

PRO·CESS

3

Special Issue 2022

VOLUME 24

www.process-worldwide.com

WORLDWIDE

**One Size
Fits All**

Modular platforms offer industry optimal HMI solutions. These solutions are perfectly suitable for any application and can be used end-to-end, from Zone 1 through non-hazardous areas.

Business & Economics

Chlorine Chemistry in the Energy Crisis

Engineering

5 Perks of Choosing a Modular Plant

Pharmaceutical Technology

Granulation in the Next Dimension



SMALL BATCHES, SPECIAL EDITIONS, FAST CHANGES.
BEST ACHIEVED WITH SCHUBERT.



To be flexible, you need options. Schubert packaging machines offer all the flexibility you need. Quick: thanks to the shortest changeover times. Versatile: even for the most diverse formats. Efficient: because they fill and pack at the same time. Environmentally friendly: because they process packaging materials as sparingly as possible. All in line with our Mission Blue: Smarter technologies for a reduced use of resources.

<https://www.schubert.group/en/cosmetics.html>

Feels just like Robinson Crusoe

Do you know that feeling? A problem occurs — be it real or perceived — followed by the inevitable meetings, discussions and votes, and then? A new tool comes along and the problem is no more ... At least that's the hope. Ever since someone clever came up with the idea of talking about solutions instead of software products, there seems to be no more problems in the world. As if ... And this does not only concern the software houses: Also the classical component suppliers no longer want to deliver only pumps, fittings or control systems any more, but to be perceived as solution providers. So far, so good. As long as the supposed solution does not create new problems, we should be fine. But there is the old joke that not only computers help to solve problems we wouldn't have without them. And thus, each solution causes new questions — not least because every manufacturer thinks they know best what we users really want. In addition, there is the unwillingness to share too much inside information with third parties as well as the hope of establishing one's own approach as a possible standard. All too often, the result is isolated solutions that involve lots of brainpower but sadly little real connectivity. Thus, in a lot of applications there is one cloud from the pump manufacturer and one from the compressor supplier, one for the valves and one for the sensors and of course another one from the automation company. On a normal day, even I have three browser windows running simultaneously with countless tabs along with a plethora of programs. I can only imagine the trouble someone has keeping up with an integrated production plant. Wouldn't it be nice if we got not only the field devices, sensor systems and of course the employees, but also the data clouds to communicate with each other? Otherwise I fear, we, as well as our valuable process data and know-how, will be stuck on desolated island solutions, feeling a little castaway. To be honest, I'm not sure if someone like Robinson Crusoe would be a good role model for any workplace environment — if I remember it correctly, that guy spend most of his time eagerly waiting for Friday to finally arrive.



Dominik Stephan
Editor



Premium Products for Hydrogen Applications from ELAFLEX

» Hoses, Couplings + Expansion Joints



Expansion for ERV-H2+

H2 Hydrogen Hoses

Ball Valves 350 bar

Ready for the Future.

H2 Hydrogen Hoses for the low-pressure range. Consistently conductive. Available size DN 13 - 50.

ERV-H2+ Expansion Joints. For the transfer of 100% hydrogen and 100% methane or other mixtures, so-called 'Hythane'. Operating pressure of 25 bar.

Ball and check valves as well as quick couplers (up to 1") for use with compressed H2 hydrogen up to 350 bar.

H2 Hydrogen Equipment with low permeation



ELAFLEX HIBY GmbH & Co. KG · SAT+ERV Sales Team
Tel. +49 40 540 005-0 · info@elaflex.de
www.elaflex.com

Content

October



Issue 3 | 2022 · Volume 24 · process-worldwide.com



How to save energy and money: an insight into energy-efficient pumps on the market. Page 26



There is a wide range of applications for these special agitator bead mills. Discover the all-rounders. Page 30

Business & Economics

Chlorine-Chemistry in the Energy Crisis

10 Can They Still be Saved?

Engineering

Industry Trend

14 Creating a Revolutionary Impact with Green Ammonia

Smart Solutions

16 5 Perks of Choosing a Modular Plant

Process Automation

High-End HMI Solutions for Hazardous and Non-Hazardous Areas

20 On Size Fits All

Revolutionary Technologies

24 Digital Transformation is Here to Stay

Pumps/Valves

Industrial Pumps

26 Make Way for Energy-Efficient Pumps

Mechanical & Thermal Processing

Dispersion and Ultra-Fine Grinding

30 Master of the Agitator Bead Mills

Pharmaceutical Technology

Drug Delivery

34 A Special Flair for Pellets

Closed-Granulation Plant

36 Granulation in the Next Dimension

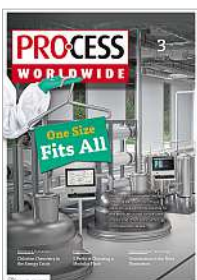


Why the pellet is probably the most versatile active ingredient formulation, and the most underestimated. Page 34

Further Sections

- 3 Editor's Page
- 6 Process Industry News
- 39 Product News
- 42 Imprint

About the cover



Mannheim-based Pepperl+Fuchs consistently uses modular platforms to offer optimal human-machine interface (HMI) solutions to industry.

Page 20

In cooperation with Pepperl+Fuchs



CLEVER MEETS SMART

Safe, reliable, efficient, flexible, future-proof, simply clever – modern automated processes are complex and require perfectly networking field devices. PROFOX actuators are smart, they are perfectly adapted to cope with complex processes and support the user.

PROFOX is easily commissioned, operated and optimised using the AUMA Assistant App. Operating data are assessed in the AUMA Cloud where service processes are coordinated.

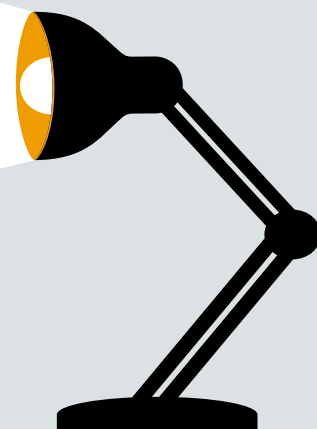
PROFOX – smart automation



www.profox.auma.com

auma[®]

Global Spotlight



More news: www.process-worldwide.com/news

Grafik: © great19 - stocklobe.com

DECARBONIZATION

World's First Demo Plant for Electrically Heated Steam Cracker Furnaces



Source: BASF SE

(l-r) Yousef Al-Benyan, SABIC; Dr. Martin Brudermüller, BASF; and Jürgen Nowicki, Linde, at the opening of the electric cracker demonstration plant in Ludwigshafen.

BASF and Linde have started construction of the world's first demonstration plant for large-scale electrically heated steam cracker furnaces. By using electricity from renewable sources instead of natural gas, the new technology has the potential to reduce CO₂ emissions from one of the most energy-intensive processes in the chemical industry by at least 90 percent compared to commonly used technologies. The demonstration plant will be integrated into one of the existing steam crackers at BASF's Verbund site in Ludwigshafen, Germany. It will test two different heating concepts, processing around 4 tons of hydrocarbons per hour and consuming 6 megawatts of renewable energy. The start-up of the demonstration plant is

targeted for 2023. BASF and Sabic are investing together into the project and the demonstration plant will be operated by BASF. Linde is the engineering, procurement and construction partner for the project, and in the future will commercialize the technology developed. The demonstration plant aims to show that continuous olefin production is possible using electricity as a heat source. The plant is designed to test two heating concepts in parallel: Direct heating applies an electric current directly to the process tubes inside the reactor, while indirect heating uses radiant heat from heating elements placed around the tubes. This will make it possible to react to different customer and site requirements. (dpo)

PRE-FEED ENGINEERING

Nextchem to Develop Green Ammonia Plant

Nextchem has been awarded a pre-FEED engineering services contract by Madoquapower2X along with CIP's Energy Transition Fund and Power2X to develop and operate an integrated renewable hydrogen and green ammonia plant to be located in Sines, Portugal. The scope of the pre-FEED engineering services includes early studies, technology and process review, modularity and logistics analysis, and front-end loading of engineering required to undertake the permitting and licensing for the project.

Madoquapower2X will use renewable energy and 500 MW of electrolysis capacity to produce 50,000 tons of green hydrogen annually, along with green ammonia capacity of up to 500,000 kt/y. During this initial phase the project will avoid the emission of up to 600,000 t/y of CO₂. (dpo)

GREEN ENERGY

Topsoe to Build Large SOEC Electrolyzer Plant

Topsoe has undertaken a final investment decision to begin construction of the world's largest SOEC electrolyzer manufacturing plant in Herning, Denmark. The manufacturing capacity of the plant is 500 MW per year with an option to expand to 5 GW. Topsoe CEO Roeland Baan said: "The case for using electrolysis to produce green fuels is now well established, but manufacturing capacity has always been the challenge. We are facing this challenge head on. We are dedicated to taking the lead on scaling power-to-x technology to help drive the energy transition, and we are investing to meet this demand and address this fundamental supply weakness." At 500 MW capacity per year, the new facility will be the world's largest SOEC manufacturing plant. This is a rapid acceleration not just for Topsoe, but also Denmark and the EU towards a green energy transition while reducing dependence on

fossil fuels. SOEC consumes less electricity than alkaline and PEM technologies, since the process requires less power overall; with the integration of a steam feed, the SOEC process becomes even more efficient. (dpo)



Source: Topsoe

The new facility will be the world's largest SOEC manufacturing plant.

REVOLUTIONARY BREAKTHROUGH

Evonik and Likat Identify New Process Options for Hydroformylation

Evonik and the Leibniz Institute for Catalysis (Likat) have made a breakthrough in the field of hydroformylation. Hydroformylation is one of the most important reactions in industrial organic chemistry, in which unsaturated compounds are converted into aldehydes and alcohols using synthesis gas. Until recently, the scientific consensus was that this reaction, if catalyzed with cobalt, has to be carried out under high-pressure conditions to stop the catalyst decomposing. This was disproved by Professor Dr. Robert Franke, head of hydroformylation research at Evonik, together with research partners from Likat, Dr. Baoxin Zhang and Dr. Christoph Kubis. "With this discovery, we have identified new process options for hydroformylation," said Dr. Franke, who is also a professor of chemistry at Ruhr University in Bochum. "In the future, it may be possible to make this large-scale reaction much more economic and environmentally friendly. Developing these processes will be our task for the next few years." The researchers suc-



Source: Evonik

The research team involving members from Evonik and the Leibniz Institute for Catalysis.

ceeded in demonstrating, for the first time, that cobalt carbonyls — very inexpensive compounds for the catalysis of hydroformylation — are active and stable even at low pressures. The key to this discovery was the development of special spectroscopic measurement methods and associated mathematical tools for data evaluation. High-pressure processes that use cobalt carbonyls as

catalysts could be replaced in the future by new processes with lower pressures. These new processes would then be more cost-effective, energy-efficient and thus more sustainable. At Evonik, this would have an impact on the production of long-chain alcohols such as the oxo alcohol isononanol (INA), which is used to manufacture plasticizers, among other things. (dpo)

COMPACT 24

COUNTING, FILLING AND CAPPING MONOBLOC MACHINE FOR TABLETS


HIGHER
EFFICIENCY


RAPID
CHANGEOVER


COMPACT
FOOTPRINT

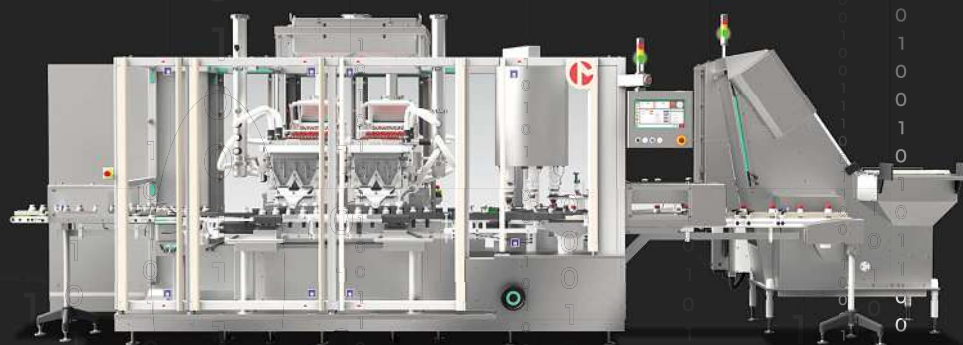

MAGNETIC
TRANSPORT



VISIT US AT:

 CPhI worldwide®

STAND 60C20



marchesini.com

SUSTAINABLE PRODUCTION

First Plant at Zhanjiang Verbund Site



Source: BASF

BASF Zhanjiang Verbund site in China: Inauguration of the first plant.

BASF has recently inaugurated the first plant of its new Zhanjiang Verbund site in the province of Guangdong in South China. The plant will provide a capacity of 60,000 metric tons of engineering plastics compounds per year in China, particularly for customers in the automotive and electronics industries. Upon completion, the new Verbund site Zhanjiang will be the third-largest Verbund site of BASF globally after Ludwigshafen, Germany, and Antwerp, Belgium, and a role model of sustainable production both in China and globally. BASF plans to power the entire Zhanjiang Verbund site with electricity from renewable resources, and plans to achieve 100 percent by 2025. Products from Zhanjiang will supply customers in the dynamic Chinese market, which is the most important growth market for global chemical production. (dpo)

DATA VERIFICATION

Consortium to Test Blockchain-based Digital System

Circularise has announced a pioneering joint project with the certification scheme ISCC, material suppliers Neste, Asahi Kasei, Borealis, Trinseo and Shell, original equipment manufacturers (OEMs), brands Arcelik, Philips Domestic Appliances and Evbox, as well as trading companies Marubeni and Itochu, in which partners tested a blockchain system to complement the ISCC Plus certification. This is the first time that ten chemical industry players and appliance companies have got together to test a blockchain-based digital system as a complement to a sustainability certification process in complex value chains. Circularise's blockchain-based digital system was tested with the ISCC Plus certification to make auditing of certified parties more efficient, and to strengthen integrity of certified data. Participants utilized a public blockchain enabling authentication, decentralization and encryption of data to verify material flows and related sustainability attributes. This innovative approach differs from other blockchain projects where companies use a private blockchain operated by pre-selected participants, such as members of a consortium. Instead, Circularise and its project partners used a public blockchain, making it virtually impossible for companies to appear more sustainable than they really are by reusing the proof of a sustainability claim across assets. This principle forms the foundation of trust in data integrity. "Certification will become more digital in the future," said Jan Henke from ISCC. "It will allow certification schemes to simplify the auditing process of supply chain actors and reduce the risk of mistakes. Companies will have an easier way to show compliance and adhere to auditing rules." (dpo)

CIRCULAR ECONOMY

Dow and Mura to Develop Europe's Largest Advanced Recycling Plant

Dow and Mura Technology have recently announced the next step in their ongoing collaboration to help solve the global plastics waste issue and advance circularity. Mura plans to construct a new facility at Dow's Böhlen site in Germany—the latest in a series of planned facilities across the U.S. and Europe to rapidly scale advanced recycling of plastics—and the first expected to be based at a Dow site. This project is targeted for a final investment decision by the end of 2023. Mura's new Böhlen facility in Germany, which is expected to be operational by 2025, would deliver approximately 120 kilotons per annum (KTA) of recycling capacity at full run-rate. This and the other planned units expected to be constructed across Europe and the U.S. would collectively add as much as 600 KTA of advanced recycling capacity by 2030—and position Dow to become the largest consumer of circular feedstock for polyethylene production globally. Dow aims to take advantage of co-location benefits, which could significantly reduce the cost of scaling advanced recycling facilities. In addition, co-location of Mura's facilities at Dow locations would be expected to reduce carbon emissions by minimizing transportation of the offtake, and because gas output from the advanced recycling process can be converted back to plastics, thereby ensuring no by-products go to waste. Mura's advanced recycling process uses supercritical steam to convert most forms of plastics—including flexible and multi-layer plastics, which have previously been deemed unrecyclable—back into the original oils and chemicals. These can then be used to create new plastic products which are even suitable for food contact packaging. (dpo)

ENGINEERING

High-Performance Elastomer Plant



Source: Mitsui Chemicals

Mitsui Chemicals' existing manufacturing plant for high-performance elastomers in Singapore.

Mitsui Chemicals has plans to bolster capacity at its Singapore-based wholly-owned subsidiary Mitsui Elastomers Singapore by building a new plant to produce the high-performance elastomer Tafmer. As part of its new long-term business plan Vision 2030, Mitsui Chemicals aims to help solve social challenges and achieve sustainable business growth by providing unique materials, features and services. The elastomer is used both as a soft molding material and as a resin modifier that dramatically improves resin properties. Its flexibility and lightness have resulted in it being used across a wide range of fields, including solar cell components, packaging materials, engineering plastic modifiers, sports shoes and automotive parts. Demand for the elastomer is strong amid robust global economic growth, and is expected to rise further on the back of efforts to achieve a circular economy and step up the introduction of clean energy. (dpo)



HIDRACAR

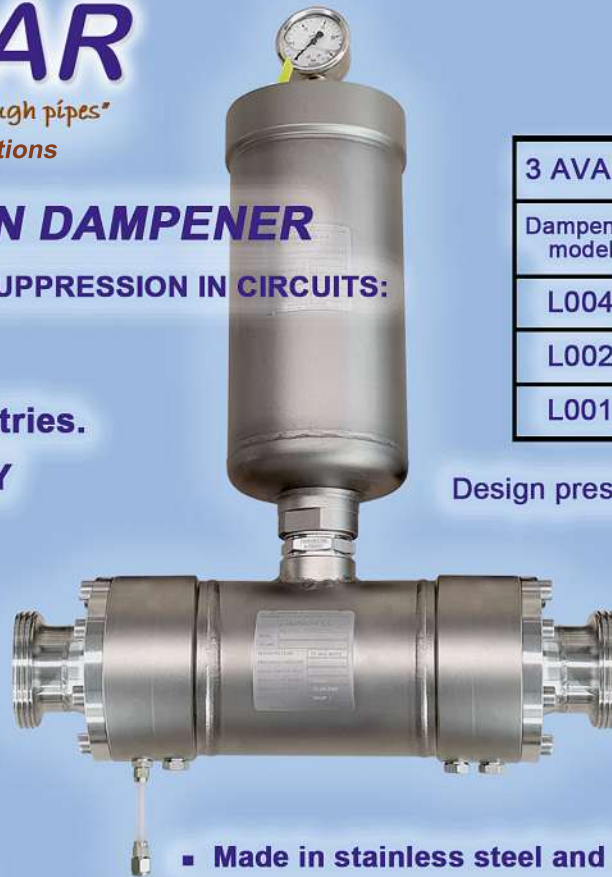
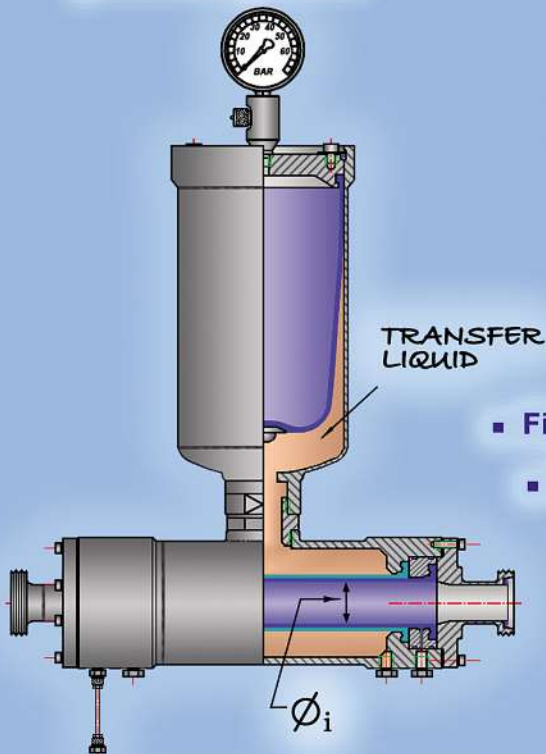
"We make liquids flow smoothly through pipes"

No. 1 providing dampening solutions

NEW IN-LINE PULSATION DAMPENERS

100% EFFECTIVE PRESSURE PULSE SUPPRESSION IN CIRCUITS:

- for FOOD & BEVERAGE.
- for PHARMACEUTICAL industries.
- with VERY HIGH FREQUENCY pressure peaks.



3 AVAILABLE SIZES

Dampener model	Internal hose diameter (ϕ_i):
L004	68 mm
L002	37 mm
L001	23 mm

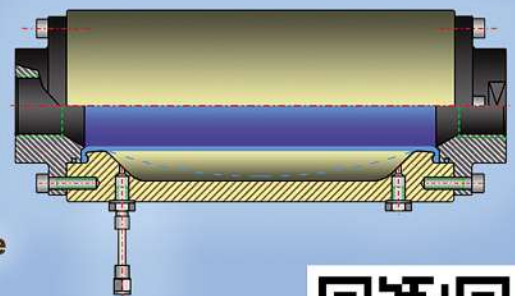
Design pressure up to 150 barg

- Made in stainless steel and other materials.
- Connection ports to suit customer's requirements.
- Fitted with a rubber hose rupture electronic or visual indicator.
- With either one or two rubber hoses in EPDM, silicone, etc,...
- Without internal corners for a thorough cleaning.
- Rubbers in compliance with FDA and CE (1935/2004) regulations.

NEW IN-LINE LOW COST PLASTIC PULSATION DAMPENERS FOR USE MAINLY IN SUCTION LINES



- This dampener does not need gas charge; it works at the atmospheric pressure.
- Fitted with a rubber hose rupture visual indicator.



HIDRACAR S.A.

www.hidracar.com

hidracar@hidracar.com



Dark clouds are gathering over the industry: The energy crisis threatens chlorine chemistry, as here at the Vynova site in Tessenderlo, Belgium.



Source: Vynova

CHLORINE CHEMISTRY IN THE ENERGY CRISIS

Can They Still Be Saved?

No gas and still little hope: Chlorine manufacturing is under enormous pressure caused by skyrocketing energy costs. Production in Europe is declining and local competitiveness is at risk, says industry association Euro Chlor. Old-world chlorine is mostly produced as part of integrated chemical value chains. But for how much longer?

Industry associations admonish, threaten and complain — we have become accustomed to this. It is part of the business of the lobbyists to throw themselves into the breach on behalf of their industries, sometimes with exaggerated pathos.

And yet, in 2022, the voices sound different, more dramatic: “Our competitiveness is indeed threatened,” explains Wouter Bleukx, Chairman from 2020 to 2022 of Euro Chlor, the association of chlor-alkali plant operators in Europe (a sector group of the European chemical association Cefic). Are the lights going out at Europe’s industrial plants?

It might come as a surprise that it is chlorine chemistry, of all industries, that is using drastic words to warn of the winter of discontent. After all, chlor-alkali electrolysis is an electrochemical process that does not use fossil fuels — neither natural gas nor naphtha — as raw

materials and, given emission-neutral electricity, would also be relatively easy to defossilize.

Nevertheless, dark clouds are brewing. Even though salt, the most important raw material for chlorine production, will not be in short supply in the foreseeable future, electricity already is. And even where power is not scarce, it is expensive. For the first time, imports into the EU are outstripping exports — in terms of sheer product volume as well as product value.

Accordingly, the outgoing Euro Chlor chairman (whose term of office exactly spanned the pandemic of 2020–22) is a little ambivalent at his last Euro Chlor general assembly in September 2022 in Munich. “Chlorine production has recovered after the Covid-19 crisis, and intensive efforts are helping to secure access to energy at competitive costs,” Bleukx explains. While the association has accomplished much despite the pandem-



WRITTEN BY
Dominik Stephan
Editor
PROCESS Worldwide

Source: MICHEL@WIEGANDT.BE/Vynova



In troubled times: Vynova manager Johan Van Den Broeck takes over as the chairman of Euro Chlor.

ic — as evidenced in part by the fact that there has been no chlorine transportation accident in the past decade — 2022 is the first time the industry could conceivably end for good.

Energy is Key to Industrial Production

Europe is losing competitiveness at breakneck speed, and there is no end in sight. With the Repower EU program as the latest milestone, the time of raw materials and energy from Russia is running out, while consumers and industry alike continue to wait for real alternatives. No wonder that the Euro Chlor Commission defined energy as the Achilles' heel of Europe's industry as early as April 2022. Accordingly, the need for renewable and flexible power supply is enormous.

As expected, the industry rejects the idea of simply cutting back production and thus consumption. EU officials, too, know that chemistry is a crucial and integral part of almost every value chain, and have assured the industry that the 'masters of molecules' will be among the last to be disconnected from the grid.

Naturally, however, no one knows how things can and should continue. Fortunately for European chlorine producers, the industry is small-scale and distributed over a wide area. Unlike for example in the U.S., the transport of chlorine in larger volumes hardly plays a role in Europe. The chemical is mostly produced in integrated industrial sites directly for local consumption.

A total of 62 plants in the EU produced about 9,645,000 metric tons of chlorine in 2021, 4.6 percent more than in the coronavirus year of 2020. The membrane process has become the dominant technology, with 84.5 percent of the market, ahead of diaphragm cells (11.5 percent) and the remaining 4.0 percent covers chlorine-alcoholate production, hydrochloric acid conversion to chlorine, metal production and chlorine and caustic production without hydrogen as a by-product.

What About Sustainability?

The companies would actually have liked to talk about another issue, since in 2021 Euro Chlor had just given itself a new sustainability program for the next decade. This includes new performance indicators that not only help to make economic and technological aspects measurable, but also include, for example, the sector's carbon footprint and its contribution to grid load balancing.

One bright spot for the chlorine industry is a very special gas that has so far not played a major role for the sector: Hydrogen is currently on everyone's agenda. The gas is a by-product of the chlorine electrolysis process, just like caustic soda. The chlorine producers themselves

Zero Liquid Discharge for liquid effluents treatment.

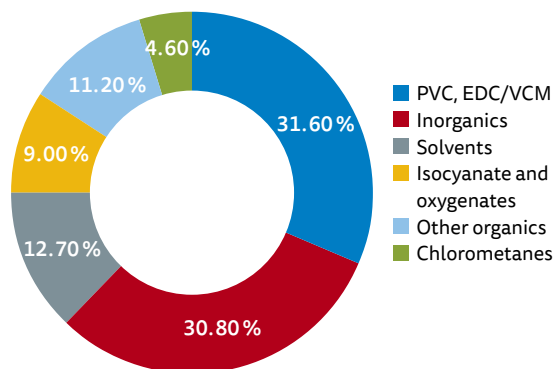
GEA offers a unique hybrid ZLD process for large wastewater capacities that generates pure water for its re-use in production facilities. Reducing the environmental impact of crystallization plants while delivering profit.



Get in touch today
gea.com/contact

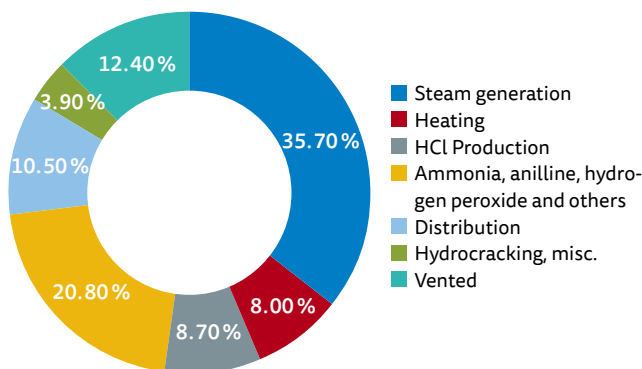


European chlorine applications



9,662,000 tons of chlorine were utilized in the production of different chemicals in the the EU in 2021.

What happens to the Hydrogen? European H₂ utilization



Source: Eurochlor

have no use for it, but the molecule could become a coveted resource for the energy industry and as a raw material for the production of chemicals. Every unused ton of hydrogen from chlorine production therefore hurts operators more and more.

Chlorine Production also Means Hydrogen

Euro Chlor companies currently produce around three billion cubic meters of hydrogen, of which around 85 percent is currently used, the lion's share for steam generation (35.7percent) or for the production of ammonia,

PROCESS TIP

"Will hydrogen become chlorine chemistry's trump card?" See for yourself in our online article on www.process-worldwide.com

aniline, hydrogen peroxide or other chemical building blocks (20.8 percent). It should nevertheless also not be forgotten that around 40,000 metric tons of hydrogen are vented unused into the atmosphere. This is not much in comparison with the total European production of millions of tons of hydrogen, but it is still 40,000 tons of one of the most sought-after molecules in this time of energy transition.

Can chlorine chemistry really become the nucleus of a new electrolysis value creation? The industry is in a favorable position, as it already has years of experience with big electrolysis plants that are significantly larger than the typical container modules of H₂ startups. And not only that: Since electrolysis stacks can be operated relatively flexibly with fluctuating amounts of electricity, the industry can contribute to grid stabilization — an aspect that could become even more important in view of fluctuating renewable energy supplies.

The difficulties are in fact more likely to be on the side of the user industries, which would have to get used to a fluctuating raw material supply — absolutely uncharted territory for thoroughly integrated chemical sites.

New Chairman in Troubled Times

However, these prospects should concern Wouter Bleukx a little less: At the General Assembly of European Chlorine Chemistry in Munich in September, Johan Van Den Broeck, Executive Vice President Commercial at Vynova, a group in which the former Inovyn chlorine chemistry operations were bundled, was elected as the new Chairman. Over the next two years, the Belgian manager intends to work to make Euro Chlor a sustainable and competitive player in the international chemical industry, and is promoting speaking with one voice among companies.

Energy processes are crucial to this, as is an understanding by policymakers of the sector's role as a supplier to virtually all value chains. However, all these plans would be waste paper if the blackout of the industry really comes at the turn of the year. Those who want to change need courage — but above all they have to stay alive long enough. ■

PROCESS INFO

The Facts of Chlorine Production:

- **Mercury cell process:** Chlorine electrolysis between a titanium anode and a mercury cathode (at which the sodium produced forms the eponymous sodium amalgam). No longer best available technology (BAT) due to mercury emissions and high energy consumption, and only allowed to operate in the EU up to 2027.
- **Membrane cell electrolysis:** The membrane process uses a chlorine-resistant cation exchange membrane approximately 0.1 mm thick, which enables high product purity with lower energy input. About two-thirds of the chlorine electrolysis plants worldwide use this relatively new method.
- **Diaphragm cell electrolysis:** In the diaphragm process, electrolysis takes place along an asbestos or PTFE diaphragm. The use of asbestos is no longer in line with BAT and the purity of the caustic soda is also limited. The process plays only a minor role in the EU, but is still widely used in the USA, for example.
- **Euro Chlor:** Euro Chlor is the association of chlor-alkali operators in Europe. Founded in 1969, the Brussels-based association now has 39 member companies, which together account for 97 percent of the European chlorine chemical industry. Euro Chlor is part of the European chemical industry association Cefic. Every three years, the association organizes a technology conference, most recently in Warsaw in May 2022.

VitraPOR® GLASS FILTERS

ROBU®

High quality material for demanding tasks: VitraPOR® glassfilter apparatuses made from pure borosilicate glass 3.3 fulfill many requirements in chemical and pharmaceutical labs as well as for industrial, biological and environmental technology applications.

Properties such as heat resistance to over 500 °C and resistance to most acids, alkalis and solvents make our VitraPOR® glassfilters, which conform to international standards, suitable for use in many chemical, pharmaceutical and technical procedures.

Custom VitraPOR® sintered elements according to your specifications are characterized by their neutral properties and open-pore structure. They are suitable for even the most unusual applications.

VitraPOR® glassfilters and glass apparatuses can be supplied in different pore size classes from smaller than 1 micron to over 500 micron and as custom made solutions in many shapes and sizes.



ROBU GLASFILTER-GERÄTE GmbH

Schützenstrasse 13

57644 Hattert, Germany

Tel: +49-(0)2662-8004-0

www.robuglas.com



www.robuglas.com



INDUSTRY TREND

Creating a Revolutionary Impact with Green Ammonia

Green ammonia is gradually becoming popular due to its benefits such as the production of zero-carbon fertilizers and fuel. It is also an excellent energy storage medium and carrier of hydrogen. Many big-ticket projects with a dedicated focus on producing green ammonia have been announced worldwide.

Today, most ammonia is produced from fossil fuels through the Haber-Bosch process for fertilizer production, but more recently, the concept of green ammonia has been trending. So, what is this all about? Green ammonia is produced when H_2 is derived from water electrolysis which is powered by renewable energy. When burned, green ammonia does not produce CO_2 emissions; instead it turns back into nitrogen and water, thus making it a powerful tool to combat the global emissions problem. Green NH_3 also acts as an excellent energy storage medium and hydrogen carrier, as it is easy to store and transport. It can be used as a clean fuel source for generating electricity, as a marine fuel to power ships, and for fertilizer production.



WRITTEN BY
Ahlam Rais

Freelance editor
PROCESS worldwide

Market Scenario

Looking at the overall scenario, the global green ammonia market size is projected to grow from 17 million dollars in 2021 to 5,415 million dollars by 2030, at a CAGR of

90.2 percent during the forecast period of 2021 to 2030, according to research firm Markets and Markets. The main growth driver for the rise of this market is the incorporation of green and energy-efficient technologies across the globe in the background of climate change concerns. In terms of geography, Europe is expected to dominate the market owing to the numerous upcoming green hydrogen projects in the region, followed by the Asia Pacific region.

Making News: Giant Ammonia Plants from Around the World

The Asian Renewable Energy Hub in Australia

Capacity: 10 million tons of green ammonia annually

Europe may be the leading region for producing green ammonia at scale but there are many big-league projects outside the region making headlines. For instance, the Asian Renewable Energy Hub in Australia is scheduled to produce up to 10 million tons of green ammonia annually from approximately 1.8 million tons of green hydrogen per year. With 26 GW of upstream wind and solar, the project is expected to be built at a total capital cost of 36 billion dollars by a consortium of five companies including BP, Inter Continental Energy, Vestas, Macquarie and CWP Energy Asia. It is claimed to be one of the largest energy projects across the globe.

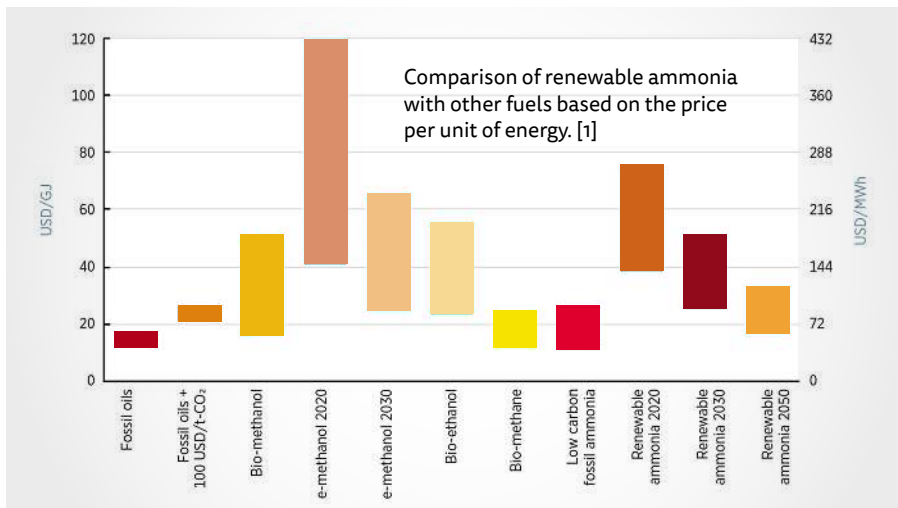
Saudi Arabia's Neom

Capacity: 1.2 million tons annually

One of the first world-scale green ammonia plants was announced by the US-based firm Air Products, the Middle-East company Acwa Power and the futuristic city of Neom, which aims to develop a new model for sustainable living. Located in Saudi Arabia, the 5-billion-dollar green hydrogen-based ammonia production unit is expected to produce 650 tons per day of hydrogen by electrolysis and then produce 1.2 million tons of green ammonia annually which will be exported to global markets and then be dissociated to produce green hydrogen for the transportation market. Thyssenkrupp Uhde Chlorine Engineers has been selected by Air Products to install an electrolysis plant of over 2 GW for the plant. Scheduled to be complete by 2025, the project aims to eliminate over three million tons of CO_2 emissions every year.

Europe is expected to dominate the green ammonia market owing to the numerous upcoming green hydrogen projects in the region, followed by the Asia Pacific region.

Source: © vchalup - stock.adobe.com



RELIABLE FEEDING SOLUTIONS FOR RECYCLING OF FIBERS AND FLAKES

PET becomes rPET



Keep the Flow

Visit us at the K 2022 in Duesseldorf:

HALLE 10/A27

Green Ammonia Hub in Oman

Capacity: 1.2 million tons of green ammonia annually

Oman has recently announced its big ambitions to contribute to the global decarbonization cause. Matching the target production of its much larger neighbor's Neom project (above), Oman is all set to produce up to 1.2 million tons of green ammonia annually. Led by the renewable energy firm Scatec and India's Acme Group, the large-scale green ammonia project will be built under a 50:50 joint venture in the Duqm Special Economic Zone. After the completion of the first phase, the project will produce 100,000 tons of green ammonia every year with 300 MW of electrolyzer capacity and powered by 500 MW of solar. Off-takers are also being considered in order to finance the project.

Norway's Green Ammonia Project

Capacity: 20,500 tons of green ammonia annually

In Europe, the chemical company Yara International is also in the process of developing a large-scale green ammonia project in Norway. Equipped with a 24 MW electrolysis plant at the firm's existing fertilizer factory at Herøya, the firm intends to partially replace the hydrocarbon-based hydrogen production in Yara's plant with proton exchange membrane (PEM) electrolysis technology. This will produce around 10,000 kg/day of clean hydrogen and ultimately 20,500 tons of green ammonia per year, which can be converted to between 60,000 and 80,000 tons of green fertilizer and also be supplied as fuel for ships. The project has secured funding of 31 million dollars and will reduce CO₂ emissions by approximately 41,000 tons per year. The first batch of green ammonia products will be delivered to the market by 2023, Yara says.

The World Needs More Green Ammonia

Green ammonia is the need of the hour as industries look to decarbonize their processes and plants in line with the Paris Agreement on Climate Change, which aims to substantially reduce global greenhouse gas emissions in order to limit an increase in global temperature. Therefore, appealing incentives such as government grants, loans and easy investments should be encouraged by heads of states to develop more of such projects. After all, the time to act is now! ■

Source

[1] Low-carbon fossil ammonia from Haldor Topsøe et al. (2020). Fossil fuel values are based on average values (2010-2020); see IRENA and Methanol Institute (2021). Methanol cost values are based on IRENA and Methanol Institute (2021). Bio-ethanol and bio-methane estimates are based on IRENA (n.d.)

Origin Materials' modular process system: Koch Modular Process Systems installed the modular skids six months ahead of schedule.



Source: Koch Modular Process Systems; © SUE - stock.adobe.com

SMART SOLUTIONS



5 Perks of Choosing a Modular Plant

With industrial firms looking to bring innovative and sustainable solutions to the market, modular plants have picked up steam across diverse sectors. One thing that stands out among all these projects is the multiple advantages that modular solutions have brought.

The benefits of modular production are well recognized and it is widely considered as the future of chemical production,” said Gabriel Loh, Team Leader at the Institute of Chemical and Engineering Sciences in Singapore, at an online session of a trade fair. With this line of thought, it is not surprising that Loh is adopting a modular approach—in which different emerging concepts and technologies would be combined—for developing the ‘Pilot plant of the Future’, a

next-generation advanced chemical manufacturing platform in Singapore.

But what exactly are modular production plants? In short, numerous or single technologies and equipment such as process equipment, instrumentation, valves, piping components, and electrical wiring (as per the project requirement) are installed together on skids, and then connected on-site. Developed off-site, these modular plants are then merged with the project.

One may also wonder why are modular plants so popular or rather why is it being considered as a promising solution for production across diverse sectors? The reason is simple: Advantages, advantages and more advantages.

| The Benefits

Speed to market: In today's ever-demanding markets and increasing competition around the world, 'speed to market' holds great importance and requires quick turnaround time from conception to the end product in the case of changing market requirements or new emerging markets. For this purpose, modular plants are the perfect solution as they provide users with a faster time to market along with an overall reduction of project delivery risk. These plants can be constructed in a relatively short period of time with a shorter commissioning and start-up duration as compared to the more traditional plants developed on-site.

On this point, Elinor Price, Senior Business Development Manager, Life Sciences, Honeywell Process Solutions elaborates, "Recent events have highlighted supply chain breakdowns in obtaining vaccines that require cold storage for populations in the middle of the African continent. The ability to have localized production of medicines and drugs will help drive the development of

more and more modular solutions to meet global patient needs."

Superior quality: Modular plants are designed and developed in an indoor environment which ensures superior quality as compared to plants built on-site. For instance, modular equipment and systems mounted on the skids are mostly designed and built at the same location, which helps the plant to attain superior quality equipment.

Flexibility: Modular solutions allow flexibility in manufacturing, as facilities can produce multi-products in some cases where skid-based equipment and systems can be changed or reconfigured quickly and at a lower cost, opines Price. The solutions can also be transported as a single unit to another location as per the project requirements.

Safety and security: Modular plants can boast of achieving safety at the off-site location, as they are built in safe workshops, unlike construction sites where there are multiple risks involved such as handling hazardous and heavy equipment, carrying out construction tasks at heights, and so on.

Reduced capex: One of the most significant plus points of these solutions is the reduction in capital expenditure, which saves money as well as time. As modular plants can be developed quickly as compared to onsite construction, the materials can also be used effi-



WRITTEN BY
Ahlam Rais

Freelance Editor
PROCESS worldwide

BILFINGER SE



BILFINGER

**WE MAKE
BATTERY
PRODUCTION
WORK.**

Bilfinger delivers a comprehensive range of services backed by many years of proven technical expertise, covering the entire lifecycle, all production steps and the various trades associated with your battery plant project.

www.bilfinger.com/en/battery-production



Source: Koch Modular Process Systems

Purecycle Technologies' feedstock evaluation unit: The project involved the advanced processing of recycled polypropylene to convert it to ultra-pure recycled polypropylene.

ciently, leading to lower labor and material costs. Also, since these modular skids are pre-assembled, tested, transported and then linked on-site, one requires less labor force as they are required only to connect the equipment. Thus, reducing labor costs once again.

Industry Scenario

Agreeing with Loh, Tom Schafer, Vice President, Koch Modular Process Systems, says, "Today, the industry is shifting away from our dependence on the future use of petroleum-based feedstocks and demanding projects which support decarbonization. Scalability and repeatable design characteristics are a must when bringing decarbonization projects to the market." This is where modular plants come in. "A modular plant delivery model will play an important and strategic role in delivering tomorrow's projects."

Adding to this, Price mentions, "In the life sciences sector, the demand is growing for more regional or localized production capacity and we are seeing a shift in product portfolios to biologics. There is a growing demand for modular systems to support quicker scale-up of both greenfield and brownfield facilities."

Live Examples from the Industry

The world's first large-scale green gasoline plant has adopted a modular approach. The project is for Arbor Renewable Gas's Spindletop plant in Texas, USA, which aims to convert woody biomass feedstock into renewable gasoline. Modular Plant Solutions' 'Methanol-To-Go' modular plant was chosen to convert syngas to methanol via Topsoe's methanol synthesis technology for the project. As a final step, a gasoline synthesis technology will also be used to produce renewable biofuel, in line with the quality standards of the region.

Recently, the US-based firm Koch Modular Process Systems designed, manufactured and installed 17 core process modules for Origin Materials' first manufacturing plant in Canada. The project, named Origin 1, will

produce PET plastic by utilizing Origin Materials' novel technology which replaces oil as the principal feedstock with 100 percent renewable plant-based feedstock. Schafer shares, "Koch Modular was engaged early in the project development phase to design and construct a demonstration-scale system for proof of concept. Upon successful proof of concept, we performed scale-up and delivered a full-scale commercial modular plant unit consisting of 15 process modules, two stair modules and a large stand-alone vessel." The modular skids were installed six months ahead of schedule.

In the refining and gas process segments, Honeywell UOP has decades of experience providing pre-engineered units, says Price. A few examples of these complete prefabricated modular units are: the CCR Regenerator which creates gasoline and petrochemical feedstocks; the Naphtha Isomerization used to upgrade naphtha to create high-quality, cleaner burning gasoline blending components; and Naphtha Hydrotreating, which creates cleaner gasoline blend stocks and feedstocks for petrochemical production by removing impurities such as nitrogen and sulfur.

In addition to this are Honeywell UOP's Modular Product Treating, used for sulfur extraction for cleaner burning fuels; NGL Recovery, which increases high-value natural gas liquid (NGL) yields with cryogenic units and fractionation technology; Gas Treating, which removes harmful contaminants from natural gas streams; LNG Processing pre-treatment systems that remove impurities upstream of liquefaction to improve plant operations and help ensure on-specification treated gas; and Modular Sulfur Recovery, used to recover sulfur to improve air quality, reduce emissions and produce a marketable by-product.

In another project, a modular unit is being developed for a spent caustic treatment solution for the world's largest polyethylene integration project — Baltic Chemical Plant's Gas Chemical Complex (GCC) project. The engineering firm McDermott was selected by Heat Transfer Technologies DMCC for module detailed engineering design and full procurement of the main equipment. Once complete, the licensed modular unit will assist the project to produce up to 3 million tons of polyethylene. The project is situated near Russia's coast in the Gulf of Finland.

With all the above examples, it seems that modular plants will continue to play an active part of the process sector as more and more industries aim to develop green and innovative solutions for the wellbeing of the people and the planet at large. ■



Source: Koch Modular Process Systems

"A modular plant delivery model will play an important and strategic role in delivering tomorrow's projects."

Tom Schafer, Vice President, Koch Modular Process Systems



Everything on screen

Asset monitoring in the process industry

Are inspections with a clipboard still part of your daily routine or do you have a full overview of your plant from the control room? Whether operating data, energy levels, or alerts – we will create an optimum concept for the acquisition and transmission of your field data, ensuring it is available exactly where it is needed.

Let's discuss how we can help you.

For additional information, visit phoenixcontact.com/asset-monitoring



Bild: © Andrey; hafakot - stco.adobe.com; Peppert+Fuchs

HIGH-END HMI SOLUTIONS FOR HAZARDOUS AND NON-HAZARDOUS AREAS

One Size Fits All

Mannheim-based Pepperl+Fuchs consistently uses modular platforms to offer optimal human-machine interface (HMI) solutions to industry. These are perfectly suited to any application and can be used end-to-end, from ATEX/IECEX Zone 1 through non-hazardous areas.

The modern process industry has ever-growing demands in terms of the quality and flexibility of the products used. HMI devices for operating and monitoring processes must also meet these challenging requirements. This is especially important in areas where harsh ambient conditions pose a particular challenge for materials and technology. For this reason, smart HMI systems must be tailored to meet the special requirements of a process plant.

VisuNet GXP: A Smart, Modular Solution for Hazardous Areas

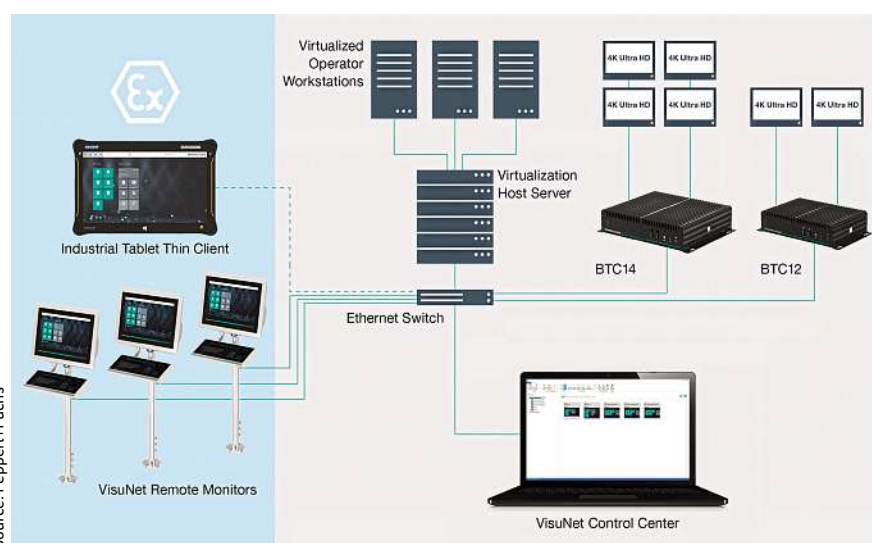
The VisuNet GXP HMI series with its compact, modular design, rated for use in ATEX / IECEx Zone 1/21 environments, consists of an extra-large display unit with a 21.5-inch or 19-inch screen and an AC or DC power supply. The core element is the computer unit, which can be configured as a thin client or a PC computer unit according to requirements. The available mounting options are also highly flexible—from a simple pedestal or space-saving wall mounting through custom solutions that are precisely tailored to the individual process plant at Pepperl+Fuchs' solution engineering centers.

New Platform for ATEX / IECEx Zone 2/22 and Non-Hazardous Areas

Pepperl+Fuchs is continuing the success story of its modular systems with the new VisuNet FLX for ATEX/IECEX Zone 2/22, Class I Div 2 and non-hazardous areas. Alongside the existing VisuNet GXP series, the VisuNet FLX series, which completes the HMI series with end-to-end solutions that can be used from ATEX/IECEX Zone 1 through non-hazardous areas, is now available to users.

The fully modular design of the new VisuNet FLX series means that the HMI system can be individually configured without compromise, while also providing fast, simple, and highly cost-effective service in the field. The modular system offers a wide range of technologies, mounting options, and peripherals.

Each individual HMI system consists of at least one computer unit and one display unit, each of which can be individually configured to meet requirements. Each system can therefore be used as a thin client, a PC, or a direct monitor to provide optimal support for the respective application.



End-to-end thin client solution — from the control room to ATEX/IECEX zone 1/21

The VisuNet FLX is available in three basic configurations, depending on individual requirements:

1. As an HMI system

This variant combines two 21.5-in. display options—both with Full-HD resolution—with a thin client, PC, or direct monitor unit installed into a housing made of stainless steel, with a design that is suitable for pharmaceutical and other industrial applications. The system can be installed on a pedestal using additional adapters, or on a wall bracket wherever it is needed in the production plant.

2. As a panel PC

In this case, various display sizes—from 21.5 in. to 15.4 in.—can be combined with the same computing units, but installable into other enclosures.

3. As a box PC

This version consists of a standalone PC or a standalone thin client for direct installation in a switch cabinet. For cost-effective thin client applications, each basic configuration is equipped with an Intel Celeron processor. For more CPU-intensive applications, Intel i5 processing units from the seventh-generation “Kaby

WRITTEN BY
Natalie Walther

**Product Marketing
Manager HMI**
Pepperl+Fuchs SE

“Lake” product family are available. Overall, the new platform is built on computer technology that provides high performance for future software capabilities while allowing components to be replaced and upgraded easily, making it a secure investment for the future.

Simple “plug and play” installation using qualified accessories



Source: Pepperl+Fuchs

Optimal Modular Platform for Each Zone

HMI devices for ATEX/IECEX Zone 1/21 are traditionally monolithic, heavy, and bulky because the ambient conditions require special housing protection and advanced measures, often resulting in large-volume devices and increased weight. With the VisuNet GXP family, Pepperl+Fuchs has developed one of the world’s lightest, fully modular, and fully enclosed HMI systems specifically designed for ATEX/IECEX Zone 1/21.

ATEX/IECEX Zone 2/22 offers more flexibility and design freedom from the outset, meaning devices can be lighter and more compact. In addition to simple and cost-effective mounting solutions, mobile trolley solutions can be implemented without compromising explosion protection. It also offers the option to work more with standard interfaces such as RJ45, D-SUB9, USB 3.0,

and DisplayPort. This significantly increases connectivity flexibility and communication speed. Accessories such as Bluetooth, Wi-Fi dongles, scale interfaces, barcode readers, and many more are considerably easier to connect. Using the panel mount can improve performance, for instance by enabling the system to be used at higher operating temperatures. This improvement can also be seen in terms of computer technology, as users are not limited to using real duplex monitors. Thanks to the two display ports, even triplex monitor scenarios with two external displays can be implemented. With such extended desktop scenarios, users can work in the field with several windows as they would expect to in the control room.

The VisuNet FLX platform developed for ATEX/IECEX Zone 2/22 is therefore of interest for a wide range of industrial applications. This is especially true for pharmaceutical clean rooms, for example in vaccine production. To this end, the HMIs feature special housings and are resistant to a variety of common chemicals and cleaning agents such as hydrogen peroxide. They are also suited for pharmaceutical applications, as the lack of steps, edges, or horizontal surfaces make them easy to clean. While other systems rely on aluminum housings, Pepperl+Fuchs consistently manufacture HMIs from stainless steel. In addition, FDA-approved seals and pharmaceutically optimized screw connections also ensure a hygienic design. ■

PROCESS INFO

Panel Rating Made Easy

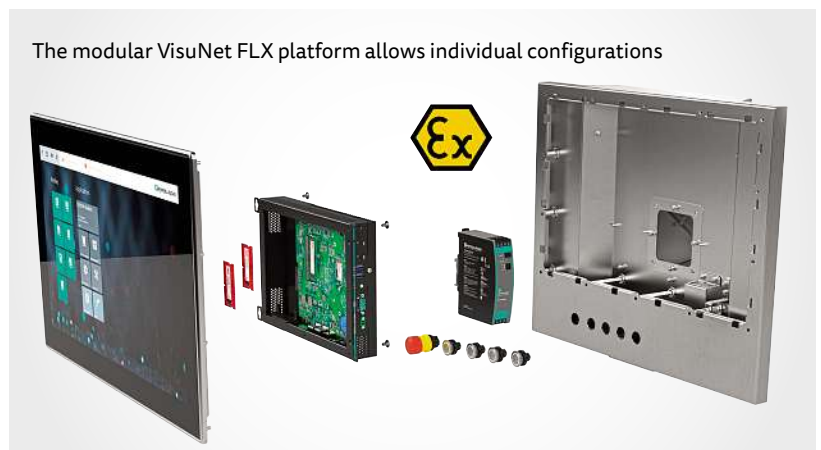
The VisuNet GXP is a modular, fully IP66 protected and ATEX/IECEX Zone 1/21 rated product family, available with a system enclosure and as a Panel PC. Since the Panel PC uses a sand encapsulation and a front-/backside IP66 design, it fulfills all ex-relevant protection methods and can be installed in other standard enclosures without the need for further Ex- or IP-rating.

The VisuNet FLX is an extremely lightweight, modular and ATEX/IECEX Zone 2/22 rated product family which is also available with a standard IP66-rated system enclosure, and as a Panel PC. However, to save weight and increase connectivity flexibility, the VisuNet FLX Panel PCs have only a IP66 front-side, but IP4x rated backside. Hence, to create a fully IP66-rated ATEX/IECEX Zone 2/22 solution, the Panel PC component must be installed into a third party enclosure which must fulfill the “Ex e” requirements to ensure a proper IP protection according the ATEX/IECEX norms.



Modular design of the VisuNet GXP platform

Source: Pepperl+Fuchs



The modular VisuNet FLX platform allows individual configurations

Source: Pepperl+Fuchs

SURPRISINGLY UP TO DATE – PROCESS NEWS DIRECTLY IN YOUR MAILBOX



Subscribe to the free email newsletters now!

If you want to stay up to date with news from the Process Industries and don't want to wait for the next printed issue, our newsletters on different topics are the best way to stay informed.

www.process-worldwide.com/newsletter

REVOLUTIONARY TECHNOLOGIES

Digital Transformation is Here to Stay



WRITTEN BY
Ahlam Rais

Freelance Editor
PROCESS Worldwide

Improving productivity, flexibility, and speed in operations as well as processes is the goal which every industry player strives to achieve — and digital transformation offers just that. Recognizing its many efficient and problem-solving technologies, the industry is beginning to realize the plus points of this much-needed transformation.

With the steady adoption of Industry 4.0 around the world, various industries are currently undergoing the 'digital transformation' in phases. Its advantages — increasing efficiency in operations and enhancing productivity while reducing costs — have led numerous players to slowly move on from their traditional processes and become a part of the transition focusing on digitalization. The Covid-19 pandemic has accelerated this switch. Many advanced technologies fall under the umbrella of digital transformation, but there are four that stand out.

| Artificial Intelligence

The concept of artificial intelligence (AI) has been around for a long time, but it's only recently that industrial units have been exploring the idea to operate their plants autonomously with the aim of enhancing productivity. For instance, for the first time in the world, a chemical plant in Japan ran autonomously for 35 days

straight. The unit was supported by an AI solution developed by Yokogawa Electric Corporation and the Nara Institute of Science and Technology. It can control operations that until now have required manual intervention through conventional control methods (both PID and APC). Beneficial for plant management, the AI technology also enables firms to improve their productivity and save energy.

A butadiene extraction plant also ran autonomously at Eneos Kawasaki Refinery's petrochemical facility in Japan for two consecutive days with the aid of an artificial intelligence system. Capable of automating large-scale, complex operations of oil refineries and petrochemical plants, the AI system proves useful for industry players due to the unavailability of experienced and skilled workers. The result of the two-day trial: The artificial intelligence system assessed about 25 critical parameters including internal temperature, pressure, flow rate and product conditions, and even adjusted 12 valves autonomously.

A digital twin enables you to continuously monitor and analyze the performance of plant assets and increase equipment availability and reliability, while reducing the cost of operations and maintenance.



Source: Bentley Systems

“In operations, AR can today already support operational and maintenance staff.”

Bart Moors, Head of Comos Industry Solutions, Siemens, Digital Industries, Process Automation

Source: Siemens



| Digital Twins

A digital twin is all about the creation of a virtual image which is a replica of a physical structure; the physical and virtual elements are able to interact with each other by sending and receiving data. When paired with AI, digital twins help plant operators obtain valuable insights from the collected data, leading to significant improvements in their operations.

Explaining this further, Richard Irwin, Senior Marketing Manager, Bentley Systems, says, “A digital twin enables digitalization by capturing 1D, 2D, and 3D data from different sources, transforming raw data into a single, complete digital twin environment, and visualizing and analyzing data from a single web portal. It opens your eyes to new insights and allows for faster and better decision-making anytime, anywhere.”

Irwin continues: “A digital twin enables you to continuously monitor and analyze the performance of plant assets and increase equipment availability and reliability, while reducing the cost of operations and maintenance. Collaboration is key in the digitalization process, and a digital twin grants engineers from design, operations, and maintenance access to the most up-to-date and reliable information across the whole lifecycle.”

Within the process sector, the Hungarian multinational oil and gas firm MOL Group wanted to digitalize the operations of its steam cracker plant in Tiszaújváros, Hungary. Digital twin technology was used to create a virtual twin of the plant which had the ability to monitor the unit’s operational performance and offer insights into optimizing production efficiency in real time. This also led to lower energy consumption and emissions.

The technology has made its way into the biopharmaceutical industry as well. An example of this is Insilico Biotechnology, a provider of digital twin technology, being acquired by Yokogawa Electric with an aim to build total bioprocess solutions that support biopharmaceutical development and manufacturing. The technology assists in real-time analysis of process data, which allows for the constant prediction of cultivation performance, the soft sensing of nutritional components, and the early detection of process abnormalities and provision of guidance to operators.

| Augmented Reality

Augmented reality (AR) is another technology that helps firms to move ahead in their digital transformation journeys. The industry has started to realize the many benefits of merging the digital twin technology with AR to save time and money. “AR provides even more context to an industrial digital twin,” Irwin says, “by providing engineers on site the necessary information they need, such as P&IDs and asset data, while working hands-free.

Source: Bentley Systems



“A digital twin enables digitalization by capturing 1D, 2D, and 3D data from different sources, transforming raw data into a single, complete digital twin environment, and visualizing and analyzing data from a single web portal.”

Richard Irwin, Senior Marketing Manager, Bentley Systems

Any issues identified can then be recorded directly into the digital twin platform.”

Emerson has launched a Remote Assistance service which uses AR to enable plant operators to respond immediately to industrial valve issues. With the support of a mobile device, plant personnel can communicate via real-time videos to resolve issues quickly, precisely and without making mistakes.

The technology is also being used to a significant extent for training industrial workers. According to Bart Moors, Head of Comos Industry Solutions, Siemens, Digital Industries, Process Automation: “In operations, AR can today already support operational and maintenance staff. In this way we can speed up the availability of trained personal as well as enhance maintenance strategies. This is possible thanks to information availability and consistency at any time and on every location.”

| Blockchain

Blockchain is a technology that can be programmed to record and track valuable information such as financial transactions, product designs, and machine parameters. What makes blockchain unique is its process. The revolutionary technology stores information in groups called blocks that are linked together in a serial order and in a straight line such that it forms a chain of blocks. The transparency and accuracy of this process helps companies to trust the data stored in each of the blocks.

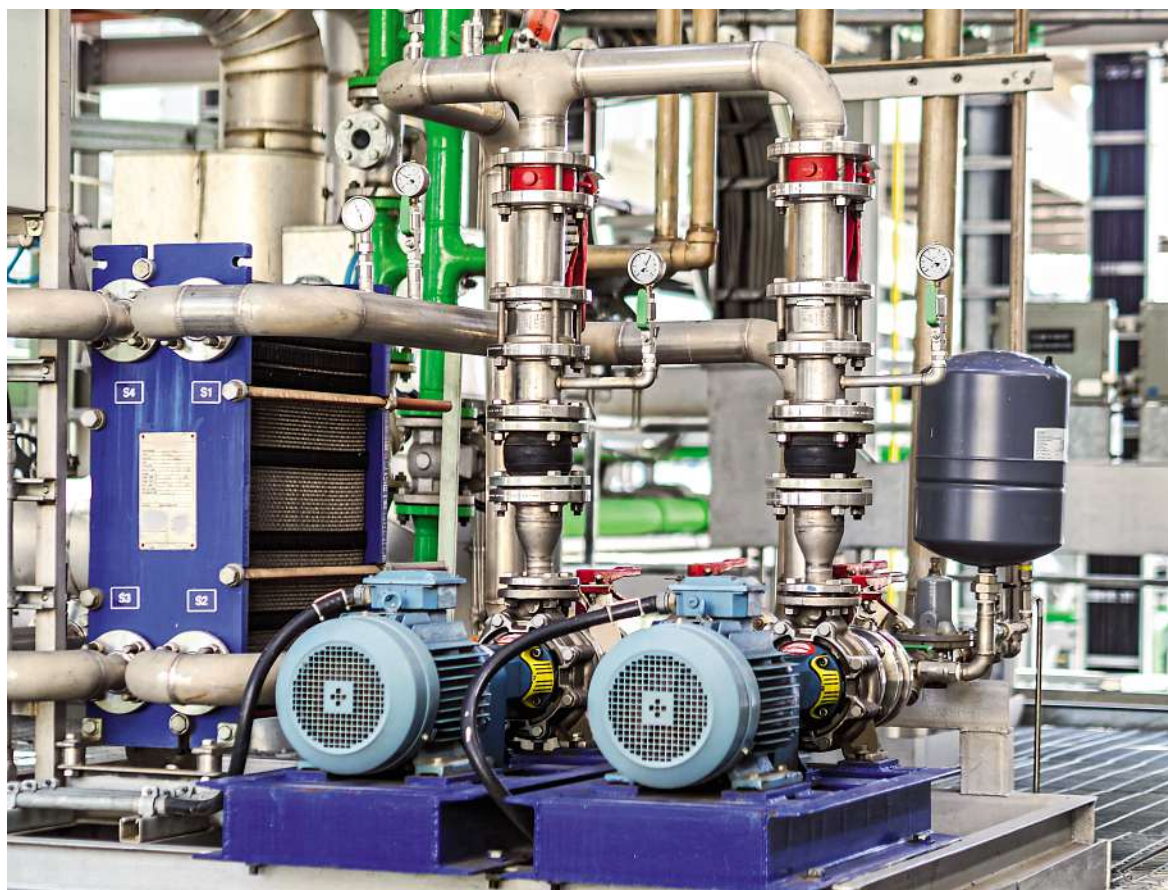
Cybersecurity specialist Ubirch has developed a blockchain solution that helps to secure plant data and also increases its credibility. This means that plant data can be stored directly or indirectly in the blockchain without worrying about issues such as being altered or changed by other sources.

Another blockchain platform, Vakt, is one of the first blockchain pilot schemes designed to enhance commodity trading and reduce paperwork in the oil industry. Some of the industry leaders that have already joined the platform include Chevron, Reliance, Total, BP, Shell, Statoil, and most recently Saudi Aramco Energy Ventures.

The software company Elemica has completed blockchain pilot projects for two global chemical firms. With the assistance of this technology, the companies were able to transfer sensitive documents and data safely.

As the industry progresses towards digital transformation, there is a possibility that new technologies may also emerge. As of today, however, these four — artificial intelligence, digital twins, augmented reality and blockchain — are enough to create a digital transformation that is real and here to stay. ■

Plant owners who use energy-efficient pumps save energy and money.



Source: chinawat - stock.adobe.com

INDUSTRIAL PUMPS

Make Way for Energy-Efficient Pumps

Mostly used for transferring liquids, air and gases, pumps are one of the major energy consumers in a plant, which leads to significant overall costs. Industry players are therefore on the constant lookout for pumps that are both energy- as well as cost-efficient. Here is an insight into energy-efficient pumps on the market.

The global industrial pumps market size is expected to reach 92.98 billion dollars by 2030 and is projected to expand at a CAGR of 4.9 percent from 2022 to 2030, according to a report by market research company Grand View Research. The main reason for this growth: rising investments in the exploration and production activities by the oil and gas companies, coupled with the growing adoption in the oil and gas industry across the globe, mentions the firm. The report fur-

ther states that centrifugal pumps held the largest revenue share of over 65.0 percent in 2021 owing to their increased applications in water supply, sewage disposal, food and beverage manufacturing, chemical, and oil and gas industries.

With this background, it is certain that the industrial pumps market is all set to expand — but how many of these pumps are energy-efficient? How many of these pumps help to reduce the total ownership costs for in-

dustry players while being the right pump for one's operations? Numerous industries rely on pumps to dedicatedly and tirelessly carry out operations over a long period of time, and it therefore becomes vital to talk about energy-efficient pumps.

From the wastewater treatment industry, the Germany-based company Netzsch shares that when it comes to existing plants, there is a much greater focus on energy efficiency today than there had been during the planning of the original plant. Pumps are the most significant energy factor in wastewater treatment and conveying systems. Due to their long service life, the costs accrued during operation make up the lion's share of the overall life cycle costs. Plant owners who use efficient, reliable pumping of the wastewater flow, therefore, save energy and money, adds the firm.

Pump manufacturers are regularly introducing new solutions in the market. Here, we highlight and focus on some of these latest energy-efficient pumps:

I ISO Seal-less Centrifugal Pump

The US-based company Flowserve now offers its Durco Mark 3 ISO pump with a seal-less magnetic drive which is suitable for various sectors including petrochemicals, basic chemicals, fine and specialty chemicals as well as



Source: Leybold
Leybold's energy efficient dry screw vacuum pump – Dry-vac DV 500.

pharmaceuticals. With a special focus on safety, the seal-less magnetic drives help to solve issues regarding hard-to-seal chemical processes in hazardous environments.

The chemical process pump offers three configurations — CBMM Long Coupled; CBME Close Coupled for fluids up to 350 degrees C (662 degrees F) without cooling; and CBME Heat Barrier for fluids up to 400 degrees C (752 degrees F) without cooling. It also provides three



Stubborn Brat*



***an obstinate raw material**
[caking, adhesive, flowing poorly]

The more complex it is to handle raw materials, the more we are in our element!

We Love Ingredients.

[We also stand for simple solutions ...]

Automated raw materials converting | storing | dosing | conveying | weighing | screening



www.azo.com



Source: Netzsch

Netzsch's Peripro peristaltic pump

superior quality containment shell options — Alloy C-4, High-efficiency Alloy C-4 and Ceramic with no eddy current losses, which if flawed will still allow the pump to securely handle the harmful liquids without any difficulty. These pumps can function in extremely high temperatures and due to the availability of the three containment shell options, users can achieve energy efficiency as well as flexibility, thus leading to cost savings.

Peristaltic Pump for Wastewater Industry

Netzsch has developed the Peripro peristaltic pump for the wastewater industry. This type of positive displacement pump boasts of a long service life and ensures flexibility. The firm elaborates that it pumps media by mechanically deforming a hose in the pump housing. Also, the hose is compressed by rollers rotating on the rotor, which moves the compressed section along the hose to the medium.

The benefit of the large XXL rollers of the peristaltic pumps is that this makes the process gentle on the hose. They are also suitable for high pressure without compromising efficiency, energy consumption, or lubrication volume. The low sensitivity to abrasion by design and the low blocking risk are other factors to support



WRITTEN BY
Ahlam Rais

Freelance Editor
PROCESS Worldwide

the use of these pumps for wastewater applications. The robust hose is the only wear part, so the pump can be repaired quickly if necessary, adds the company.

Oil-injected Screw Vacuum Pumps

Next in line is the new GHS 1402-2002 VSD+ series from Atlas Copco. The company makes use of its existing range of GHS VSD+ variable speed-driven oil-injected screw vacuum pumps as the base for its latest innovation. Useful for vacuum cooling, vacuum chambers as well as the production of plastic components and food packaging, the compact new solution offers high performance.

It also comes with a controller which helps leaders from the sector in the 'Industry 4.0' scenario. The crucial new addition to the solution is the oil-injected screw element with compression optimization valves which proves beneficial for high pumping speeds for rough vacuum applications. In terms of energy costs, these vacuum pumps can save as much as 50 percent or more.

Dry Screw Vacuum Pumps

In addition to this, Leybold has launched energy-efficient dry screw vacuum pumps – Dryvac DV 800 and DV 500. Used in heat treatment or coating systems, these pumps can also be used as backing pumps in food packaging and operate without lubricants in the compression chamber. Completed with a networkable frequency converter as well as IE3 motors, the dry screw vacuum pumps make use of less energy and function efficiently due to the screw design, which comes with a specially adapted variable pitch. Interestingly, these pumps do not require much maintenance and thus help in reducing overall operating costs. For high pumping speed applications, DV 800 proves to be a good bet.

The demand for energy efficient pumps is growing and with the constant endeavour of pump manufacturers to develop new, powerful and efficient solutions, the market is still evolving. This helps industrial users to select the right energy efficient pumps for all their plant operations. ■

The global industrial pumps market size is expected to reach 92.98 billion dollars by 2030 and is projected to expand at a CAGR of 4.9 percent from 2022 to 2030, according to a report by Grand View Research.



Source: Atlas Copco

The new GHS 1402-2002 VSD+ series from Atlas Copco.



PROCESS KNOW-HOW AROUND THE WORLD

Discover the whole world of process industry.

The trade magazine and online channels for specialists in the chemicals, pharmaceuticals and process engineering sectors - worldwide.

www.process-worldwide.com

DISPERSION AND ULTRA-FINE GRINDING

Master of the Agitator Bead Mills

Chemical, pharmaceutical and food producers, colleges and universities all over the world use them: Wet-milling technology has been revolutionized by WAB with the development of its horizontal agitator bead mills. At this year's Achema, the resourceful Swiss company was presenting the latest generation of its Dyno-Mill UBM (Universal Bead Mill).

There is a wide range of applications for the Dyno-Mill agitator bead mills of the WAB Group. Their special wet grinding technology ensures brilliant colors for all types of coatings, optimally ground flavors for foodstuffs, targeted bioavailability of active medical ingredients, extraction of vaccines and much more.



What do a chicken plucking machine, a tobacco seedling setting machine, a knothole drilling machine and an agitator bead mill have in common? All these products can be found on a long list from the early 1980s of a Swiss company whose founder was tireless in thought and action. His personal secretary said of her boss: "Finding things is an art! He found gaps for innovations. He found the right people who could make things happen. He found new patents, new locations. He found his wife, he found agents for his machines and he found solutions to problems." We are talking about Willy A. Bachofen (1912-2000), founder of the machine factory Willy A. Bachofen AG based in the city of Basel.

Even though the chicken plucking machine alone (which achieved world fame among experts) would be worthy of an article in its own right, in what follows here we devote our attention to the wet-milling technology.

At the end of the 1960s, Willy A. Bachofen succeeded in bringing a new precept in dispersing and milling technology to the world market. The performance of wet-milling technology was significantly improved with the development of the DYNO-MILL, the first fully self-contained horizontal agitator bead mill. For the first time, it became possible to disperse and grind in a self-contained system, without the ingress of air.

In 1967, Bachofen secured the manufacturing rights—the beginning of a new era in the company's history and the catalyst for a continuous upswing. Over the following decades, the mills were continuously developed, and today, the WAB Group offers a wide range of wet-milling solutions for applications in research, development, prototyping and production.

Supremacy of the Wet-Milling Technology

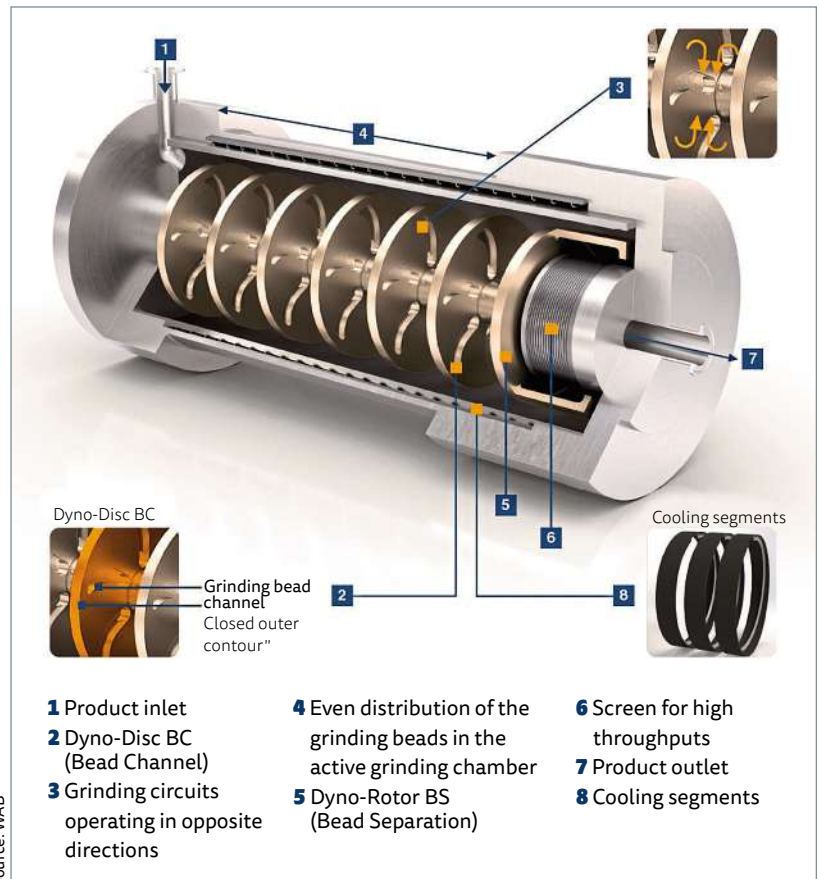
Agitator bead mills have long since gained a dominant position in the field of nano-scale and colloid wet grinding of, for example, lacquers, paints, pesticides, microbiological cell material and pharmaceuticals. Controlled deagglomeration, dispersion and true grinding of solid particles in a liquid medium are the principal focus of wet-milling technology. Particle sizes below 100 nanometers can thus be achieved, which other grinding techniques can often only achieve with restrictions.

Here's how it works: The grinding suspension is placed together with the grinding beads in a horizontal (or vertical) cylindrical grinding container with an axial high-speed agitator shaft carrying several agitator discs. The suspension flows continuously through the grinding container and is ground by pressure and shear stress in a recirculating flow between the grinding beads as they are whirled around by the agitator. At the outlet of the machine, screens or separation gaps prevent the grinding beads from escaping along with the finished grinding suspension.

The grinding fineness depends on:

- the type and filling level of the grinding beads,
- the diameter ratio of the grinding beads to the particle size of the feed material,
- the type of grinding stock to be ground,
- the type of agitator elements,
- the average dwell time of the suspension in the grinding chamber.

Dispersing agents prevent the fine particles from agglomerating and stabilize the grinding suspension.



Source: WAB

Grinding principle of the Dyno-Mill UBM

The Dyno-Mill Universal Bead Mill (UBM)

The new generation of WAB agitator bead mills highlighted at this year's Achema covers the entire range from dispersion to ultra-fine grinding of small product quantities right up to the production of large volumes. Even highly viscous products can be processed with high throughput rates. One of the strengths of the Dyno-Mill UBM is the extremely even distribution of grinding beads in the active grinding chamber. This makes it easy to determine stable and efficient process parameters for both single-pass and recirculation modes.

New Generation of Agitator Discs

The innovators at WAB have developed a new generation of agitator discs—the Dyno-Disc BC (Bead Channel)—especially for the Dyno-Mill series. They have special grinding bead channels in combination with a closed outer contour. The channels ensure efficient acceleration of the grinding beads along a precisely defined path.

During operation, each of the channels create counter-rotating grinding circuits between the agitator discs. The outer contour of the new agitator discs is completely closed within the agitated bed of grinding beads. Therefore, these remain between the agitator discs and are evenly distributed in the active grinding chamber. This ensures that the bed of grinding beads is efficiently utilized. Dyno-Disc BC agitator discs are designed for high wear resistance and consistently high performance while simultaneously reducing maintenance costs.



WRITTEN BY

Dr. Jörg Kempf

Editor-in-chief

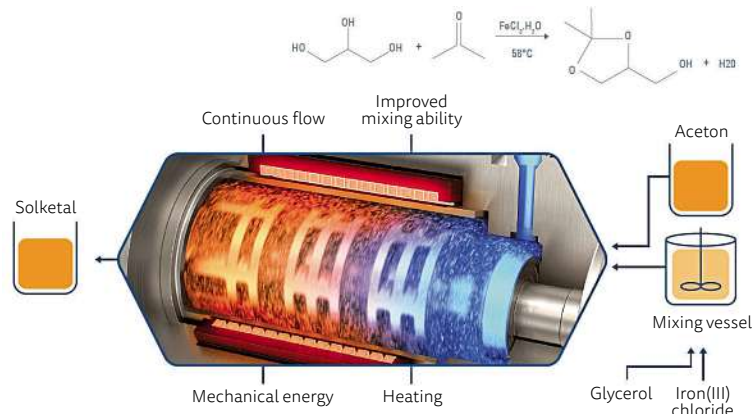
PROCESS Worldwide

The grinding or dispersing process with the Dyno-Mill can be run in different operating modes, and hence can be optimally adapted to the application and required product quality:

- In the single-pass process, the grinding suspension from the supply container passes through the mill in a single closed pass.
- In the simple circulation process, the grinding suspension passes through the mill several times until the required particle size is achieved.
- In the circulation process with start-up pass, the grinding suspension is first pumped into the mill from a pre-mixing container and only then does the simple circulation process start. Once it has been emptied, the pre-mixing container can be prepared for the next batch.
- In the circulation process with final pass, the grinding suspension is collected in a separate discharge container after the required particle size has been achieved.
- In pendulum operation (“multipass process”), the circulation process randomly “swings” between two different supply containers until the desired particle size is reached.
- Two mills can also be connected directly in series — without an intermediate container — in order to achieve particularly high particle finenesses. The second agitator bead mill can be equipped with smaller grinding beads.

PROCESS-INFO

Green Chemistry: Agitator Bead Mill as a Reactor



Source: WAB

Application example for the WAB Impa°Ct reactor: conversion of glycerol and acetone to isopropylidene glycerol (also called solketal), a synthetic building block in the chemical and pharmaceutical industry.

Chemical transformation triggered by mechanical force, known as “mechanochemistry”, offers many opportunities for the development and production of new molecules as well as materials, and offers several advantages over conventional production processes. WAB is also convinced that mechanochemistry is an important technology for a greener future of the chemical industry and has been investing in its introduction for several years. Although long proven in research, the implementation into industrial application has not been successful so far, as no suitable and scalable devices were previously available. The innovative WAB Impa°Ct Reactor now closes this gap: the mechanical energy is introduced by means of grinding beads. An induction heater implemented into the grinding chamber heats the reactants directly and efficiently up to 160 °C. Conventional batch processes can be replaced by a continuous process with the WAB Impa°Ct reactor. The developers promise faster, more selective and innovative reactions, a significant saving of solvents, and industrial scale-up.

Depending on the task and the Dyno-Mill used, different reaction times can be realized with one or more pre-mixes. This saves valuable raw materials and time, as it significantly reduces the cleaning effort between the individual tests. Important process parameters, such as product temperature, pressure and flow rate, are controlled and logged. The system enables both single-pass and circulation processes, and can be used for liquid and viscous pumpable products as well as heterogeneous catalysts. Processing volumes start with one liter of suspension and can be scaled up to the larger models of the Dyno-Mill series, combining the three WAB Dyno-Mill technologies in one reactor: the Dyno-Accelerator, the patented Dyno-Disc BC agitator discs and the Dyno-Disc KD agitator discs. Together with the grinding beads, the technology guarantees a high and uniform mechanical energy input with simultaneous good mixing and thus surface renewal of the reactants.

Wide Range of Applications

The new generation of Dyno-Mill Universal Bead Mills offers the optimum wet-grinding unit for every type of wet-milling tasks — with grinding chamber volumes from 0.5 to 100 liters and particle finenesses down to below 50 nanometers. A variety of grinding bead materials (diameter 0.2 to 2.5 mm), e.g. ceramic or glass, are available. All machines are ergonomically designed and also have permanently installed stainless steel trays.

The range of applications for agitator bead mills is diverse: the special wet-milling technology ensures brilliant colors for all types of paints, optimally milled aromas for foodstuffs, targeted bioavailability of active medical substances, extraction of biological raw materials and much more. Three applications are given below as examples.

Active Pharmaceutical Ingredients

Many modern active pharmaceutical ingredients have poor solubility properties. Bioavailability can therefore become a challenge in product development. This is where the Dyno-Mill pharmaceutical wet-milling technology helps: by reducing the particle sizes during wet grinding, the available active ingredient surfaces increase exponentially and so improve the bioavailability of the active ingredient. Machines specially developed for sterile production are available for this purpose. The most important features are:

- cleaning in place (CIP) and sterilization in place (SIP),
- semi-automatic or fully automatic control of the CIP/SIP process,
- optionally available WAB Scada system (according to 21 CFR Part 11) for control, data acquisition and data processing,
- machine production in compliance with current Good Manufacturing Practice (cGMP) and EHEDG directive,

- material certificates in compliance with FDA requirements.

For all Dyno-Mill Pharma installations, the FDS, DQ, FAT, SAT, IQ and OQ qualification documents required for validation, plus the certificates for process-relevant machine components (calibration and material certificates) are available.

Plant Protection Products in Suspension

Plant protection products are chemical or biological active substances that protect plants from harmful organisms or prevent them from impacting plants. Whether these are herbicides, insecticides or fungicides: modern wet milling allows simple and dust-free handling of all types of active substances. Products with the smallest concentrations of solids in suspension have the following advantages:

- no clogging of the spraying apparatus,
- even distribution of the active substance,
- higher effectiveness and yield due to the larger area coverage,
- no sedimentation during transport or storage,
- easy dilution without re-agglomeration.

The Dyno-Mill agitator bead mills can easily mill large quantities of plant protection products to the desired particle size and are characterized by compact design and shorter cleaning times. The risk of cross-contamination is reduced.

Nail Polishes

Nail polishes are available in all color shades and special effects. Manufacturers are constantly developing new colors to go with the latest fashion trends. Besides the colors, the ease of application is important: The polish should spread easily during application and it should not drip. This allows for perfect drying.

The two basic components of modern nail polishes are usually a thixotropic base (gel) and a pigmented color paste. For grinding of the thixotropic base, the viscosity



Source: WAB

The laboratory mills (Dyno-Mill Uni Lab in this case) are ideal for developing new formulations with small product quantities and calculating scale-up factors.

and gloss are of primary importance. For the separately ground color paste, the color properties (intensity and hue) and gloss are important. By combining all the properties, the two complement each other to create the finished nail polish. WAB offers the whole range of agitator bead mills for the manufacture of high-quality gels and color pastes.

WAB's process experts will help customers to find the best solutions for their applications in one of the company's local Process Technology Centers (PTCs). The reliable and technically competent customer service as well as the broad network of the WAB Group work together like the parts of a Swiss watch. ■



On-site appraisal



Dismantling

AF FOETH

USED AS NEW SINCE 1908

Cost-effective upscaling & downscaling

- ✔ Quick offer for your surplus equipment
- ✔ Experienced project management
- ✔ Worldwide network of buyers for re-sale

We **mechanically test** each machine before shipment, ensuring it's ready for a **second life!**

+31(0)342 415 551

info@foeth.com

www.foeth.com



Complete testing



Reconditioning



Source: © eassis, ipopba - stock.adobe.com; [M]VCG

DRUG DELIVERY

A Special Flair for Pellets

Before new active ingredients can achieve market success, drug delivery must play its part — and OSDs continue to rank highly as the formulation of choice. We look at why the pellet is probably the most versatile active ingredient formulation, and the most underestimated.

Active ingredient formulation is a fine art and a matter for specialists — yet many pharmaceutical companies like to take the path of least resistance when launching a drug. For the sake of simplicity, they press the active ingredient into a tablet along with excipients. However, at least by the time the topic of life cycle management is broached, good advice can prove expensive. That is when Glatt Pharmaceuticals comes to the fore. The Glatt subsidiary has now been in the market for more than 25 years, and Dr. Norbert Pöllinger has been there from the very beginning.

In that time, the initial team of five employees has grown to over 150. Pöllinger emphasizes that, as a manufacturer of process technology, Glatt enjoys a good reputation among pharmaceutical customers worldwide, and the service subsidiary certainly benefits from the machine manufacturer's reputation. The developers, who are based in Binzen, Germany, specialize in multiparticulate dosage forms, i.e. powders, granules and pellets. Here the focus is on optimized bioavailability, taste masking, and improving the solubility or stabilization of the dosage form. Pöllinger is a real pellet fan and, over the decades, has become a sought-after specialist

in this field. His special flair for this dosage form probably dates back to the days when the pharmacist worked in galenic development at Bayer. At some point, the call from Binzen came and he began to build up the team that today accompanies pharmaceutical companies worldwide from development to market supply

Despite New Therapy Options, People Still Swallow Pills

Speaking of market supply: According to Pöllinger, the majority of active ingredients confronting Pharmaceutical Services are “small molecules”. Despite all the hype about new forms of therapy, almost 90 percent of the drugs developed and manufactured by the pharmaceutical industry are still small molecules with a molecular weight of 0.1 to 1 kilodalton, which are swallowed as capsules or tablets. The preferred site of absorption of such active ingredients is the gastrointestinal tract. This is yet another reason why oral formulations are still the workhorses of drug delivery.

However, there are additional reasons why Binzen will not be running out of work any time soon. “People come



WRITTEN BY
Anke Geipel-Kern

Senior Editor
PROCESS

to us with complex requirements when the active ingredients are difficult because the uptake kinetics are poor, the active ingredients are extremely bitter, or there are special requirements for the uptake site. It is also about life cycle management and the question: What comes after the initial formulation?" says Pöllinger, immediately providing the explanation: "Many companies work with a rapid-release formulation for market approval in new NCEs, and then figure out how to design the rest of the drug's life cycle later."

Children are Special Patients

The EU created a special challenge for pharmaceutical companies a few years ago: The authority will only grant approvals if there is also a formulation suitable for children. Since 2007, an EU regulation has been in force that requires pharmaceutical companies to submit a pediatric investigation plan for new marketing authorizations and to conduct studies with children. To make this development effort worthwhile for the companies, the EU has promised benefits such as an extension of patent protection for another six months. Since then, many things have changed, but the problem has remained that children, especially infants, find bitter medicine very hard to keep down. Child-friendly formulations are needed so that the child does not spit out the medicine in disgust. This is a broad playing field for Glatt experts, whose expertise includes the formulation of the antibiotic clarithromycin, which is given to children to treat middle ear infections or pneumonia.

Glatt was and is also involved in another exciting project: Together with Diurnal, a spin-off of the University of Sheffield and Berlin Charité, the experts have developed pellets that are filled into transport capsules for the treatment of a congenital hormone deficiency in newborns. Babies who suffer from this cannot produce their own cortisone and have to take the hormone for the rest of their lives.

For years, only tablets were available, which could only be dosed very imprecisely for newborns and infants. That was until bioavailability studies showed that hydrocortisone-loaded pellets not only worked just as well, but could also be precisely adjusted to the weight of the young patients.

Now the EU-funded project has entered its second round: To reduce the number of adult intakes, pellets with a special coating will soon be available — a "controlled-release formulation" that mimics the natural progression of cortisone levels.

Which Dosage Form do You Prefer?

Anyone developing a dosage form for a new active ingredient is first faced with a few very fundamental questions:

- What is the molecular nature of the drug?
- Where should it be absorbed?

- How high does the dosage have to be?
- How often is it to be administered?

"We've been focusing predominantly on multiparticulate dosage forms, mainly pellets, for the last 25 years," Pöllinger says. In his opinion, pellets are particularly suitable for clinical studies. If you want to test ascending dosages, e.g. for tolerance, the beads coated with active ingredient are much easier to dose than tablets, which quickly become unwieldy. "That's why we're trying to convince companies to use the pellet form," the pharmaceutical expert explains. But multiparticulate forms also offer advantages for subsequent life cycle management. Starting from a basic concept, it would be possible to control the release kinetics of the drug and/or the site of resorption in the second and third attempts.

Medicines for pediatrics and geriatrics — all of this is easily possible with pellets, according to Pöllinger.

It's All a Question of Absorption

Many issues revolve around drug absorption and solubility enhancement. Whether the transport to the site of action is successful is decisive for the existence or non-existence of new developments. "For example, self-emulsifying surfactant mixtures improve the absorption of hydrophobic active ingredients quite decisively," Pöllinger explains. The experts also have processes such as "solid dispersion" in their repertoire. This refers to the conversion of crystalline to amorphous molecular structures, which dramatically increases the solubility of active ingredients in combination with suitable polymers such as polyethylene glycol (PEG) or polyvinylpyrrolidone (PVP).

Pellets may contain the solid dispersion in the form of a layer on a starter bead — or they may consist entirely of the solid dispersion, as matrix pellets.

Pöllinger also sees potential for pellets in processing highly active ingredients. Toxic dusts would not be produced at all with coated pellets, and the number of transfer steps and the risk of contamination are also reduced compared to tablet production.

What's Next?

There are also ideas for the future, Pöllinger says. Pellets could enable individualized medicines that contain different drug pellets for multiple ailments. The background should be familiar to many people who care for their mother or father. Elderly people often suffer from several diseases and may have to take statins, blood pressure lowering drugs and much more. This can often add up to up to ten tablets a day.

"The point here is to make medication more intelligently, more thoughtfully and with more individualization, because people often suffer from side effects that cancel out the positive effects," Pöllinger explains. He believes the range of possibilities offered by pellets is far from exhausted. The art of active ingredient formulation still offers great potential for innovation. ■

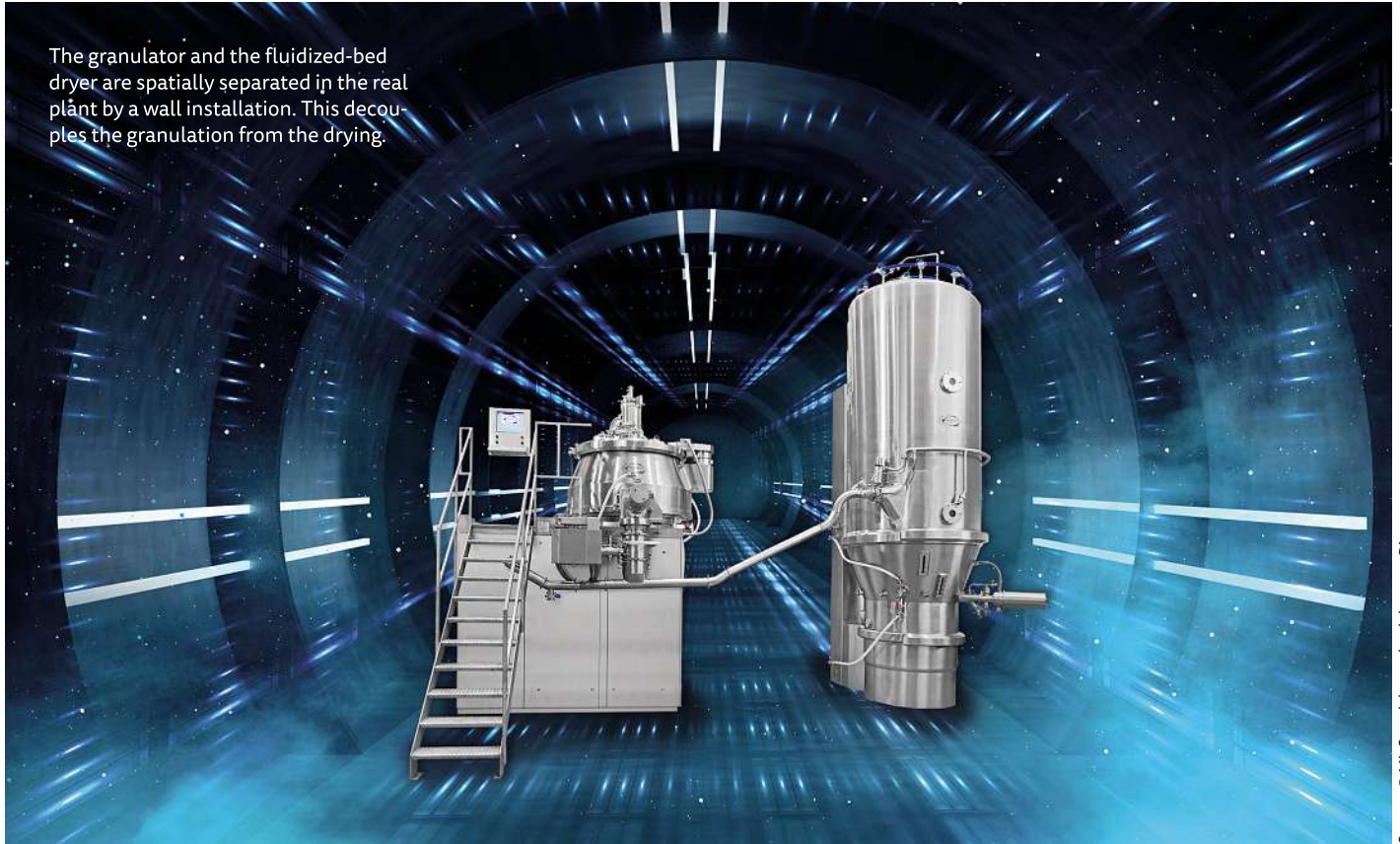
"We find pellets particularly exciting when it comes to highly active and poorly soluble active ingredients."

Norbert Pöllinger



Source: Glatt

The granulator and the fluidized-bed dryer are spatially separated in the real plant by a wall installation. This decouples the granulation from the drying.



Source: © MiaStendal - stock.adobe.com; Diosna

CLOSED GRANULATION PLANT

Granulation in the Next Dimension

It sounds like the famous squaring of the circle: high-capacity OSD production in a limited space, with the integration of one of the largest granulation lines in the Middle East added to the mix. Below, we give insights into a project of superlatives.

WRITTEN BY

Ibrahim Alsaleh

Sales Manager

DIOSNA Dierks & Söhne
GmbH

**Philopatir
Meshreky**

Area Sales Manager

DIOSNA Dierks & Söhne
GmbH

Markets in Egypt are driven in particular by rapid growth in the country's population, which has increased from 68 million in 2000 to over 106 million in 2022. Pharmaceutical manufacturer Al Andalous was therefore eager to increase its capacity to match the needs of this growing market by producing affordable generic pharmaceutical products — in premium quality — for Egyptian patients. In addition, the company wanted to achieve better monitoring and control of its operating parameters.

Specializing in the production of branded generics, Al Andalous started its business in 2007. The company has

now become one of the fastest-growing pharmaceutical companies in Egypt. As a result of its success in the Egyptian market and to fulfill demand in both the Egyptian and export markets, the company decided to build its own production site in the city of 6th of October, just outside Cairo. With a total area of 14,000 m², the factory meets the most recent Egyptian MOH regulations as well as EU, WHO and cGMP standards.

The heart of the new production facility is an efficient granulation line with a high production capacity. A durable production line with modern automation and a closed system to ensure homogenous and repeatable

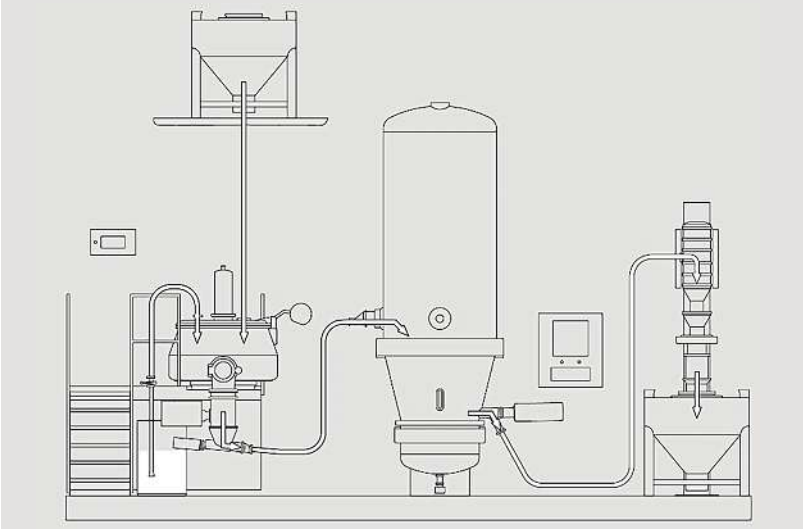
granulation was crucial for Al Andalous. The company chose a granulation line from Diosna combining a mixer-granulator and a fluid bed dryer with a capacity of 1,250 liters.

Challenge: Lack of Space and a High-Capacity Machine

A granulation line of such a huge size presented the project partners with a major task — the installation of one of the biggest machines in the market in an area that is rather small in comparison to the machine capacity. At the same time, they had to make sure that workers were able to move freely in the room and perform a variety of tasks around the machine. This required meticulous attention to fit the granulation line into the required space and ensure good maneuverability inside the room for both workers and materials.

To fit the limited height of the production area the Diosna engineers created the lid of the high-shear mixer as a swiveling design while allowing optimal product transfer between the granulation components. It was necessary to create an opening in the building's concrete ceiling to fit the towering height of the 1,250-liter fluid bed dryer. The fluid bed dryer was then embedded into the room through the concrete ceiling opening. The fluid bed dryer is executed in a 12-bar shock-resistant de-

Source: Diosna



A typical granulation process in a closed system.

sign and is thus enormously heavy. Very careful maneuvering was of great importance. The machine was moved into the designated production area under the constant supervision of both companies' engineering teams. Thanks to meticulous planning and a skillful coordina-



- > CONTROL & AUTOMATION
 - > BUSINESS & ECONOMICS
- > POWDER BULK HANDLING
 - > PUMPS & COMPRESSORS
 - > EX PROTECTION & SAFETY
 - > ENGINEERING
- > PHARMA & FOOD
 - > OIL & GAS

11271

Your favourite topics

All key topics around your job on your favourite device. Read news, articles and whitepaper the way you like it.

www.process-worldwide.com



handle with...
CORA.



Valves and systems to control and dose powder and granule flow in Pharmaceutical and Chemical industry

CORA® www.coraitaly.net

Tel. +39 0583 20590 - Fax +39 0583 20481 - info@coraitaly.net



tion, the machine was installed and run while the factory remained fully operational.

Batch Multiplier: Optimized Processes

Al Andalous aims for efficient granulation processes and continuous product transfer between granulation components, in order to run more batches with high granulation efficiency and yield.

The material flow between the different machine components takes place through a closed and automated system to ensure dust-free product transfer between the granulation components, minimizing product loss and increasing yield. Feeding starts from a handheld vacuum transfer lance in the high-shear mixer, which sucks the powders into the mixer. The product is then mixed, and a binding solution is added to the powder to create granules in the cylindrical-conical high-shear mixer where the product moves in 3D motion.

The highly efficient mixer, with optimum product flow thanks to the geometry of the mixer and impeller, achieves excellent mixture homogeneity and high yield. The binder solution is added to the mixer through a peristaltic pump. After reaching the granulation end point, the wet granules are discharged to the integrated conical mill to be then pneumatically transferred into the fluid bed dryer. The product is transferred through the tangential inlet positioned in the fluid bed dryer, which works along with the air distributor plate that has tangentially aligned air passage openings. This creates an even better air circulation and avoids deposits on the wall, for more yield. The air distributor plate is fixed centrally instead of via a flange, creating a bypass air seal that avoids dead zones and product accumulation on the sides. After drying, the granules are then discharged through a vacuum conveyor to the dry mill, which is finally discharged into intermediate bulk containers (IBCs).

Production Synchronization — Time and Quantity Effects

Flexibility in the processing of batches was an important aspect within this project for Al Andalous. The company wanted to produce two different batches in the same area. A through-the-wall installation concept was a feasible solution. The high-shear mixer and the fluid bed dryer are thus implemented in different rooms. This gives the opportunity to start the granulation of the next batch while the first batch is in the drying phase.

When it comes to spray technology, flexibility is not neglected either. Components that can be retrofitted, such as top and tangential spray or bottom spray processes, can be easily implemented. The machine also has a police filter deduster installed, paving the way for an easier and less costly installation of a Wurster spraying system in the future.

Automation and Control via Two Operator Interface Terminals

The pharmaceutical company's need for simultaneous production monitoring and process control was covered by Diosna's 21 CFR part 11 industrial PC control system. The user-friendly HMI ensured that the line operators have excellent control of the process and monitoring of

the line. In addition, they can operate the machine via two identical interfaces and visualize both machines from any of the operator terminals. The operator can run each machine separately when needed. Important parameters like the differential pressures of the inlet and exhaust air filters for the fluid bed dryer are monitored with no need to enter the technical area. Alarms give appropriate warnings if any process value is exceeded.

An automated and easy to use cleaning process brings great benefits in speeding up production in the plant. In this project Al Andalous focused on minimizing the need for operator interference in the cleaning, along with easy cleaning validation.

The line components are cleaned using the WIP station. The operators can also add detergents to the cleaning process automatically. The high-shear mixer shaft seals are cleaned using an automated CIP system. The main mixing tool

can also be raised automatically after cleaning to confirm the cleaning and to make it easier for the cleaning validation activities to take place. The high-shear mixer is also equipped with a detachable spray ball to perform a full automated WIP. For cleaning of the fluid bed dryer, the operator lowers the filters and removes them.

Then the operator starts the automatic cleaning. All components such as sampling tools and the pneumatic conveyor are involved in the cleaning process. Within the project, the CIP and WIP system was developed and realized according to Al Andalous' vision of optimized production.



Source: Diosna

Diosna CAP1250 fluid bed dryer with the filters lowered.

Doubled Capacity and Ready For the Future

Looking back, the project was a complete success for Al Andalous. The granulation system line has been put into operation and is working to the customer's full satisfaction. The requirements in terms of functionality as well as space utilization were fully met. This line has doubled the batch capacity from 500,000 tablets to 1,000,000 tablets. The premium quality of the machine means current and future increasing capacities can easily be dealt with. The machine has helped to achieve much better granulation efficiency and a higher output. In yet another highlight: the granulation line can also be upgraded with additional functions such as spray granulation and pelletization techniques. It is a firm foundation allowing Al Andalous to offer a competitive production portfolio in the future. ■

Important factors for Al Andalous: a production line that is durable, an efficient automation design, and a closed system for homogeneous and repeatable granulation.

REAL-TIME APP

Smart Filtration

Gea has introduced an intelligent software solution for membrane filtration plants. Known as Gea Smart Filtration, the software monitors the plant status remotely via an app and makes use of cloud connectivity and real-time analytics to increase plant availability and performance. Seagarden, a Norwegian supplier of fish-based ingredients, has invested in a Gea membrane filtration plant that the company plans to control via the app in the future. Gea Smart Filtration monitors membrane filtration systems in real time and visualizes the status on a digital dashboard. The goal is to extend the life of the membrane and enable customers to prevent failures and product loss. In the first phase, the software will serve as an overview and service planning tool. In the following two development phases, it will increasingly become a digital forecasting tool that independently analyzes big data from the plant and suggests ways to optimize energy consumption, adds the firm.

www.gea.com

THERMAL MASS FLOW METER

Reliable Hydrogen Metering



Source: FCI

Fluid Components International's ST80L Series thermal mass flow meter is used to measure hydrogen in vegetable oil hydrogenation processes. The flow meter is well suited for H₂ measurement in 1- to 2-inch (DN25-DN50) lines at pressures up to 70 barg (1000 psig). It features accuracy of ± 1 percent

of reading with ± 0.5 percent repeatability over a wide flow range of 0.0062 to 838 SCFM (0.01 to 1425 Nm³/h) under variable process temperatures, making it ideal for measuring many other process gases, waste gases and compressed air in food and beverage plants, states the company. The ST80L does not utilize any moving parts by employing solid-state platinum RTD sensors that are precision matched and embedded in equal mass thermowells. The sensor's design requires virtually no cleaning and is less prone to fouling than other flow measurement technologies when there is a concern about particulate laden gas streams, according to a press release. The inline thermal mass flow meter (pipe spool length of 9xDN) can be delivered with a low pressure drop Vortab Flow Conditioner. This flow conditioner is welded at the inlet of the flow meter allowing for very short piping installation lengths (only 3xDN required for upstream straight length).

www.fluidcomponents.com

FROM MG2 ITALY

Advertisement

Inhalation Solutions for Powder Low Dosages



Source: MG2

MG2 
Keeping ahead for you

KONTAKT

MG2 S.r.l.

Via del Savena, 18
40065 Pianoro (BO) - Italy
sales@mg2.it
www.mg2.it

Founded in 1966, MG2 is a worldwide brand leader in designing and manufacturing processing and packaging machines for the pharma, nutraceutical, cosmetic and food industries. MG2 Processing Division is the core business of the Company, focusing on capsule filling machines, complementary production quality control machines and weight control systems.

Since 1990, MG2 has been developing solutions for inhalation purposes to meet the most demanding customers' requirements on the capsules filling process of formulations for DPI systems. MG2 applies both the volumetric technology by dosator and the net in-process weight control system to capsule filling machines from

R&D to high-production speed. A dedicated team of product specialists and R&D experts is always ready to support customers during each phase of the formulation and manufacturing process inside the Pharma Zone, a pharmaceutical area specially conceived for Pre-Clinical tests, R&D and technical batches at MG2 headquarters. Furthermore, MG2 has developed several partnerships with well-known Italian and foreign Universities, Research Centers, suppliers of both hard-shell capsules and pharmaceutical excipients. Every year MG2 also takes part to inhalation events and conferences all around the world. Discover MG2 at CPhI Worldwide 2022, Hall 6.0, Stand 60C73.

ROBOTIC VIAL FILLING

Filling, Stoppering and Capping



Source: Steriline

The new Robotic Vial Filling and Capping Machine under isolator (RVFCM50) from Steriline can process up to 2,400 pcs/h. Once vials are washed and depyrogenated, the first of three robotic arms grasps two vials at a time and places them under the filling heads, which are linked to

two peristaltic pumps that potentially allow infinite capacity filling. This step happens directly on two weighing cells, so that the filling volume can be checked in real time during filling operations and the recipe parameters can be met. Once they have been properly filled, the vials are moved to the second robotic arm for the stoppering process and then to the third robotic arm for capping. Whenever the check sensors detect any non-conformity during filling, stoppering or capping, the process can be repeated to guarantee the conformity needed according to the company's "robotics zero-loss philosophy". Furthermore the machine is equipped with an isolator that ensures the sterility of the processed vials and protects the operator at the same time.

www.steriline.it

PLASTICS PELLETIZING

Complete Central Injection System

In May 2022, Maag Group acquired the French tool manufacturer AMN DPI (AMN), thus continuing its growth as an integrated supplier of systems for the plastics industry. For the first time, a complete AMN Central Injection System (CIS) consisting of a 1,500 mm diameter die plate with a central water injection and sword-shaped knives will be displayed at this year's K trade fair in Duesseldorf, Germany from October 19-26. CIS was designed to improve pellet cooling and ejection, and is an effective solution for high melt index or peroxidized polymers, says the company. Products from AMN, with its global reach, complement the Maag Group portfolio and provide additional value in all polyolefin applications, adds the firm. Die plates are the heart of the underwater pelletizing system, and are necessary to produce high-quality and consistent pellets. Over many years, the unique technologies of AMN die plates have demonstrated their performance and longevity in many applications, especially for high-capacity underwater pelletizers.

www.maag.com



Source: Maag Group

PUMPS

Industrial Vacuum Processes

In industrial vacuum processes, the requirements for smart performance management and energy efficiency are constantly increasing. For more intelligence, variability and efficiency in coating, drying and heat treatment processes, Leybold has developed the Varodry Vdi vacuum system with integrated Vacontrol Cab control. The pump systems of the new series consist of the air-cooled, oil-free Varodry screw pumps, the dry-compressing Roots pumps of the Ruvac series as well as the Vacontrol Cab control for smart management of all pump processes. The Vdi system can be configured by the operator according to the process requirements: This allows users to set their own vacuum capacities as needed to match the pump-down process and the pumping speed, according to the company. To protect against critical gases and particles, the system can be equipped with gas ballast and purge gas. In some application environments where steam or dust is present, additional filter options ensure an uninterrupted vacuum supply. Additional energy savings and even wear are ensured by the Energy Saver Kit.



Source: Leybold

www.leybold.com

PHARMA PACKAGING

Blister Serialization and Aggregation



Source: Sea Vision

Sea Vision and the Marchesini Group are launching a new solution for primary pack serialization and aggregation, comprising a complete range of technologies to print, inspect and pack serialized blisters and perform aggregation with cartons, all integrated in a 4.0 environment.

With regard to hardware, the Contact Image Sensor with Coaxpress interface was identified by Sea Vision as the most appropriate tool for the needs of this technological challenge. Integrated into the Sea Vision Tracker, this sensor makes it possible to homogeneously inspect web up to 367 mm with high resolution (600 dpi) and inspect foils in a wide range of materials. It also achieves a high image transfer speed, enabling line speeds of up to 75m/min. The integrated lighting system and CIS customization for the most demanding reflective surfaces work together to minimize the physical footprint of the machine. Furthermore the sensor helps to cancel the shear deformation effect on the image in order to optimize print quality control, partly thanks to continuous foil dragging.

www.seavision-group.com

PHARMA MACHINES

Filling and Packaging

The Blistar blistering machine from MG2 is designed to optimize the primary packaging of capsules and tablets in blisters for pharmaceuticals and nutraceuticals. The electronic control guarantees fast size change-over by recalling recipes, and can manage up to 150 blisters/minute with maximum dimensions of 90x140 mm, states the company. It allows customers to create a complete packaging line, starting from the capsule fillers to the end-of-line machines. With the Flexilab, MG2 presents a capsule filling machine specifically designed for small batches and special production, suitable for several pharmaceutical oral forms, with production speed up to 3.000 capsules/hour. It can be equipped with two dosing units specially designed for trending applications: the Microdose unit suitable for powder micro-dosages (including API without excipients) from 0.5 mg, and the liquid filling unit which can manage cold liquids, hot-melt liquids and suspensions up to 70 °C.

www.mg2.it

CASE STUDY

Flexible Screw Feeding of Problematic Chemicals



Source: Flexicon

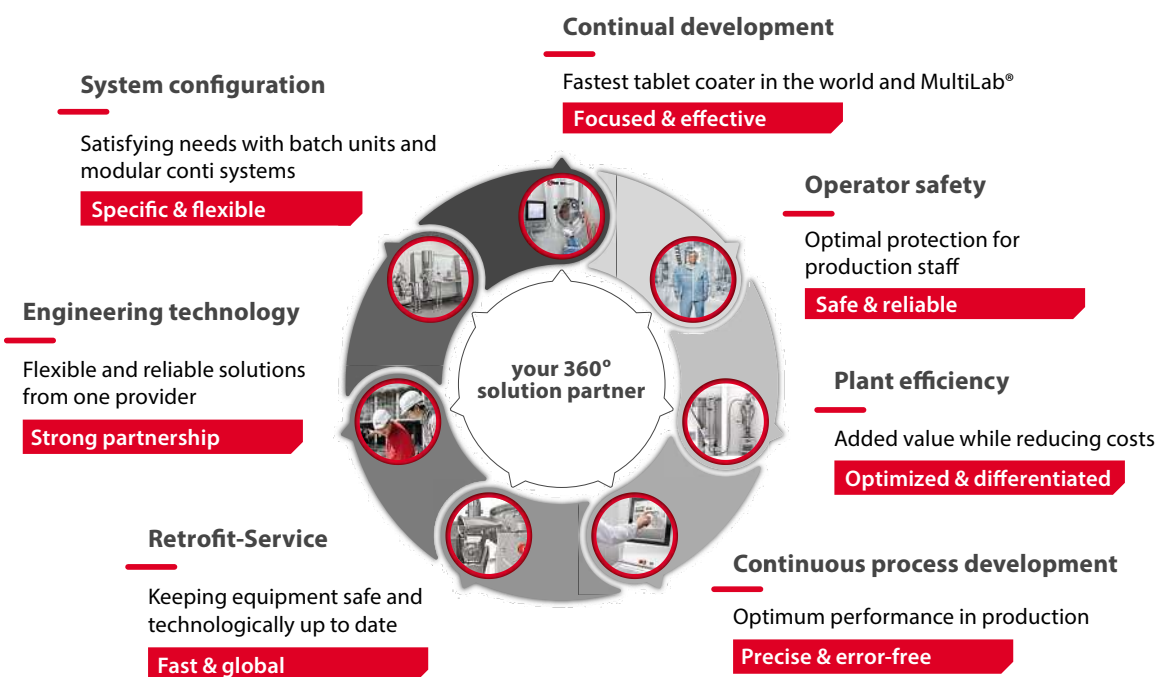
A manufacturer of specialty chemicals handles two problematic powdered ingredients, benzofuroxan and triazolone, to produce energetic products for mining and demolition. To improve throughput and handling of these ingredients, the company installed a flexible screw conveyor and receiving hop-

per from Flexicon (Europe). The hopper has a footprint of 700 x 1100 mm, fitting into the plant's restricted product loading area while leaving ample space to empty drums containing the materials. A support tray combined with a hinged hopper cover allows for quick and ergonomic loading of the materials. Steep back and side walls of the stainless steel 110 L capacity floor hopper reduce the ability of the hygroscopic ingredients to bridge or 'rat-hole.' Combined with the hopper geometry, a mechanical agitator assembly maintains good flow of material while eliminating material agglomerations, states the company. The conveyor, a Flexicon model 1312, comprises a flat, centerless stainless-steel screw that rotates within an outer tube of abrasion-resistant ultra-high molecular weight polyethylene. Flexibility of the screw and tube allow the conveyor to exit the hopper at a 45 degree incline and curve to vertical, propelling materials 5.5 m to the dosing system inlet, dust-free, adds the firm.

www.flexicon.com



UNIQUE WORLDWIDE: OUR COMPETENCE – YOUR PERFORMANCE



IMPRINT



www.process-worldwide.com

Subscriber Service

DataM-Services GmbH
 Franz-Horn-Str. 2, 97082 Würzburg, Germany
 Phone +49 931 4170-462
 vogel@datam-services.de

Reader and editorial service

Editorial enquiries:
 Phone +49 931 418-2333
 fachmedien@vogel.de

Editor-in-chief:
 Dipl.-Chem. Dr. Jörg Kempf (kem), V.i.S.d.P.

Editors:
 B.A. Wolfgang Ernhöfer (wer)
 Dipl.-Biol. Anke Geipel-Kern (agk)
 B.Eng. Dominik Stephan (dst)

Freelance Editors:
 Ahlam Rais (ars), Phone +91 22 256 444 69
 Alexander Stark (ast)

Content-Manager:
 Doris Popp (dpo)

Conceptual Design & Layout:
 Alexandra Geißner

Spellings, names of firms and products:
 In general we follow the recommendations in Duden.

Legal disclaimer:
 The content of individual articles is the responsibility of the authors named and does not necessarily reflect the opinion of editorial staff. Although all published material is checked carefully, no liability can be accepted for possible inaccuracies. No part of this publication can be reproduced in any form or, with the help of electronic systems, processed, copied or distributed, without express written permission.

Sales

Chief Sales Officer:
 Benjamin Wahler
 Phone +49 931 418-2105
 sales@vogel.de

Order Management:
 Phone +49 931 418-2079
 ordermanagement@vogel.de



Vogel Communications Group GmbH & Co. KG
 Max-Planck-Str. 7/9, 97082 Würzburg, Germany
 Phone +49 931 418-0
 www.vogel.com

Ownership:
 Full liability:
 Vogel Communications Group Verwaltungs GmbH
 Max-Planck-Straße 7/9, 97082 Würzburg, Germany
 Limited partners:
 Dr. Kurt Eckernkamp GmbH,
 Nina Eckernkamp, Klaus-Ulrich von Wangenheim,
 Heiko Lindner, Axel von Kaphengst

Managing Directors:
 Matthias Bauer (Chairman), Günter Schürger

Print:
 Vogel Druck und Medienservice GmbH
 97204 Höchberg, Germany

Copyright:
 Vogel Communications Group GmbH & Co. KG

OPEN LAB

Research on Sustainable Technologies



Source: ima

Ima has launched Open Lab — a network of the company’s technological laboratories and testing areas. The goal is to merge studies, experimentation and industrial development activities on materials including all laboratory phases. The service is offered to customers in all business sectors served by the firm:

pharmaceutical, food, dairy, baby food, coffee, tea and herbs, tissue and nonwovens, and cosmetics. The program includes on-site material testing on dedicated machines under the supervision of group engineers and researchers, to simulate real manufacturing conditions without interrupting customers’ production cycles. Open Lab has four operational sites, located respectively in Bologna, Italy; Lugano, Switzerland; Arezzo, Italy; and Lowell, USA.

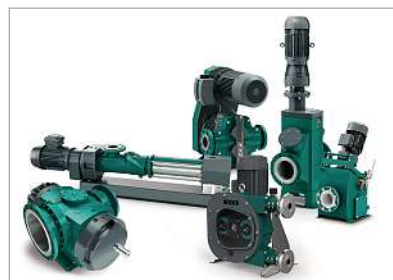
www.ima.it

PERISTALTIC PUMP

Pumping of Complex Media

As a global specialist in pumping complex media, Netzsch Pumps & Systems offers customized solutions. In doing so, the pump manufacturer analyzes the specific requirement and selects the appropriate positive-displacement pump from its extensive product range. New is the Peripro peristaltic pump. It is entirely insensitive to dry running, pumps media with 70 percent solids content without any problems, and as a pump without mechanical seals and valves, is hardly susceptible to wear. Also on display at this year’s Achema were the Nemo progressing-cavity pump, which conveys complex media gently and with low pulsation, the Tornado rotary lobe pump, which is used primarily for its high performance, and the Notos multi-screw pump, which can build up high pressures.

pumps-systems.netzsch.com



Source: Netzsch

INDUSTRY INNOVATIONS

The Latest Packaging Solutions



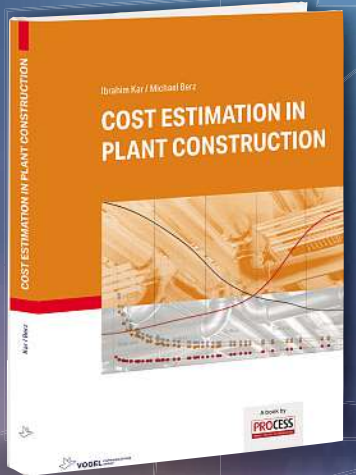
Source: Gerhard Schubert

The latest solutions from Gerhard Schubert include a flexible traypacker and the Partbox, a new 3D printer. The traypacker packs hamburgers, which are sealed in a transparent pack, into cardboard trays with separate lids. The machine can pack products into three packaging variants from 4-count to 16-count packaging, mentions the firm. A variety of packing configurations can be created by flexibly combining single and multiple packs. Single trays can either be glued next to each other or stacked to create a double tray. A completeness check also ensures that only complete trays filled with flawless products are sealed.

The F4 picker tool for transferring the products as well as the lidding tools are each fitted with 3D printed parts, which the customer can call up as a print job via the Partbox streaming platform — and produce themselves using the new Partbox printer from the firm.

www.schubert.group

How to Do a Cost Estimation in Plant Construction



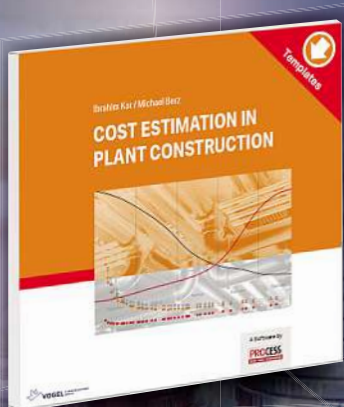
Ibrahim Kar / Michael Berz

Cost Estimation in Plant Construction

1st edition 2021, 184 pages
ISBN Hardcover: 978-3-8343-3495-4
ISBN E-book: 978-3-8343-6275-9
119.80 EUR

At the early project stages of plant construction, cost estimates for projects in the process industry are a prerequisite for gaining a competitive advantage in a global market with increasing commodity prices, engineering and installation costs.

The book gives a detailed overview of the structure of cost estimates in brownfield and greenfield plant projects and shows the method of preparing the required accompanying documentation. Using a project example, the book presents a cost estimation with different levels of accuracy. Important templates and accompanying documents are provided in the appendix.



Ibrahim Kar / Michael Berz

Templates: Cost Estimation in Plant Construction

Version 1.0 2020
ISBN: 978-3-8343-2424-5
149.00 EUR

The templates are an addition to the specialist book „Cost Estimation in Plant Construction“, as the templates and accompanying documents from the appendix are offered as fully editable digital version. Thus, the templates are a practical tool for cost estimators who need to prepare the accompanying documents for a cost estimation. The package comprises six different templates that can be adapted to project-specific requirements. Furthermore, the sample calculation from the book with an accuracy of $\pm 30\%$ is made available as an Excel file.

Order now!

Further information and purchase at

www.vogel-fachbuch.de/en



the All-In-One
PHARMA

One supplier takes care about the complete line, the entire process. Achieving real innovation requires the complete interaction of every single element. It means creating an environment where people, equipment and technology come together in perfect synergy.

This is IMA Pharma. This is the All-In-One.

Visit us at CPhI Worldwide 2022, Booth 60C21

ima.it/pharma

