refinery projects in the domestic and the international markets in the past. This project, with its uniqueness in terms of complexity and environment friendliness paves the way for executing similar projects in the future.

L&T MMH has executed this project in a time bound manner ensuring the most critical process units of the refinery are ready. The company used the modular erection methods with sophisticated machinery for speedier project execution. L&T MMH team overcame many difficulties at the remote location of the project including limited material availability, inadequate local skilled workmen, hilly terrain, and heavy rainfall with a prolonged rainy season etc.

Moreover, the challenging work was completed during the outbreak of Covid

19 pandemic, with 2,000 workmen working at the site with all due precautions and safety measures. L&T MMH team ensured utmost care for the workmen by providing not only basic amenities but also requisite medical facilities and timely payment of wages to maintain high morale of the workmen and to protect them from infections during this period.

### **BPCL to Infuse Rs One Lakh Crore over Next Five Years to Become Future-Ready**

The Bharat Petroleum Corporation plans to invest more than Rs one lakh crore over the next five years in raising petrochemical production capacity, gas business, clean fuel and augmenting marketing infrastructure.

The investment will help BPCL prepare for the future where conventional fuels and zero-carbon mobility in the form of electric vehicles (EVs) and hydrogen will co-exist, while giving it the option to convert a greater degree of crude oil directly into high-value petrochemicals.

The company is looking to create 1,000 MW portfolio of renewable power generation capacity, mostly through acquisitions while also invest in biofuels and hydrogen. It is targeting to convert 7,000 out of over 19,000 petrol pumps

into energy stations in the medium to long term by offering multiple fueling options like petrol, diesel, flexi fuels, EV charging facility, CNG and eventually hydrogen.

The company will be investing over Rs one lakh crore at the group level majorly in enhancing petrochemical capacity and improving refining efficiencies (Rs 30,000 crore), gas proliferation (Rs 20,000 crore), upstream oil and gas exploration and production (Rs 18,000 crore) and augmenting (fuel) marketing infrastructure (Rs 18,000 crore).

It is adding petrochemical units at the refineries, the latest being at Kochi, to capture value addition from producing speciality chemicals. With the commissioning of two units in propylene derivative petrochemical project (PDPP) at Kochi, Kerala refinery in February 2021, the company has joined the leaders in production of niche petrochemicals.

The company will increase its presence in petrochemical space, integrating with its refining activity to diversify and hedge. BPCL too is investing heavily in city gas networks and setting up 12 LNG fuel stations and the company has license to retail CNG and piped natural gas in 37 geographical areas. The firm and its joint ventures have 1,393 CNG stations. EV charging facilities have already been installed in 44 petrol



pumps in major cities, and the plan is to ramp it up to 1,000 by 2023-24.

The company is also setting up an ethanol production unit at Bargarh, Odisha with a production capacity of 100 klpd. It is also exploring the possibility to set up four more ethanol plants in deficit states with a capacity of 100 klpd. Of the Rs 18,000 crore upstream investment, an amount of Rs 16,000 crore will be BPCL's share in a LNG project in Mozambique. The planned capex will be funded through a mix of internal resources and borrowings.

## 40 **Odisha bets on the Specialty Steel to join advanced steel making countries like Japan and South Korea**

Principal Secretary, Industries Department of Government of Odisha, Hemant Sharma, IAS emphasised that the newly inducted Product Linked Incentive (PLI) scheme on Speciality Steel will improve the production capacity to 60 MTPA from 18 MTPA and invited various steel companies to set up their units in Odisha to produce Speciality Steel.

Speaking at the webinar on "Production Linked Incentive (PLI) Scheme for Speciality Steel Industry of Odisha" jointly organised by industry body

FICCI and IPICOL, Principal Secretary, Industries Department highlighted the strategic importance of Odisha for the steelmakers such as the abundance of mineral and human resources, high quality industrial and logistic infrastructure, advanced policy framework and most importantly the stable governance.

The Union Cabinet has approved a ₹6,322 crore production-linked incentive (PLI) scheme for speciality steel that is expected to attract investments of around ₹40,000 crores and Odisha being a leader in the steel sector will further extend the necessary help to the downstream industries to multifold the production.

In the webinar attended by the leading steelmakers across India, MD IPICOL, Bhupendra Singh Poonia, IAS said that we are doing reforms and taking proper measures to make the state more industry-friendly and has also invited all the companies to visit and explore the investment opportunities in Odisha.

A presentation on the PLI scheme and the advantages of Odisha for the downstream industry was also given to the potential investors.

Industry leaders and senior officials from the Government of India and Odisha including V R Sharma, MD, JSPL,



Dr. Mukesh Kumar, Director, SRTMI, Kalyan Mohanty, CGM, IPICOL, N Gowri Sankara Rao, Director (Finance), MIDHANI Ltd. Navnath Laxman Vhatte, CEO & Director, ESL Steel, Dr. Anil Dhawan, ED, Alloy Steel Producers Association, Tirthankar Banerjee, Secretary, Steel Wire Manufacturers Association of India, Sanjay Jayram, Executive Vice-President (Sales & Marketing), JSW Steel Ltd., Pankaj Satija, Chief Regulatory Affairs, Tata Steel Ltd. were also present at the virtual webinar.

Odisha has been consistently adding steel manufacturing capacity, which has gone up from 2 MT in the year 2000 to 20 MT in the year 2020. Several steel and downstream industries are already in various stages of implementation. With

the new opportunities in the downstream sector, the state will soon achieve Hon'ble Chief Minister's Vision 2030 of making Odisha, the "Steel Hub of India" ■



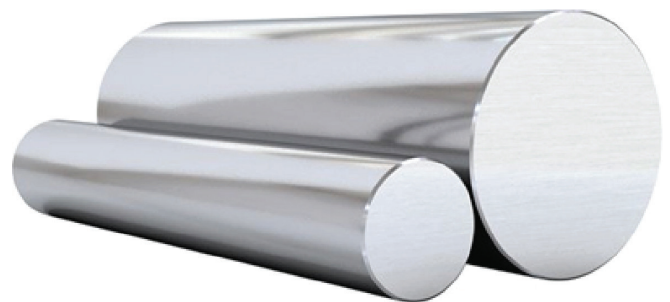
## Extend your Possibilities Introducing Sanicro® 825 Bar & Hollow Bar



Bar and hollow bar for components exposed to acids and seawater in challenging environments.

Sandvik grows its nickel alloy sanicro® family with new grade and formats for tough acidic and seawater conditions.

Despite these turbulent times, general industry continues to make progress in overcoming many of the roadblocks to



Sanicro® 825 bar peeled/polished



Sanicro® 825 bar peeled/polished

higher productivity. Whether it's in energy, chemical processing or other sectors, the challenge is often battling extreme conditions – acids, seawater, elevated heat and pressure that may jeopardize performance. Since its founding in 1862, Sandvik,

The sweden-based high-tech global engineering group, has worked closely with industrial customers to innovate new



materials to meet these challenges. Now it is extending its sanicro® family of nickel-based alloys to offer a broader range of high-performance options.

“Sanicro® 825 is more cost-efficient than alloy 625 and alloy 718 – and hollow bar drives down machining costs.” In 2021, in response to customer requests, the company is now introducing Sanicro® 825 (UNS N08825), its first-ever nickel-iron-chromium alloy in bar and hollow bar formats. The material will be available in a selected stock assortment, or made to order, ranging from 20 to 260 millimeters (0.787 – 10.24 inches) in three to seven-meter lengths (118.11– 257.6 inches), depending on the diameter.

## Building on a legacy

Broadly classified as corrosion-resistant alloys (CRAs), the new grade and formats build on Sandvik’s 60-year legacy of making premium, high-alloy Sanicro® products (mainly tubing) for corrosive, high-temperature environments.

## Backlog of requests

“We’re very excited to offer this new grade and have already built up a backlog of requests,” says Marcus Hillbom, technical marketing and sales, at Sandvik. “At elevated temperatures and in corrosive conditions, Sanicro® 825 offers clear advantages to standard stainless steel or duplex grades.



It is also more cost-efficient than superalloys like alloy 625 and alloy 718."

70 years of nickel alloy expertise to be sure, Sandvik is no newcomer to the field of high alloy steels.

For more than 70 years, the company has been a world-leader in pioneering stainless steels and special alloys for demanding industries such as the oil and gas, nuclear and other sectors.



**Marcus Hillbom**  
Technical Marketing Manager  
Sandvik

### What is the Sanicro® family?

So what is the so-called Sanicro® family and where does Sanicro® 825 fit in?

Sanicro® 825 –  
Chemical composition (nominal) %

| C             | Si  | Mn  | P             | S             | Cr       | Ni            | M<br>o  | Cu      | Al       | Ti  |
|---------------|-----|-----|---------------|---------------|----------|---------------|---------|---------|----------|-----|
| <0<br>.0<br>3 | 0.4 | 0.7 | <0<br>.0<br>3 | <0<br>.0<br>3 | 22<br>.5 | 40<br>.5<br>* | 3.<br>4 | 2.<br>0 | 0.<br>15 | 0.8 |

\*ni>40

According to Marcus Hillbom, Sanicro® is a registered Sandvik trademark that dates back to 1964. The name was first used (and still is) to brand the company's family of nickel alloys and high-alloy austenitic stainless steels.

### Stamp of excellence

"within the Sanicro® range, we naturally adhere to all EN, UNS and ASTM standards. At the same time, we wanted to let our customers know that Sandvik metallurgists have put their own stamp of excellence on the chemical composition," says Hillbom.

Tight tolerances – consistently "we like to say that we strive to set a 'standard within the standard,' which means consistently adhering to even tighter tolerances on the chemical composition than what is technically required, batch after batch. This is very true for Sanicro® 825 (UNS N08825), which we've further tailored and optimized to find the high-performance sweet spot for bar and hollow bar."

### Typical industries served

- Oil and gas
- Chemicals
- Petrochemicals

- Pulp and paper industry
- Pickling equipment
- Nuclear fuel reprocessing
- Food

### Examples of components and installations

- Flanges
- Valves and discs
- Fittings
- Couplings
- Rings and seals
- Bolts and nuts
- Shafts
- Forgings
- Waste heat recovery exchangers
- Heat exchangers
- Evaporators
- Off-shore piping systems



Subsea valves and flanges require strong, corrosion-resistant materials that meet the relevant standard

### Versatile applications and benefits

A well-known material for many years, alloy 825 is a reliable, high-performing

workhorse with Key cost-performance benefits in sulfuric and phosphoric acid as well as seawater and other applications.

The recent addition of Sanicro® 825 in bar and hollow bar formats further extends these possibilities.

Sandvik says key benefits are mentioned below-

- Very high resistance to general corrosion, pitting and crevice corrosion.
- Excellent resistance to corrosion in environments containing hydrogen sulfide.
- Very high resistance to stress corrosion cracking (scc) in chloride-bearing environments.
- High mechanical strength and excellent toughness.
- Ease of welding and machining (e.g. Hollow bar advantage).

What's more, Sanicro® 825 bar and hollow bar can be safely used in Cryogenic conditions (-196°C) or at elevated temperatures (540°C).

### High resistance to general corrosion

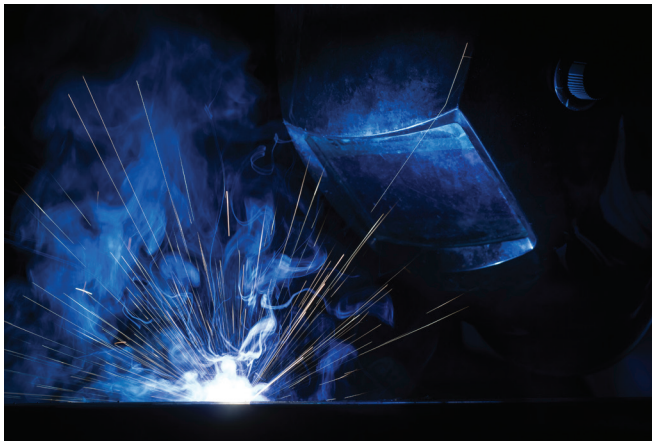
Sanicro® 825 offers excellent resistance to most types of corrosion and outperforms many other standard alloyed austenitic

## IMPACT FEATURE

grades. For example, it is far superior to molybdenum alloyed stainless steels such as aisi 316l, particularly when exposed to non-oxidizing media such as sulfuric acid or phosphoric acid. Also, its corrosion resistance in nitric acid is more favorable than with aisi 316l, and it is superior to 904l in sodium hydroxide.

"The corrosion resistance and mechanical properties are outstanding."

46



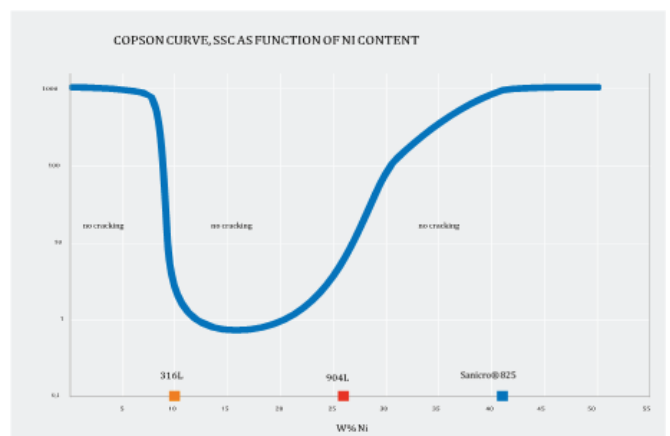
Tungsten arc welding (tig/gtaw) is recommended for sanicro® 825



Visual inspection and marking.



Corrosion test boiling (huey)



Stress corrosion cracking (scc) materials comparison



### Avoiding stress corrosion cracking

"Clearly, the nickel content was another key consideration," says magnus brink, technical marketing specialist at Sandvik. The trick is not to have too little and not too much as to increase costs. We always have slightly above 40% to ensure excellent resistance to stress corrosion cracking (scc) induced by chlorides and alkalis. Sanicro® 825 is virtually immune to scc compared to both aisi 316l and aisi 904l, also in sour environments, as shown in figure 1."

### Nidi testing in sour environments

Independent tests by the nickel development institute (nidi) concluded that Sanicro® 825 can be used in sour environments up to 260°C with h<sub>2</sub>s contents, corresponding to a partial pressure of up to 10,000 psi in the absence of elementary sulfur. The material also shows some immunity to all concentrations of co<sub>2</sub>. Sanicro® 825 is used in the oil and gas industry and, according to iso 15156/nace mr0175, it is acceptable for use in the cold worked and annealed condition, with no environmental limits on partial pressures of h<sub>2</sub>s or elemental sulfur. Compared to aisi 904l, with a similar cr, mo and cu content, it is also much more resistant to scc, due to its high ni-content.



**Magnus brink**  
Technical Marketing Specialist  
Sandvik

### Pre beating the industry standard

Corrosion tests carried out on Sanicro® 825 in sodium chloride solutions indicate superior pitting and crevice corrosion to that of aisi 316, largely due to its higher chromium and molybdenum content. The material has a pitting resistance equivalent number of pre >32.8, which is higher than the industry standard.

### Comprehensive quality control

According to magnus brink, Sandvik has a long-time commitment to safety (zero accidents policy), sustainability (un climate goals) and some of the most rigorous quality control standards in the industry. "we control the entire manufacturing process – from the initial melt of recycled steel to the final product," he says. "this means that, if needed, we can trace every single product back to the initial batch number."

"Sanicro® 825 has its stamp of excellence by Sandvik metallurgists – our r&d team

has tailored the chemistry for optimized performance.”

### Meeting international standards

Sanicro® 825 meets the astm b425 and asme sb 425 standards and is approved by the american society of mechanical engineers (asme) for use in accordance with asme boiler and pressure vessel code, section i and section viii, div. 1. It also has nace approvals mr0175/iso15156 and mr0103/iso17945. Manufacturing approvals include ams2750 and api 6a. Pre-approval for pma for ped 2014/68/eu is pending.

### Welding – free of intergranular corrosion

Sanicro® 825 was designed with high structural stability in mind to avoid the risk of intermetallic phases during welding at elevated temperatures. Even in the heaviest sizes, it can be welded without the risk of carbide precipitation causing intergranular corrosion. This is due, in part, to its low carbon content, but also the fact that it is titanium stabilized.

### Less machining, more corrosion resistance

‘The addition of hollow bar in alloy 825 is a first for us, meaning that machining costs can be greatly reduced. This gives higher productivity and allows fabricators to come closer to net shape faster,’ says brink. The new grade is expected to provide a welcome range of new options for fabricators of heat exchangers,

evaporators, offshore piping systems and other engineering installations where flanges, valves and discs, fittings and couplings must resist highly corrosive acids or chloride-containing seawater.

### 50% reduction in machining costs

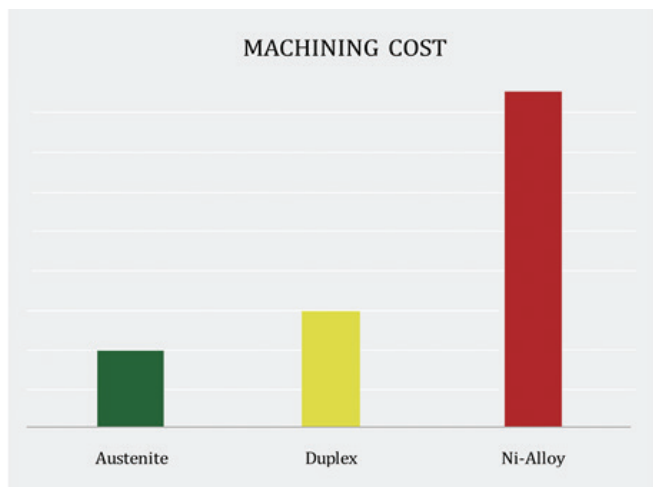
“Compared with solid bar, the time and cost of producing a complete component from Sanicro® 825 hollow bar is reduced by at least 50%,” says brink. “this is due to the reduced need for drilling, boring and other fabrication steps.” He adds that Sandvik can also provide recommendations for optimal cutting tools and speeds through Sandvik coromant, its world-renowned machining business area.

### New grades in the pipeline

To sum up, and looking ahead, Sandvik’s introduction of Sanicro® 825 bar and hollow bar is just the first step in a series of new nickel- based alloy products that will extend customers’ possibilities for handling extreme situations. Over the medium and long-term, the company plans to increase its stock material portfolio with high alloy nickel grades such as Sanicro® 625, Sanicro® 925, and Sanicro® 718. The new grades, to be introduced shortly, are expected to be particularly useful for critical downhole applications in the oil and gas industry, among other industries.



Machining of sanicro® 825 nickel alloy bar using sandvik coromant carbide cutting tool



Sanicro® 825 hollow bar helps reduce machining costs, which are traditionally higher for nickel alloys than other grades.

“The arrivals of Sanicro® 625, Sanicro® 925 and Sanicro® 718 will be great news for critical downhole applications.”



Article by  
**Henrik Zettergren**  
Global Product Manager  
Sandvik, Based on interviews and independent research from the nickel development institute.

“I’m very proud to see the development and integration of new nickel grades into our bar portfolio. Not only does this give us a broader offer, it brings even greater value to our customers. From a Sandvik bar perspective, we’ve never introduced such an extensive range of new grades to the market in such

A short time – something that will make my work as global product manager even more exciting.” ■

#### For more information

**Vikram Pandit**

APAC Business Development Manager

Email: [vikram.pandit@sandvik.com](mailto:vikram.pandit@sandvik.com)

Website <https://www.materials.sandvik/en/>



HATCH

# Filtration and Separation in a Pneumatic Conveying System



Etienne Brochu  
Senior Mechanical  
Engineer, Hatch

In my early career at Hatch, I was given the opportunity to work with subject matter experts in the field of bulk solids handling and specifically, pneumatic

conveying. At that time, I didn't realize there would be such vast amounts of knowledge to absorb before being able to master the subject. I believe this is mainly because pneumatic conveying systems consist of multiple pieces of equipment with varied functions, requiring knowledge in several engineering fields such as fluid mechanics, piping, heat transfer, bulk materials handling, dust collection (or filtration and separation), etc. An entire career can be devoted to being a specialist in filtration and separation, which is only a single engineering field amongst many that are required to determine best pneumatic conveying solutions. I am fortunate to have experience in all these fields so that I can apply built for

purpose solutions, understanding all the parameters required.

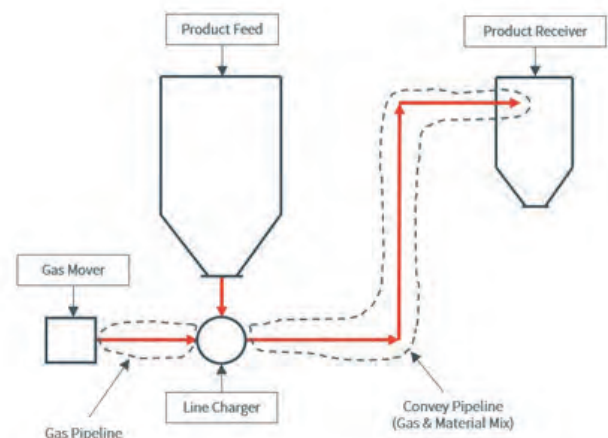


Figure 1: Pressure system

The main purpose of a pneumatic conveying system is to transport product (bulk solids) from point "A" to point "B" pneumatically. The gas mover generates a flow of gas into the gas pipeline. The line charger introduces the bulk solids from the product feed to the convey pipeline. The line charger outlet is where the gas and the bulk solids get mixed together. The mix of gas and solids moves through the convey pipeline due to the pressure differential between the pick-up point and the product receiver, where the solids get separated from the gas.

There are two types of pneumatic conveying systems: a pressure type system and a vacuum type system. In a pressure system (Figure 1), the conveying gas pressure in the pipeline, up to the product receiver, is above atmospheric pressure. In a vacuum type system, the conveying gas pressure in the pipeline, up to the product receiver, is below atmospheric pressure. In this case, the gas mover is located downstream of the product receiver (Figure 2). In both cases, the gas moves from a point of higher pressure to a point of lower pressure.

This article will focus on the product receiver part of a pneumatic conveying system, where the filtration and separation occurs. The objective is to explain how the filtration and separation is done in a pneumatic conveying system and how the pneumatic conveying parameters can influence the design of the filtration and separation devices in such a system.

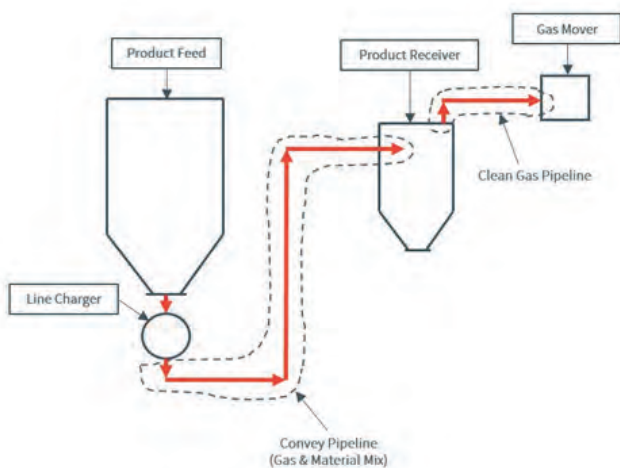


Figure 2: Vacuum system

Particular product receiver filtration units may be in the form of:

- **Filter receivers**
- **Bin vents**
- **Baghouses**

Each of these devices have the same filtration principle: they push or pull a mix of gas and solids through a filtration membrane in order to separate the particles from the gas. A filtration membrane can either be a bag filter or a pleated cartridge where it separates the clean side from the dirty side of the filtration unit. Figure 3 shows a filter receiver sketch.

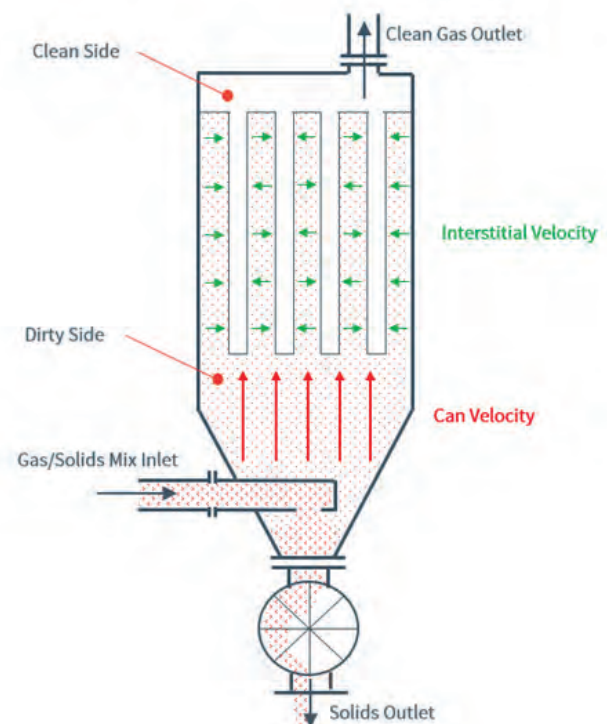


Figure 3: filter receiver

The first step in designing a product receiver filtration unit is to calculate the actual airflow rate (m<sup>3</sup>/h) coming into the filtration equipment. This can be calculated using pneumatic conveying system design software. The second step is to set the air-to-cloth ratio, where the recommended range is from 5 to 10 (when using filtration bags and cages) for a pneumatic conveying system. The filtration area can then be calculated using the following formula:

$$\text{Minimum Filtration Area [m}^2\text{]} = \frac{\text{Actual Inlet Airflow} \left[ \frac{\text{m}^3}{\text{h}} \right]}{\text{Air-to-Cloth Ratio} \left[ \frac{\text{m}}{\text{h}} \right]}$$

## 52 Special considerations for pneumatic conveying systems

There are different modes of pneumatic conveying (Figure 4):

Dilute phase (also known as stream phase) where conveying is done at a high velocity and low pressure with a homogeneous mix of air/solids

Permeable dense phase where conveying is done at a low velocity and high pressure and solids take on the form of slugs in the pipeline

Mixed phase where the mode of conveying is a mix of dilute and dense phases conveying at a moderate velocity and pressure. The dense phase can be observed in the lower section of the pipe while the dilute phase can be observed in the upper section of the pipe

Depending on what mode of conveying is used in the system, a surge factor may be applied to the minimum filtration area.

For a dilute phase mode of conveying, no surge factor is required. For a mixed phase mode of conveying, it's recommended to use a surge factor of 1.5 to 2. For a permeable dense phase mode of conveying, it's recommended to use a surge factor of 2.5 to 3. The formula then becomes as follows:

$$\text{Minimum Filtration Area [m}^2\text{]} = \frac{\text{Actual Inlet Airflow} \left[ \frac{\text{m}^3}{\text{h}} \right]}{\text{Air-to-Cloth Ratio} \left[ \frac{\text{m}}{\text{h}} \right]} * \text{Surge Factor}$$

Once the minimum filtration area has been calculated with the appropriate surge factor, a filtration unit model can be selected from a preferred manufacturer catalog, which generally gives the filtration area per model.

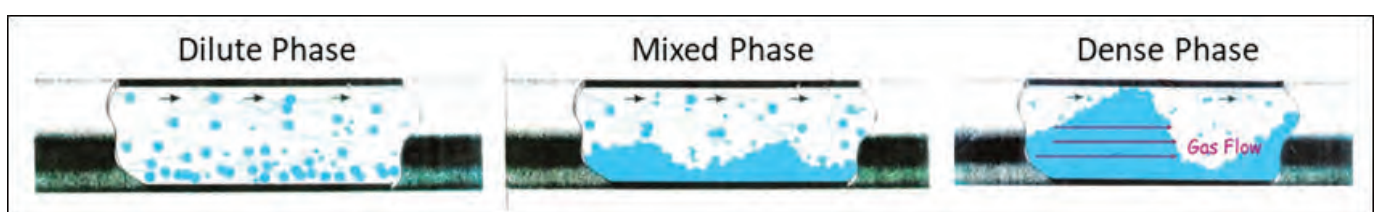


Figure 4: Modes of Conveying



## Layout considerations

Higher filtration requirements typically call for larger filtration equipment. This can be a concern when available room is limited for the system. Using pleated cartridges instead of filtration bags can better accommodate the equipment layout if room availability is a factor. Pleated cartridges have a higher filtration area than filtration bags, so the size of the filtration equipment can be considerably reduced. The caveat of using pleated cartridges is that they can be less reliable when capturing finer particulate as they tend to get stuck in the pleat's hollows. When conveying finer materials, it is recommended to use filtration bags when layout permits.

## Filtration membrane cleaning

The most common filtration membrane cleaning method for filtration equipment is the pulse jet cleaning method. This method consists of pulsing air at a high velocity in a very short amount of time in the clean side of the filtering media. The pulsing is done at a pre-programmed frequency to dislodge any stuck fine particles from the bags/cartridges. A pulse-cycle can be programmed either on a temporal basis or a differential pressure basis (across the filtration membranes). It is recommended to program the pulse jet cleaning cycle on a differential pressure

basis instead of on a temporal basis because it can significantly increase the entire pneumatic conveying system efficiency since it decreases the pneumatic conveying pressure fluctuations. In fact, pressure fluctuations in the conveying pipeline can disturb the flow of material being transported and negatively affect system efficiency.

## Passive vs. active filtration

One of the advantages of a filtration unit fed from a pneumatic conveying system is that the air mover used to convey the solids is also used as the air mover required for the filtration and separation, meaning that the filtration equipment can run passively. In this case, no additional equipment or moving parts are required for the filtration to be successful. Although this is ideal, the downside is that it can create positive pressure inside the product receiver, which can lead to dust emissions and spill in some cases. If this issue is identified during the design phase, an exhaust fan can be added at the outlet of the filtration unit to create slightly negative pressure inside the product receiver. Note that this statement is true for pressure type pneumatic conveyors only, as vacuum type systems already generate negative pressure in the product receiver.

## Pre-filtration separators (cyclones)

In some specific cases, a pre-filtration cyclone can be added to a pneumatic conveying system. For example, when pneumatically conveying high temperature products, it's recommended to add a cyclone prior to the final filtration equipment in order to avoid the risk of large hot particles entering the final filter and burning the filter elements.

Another example would be to help capture "good" product prior to reaching the final filtration process. Typically, when the product reaches a final filter, whatever is captured and discharged out of it is considered waste product of no commercial value. In some cases, it can be classified as "off spec" and sold for a percentage of "spec" material into certain markets. The cyclone can capture the larger particles that are typically still considered good product.

- Layout where the system is installed
- A thorough effort on filtration and separation equipment design that serves a pneumatic conveying system will significantly increase system efficiency while reducing operation downtime, capital cost, and operating cost.

Étienne Brochu graduated in mechanical engineering from École de Technologie Supérieure, Montréal, Canada. He currently works with the specialized Bulk Materials Handling group at Hatch and has developed an expertise in pneumatic conveying by working closely with several of Hatch's more experienced personnel in the field of bulk solids handling. ■

## Conclusion

When designing a filtration and separation device for a pneumatic conveying system, the following considerations should be factored in:

- Characteristics of the product being transported
- Pneumatic conveying system type (vacuum vs. pressure)
- Pneumatic conveying system mode of conveying (dilute, mixed, or dense phase)

Dynamic Platform  
to  
Connect with Chemical Industry Ecosystem  
Direct Reach  
to  
**>200,000 Readers**  
across  
**>25 countries**



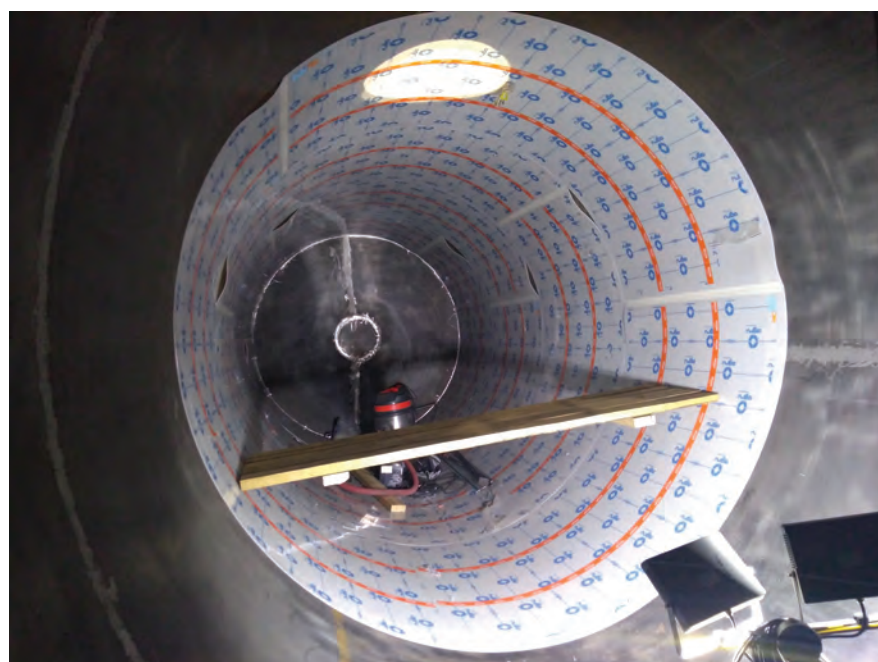
Embed Product Video



Choose the embedded features: insert all  
embedded features Contact: [sales@jasubhai.com](mailto:sales@jasubhai.com)



# Corrosion protection with AGRU ECTFE



same time, a container lined with ECTFE can be cleaned easily and quickly due to its smooth inner walls.

## Highest chemical resistance is the goal

The horizontal steel tank measures 9740 mm in length and 2760 mm in diameter and is equipped with two hatches and nozzles for filling and pouring. During operation up to 98 % sulphuric acid or 79

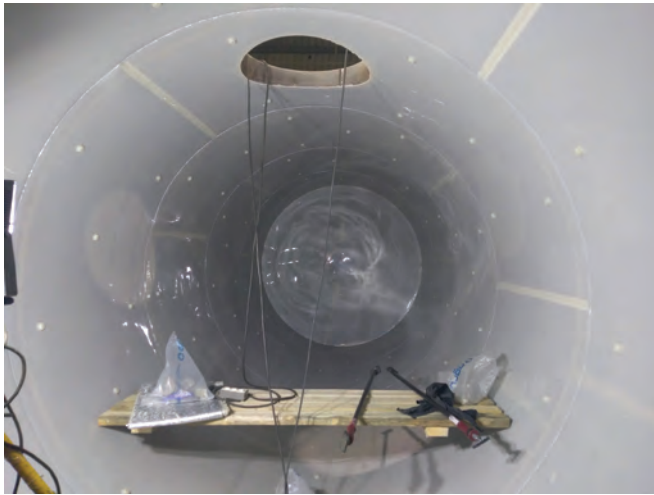
% phosphoric acid is stored in the tank. These acids can reach temperatures up to 100 °C. As a storage container for acids, the steel tank must be permanently acid-proof, because base metals oxidise when they come into contact with aggressive

media. For this extreme application, an inner lining made of the high-performance plastic AGRU ECTFE sheets was the first choice for corrosion protection. In

## AGRU ECTFE inner lining for acid proof large-volume steel tank

The life-prolonging lining of steel tanks with thermoplastics is one of AGRU's core competences. In Yekaterinburg, tank manufacturer PolyTechnika has lined a large-volume steel tank with a capacity of 50 m<sup>3</sup> with an acid-resistant lining. For this purpose, 3 mm thick ECTFE sheets were attached to the inside of the tank with fixed-points and welded media-tight. Excellent chemical resistance in combination with a higher temperature resistance make ECTFE an indispensable material in the chemical industry. At the





The excellent weld joint quality makes the container acid-proof for years to come.

contrast to conventional rubber linings, the material permanently withstands the most adverse conditions and can be used in a pH range of 1 - 14. Even 98 % sulphuric acid ( $\text{H}_2\text{SO}_4$ ), 70 % hydrofluoric acid (HF), 50 % sodium hydroxide (NaOH) and 36 % hydrochloric acid (HCl) are safely handled up to  $+120^\circ\text{C}$  over a long period of time. AGRU ECTFE is also the first choice for highly oxidative applications such as sodium hypochlorite ( $\text{NaOCl}$ ), chlorine gas ( $\text{Cl}_2$ ) and ozone ( $\text{O}_3$ ).

The horizontal steel tank is media resistant due to the ECTFE lining and can be cleaned easily and quickly, thanks to the smooth inner surfaces.

### High-voltage spark test ensures tight welds

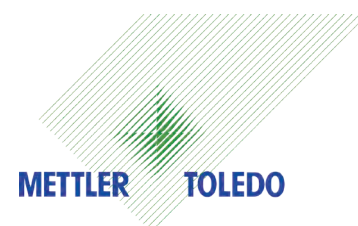
PolyTechnika installed 3 mm thick ECTFE sheets in the format 3000 mm x 1500 mm. The welding work with inert gas was



The completely lined steel tank was delivered to its owner on time.

carried out in accordance with DVS 2207-3 and electrical spark testing was used for weld seam testing. The necessary testing device emits high voltage to the weld seam via an electrode. In case of leakage, a spark flashover occurs between the testing device and the steel container, which is visible and audible. This test method is based on the principle of gas discharge when high voltage is applied to a discharge path. As all welding work proved to be flawless, the container could be handed over to the owner on time. Excellent chemical resistance combined with high temperature resistance make ECTFE an indispensable material in the chemical industry.

# A Standardized Weighing Workflow for Innovation in Lubricating Oils



METTLER TOLEDO's Excellence weighing equipment helps a global leader in specialty chemicals to realize accurate, precise quality control of intermediate and final products during oil and lubricant development and manufacture.

A pioneer in the development of specialty chemicals manufactures lubricants such as hydraulic oils, as well as lubricant additives and additive packages, for a variety of industrial applications. As weighing is fundamental to their processes, they rely on METTLER TOLEDO's Excellence balance technology to ensure high-caliber products that comply with industry guidelines.

In their development and QC laboratories, quality is assessed by titration, chromatography, filterability assays and more. Filterability reflects the ability of a hydraulic fluid to pass through a fine mesh without clogging; it is used to evaluate the properties of new hydraulic oil formulations, and is influenced by the additives used during formulation and the overall hydrolytic stability of the oil.

## Standardized assays, comprehensive results

The company's R&D lab follows the

test methods defined by ISO 13357 (Determination of the Filterability of Lubricating Oils) and AFNOR IP 448 (Filterability of Hydraulic Fluids) to monitor this parameter. The procedures are intricate, involving several weighing steps as well as waiting time and calculations. As the oil samples are filtered, the pressure applied to them must be precisely defined; both the first fluid drop and the level of fluid generated over time must be collected and recorded. To ensure the accuracy of filterability- testing results and prevent rework, the scientists use an XPR A pioneer in the development of specialty chemicals manufactures lubricants such as hydraulic oils, as well as lubricant additives and additive packages, for a variety of industrial applications. As weighing is fundamental to their processes, they rely on METTLER TOLEDO's Excellence balance technology to ensure high-caliber products that comply with industry guidelines. In their development and QC laboratories, quality is assessed by Precision Balance with the LabX® laboratory software. The software displays each operation in their

SOP on the balance touchscreen in sequence. Once a test is finalized, calculations are automatically performed.





Figure1: The LabX software prompts operators to complete each step in their SOP by displaying commands on the balance terminal. Data generated by the XPR Precision (left) and Analytical is securely recorded in LabX's central database.

And with complete data and metadata stored in a secure database, further analysis and iteration are facilitated, accelerating new product development.

## Accurate weighing data for any sample

Fast, stable and accurate weighing results are also instrumental to keeping manufacturing moving.

The XPR Analytical Balance offers readability to 0.01 mg to support rigorous sample or standard preparation applications in the company's analytical

lab. With quality features such as StatusLight™ and LevelControl, the balance informs QC technicians at a glance if it is ready to weigh, or if corrective actions must be taken prior to use. When substances, or their containers, electrostatic charges exceed limits, the StaticDetect™ sensor triggers an ionizer to counteract the charge, ensuring stable results. And LabX also prompts operators to complete all steps in their SOPs, securely recording all data generated. With their comprehensive weighing solution, company scientists maintain complete confidence

in their results. Not only can they be sure that steps are never omitted, but with bidirectional data-transfer between LabX and their LIMS, results are easily discoverable and audit preparation is a snap. Indeed, the setup smooths their path to innovation. ■

### For more information

Call us Toll Free: 1800 22 8884 / 1800 1028460

Email: [sales.mtin@mt.com](mailto:sales.mtin@mt.com)

Website: [www.mt.com/pro-safety-TDL](http://www.mt.com/pro-safety-TDL)

## Techno-Economics of Sludge Dewatering

60

**I**ndia, as a transitioning country, in efforts to become a developed economy, is realizing two significant challenges. First is the well-known exponential growth in population, where the metropolitan residency in India has climbed from 11.4% in 1901 to roughly 34% in 2019, and second is the shortage of infrastructure availability (World Bank Data, 2019). As a result, two self-surfaced problems India is encountering with, namely, water shortage and excessive sewage. Wastewaters are generally regarded as a burden on industries because of the considerable costs involved in treatment before they can safely be discharged into the environment.

According to the Order by National Green Tribunal (NGT) regarding the effluent discharge standards, the Class I and II cities generate about 61,948 MLD sewage in India (NGTPB, 2019). Further, about 60% of untreated wastewater has contaminated approximately 75% of surface water sources throughout the country. In India, in Class I metropolises, the activated sludge process is generally the adapted

technology for treatment, covering nearly 60% of the total installed capacity.

The treatment scheme based on primary sedimentation followed by activated sludge process with anaerobic sludge digester and sludge drying beds for anaerobic sludge is quite a suitable scheme for metro cities where land availability is scarce. In India, most of the sewage treatment plants were developed under various river action plans (from 1978-79 onwards) and are located in cities/towns along the banks of major rivers (CPCB, 2005).

The effluent sludge is treated using any of the following three techniques:

- 1) Primary settling followed by Activated Sludge Process
- 2) Up-flow Anaerobic Sludge Blanket plus Polishing Pond
- 3) A series of Waste Stabilization Ponds

Out of the methods as mentioned above, the first technology (i.e., activated sludge process) has an ability to give the output of final effluent exhibiting

biological oxygen demand (BOD) and total suspended solids (TSS) values below 20 mg/L and 30 mg/L, respectively. This is well below the norms set by the Central Pollution Control Board (CPCB) of India for various after treatment parameters for effluent. The treatment systems in a standard form of activated sludge process are based on treating both primary and secondary sludges in anaerobic sludge reactors. Thus, excess sludge generated in the anaerobic reactor is transferred to the sludge beds. This manifests an ever-increasing crisis of yielding an enormous volume of surplus activated sludge for an otherwise excellent treatment process even after assuring a minimal after-effect on the aquatic environment.

About 25 common effluent treatment plants are operating in the state of Maharashtra with a cumulative capacity of 203.35 MLD (MPCB website, 2020). Equipped with the activated sludge treatment, the plants can safely discharge the treated effluent. The excess activated sludge generated in these plants is generally sent to the waste management authorities for landfilling, and this creates the very problem of excessive landfilling. Infact, landfilling need not the last option for the disposal unless it contains hazardous waste materials.

The wastewater sludge or biosolids is a prolific source of nitrogen (N), phosphorous (P), and energy (C). Nearly 1.2 million metric tons or 22% of total

treated wastewater sludge is utilized to develop the soil for grasslands and crops in the United States (Chen et al., 2002). This utilization of the excess sludge should be, in fact, prominently practiced in agricultural countries like India for crop improvement and irrigation.

## The Challenge: Excess Activated Sludge

Traditionally, dewatering or thickening of the excess activated sludge is a formidable task due to its ability to hold a large amount of bound water, which is around 98%. The excess activated sludge is usually associated with several microbiological problems that can occur in sludge dewatering. These include non-settleable growth, pin floc problems, zoogloea bulking and foaming, polysaccharide bulking and foaming, nitrification and denitrification issues, etc. Appropriate handling, treatment, and disposal of the excess activated sludge is expensive and comprises 60% of the total operating costs of a treatment plant (Li et al., 2016). A combination of all the aforementioned reasons causes a hold-back in exploring the usage of excess activated sludge for a country like India.

## Our Efforts

Our team from the Institute of Chemical Technology, Mumbai, visited several



Common Effluent Treatment Plants (CETP) in Maharashtra and performed filtration experiments to understand the sludge properties. The elemental analysis conducted on the excess activated sludge of one of the CETP is shown in Table 1.

| Element | Mass % | Element | Mass % |
|---------|--------|---------|--------|
| C       | 24     | K       | 2.6    |
| N       | 7.8    | Ca      | 10.9   |
| O       | 8.2    | Cr      | 0.6    |
| Na      | 0.9    | Fe      | 6.5    |
| Al      | 15.2   | Co      | 0.35   |
| Si      | 16.2   | Cu      | 3.15   |
| P       | 0.5    | Hg      | 3.1    |

Table 1. Quantitative analysis of a typical excess activated sludge

62

As can be seen in Table 1, the excess activated sludge composition exhibits a high amount of carbon and nitrogen, which is in agreement with the claims made in the earlier paragraph. Also, the optical microscopy image in Figure 1 reveals the particle size of the excess activated sludge flocs between 25.44 to 56.18  $\mu\text{m}$ . This data is important and crucial in deciding the filter size and filtration methodology. This would also imply that, in this case, the filter size selection below 25 microns may work very well in filtering solids.

On further filtration experiments, the chemical oxygen demand (COD) of the filtrate was reduced to 500–700 mg/L. This is excellent and further treatment will decrease the COD values well below

the CPCB standards of 250 mg/L. Also, the filtration time was considerably reduced by adding a suitable coagulant. In comparison, the time needed to filter the excess activated sludge by using a coagulant was almost 10 times less than the non-coagulated experiments. This is a significant finding, and this may very well be related to the particle agglomeration taking place at the calculated coagulant dosing above its threshold value. This also indicates that the common effluent treatment plant may need to revise its coagulant addition calculation for better separation results. In such cases, often the much-overlooked particle properties, the zeta potential, plays an additional role, where adding sub-optimum coagulant dose may be detrimental to particle cluster formation. This is because, at higher zeta potential, say about 40 mV or more, the intra-particle repulsion inhibits particle agglomeration. The zeta potential values close to 0 mV do assist in agglomeration because of the stronger van-der-Waals forces (Kumar and Dixit, 2017).

The coagulants are added to exploit the commonly occurring forces between particles such as van der Waals forces and electrostatic forces. The tendency of the particles to become cohesive determines the state of dispersion of the particles and hence the type of settling i. e. particulate settling or aggregate settling. In dilute sludge, the particle settling velocity is higher for larger sized particles. However, in concentrated sludge, the larger particles

are decelerated, and smaller particles are accelerated, resulting in all the particles settling at the same velocity. This is due to the fact that, at higher concentrations, the velocity of the rising displaced liquid is higher, which promotes hindered settling and inhibits selective settling.

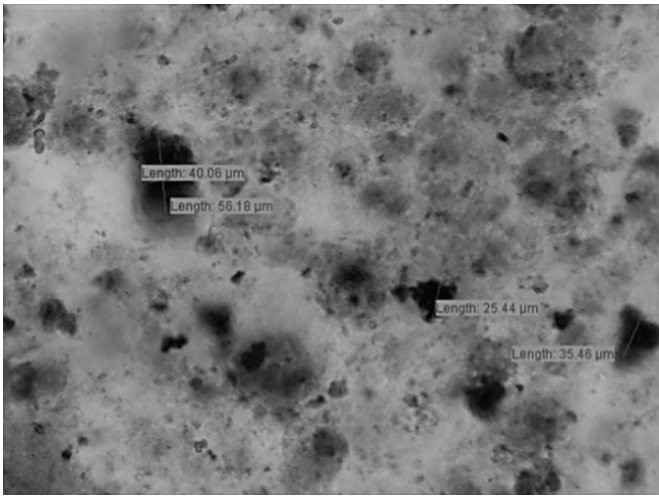


Figure 1. Optical microscopy image of excess activated sludge

Cost Analysis

The cost-benefit analysis is based on two key areas, namely, fixed cost and operating cost. Table 2 details the fixed

cost of the commonly used dewatering technologies, such as the gravity settling system and textile bag filters (Sharrer et al., 2010). As clearly can be seen from the table, gravity thickening costs the least to install; however, it is also a time consuming and cumbersome process. Moreover, it requires a large footprint for the installation. The bag filter costs more to install, and they suffer from secondary waste generation from discarded bags. Table 2 also represents the estimated operating cost of the existing technology, assuming the typical cost of electricity per kWh as Rupees 10.

For a 10 MLD effluent treatment plant, a typical decanter-centrifuge produces 6400 L/day of surplus activated sludge, which translates into 160 kg/day dry solids after drying. The operating power requirements of the decanter-centrifuge is in the range of 30 to 40 kW, which operates to discard WAS. The dumping and transportation cost of this WAS is 1300 and 700 Rs/T, respectively. This cost

| Equipment          | Fixed Cost (USD) | Fixed Cost (INR*) | Power required (kW) | Energy consumption (kWh/d) | Operating cost (INR/year) |
|--------------------|------------------|-------------------|---------------------|----------------------------|---------------------------|
| Gravity thickening | 83,322           | 62,56,648         | 30 (min)            | 720                        | 25,92,000                 |
| Textile bag filter | 2,43,651         | 1,82,95,753       | 18                  | 432                        | 15,55,200                 |
| Volute filter      | 1,13,333         | 85,00,000         | 23                  | 552                        | 20,14,800                 |
| *1 USD = 75 INR    |                  |                   |                     |                            |                           |

Table 2. Cost of various dewatering techniques for a hypothetical 454 MT/year capacity

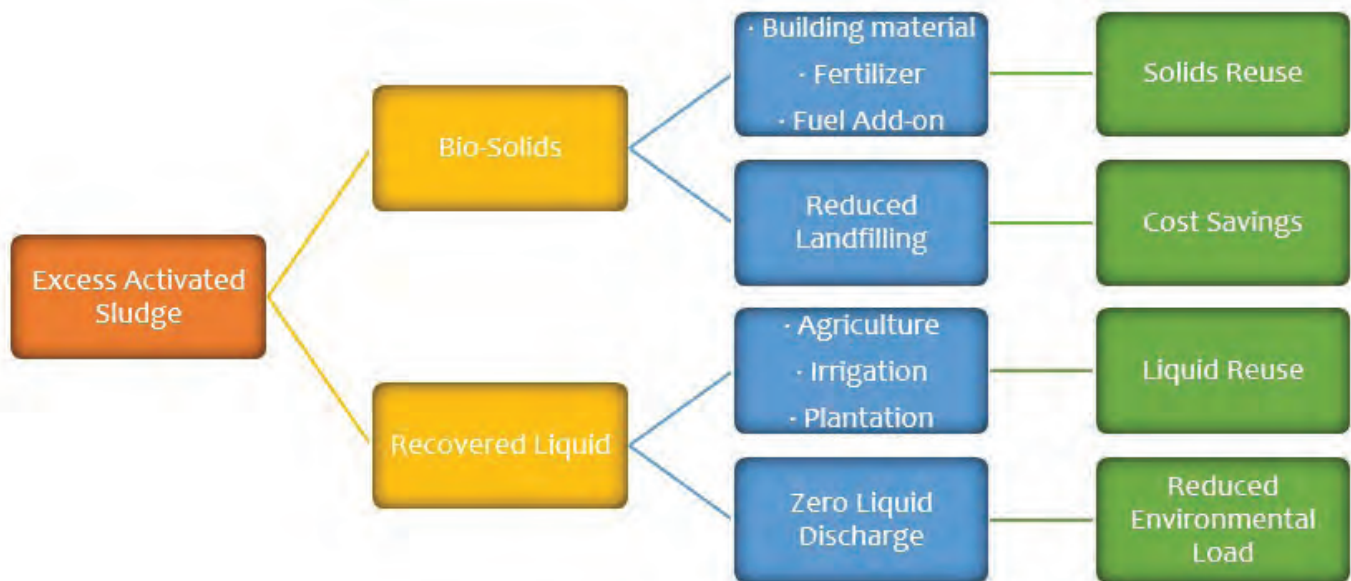


Figure 2: Benefits of utilizing excess activated sludge

is exorbitant considering both operating as well as the disposal cost, yet it doesn't cover the long term cost of environment damage. These compulsions has driven several companies and centralized effluent processing plants to look for better option and yet economic and affordable. Any low cost material handling technology, be it for sludge handling and further processing (volume reduction) or for that matter any other sundry stream perceived as wasteful product, must come handy and useful. The volume reduction technology of sludge by volute filter is one of the key technologies that could be utilized elegantly. There are also some other competing technologies such as moving belt filter or mono-belt filtration technology. Here, it is important to note that the volute filter is in vogue only in recent time for waste activated sludge dewatering. This is already in use in couple of industries located in the Mahad

Industrial area, konkan. It costs around 5 Lakhs for a 3 m<sup>3</sup>/h capacity unit and consumes only about 1.35 kW/h of power. Although slightly costly, the volute filter offers predominant advantages such as smaller footprint, automatic self-cleaning, and less filtration time.

### Use Case Scenario and Future Prospects

The proper utilization of excess activated sludge may help a wide range of industries such as chemicals, food, fiber, steel, automotive, power, sugar, and pulp and paper. As portrayed in Figure 2, the treatment of surplus activated sludge may warrant greater access to safe and affordable (recovered) alternative water resources for irrigation for farmers and rural communities. The solids rich in biological content can be digested to



provide an option to use as a fertilizer. In the test conducted, the calorific value of the dry sludge was found to be reasonable at 4000 kcal/kg. This opens an opportunity to use it as a fuel when combined with coal or biomass briquettes. The ash produced after burning can be used for the production of building and road surfacing products. Moreover, solid waste can be developed as an adsorbent or used as a cement filler material.

A reduction in the final volume of the solids by 80 to 90% may cause power and, sequentially, budget savings due to the decrease in upcoming costs to cope with excessive landfilling, increasing freshwater scarcity, and costly water treatment procedures. This may significantly benefit municipal corporations and industries from the reduced environmental burden. ■

## Reference

- [1] World Bank Data, 2019: <https://data.worldbank.org/indicator/SP.URB.TOTL.IN.ZS?end=2019&locations=IN&start=1960>
- [2] NGTPB, 2019: Order Of The National Green Tribunal Regarding Effluent Discharge Standards For Stps, 30/04/2019
- [3] CPCB, 2005: Parivesh Sewage Pollution – News Letter. Central Pollution Control Board, Ministry of Environment and Forests, Govt. of India, Delhi
- [4] MPCB website, 2020: <http://www.mpcb.gov.in/cetp-reports-at-glance/>
- [5] Chen et al., 2002: Chen G, Yue PL, Mujumdar

AS. Sludge dewatering and drying. *Drying Technology*, 311; 20(4–5): 883–916.

[6] Li et al., 2016: Li Y, Yuan X, Wu Z, Wang H, Xiao Z, Wu Y. Enhancing the sludge dewaterability by electrolysis/electrocoagulation combined with zero-valent iron 314 activated persulfate process. *Chemical Engineering Journal*, 303:636–45.

[7] Kumar and Dixit, 2017: Kumar A, Dixit CK, *Methods for characterization of nanoparticles. Advances in Nanomedicine for the Delivery of Therapeutic Nucleic Acids*. Woodhead Publishing, 43–58.

[8] Sharrer et al., 2010: Sharrer M, Rishel K, Taylor A, Vinci BJ, Summerfelt ST. The cost and effectiveness of solids thickening technologies for treating backwash and recovering nutrients from intensive aquaculture systems. *Bioresource Technology*, 101: 6630–6641.

[9] AMCON website, 2020: <https://en.amcon.co.jp/products/volute/features2/>

## Authors

### Dr. Sachin Jadhav

Assistant Professor of Chemical Engineering, Department of Chemical Engineering, Institute of Chemical Technology, Mumbai



### Prof. Bhaskar Narayan Thorat

Director & Professor of Chemical Engineering Institute of Chemical Technology, Institute of Chemical Technology, Mumbai-IOC Odisha Campus, Bhubaneswar



## DesaliTec™ Closed-Circuit Reverse Osmosis

**D**esaliTec™ Closed-Circuit Reverse Osmosis (CCRO) a DuPont brand, has set a new standard for RO, opening opportunities for dramatic cost savings and operational benefits. Ajay Bajaj of DuPont Water Solutions explains how this breakthrough technology works and its significance to industrial and municipal water and wastewater reuse.



**Flexibility:** DesaliTec™ CCRO systems automatically adapt to changing feedwater and allow the operator to modify recovery, cross flow, and flux in real time.



**Reliability:** DesaliTec™ CCRO systems naturally mitigate the fouling and scaling that typically plagues reverse osmosis systems. Automated operation with online monitoring provides additional protection.

**Maximum Recovery:** DesaliTec™ CCRO

systems come with an elegant single-stage design, operating at up to 98% recovery, allowing you to achieve your sustainability goals.

**Energy Savings:** DesaliTec™ CCRO systems hug the osmotic curve as a function of time, reducing the energy consumption on higher salinity feed waters.



**Return On Investment:** Using DesaliTec™ CCRO, owners and operators can mitigate the risk of downtime, while the data-driven software maximizes operational efficiency in real-time. With savings in water, wastewater disposal, energy, chemicals, cleanings, membrane life and optimized pretreatment, ROI is typically recognized in less than a year.

It is no secret that fresh water supplies are limited and are under pressure almost everywhere in the World. With more people, more industries, urbanization, depleting resources, pollution, climate

change, and massive difference in untreated and treated wastewater, the pressure on water supplies will continue to intensify. A future where industry has the necessary water to make the products



Cites / Credits: United Nations Sustainability Development Goals Reports

on which we rely. A future where we 'efficiently' optimize the circular nature of water so that not a drop of water is wasted.

Water management is being emphasized 'as a priority' at highest levels and there are several initiatives that promotes management and conservation of water in an efficient possible manner, like 'Catch the rain', 'more crop per drop', 'rain water harvesting', and 'reuse' are few names of many sustainability development goals (SDG6) initiatives, refer image 1. Government and regulatory authorities are emphasizing on reuse / zero or minimum liquid discharge, promoting internal water

reduction for Industries and making discharge norms stringent for discharge.

We know it is doable. Many of the technologies required to optimize water — at the residential level to the global level — exist today. We have one such breakthrough technology, known as Closed-Circuit Reverse Osmosis.

Breakthrough innovations often either fundamentally change a method of work or change how something is done. For example, smartphones are not merely used only to make phone calls but with the introduction of digital tools it offers users to communicate, connect, consume, and share information and often addresses pain points of old ways of doing things.

DuPont has introduced DesaliTec™ CCRO systems formerly known as Desalitech CCRO, that fundamentally disrupts traditional reverse osmosis (RO) technology, sparking a technological revolution that delivers cost savings and operational benefits far beyond the capability of its predecessor. Traditional RO largely remained in a technological standstill following its academic inception in 1959 and commercialization beginning in the 1960s. Membrane evolutions and adding stages in series did manage to improve efficiency, yet many of the



contemporary RO systems sold today use design principles dating back to the 1980s. DesaliTec™ CCRO, however, signals a new awakening for the industry, its practitioners, and users.

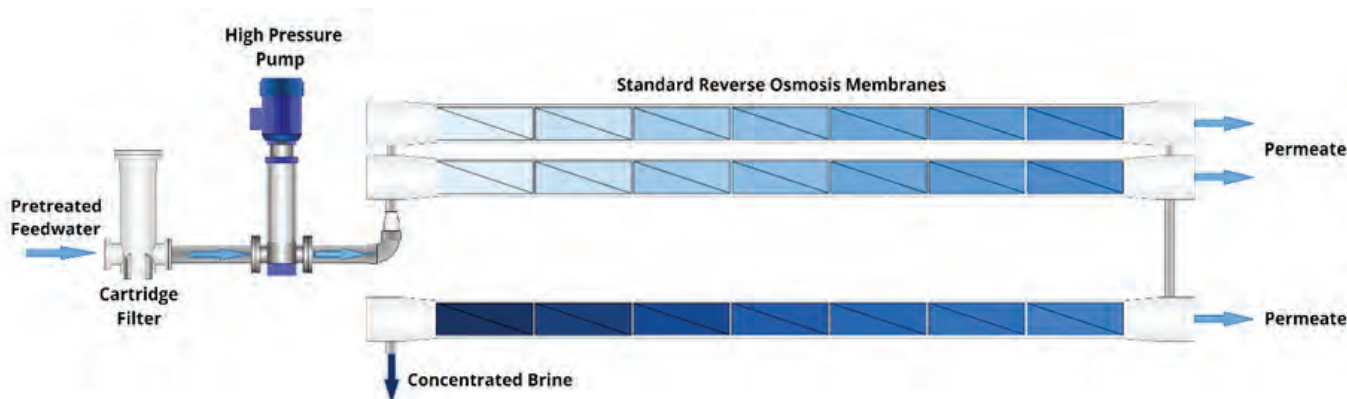
## Traditional RO

RO is the primary technology used in the desalination of municipal and industrial water and wastewater for many years now. Effective at removing salts, its operational limitations include low recovery rates, fouling and scaling of membranes, high clean-in-place (CIP) frequencies, short membrane life, difficulty in managing variations in feed water quality, compromised permeate quality, high operating costs, and others. The key to solving all of these issues ultimately stems from an innovative solution that involves reinventing the basic filtration process.

Every stage of the traditional RO process is comprised of multiple sequential

membranes, and each stage can only achieve 50% recovery. It takes two stages to achieve 75% recovery, creating 25% waste. With every 5% increase in recovery over 75% mark, adds a different type of complexity to the traditional design like concentrate flow warnings, flux and flow unbalancing between stages, etc. To optimize this balancing act hybrid-staging or inter-stage booster pumps, back-pressures, low concentrate are used to establish hydraulic balance, but these approaches sacrifice operational flexibility and make it complex to operate at varying water temperatures. Even so, this is the standard configuration of most industrial and municipal RO systems.

In traditional multi-stage RO systems, recovery, flux, and crossflow are coupled, so managing efficiency and performance is a balancing act. The systems are either reliable but inefficient, or they are efficient but unreliable.



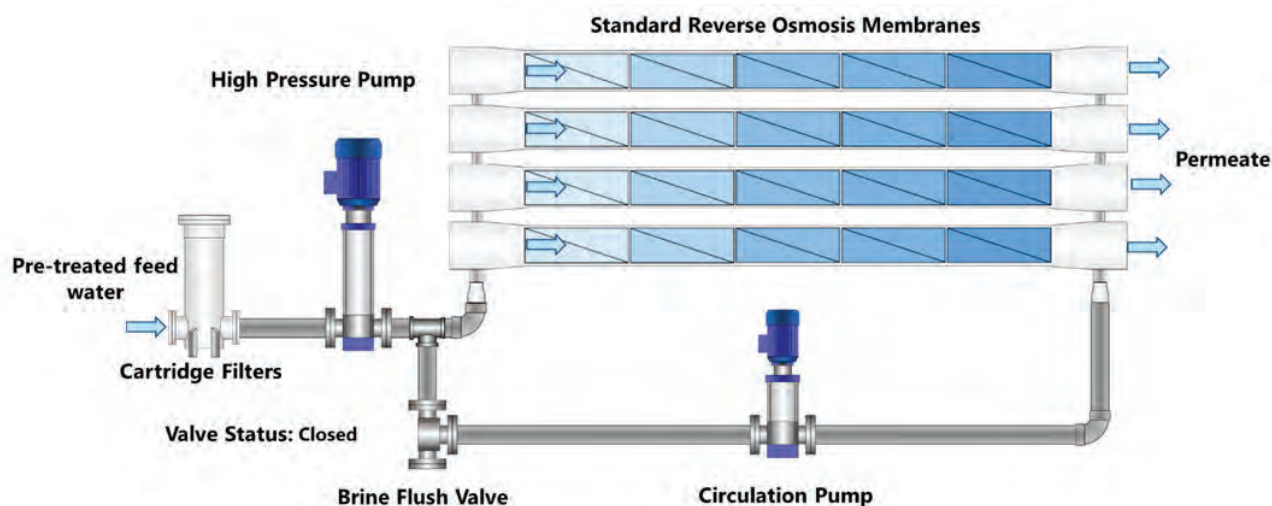
Typical representation of traditional RO System

While the industry has made significant advancements to individual aspects of the RO process – including membrane elements, variable frequency drives, and analytical equipment – none of these advancements have been due to optimization of the fundamental design.

### DesaliTec™ CCRO breakthrough

DesaliTec™ CCRO is one such fundamental design optimization with an uniquely configured closed circuit design. It is a semi-batch, single-stage elegant design where recovery, flux, and crossflow are uncoupled with automated triggers to purge concentrate based on volumetric recovery, pressure, and/or conductivity. This flexibility helps achieve a significantly higher level of efficiency and reliability than RO.

Good resistance to fouling and scaling, along with high recovery operation, is important in most brackish water desalination, industrial water purification, and water reuse applications. The CCRO process provides new and enhanced means for addressing these challenges. Independently controlled crossflow supplied by a circulation pump efficiently washes the membranes, resulting in lower concentration polarization, and reduces the effects of scaling and fouling. As the salinity throughout the sequence cycles up to that of the most concentrated brine, and with freshwater ingress biofilm formation and scale precipitation can be disrupted – and even reversed. A high-recovery design is constructed in one stage typically consisting of four or five elements per vessel to optimally balance performance and costs.



Typical representation of a CCRO System

Notably, the sequence time of purging concentrate is much shorter than the induction time for precipitation of most sparingly soluble salts. This is sharply contrasting from the steady-state conditions in traditional RO systems, which maintain nearly constant concentrations throughout their membrane arrays for months or even years. Additionally, because recovery can be easily controlled, the adaptive process can be adjusted if the concentration of scaling salts or other feed water properties change. Due to these properties, the CCRO process is inherently more reliable than a traditional, multi-stage RO.

**70** System reliability is a key factor in the adoption of the autonomous, data-driven process for critical applications. Traditional RO systems are only reliable when operated at lower recovery rates. For example, a single-stage, 50-percent recovery RO system will typically have less fouling and scaling than a two-stage, 75-percent recovery RO system that will, in turn, have less fouling and scaling than a three-stage, 88-percent recovery RO system. While reliability is a primary operational driver for many customers, they find that they must choose to operate multistage RO systems that compromise efficiency.

In the CCRO process, this compromise is no longer required. In fact, the higher the recovery, the more significant the concentration variations between most

concentrated brine and fresh water ingress will get, in turn providing better immunity to biofouling. In addition, the adaptive nature of the process will keep the system at optimal performance as feed or membrane conditions vary over time, providing a level of reliability and efficiency that cannot be achieved with a traditional RO system.

## **DesaliTec™ CCRO sets new standards**

Overcoming the technical limitations of traditional RO, DesaliTec™ CCRO is fundamentally changing how companies and organizations in all industries approach municipal and industrial water and wastewater treatment. Automating applications previously thought impossible, DesaliTec™ CCRO demonstrates the following:

- High recovery is no longer a hydraulic limitation
- Fouling and scaling can be mitigated
- CIP frequency and membrane life can be extended
- Managing variations in water quality can be automatic
- Permeate quality can be a set point
- Reducing chemical and energy costs comes naturally
- Operating systems using data driven, autonomous IoT software is a reality

There is new disruption in reverse



| Industry     | F&B  | Non-Profit Foundation  | Paper Mill   |
|--------------|--|--|--|
| Application  | Ingredient Water for one of the Fortune 500 Company  | Mega Community Kitchen – Potable Use   | Wastewater for reuse   |
| Project Size | 2 x 158 m3/hr  | 1 x 8 m3/hr  | 2 x 45 m3/hr   |
| Challenges   | A treatment method with maximum water utilization and minimum wastewater generation is necessary for achievement of corporate water replenishment goal.                        | Improved utilization of water for the mega kitchen as significant amount of water used to go down the drain due to challenging water source. | Company wanted to improve purified water supply for expansion for a High salinity water, with high silica content source.  |
| Solutions    | Proposed solution produces high purity ingredient water at recovery rates $\geq 93\%$ , far exceeding what is achievable with traditional multi-stage reverse osmosis systems. | Proposed solution produces potable water at 85% to 90% recovery and saves 30 Million liters of fresh water per year.                         | Proposed DesaliTec™ CCRO solutions works at around 88% recovery as against 73% traditional RO.   |
| Results      | High recovery means better utilization of water supplies and less waste to dispose of.<br><br>The facility was able to achieve a water neutral sustainability goal.            | Approx. 30 Million liters per year water saved with DesaliTec™ CCRO.<br><br>Estimated cost saving of approx. INR 37 Lakhs / annum.           | 200% increase in permeate production<br>26% less wastewater generated<br>5% less energy required<br>63% less use of Antiscalant<br>600% reduction in CIP frequency |

osmosis. Reverse osmosis will continue to be the primary technology for desalination of water and wastewater; however, CCRO is now the new operational standard. The inefficiencies and limitations of traditional multi-stage RO designs are no longer tenable when an elegant, single-stage design delivers a superior process offering clear operational, environmental, and financial benefits. With more than 250 installations delivering quantifiable payback on six continents and in over a dozen different industries, it's clear that the industry has also taken notice. ■

### Reference

- Michael Boyd (April 2019). "Twenty-first century reverse osmosis disrupts traditional technology", *World Water Magazine*, pp. 26-28.
- Image1 courtesy UNWATER.org

72



### Author

**Michael Boyd**

Senior Regional Sales Manager  
DesaliTec



### Co-Author

**Ajay Bajaj**

Regional Account Manager  
CCRO – India and Sub-Continent

# CHEMICAL ENGINEERING WORLD

Dynamic Platform  
to  
Connect with Chemical  
Industry Ecosystem

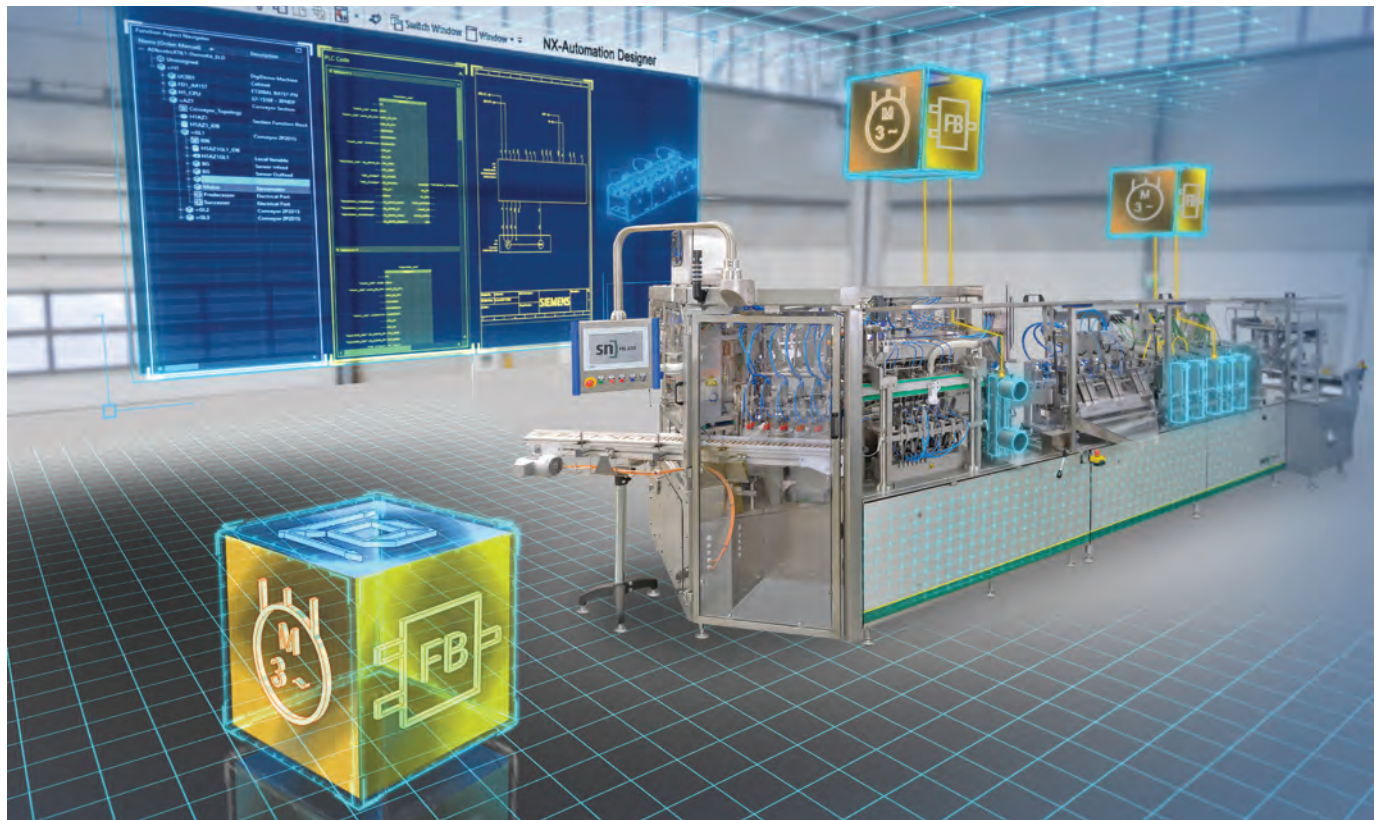
Direct Reach  
to  
**>200,000 Readers**  
across  
**>25 countries**

[sales@jasubhai.com](mailto:sales@jasubhai.com)

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



## Siemens Extends Xcelerator Portfolio with New Functions



Siemens Digital Industries Software announces the release of NX™ Automation Designer software and NX™ Industrial Electrical Design software, a new suite of solutions that provide a central design application for industrial electrical and automation design. These new tools can help manufacturers of production systems to manage design complexity, shorten development lifecycles and increase the quality of their designs. Direct integration with Teamcenter® software for product lifecycle management (PLM) and the entire NX design software portfolio

provides a unified multidisciplinary design environment for production systems engineering.

NX Automation Designer and NX Industrial Electrical Design provide new functions for efficient electrical and automation design of industrial equipment. Electrical engineers can complete their work faster with enhancements to connection handling and reporting, new OOTB symbols for IEC, ANSI and fluidics and 2D cabinet dimensioning. Automation engineers benefit from extended software generation capabilities for sequences and



safety programs.

The latest release enables customers to get started in the world of functional design, by enabling them to start their electrical and automation design work without Teamcenter. This allows customers not looking for a complete PLM system to benefit from the electrical and automation design capabilities. By boosting engineering productivity with a new level of multi-disciplinary collaboration, NX Automation Designer addresses the growing demand for product variety from consumers by lowering businesses' IT costs.

"Today, in order to maintain profitability, you have to realize more projects with the same number of employees. Furthermore, you need to quickly react to different in complex customer requirements," says Karl Stieler, Owner STiMA GmbH & Co. KG. "This means we need the close interaction of mechanical design, electrical design and automation technology. We are perfectly prepared for the future and its challenges on the market with this solution by Siemens."

STiMA chose the NX platform to combine various disciplines – mechanical, electrical, and automation – into one environment to more efficiently manage projects and improve quality. With the help of NX and particularly NX Automation Designer,

STiMA reduced their engineering time by 45% through consistent data across the different areas and a more efficient workflow. The scalability of NX benefits customers like STiMA by allowing them to start with a single module or combine different modules with each other.

"Thanks to the integrated toolchain from Siemens, digitalization is even possible in small-medium size enterprises," says Wolfgang Schloegl, Vice President Digital Engineering at Siemens. "Through this toolchain a significant efficiency enhancement can be achieved in particular when realizing new products." ■

#### Contact :

<https://www.plm.automation.siemens.com/global/en/products/mechanical-design/automation-design.html>

## PLA Crystallization and Drying In Minutes Instead Of Hours

Poly lactide (PLA) continues to enjoy increasing popularity. A particular challenge in processing is crystallization and drying. Because PLA is a hygroscopic thermoplastic, it readily absorbs moisture from the atmosphere. The presence of even small amounts of moisture hydrolyzes the biopolymer in the melt phase and reduces the molecular weight. As a result, the mechanical properties of PLA decrease and the quality of the final product is compromised. Therefore, PLA must be thoroughly dried directly before



melt-processing. In many cases, recycled polymer must also be crystallized before drying. With its infrared rotary drum (IRD), KREYENBORG offers a fast, energy-saving and product-friendly solution.

Feed material is first introduced into the rotary drum by a volumetric dosing system. High-level heat is then quickly and directly introduced into the core of the material by means of infrared light. This energy thus heats the material from the inside and drives the moisture out through heat flow from the inside out.

The mixing elements integrated in the spirals, as well as the rotation, ensure continuous mixing of the feed material. In the process, the material at the surface is constantly exchanged. These continuous rotary movements prevent the product from blocking and clumping. With these

advantages, drying times of only 15 minutes can be achieved. In conventional hot air dryers, the previously crystallized PLA can be dried at only 65-90 °C (150-190 °F) using dehumidified air.

Here, higher drying temperatures could lead to softening and blocking of the polymer in the dryer. Typically, this results in drying times of between 2 and 8 hours, while lower drying temperatures result in even longer drying times. The energy input necessary for these conventional processes is sometimes considerable.

Generally, PLA must be dried to a moisture level of < 250 ppm and maintained at this level to minimize hydrolysis during melt processing. Achieving and maintaining these kinds of levels is not optional, but is an absolute necessity, and is feasible using KREYENBORG's infrared rotary drum. A dry granule helps control relative viscosity (RV) loss, which should be less than 0.1. Controlling RV loss is critical to maintaining impact resistance, melt-viscosity and other important properties of the feedstock. KREYENBORG invites customers who want to see the performance of the machinery in action to participate in pilot plant trials, which now can even be conducted online. ■

#### Contact

<https://www.kreyenborg.com/produkt/ir-clean/>

## Thermon Introduces the Thermon EnviroDyne™ Methane Destruction Unit



primary component of natural gas is methane. Given that methane emissions are an especially noxious

Thermon Group Holdings, Inc, a global leader in industrial process heating, announced the introduction of the Thermon EnviroDyne™ Methane Destruction Unit, which converts harmful methane gas emissions to water vapor and carbon dioxide without using a flame. This new technology is the latest development in Thermon's drive to provide sustainable solutions to dramatically reduce its customers' global emissions footprint.

Developed in response to customers looking for a way to effectively reduce fugitive emissions released while venting natural gas, the Thermon EnviroDyne™ Methane Destruction Unit is poised to play a critical role in reducing harmful greenhouse gases and managing climate change responsibly.

"As a company, we are firmly dedicated to doing everything we can to be responsible stewards of the global environment. The

source of damaging greenhouse gases, 70-80 times worse than CO<sub>2</sub>, we, as experts in catalytic reactions, created the Thermon EnviroDyne™ Unit to reduce them," said Mark Roberts, Senior Vice-President Heating Systems and Engineering for Thermon. "By drawing upon our long-term experience in deploying innovative catalyst formulations to target the flameless conversion of methane gas emissions to water vapor and carbon dioxide, we now offer the Thermon EnviroDyne™ Unit as an effective, efficient, and reliable solution."

The long-term impact of the Thermon EnviroDyne™ is far-reaching with its ability to convert vented emissions released by pneumatic devices and other sources at a rate of 90% or higher. As a result, the

Safety is also a key benefit. Because it operates without employing a flame, it operates safely in otherwise extremely



hazardous locations where using a flame poses a serious risk of explosion.

This flameless technology consists of just two modules: a converter module and a gas train module that feature no moving parts. Following initial start-up via electric power, it operates continuously when supplied with air and clean fuel. The system is highly reliable, featuring a patent pending proprietary explosion-proof catalyst pad. Because the converter module consists of 300 series stainless-steel components, it is resistant to corrosion. It is suitable for use in hazardous locations, and is CSA C/US-certified to meet requirements for use in Class I, Div. 1 & 2 hazardous locations, Temperature Code T2C in the USA and Canada. ■

**Contact**

angele.anson@thermon.com

## MT100 Multipoint Flue Gas Flow Meter Earns TÜV Certification



Environmental, process and plant engineers responsible for continuous emissions monitoring (CEMS) with automated measuring systems (AMS) from stacks, flues, ducts and chimneys will find that the advanced MT100 Series Multipoint Mass Flow Meter from Fluid Components International (FCI) is now their newly TÜV QAL1 certified solution that meets EU Directive 2010/75/EU .

The MT100 Series Multipoint Mass Flow Meters feature proven thermal dispersion flow sensing technology. This advanced, next-gen meter was designed specifically for flue gas flow monitoring in large stacks, ducts, chimneys and pipes. It accurately monitors and reports the flow rate and/or the totalized flow of all gases and mixed gas compositions, including hot, moist, aggressive and dirty flue gases emitted by industrial processes and which are being

treated and reduced to help reduce the global warming of the planet.

The highly repeatable and reliable MT100 Series Multipoint Mass Flow Meter is now TÜV-certified as AMS compliant with EN15267-3 with QAL1 and EN14181 (2015). Certification by TÜV, a highly respected independent and internationally recognized organization that approves numerous emissions monitoring equipment, including flue gas flow meters, assures FCI's customers that this meter meets its specifications, complies with EU air pollution directives and is suitable for flow data reporting per these directives.

78

The MT100 meter's sensors can be installed either across a mast or can be inserted at multiple points around the process line in a single plane. In hot, dirty and/or moist or corrosive flue gases, it also excels because there are no moving parts, orifices or glass windows to foul or clog. The instrument can measure flue gas processes operating up to 454 °C (850 °F). The MT100 Series Flow Meters measure flow rates over a wide range from 0,07 to 305 NMPS (0.25 to 1000 SFPS) with 100:1 turndown and with excellent accuracy of  $\pm 1.75\%$  of reading,  $\pm 0.5\%$  of full scale.

Its best-in-class large color touch-screen LCD readout provides comprehensive process information to users with both analog and digital displays of flow rate,

temperature and totalized flow, a user time-base selectable strip-chart of flow rate and sensor status diagnostics. ■

## The New Omnicontrol® Universal Control Unit Pfeiffer Vacuum



Pfeiffer Vacuum control unit OmniControl

The new OmniControl unit allows the comprehensive control of a complete vacuum system using just one device. It combines the control of the total pressure with the control of the pumps. The unit communicates with products that support the Pfeiffer Vacuum RS-485 protocol (e.g. HiPace, HiScroll, HiLobe, MVP and DigiLine). This makes it possible to exchange and process data between various Pfeiffer Vacuum products without any difficulty and without having to invest in additional devices. Optional gauges from the ActiveLine range (with analog output) can also be

connected. The 3.5" touch screen with an intuitive user interface ensures easy and convenient control of the vacuum system. For example, a button for switching the devices on and off can be added. The total pressure and the pump parameters (RPM, power input etc.) can be displayed at the same time.

The basic version of the OmniControl is available with or without an internal power supply. Devices without a power supply are available as a rack mountable or mobile device for manual operation. This means that the control unit can be used either locally or at various locations. Rack mountable devices are also available with an optional table holder.

With the Gauge/IO option, there is no need for a separate vacuum gauge controller. Various inputs and outputs are provided for connecting external components. For example, a valve can be switched according to the pressure level.

With the Data option, the measured values can also be saved as a CSV file on a USB stick or a MicroSD card. The data can then be analyzed and archived. The data items to be saved can be freely defined (total pressures, RPM, error codes etc.) ■

# CHEMICAL ENGINEERING WORLD

Dynamic Platform  
to  
Connect with Chemical  
Industry Ecosystem

Direct Reach  
to  
**>200,000 Readers**  
across  
**>25 countries**

[sales@jasubhai.com](mailto:sales@jasubhai.com)

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





Dynamic Platform  
to  
Connect with Chemical Industry Ecosystem  
Direct Reach  
to  
**>200,000 Readers**  
across  
**>25 countries**



Embed Product Video



Choose the embedded features: insert all  
embedded features Contact: [sales@jasubhai.com](mailto:sales@jasubhai.com)

