JM

Johnson Matthey
Inspiring science, enhancing life

Informally speaking

A formaldehyde magazine from Johnson Matthey

- Meet our teams!
- **JM-LEVO** commercially launched
- Process safety elevated to new heights
- Bioplastics driving new BDO demand in China
- Measurement errors not always wrong

WINTER/SPRING 2021

A year like no other

Dear reader, It is now just over a year since we had to postpone the Formaldehyde Americas 2020 April conference in Houston due to the Covid pandemic. We understood quite quickly that we would need to adjust to the new situation, and that it would be a challenge. How would we meet customers, provide loading services or start up new plants during a pandemic with travel restrictions?

Like many, we have struggled with the ever-changing conditions, particularly for providing the loading services and to commission new plants. But thanks to an extremely dedicated team and your cooperation, we have managed to come up with innovative and workable solutions, and also to commission several plants (see page 17).

Our way of interacting has changed too. Digital tools like Microsoft Teams and our newly launched **JM-LEVO™** Formaldehyde Portal with premium features, have enabled good communication between our sales and technical support teams and you, our customers. They have also enabled us to continue developing our products and to work closely together, though differently. On page 10 you can meet all our teams, and on page 6 you can read what a day in the life of one of our technical support managers is like these days.

As mentioned in the previous edition, we have, among other things, an ongoing catalyst development project aimed at improving selectivity and yield, and we were hoping to launch one new product by early 2021. Although delayed, the work continues, and we have been able to observe other positive improvement potential along the way. Yield and operating economy have been ever more vital during the pandemic, proving the importance of continuously monitoring performance. See Ola Erlandsson's informative article on page 7 about yield and instrument errors.

In other news, we invite you to take a fresh look on how a well-maintained turbocharger can boost your energy savings (page 15). We also received an Industry Project Award for our high-pressure formaldehyde technology, **FORMOX**™ 2.0, at the IChemE Global Awards. Although evaluation of our first plant with this new technology has been delayed due to the pandemic, we look forward to bringing you more news about its performance in coming issues. Finally, always vigilant when it comes to hazards, we want to share with you some of what JM has been up to over the last year in the area of Process Safety (page 8).

As always, we look forward to our next contact with you, whether it be through Teams or our first webinar, details on page 3, until we meet again in person.

Lars Andersson and Ronnie Ljungbäck
Global Market Managers Formaldehyde

Content

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IChemE award for **FORMOX** 2.0

After a challenging 2020 we were delighted to end the year on a high as we scooped the Industry Project Award at the 2020 IChemE Global Awards for our high-pressure formaldehyde technology, FORMOX 2.0. The IChemE Awards celebrate excellence in chemical, process and biochemical engineering and are widely considered to be the world's most prestigious annual chemical engineering awards.

You might have followed the progress of our **FORMOX** 2.0 technology through previous editions of Informally Speaking. Commercialisation of this novel approach to formaldehyde production has been achieved via comprehensive catalyst and process technology development and an extraordinary team effort, resulting in the first commercial, full-scale reference operating since the end of 2019.

Formaldehyde is a strongly growing market and we continue to maintain our leadership position through our ability to innovate, improve efficiency, and increase productivity of our plants. That's a significant challenge in a mature technology space, so we are extremely proud to have received this recognition from IChemE for **FORMOX** 2.0

Hopefully this is only the first step on a journey where our power-saving turbocharger technology design, along with refinements in plant design and improved catalysts, will enable our customers to produce formaldehyde meeting every need whilst also improving sustainability.

You can read more about our **FORMOX** 2.0 technology in the Winter 2017/2018 and Winter/Spring 2019 issues of Informally Speaking. To learn more about the IChemE Global Awards you can visit www.icheme.org.

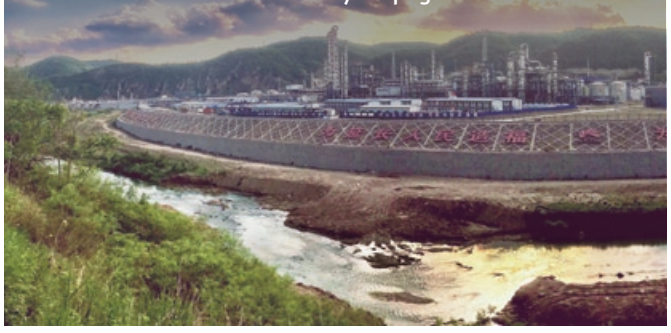
BY

Nicole Watson
Marketing Communications Representative

On the front page:

BDO and formaldehyde surge to new heights as new regulations for degradable plastic material take effect in China

Read more about this story on page 12



UPCOMING CONFERENCES

In keeping with guidelines during the ongoing COVID-19 situation, our regular Formaldehyde conferences are on hold for now - but please join our webinar **'Optimising formaldehyde production through changing business requirements'** on 11 May 2021 - email here for info/to register.

JM-LEVO Formaldehyde now launched with premium features for optimising production

As many of you know, commercial launch of our new digital Portal was during under the latter part of last year. Here is the latest update on where we are at the time of this article being published, and what we look forward to as more and more of you begin to use it.

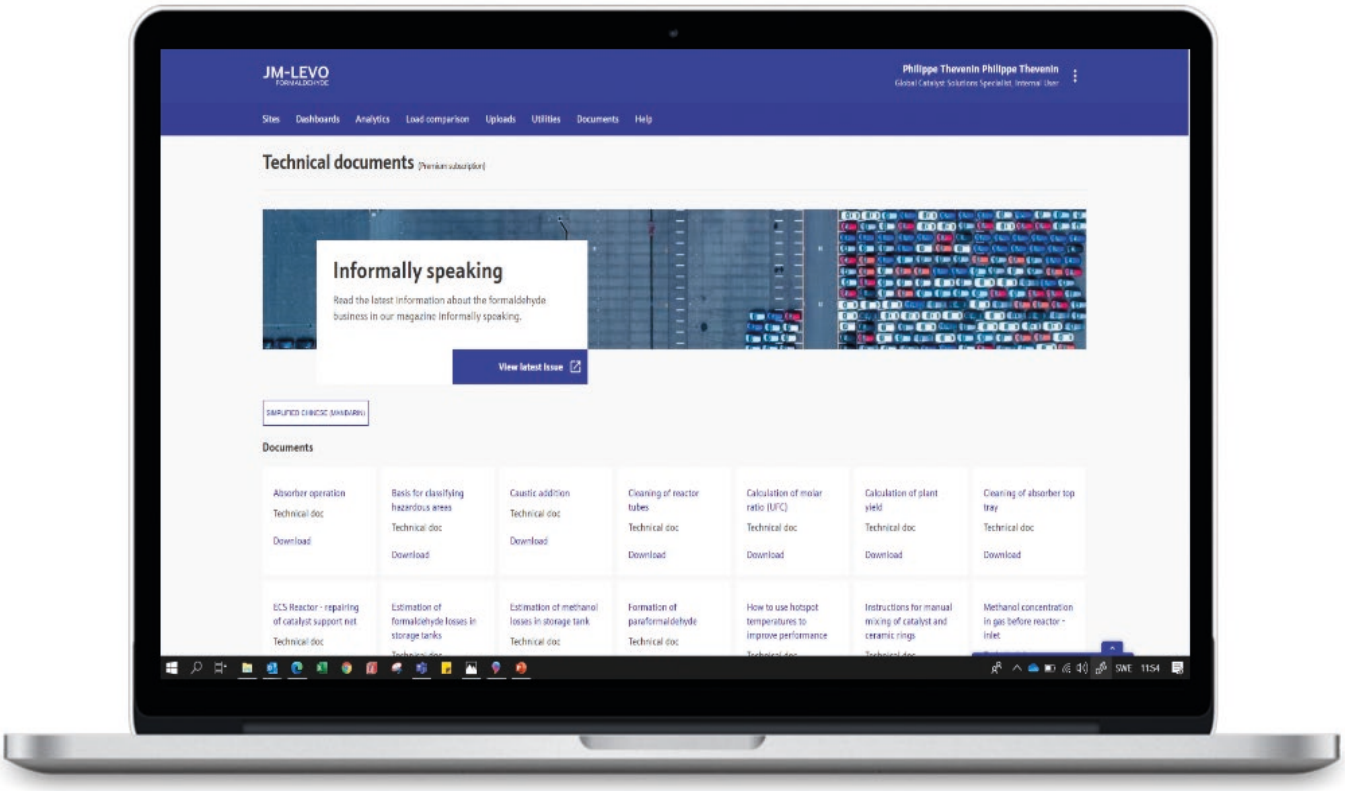
Development of the Portal is part of the growing trend towards more data-based tools and automated solutions that customers are asking for. So to make sure it would address relevant needs, we asked a few customers to take part in pilot trials during the development process. With the aid of the input and feedback they provided, we have since launched our first commercial release, version 1.0, which includes a number of core features described below.

Many benefits available in Version 1.0 - Premium Level

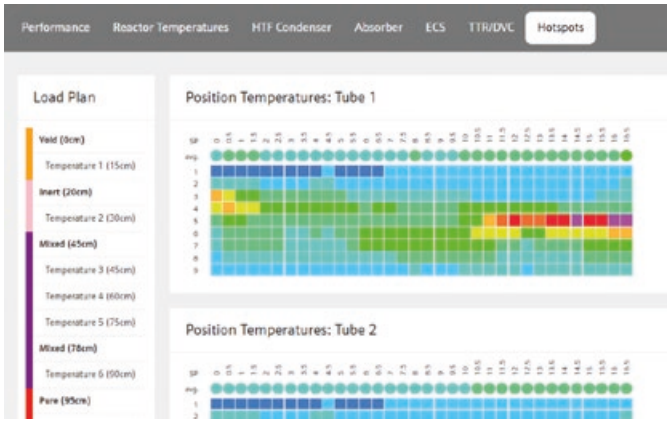
One of the most beneficial features is a new machine learning tool that helps you to optimise the performance of your plants, especially when conditions change. Another is the ability to compare and visualise key metrics between previous loads

(historical), allowing you to make use of a wealth of historic data. Direct Variable Cost (DVC) and Time-to-Reload (TTR) calculations are also incorporated into the Portal, providing you with additional insights in your operations, making it easier for you to manage your formaldehyde (or UFC) production.

The TTR calculation is a forecasting tool similar to some autonomous capabilities now being built into cars. It helps you to pinpoint the most optimal time to replace the catalyst based on a number of parameters and performance data, focusing on the production economy. The DVC calculation shows you your cost



for producing one tonne of formaldehyde and displays fluctuation over a two week period. Other features include multiple data-driven visualisations (dashboards) that enable you to see data in new and more efficient ways. You can also search for our helpful Technical Information documents available in both English and Chinese language, plus soon to include Russian language copies.



Roles and access

Each user is assigned a role within **JM-LEVO**, e.g. Global Manager, Site Manager or Plant Manager, that determines which areas within the Portal the user can view. The Global Manager role is intended for a person who is overseeing multiple sites. The Site Manager will have access to a specific site only. And the Plant Manager will be focusing on a single plant. Your JM representative will get in touch to walk you through these different roles. You will then be able to define the most appropriate roles for the different users within your organisation so that they can get the most benefit from the Portal in their daily work.

Looking ahead

The development of the **JM-LEVO** Formaldehyde Portal continues and we encourage those of you already with access to provide feedback on existing features as well as to give specific suggestions for what additional functionality would be of interest to you. If you do not yet have access, please get in touch with your JM representative; they will be able to give you more details and can also run a demonstration of the key functions.

Some of the features we are working on, to incorporate into future releases, include items such as direct export of DCS (Distributed Control System) data to the Portal, two-way communication, a Global Manager dashboard (multi-site dashboard) as well as visuals for steam production and power consumption. Of course, in addition to the FAQ and Help menu within the Portal, you will also find an updated User Guide describing the various features and functions and helping you to navigate in the Portal.

Follow JM on LinkedIn for further updates or contact Philippe or your Regional Sales Manager or Technical Support Manager if you have any questions.

BY

Dr Philippe Thevenin
Global Technical Services Leader – Formaldehyde

Providing technical support from home

A day in the life of Alex

Alejandro "Alex" Perez is a Regional Technical Support Manager and a familiar face to many of you. Early after the pandemic hit he, like most people, had to adapt to a whole new situation which meant working from home.

"It was hard at first," he says, "getting used to meeting customers and colleagues digitally rather than in person. I miss the connection of meeting people in the workplace, but after a while I found I was actually able to have more frequent contact and meetings with customers than I was before. It's not that we didn't have these capabilities before the pandemic, but no one was using them. Before it was much more contact via e-mail. Now we talk to each other."

Alex's job is to help customers out when there is something that they need. "There were times at the start of the pandemic when some customers I spoke with said they were having trouble procuring certain supplies or spare parts from suppliers who couldn't deliver. We were able to help them get what they needed sooner, which was a great feeling," he says.

> "Before it was much more contact via e-mail. Now we talk to each other!"

"At one point people were saying, 'I wonder what things will be like once this is over,' as we have been able to provide a lot of support via Teams and having customers send us photos via e-mail. And we now have the **JM-LEVO** Formaldehyde Portal as well, so customers can get a lot of info and support directly that way. But I still see the importance of meeting customers face-to-face, and I look forward to getting back to that."

Instrument errors are not always wrong

It is very easy to think that all instrument values shown on the screen are absolute truths when operating a formaldehyde plant. The truth is, however, that all instruments have an inherent error in the reading. It is possible to spend more money to get more accurate instruments, but the error will only be smaller, it will never go away completely.

The good news is that extreme accuracy is seldom needed in order to operate a formaldehyde plant in an optimum way. It makes very little difference if the reactor inlet temperature is 209.5°C or 209.61°C. Normally, it is the approximate value and the trend that is used for controlling the process.

However, there are a few instances when the accuracy matters a lot. Flow meters that are used for cost calculations is one. A deviation of 1 % could result in significant differences when operating a plant over 10 years.

Comparing small differences is another. A typical example is comparing the methanol to formaldehyde yield in two separate plants. If we have an instrument error of ±0.4 % on both the methanol flow meter and the product flow meter, and both plants have the same true yield of 92.0 %, then the DCS readings could still, in the extreme case, show 91.2 % for one of the plants and 92.8 % for the other. One plant manager happy, the other not so happy, getting the same real performance.

Consult the documentation

The maximal allowable error should always be given when specifying instruments for applications where the accuracy needs to be high or well known. Data on the instrument error can typically be found in the instrument documentation supplied by the instrument manufacturer. It is important to see if the error is on 'measured value' or on the 'full range'. The 'full range' type will give a higher error (in %) at the lower part of the range. The error should always be used so that it is applicable for the measured value. The error will often also depend on the temperature and the pressure, and compensation factors for that will be given in the documentation. The factors will typically be larger if the operating conditions deviate a lot from the calibration conditions.

Calibration can be done for a flow meter, but it is only done in one point at the time. The more points that are used during the calibration, the better accuracy can be achieved. Typical calibrations are zero calibration, two-point calibration (zero and max) and three-point calibration (zero, max and in-between). The calibration will not eliminate the error completely, but it will make sure that the instrument accuracy stated in the documentation is met.

Note that these are not the only factors that may affect the instrument reading. Other typical errors include, for example, loss of signal strength in the signal wires.

Conclusion

It is important to understand that instrument error does not mean that there is something wrong with the instrument. It is just a way of describing its limitations.

Instrument error = Instrument reading – True reading

BY

Ola Erlandsson
Senior Process Specialist

JM elevates Process Safety to new heights

Customers who have followed the history of the FORMOX process know that process safety has long been one of our topmost priorities. But ensuring safety is a never-ending task... Over the past year almost everyone at JM in Perstorp has joined thousands of fellow JM employees across the globe to learn more about how what each of us does in our work has the potential to save lives.

"That's been a really big takeaway for me," says Mergim Pacolli, one of the youngest and most recent additions to the team of process engineers at site Perstorp. "Seeing how a small design flaw can have such devastating consequences years later, really made a strong impression on me."

Mergim is part of the Process Group that recently completed new, in-depth and organisation-wide process safety training. He's referring to a fatal incident, outside of JM, that took place years ago in the U.S. and is one example used in the training to illustrate what can happen when things go wrong. "The training made it very clear just how big a responsibility each of us carry and how we always have to do everything we can to make these processes safe."

Huge investment by JM

"This new process safety training is a really big initiative by JM," explains EHS Advisor Anette Björk. "It's a huge investment just in terms of the massive number of hours devoted to training around the globe." Anette has been working at JM as part of the formaldehyde production team for about nine years, three as the Process Safety Lead for the Perstorp site. Part of that role is to ensure that every one of her co-workers is able to complete a series of specially developed training modules and discussion sessions focusing entirely on process safety. Both Anette and her counterpart in the UK, Rob Tanfield, Process Safety Engineer Group EHS, say that a lot of emphasis has also been placed on leadership.

"The training is tailored to be relevant for everybody in their respective role. It's not just for operators," says Rob, "but for everyone all the way up to the CEO. For many, it's a refresher. For others, it's new, and it starts with awareness of what Process Safety is and why it is of high importance."

Developed by the CCPS

The training includes various topics as detailed in a process safety model developed by the Center for Chemical Process Safety (CCPS), a membership organisation within the American Institute of Chemical Engineers (AICHe).

"Many times, we focus a lot on occupational safety in an operation unit since these risks are seen more frequently," says Anette. "Although the process safety incidents are rare, the

JM's Global Process Training

- Part of a refreshed, global strategy for JM businesses involving high hazard processes
- Based on historical and well-documented accidents from the Chemical Industry
- Shows links to historic legislation passed as a result of major incidents
- A huge investment in training hours for entire organisation, including leadership
- A significant percentage of JM employees worldwide have completed the training so far

Anette Björk, Process Safety Lead Perstorp

Lars Schüler, JM Process Safety Lead

"We need to stay vigilant, think about the hazards and make sure we have an efficient management system in place to control those hazards."

consequences can be extremely serious, so we need to stay vigilant, think about the hazards and make sure we have an efficient management system in place to control those hazards."

"In the end it's about a philosophy," adds Anette, "a way of thinking that affects how we approach everything from our impact on the environment and people, to equipment, emissions, redundancy, and so on."

Staying one step ahead

Anette has recently been joined by her long-time colleague, Lars Schüler, to assist as Process Safety Lead for the R&D department. Lars is a Senior Lab Engineer and has over 25 years at the Perstorp site, most of them in R&D.

"In our work we have to continuously stay one step ahead. So when I hear someone saying they don't think certain types of accidents could ever happen, it's actually an acknowledgment that we're doing what we're supposed to be doing." Lars has been pleased with both the scope of the training provided and the response of his co-workers. "In my experience," he says, "it's a lot about helping people understand how easy it is for things to go wrong. It's been an eye opener for many," he says, "and a lot of good discussions have come out of it."

Lorentz – A familiar face to many

Lorentz Rensfelt, Electrical & Automation Engineer, has been working with or at JM Formox for over 20 years. Thanks to his involvement in the commissioning of numerous plants around the world, his is a recognisable face to many customers.

"Process Safety has been a part of our culture here since long before I started back in '98. And with every commissioning I've been a part of we have always brought our way of thinking about safety to our customers. Customers these days are generally very much onboard when it comes to how to think about safety. It's a big difference compared to 10 years ago."

As examples of steps taken over the years to make plant designs safer, Lorentz mentions things like solutions for containment of chemical spills, evacuation routes to ensure there are always two ways in and out, firefighting precautions such as inert gas injection, and venting mechanisms to prevent a potential deflagration from escalating to a more serious explosion.

Fredrik – Behind the designs

Fredrik Lövgren is Senior Mechanical & Piping Engineer and has been at JM Formox for six years, the first four working at the catalyst plant in Perstorp. Prior to that he worked within the nuclear power industry.

"The training was a very good refresher, and a reminder that what we do here can also have an influence on the safety of our customers"

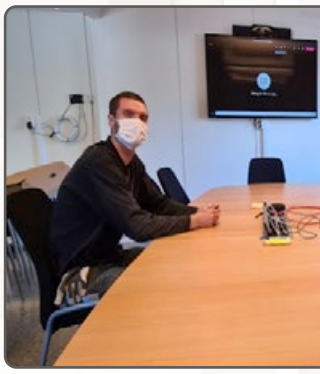
"The training was a very good refresher, and a reminder that what we do here can also have an influence on the safety of our customers. One way is by encouraging those of us involved in plant design to rethink some things and to make sure that whenever we design something, we do not introduce anything into the design that might turn up as a safety risk later on – that we eliminate risks already in the design as early as possible. The course led to some good discussions between me and my co-workers about how we design things, and that is very positive."

In a year where Zoom, Google Meet and Microsoft Teams became a part of our daily lives, we invite you to zoom in and...

Meet our Teams

Operations 1

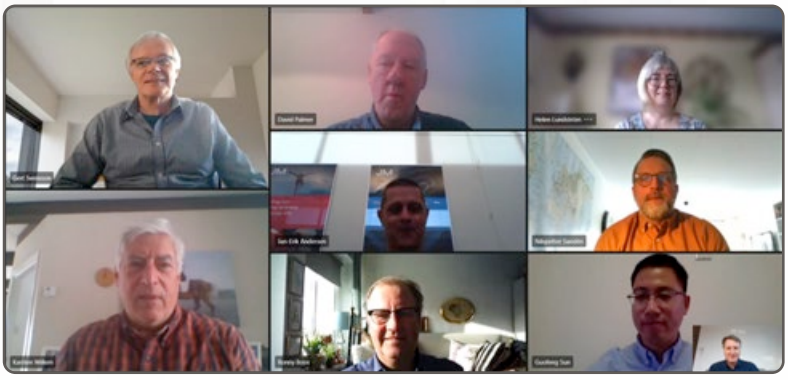
Process



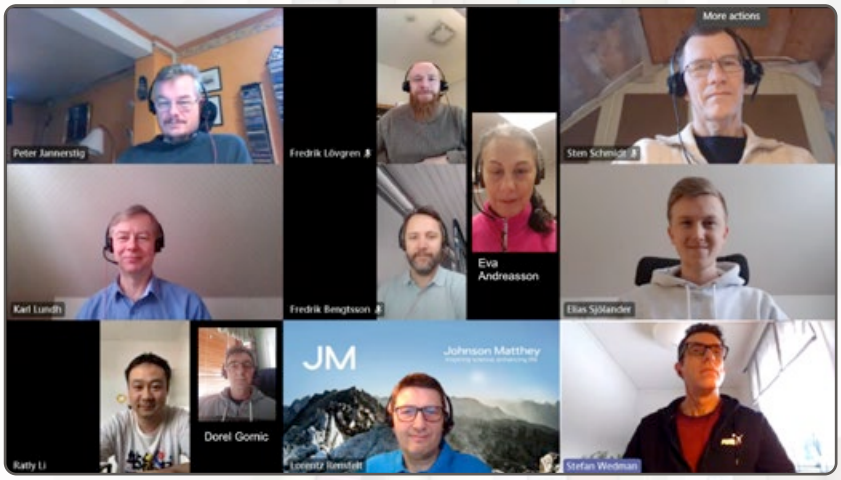
Operations 2

Finance, HR & IT

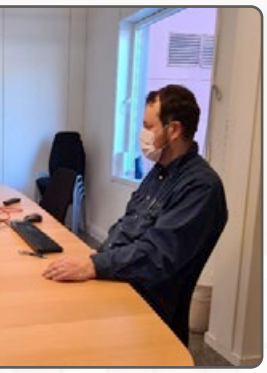
Operations 3



Projects



Engineering



Commercial

R&D

BDO and formaldehyde surge to new heights as new regulations for degradable plastic material take effect in China

With growing demand for sustainable packaging and the urgent need to address environmental issues such as marine plastic pollution and plastic waste disposal, degradable material is finally becoming a viable alternative to conventional plastics.

A major step in this direction was recently taken when China, one of the world's biggest users of plastics, unveiled a major plan and new policies to reduce single-use plastics across the country. The new regulations will be phased in during 2020-2025. One major step in this direction, effective as of last year, was a ban on the use of non-degradable plastics in major cities (Beijing, Shanghai, Tianjin and Chongqing). The regulations will be extended to most towns by the end of 2022, and to all regions by 2025.

The impact is also significant for the industry, as biodegradable plastic alternatives are still limited and expensive. According to GCiS China Strategic Research, total domestic sales of biodegradable plastics in China equalled about 135,000 tons in 2016. However, the production capacity for biodegradable plastics was beyond 600,000 tons, most of which was exported to western countries. To put this in perspective, consider that gobal use of plastics for single-use items is around 500 million tons per year, of which approximately 0.5% is bioplastics and only half of that is degradable (Source Bioplastics 2020.2025, Dr Michael Dent).

Four million tons new capacity

The prospects of the new regulations are causing companies in China to ramp up production of biodegradable plastics, adding an estimated annual capacity of 4 million tons by 2025. At the same time, the new, stringent regulations imply a reduction in plastic consumption, which could create significant implications for the plastic value chain, but the situation is not yet clear. The economics associated with the production of biodegradable plastics show that it has yet to achieve desirable economies of scale and cost competitiveness.

Another concern is that whilst biodegradable plastics are decomposed by living organisms, most require specific industrial treatment at high temperature to be degraded. Left in landfills under normal conditions, the material can take much longer time to break down. Thus, in order to cope with the expansion of biodegradable plastics, China will not only need to add new required composting capacity in its cities. It will also need to develop the infrastructure necessary to ensure 'end of life' and consumer routes for transporting biodegradable packaging to the kinds of industrial facilities capable of processing it.

Bioplastics and biodegradable polymers

Bioplastics are derived fully or in part from biological and renewable feedstock known as biomass, typically starch or cellulosic. More than 20 groups of degradable plastic polymers exist. However, bioplastics are not necessarily biodegradable.

Bioplastics and bio-based polymers utilise the chemical or biological refinement of biomass to produce a polymer. These differ from fossil-fuel based as the feedstock is renewable.

The various polymers are typically defined in the market and produced on a commercial production scale as belonging to one of three major types:

(I) Partially degradable starch blends, or PSM (Plastarch Material)

(II) PLA (polylactide)

(III) Polybutylene-based polymers, e.g. PBS (polybutylene succinate) and PBAT (polybutylene adipate terephthalate)

Starch blends are readily degradable natural polymers but have poor water resistance and mechanical strength. They need to be blended to improve performance and reduce cost, e.g. TPS (thermoplastic starches). However, the need for blending typically reduces their degradability.

PLA is derived mostly from biomass sources but relies on feedstock such as corn starch, sugar cane, etc. It offers acceptable mechanical and thermal properties and is renewable, but is biologically degradable only at elevated temperatures, typically as in commercial composts.

PBS & PBAT: PBS can be derived from partly natural and partly fossil-based resources, and is produced from succinic acid, 1,4 butanediol (BDO) and an organic component. PBS may have difficulty finding its way due to the limited viability of succinic acid. PBAT is derived from adipic acid, 1,4 butanediol and terephthalate. Its main advantage is that PBAT is a fully degradable alternative to conventional LDPE. Another advantage is that production of PBAT can utilize general polyester production technology.

PHA (Polyhydroxylalkanoates) produced from microbial fermentation mainly using sugar. The restriction for wide commercialization and industrialization of PHA is the high cost.

PCL (Polycaprolactone) typically used degradable polyurethanes.

It is not likely that we will see one single strategy for reducing the volume of plastic waste. Biodegradable alternatives is one route, and so far the response has been explosive growth driven by the new legislation that took effect in China's major cities last year and will be in effect nationwide by 2025. However, the transition to industrial scale production is still not straightforward; lack of public awareness and willingness to pay more for a 'greener' product hampers demand. Other parallel strategies for keeping plastics out of landfills and the environment include reusable packaging systems and reductions in overall plastics use.

The outlook for BDO and formaldehyde

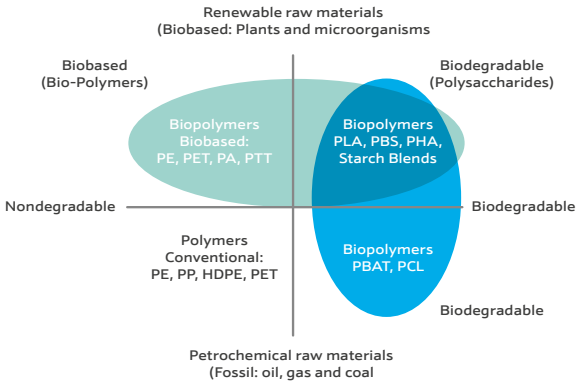


Figure 1: Interrelation between biodegradable and conventional plastics

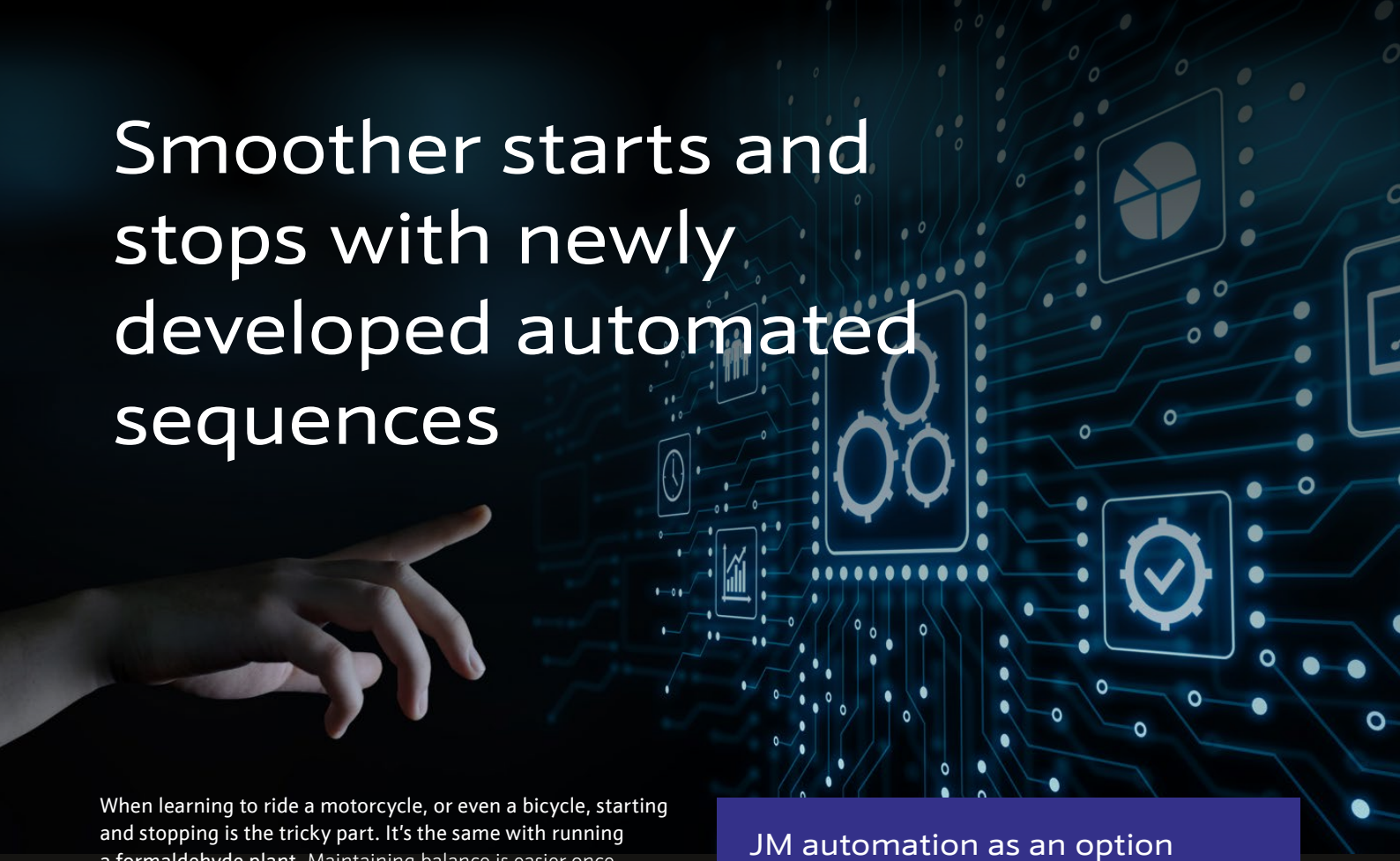
As it looks today, PBAT material and PBAT composites are the most promising candidates as they combine the excellent biodegradability provided from aliphatic polyesters with other good properties from aromatic polyesters. Many products based on PBAT have already been applied into fields such as shopping and garbage bags, tableware, mulch film etc., and more applications for PBAT are under development.

As 1,4-butanediol (BDO) is seen as the main route for PBAT in China, the demand for BDO is expected to increase significantly, causing the domestic market price for BDO to surge. According to a recent BDO conference in Tianjin, growth in the demand for BDO and PBS is expected to exceed an additional 2 million tons by 2025. This in turn is expected to create higher demand for formaldehyde in China in the coming years.

BY

Lars-Olle Andersson
Business Lead
Formaldehyde China

Smoother starts and stops with newly developed automated sequences



When learning to ride a motorcycle, or even a bicycle, starting and stopping is the tricky part. It's the same with running a formaldehyde plant. Maintaining balance is easier once everything's rolling smoothly along. Simon Smrtnik, Associate Specialist Formaldehyde Process, along with his colleagues in the project department, Victor Åberg, Lukas Olsson and Marko Ristovic, have been working over the past year with a number of projects involving automated sequences for starting and stopping a **FORMOX** plant.

"These sequences are all designed to make things much easier, if possible safer, and more reliable for the customer," says Simon. "Each sequence is unique and varies in complexity depending on certain customer conditions as well as on factors such as whether the plant is used to produce formalin or UFC."

Automated start of UFC production

For one part of the project, an automated sequence to better manage the risks associated with transitioning to UFC mode has been developed. The sequence begins with starting up the plant in Formalin mode. It then introduces urea to make the transition to UFC mode, which is a very pH sensitive operation.

"This part of the process always involves a risk of solids building up in the absorber," explains Simon, "something that could have severe consequences for the equipment. The automated sequence is designed to ensure that doesn't happen by carefully monitoring various parameters including pH and temperature. This is made possible with the help of specially selected instruments dimensioned to withstand the harsh conditions, usually placed inline. Temperature is a particularly important parameter, as it has a large influence on the water balance in the absorption tower."

"The sequence automatically monitors, applies the brakes when necessary, and makes all the right adjustments to bring operation to its optimal state," says Simon. "Once that is done, the continued operation is controlled manually."

JM automation as an option

JM can provide expanded automation functionality as an option to the standard plant portfolio. The automation package includes an automatic start-up and shutdown sequence where the DCS controls each step in the sequence with a minimum of operator interaction.

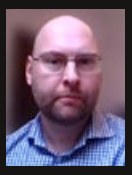
The smoother the facility, the greater the need for automation

Ironically, the smoothest running plants are sometimes the best candidates for introducing automation. In plants that experience more frequent stops and starts, operators tend to be better trained and skilled at starting and stopping manually. Conversely, in plants that rarely experience interruptions in operation, the staff may not be as well prepared for manually starting it up again in the fastest, safest and most optimal way.

For further information about our automation solutions please contact Fredrik Rietz at Fredrik.Rietz@matthey.com or Lars Andersson at Lars.Andersson@matthey.com.

BY

Charles Hodgdon
Editor



Simon Smrtnik
Co-author

A well-maintained turbocharged plant provides greener, more cost effective production

It's been a while since we've written about our turbocharger solution, an innovation that was first launched more than ten years ago. A lot has happened since then, and many lessons have been learned along the way following some early challenges. One that cannot be emphasized enough is the importance of proper care for the turbocharger and its optimal operation in order to generate the expected high-power savings.

As always, for achieving energy savings it is important to keep the pressure drop low in the process gas system. The pressure drop derives from actual piping and vessel configurations and cannot be significantly lowered during operation aside from the inherent dependency on the process gas velocity and the system pressure. In a turbocharged plant, however, it is particularly important to strive for keeping the pressure drop as low as possible over the oxygen control valve (see figure 1). This is to ensure that no unnecessary pressure resistance is introduced in the process gas circulation loop as compared to a plant with no turbocharger. Let's take a look at why this is so.

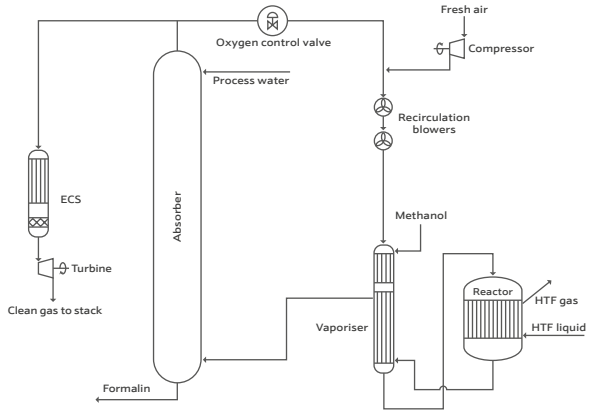


Figure 1: Location of the oxygen control valve in a turbocharged plant

Free compression and less energy when done right

The energy used to circulate the process gas originates from the electrical power to the fans, resulting in process gas momentum. Therefore, any additional pressure resistance added over the oxygen control valve, which, in a turbocharged plant is placed in the circulation loop, results in increased usage of fan electrical power. This reduces the power-saving margin that a turbocharger adds in comparison with a conventional plant that uses an electrically driven pressurisation blower.

Thus, a turbocharged plant should ideally be operated by striving to keep the oxygen control valve as open as possible and leaving the oxygen control to the turbocharger's VTA (variable turbine area). Moreover, higher power savings are generated when the plant is operated at higher pressure, as it is costly to compress the air feed with a pressurisation blower, but free with a turbocharger.

The Turbocharger solution

- 15 turbochargers currently in operation
- At full plant capacity the expected savings with the turbocharger ranges from 17 to 21 kWh/MT37FA depending on the pressure drop over the oxygen control valve
- Continuous development together with PBST

The combination of open oxygen control valve and a high methanol inlet, i.e. a higher methanol ratio for a constant process gas flow for a given input of electrical energy, results in the highest savings. At full capacity operation at a system pressure of 1.5 bar, the expected savings with the turbocharger ranges from 17 to 21 kWh/MT37FA depending on the pressure drop applied over the oxygen control valve. Here, every increase in pressure drop of 10 mbar reduces the savings by approximately 0.5 – 1.0 kWh/MT37FA.

Long-term gains and continuous development

Like many advanced technologies, a turbocharger needs to be carefully maintained for it to function in an optimum way and provide the type of payback and long-term gains that make it such an appealing and sustainable solution to begin with. Our experience shows that customers who give it the right amount of care and attention can benefit from a robust machine with high electrical power savings. At the same time, we continue to work closely with PBST to develop the turbocharger solution further. A good example are enhancements to the VTA control, which allows charge air delivery to be precisely and continuously optimized to demand at all loads and speeds.

For more information about our turbocharger solution, please contact Simon Smrtnik at Simon.Smrtnik@matthey.com, Nilspetter Sandén at Nilspetter.Sanden@matthey.com, or your Regional Sales Manager.

BY

Charles Hodgdon
Editor

Simon Smrtnik
Co-author

In a time of a pandemic, things have slowed but not stalled

In a year heavily impacted by the pandemic, the formaldehyde industry is no exception. We can see its influence on the market as a whole, as well as on individual projects. I think all of our ongoing projects have been impacted in one way or another. There are examples of projects where the activities have been paused for some time, and for others where activities have been postponed. We have also been forced to carry out several project activities from a distance that we normally would have done on site.

This of course created new challenges for the project teams. Start-up of plants and technical support has been provided from a distance. But despite these challenges, we are happy to report quite a lot of start-ups during the year and significant progress with ongoing projects – see updated list of projects and start-ups.

What will the future hold?

From a market perspective, we experience that some investment projects have been put on hold due to the uncertainty following the pandemic. On the other hand, we can see that formaldehyde demand has increased again and in several regions is back to the same high level as of a year ago. Currently the number of new requests for increased capacity is fewer than normal, except in China. As we hear on the news and from customers and colleagues in Asia, the Chinese economy is growing significantly, which is reflected in the need for more formaldehyde capacity. Also biodegradable plastics (see article on page 12) is a relatively new area of formaldehyde applications that we believe may very well lead to increased demand.

BY

Fredrik Rietz
Global Commercial Licensing Manager Formaldehyde Plants

From left to right: Three fine examples of FS3/FT3 plants recently started in China during the pandemic; Shaanxi Yanchang Petroleum, Hubei Yihua, and Shangdong Shengquan

New Projects

- A client in Sichuan Province, China has signed an agreement for an FT3 plant.
- A client in Fujian Province, China has signed an agreement for an FT3 plant.
- An agreement for an FS3 plant to Russia has been signed.

Ongoing projects

- The project with a **FORMOX** FT3 plant in Henan Province, China has been shipped and installation is ongoing.
- The project with an Emission Control System to a client in China is in the construction phase.
- The FS3 plant to a client in Europe is in the design phase.
- The project with two plants, FS3 & FT3, to Xuzhou Yuanfeng New Material Tech. Co., Ltd., China is proceeding well with installation.
- The FT3 plant to Wanhua Chemicals Group Co. Ltd. in Yantai, China, their third **FORMOX** plant on this site, is in the construction phase.
- The FT3 plant to Wanhua Chemicals (Ningbo) Co. Ltd. in Ningbo, China, their third **FORMOX** plant on this site, is proceeding well with construction.
- The project with Inner Mongolia Jiutai New Material Co., Ltd. in China is in the construction phase. The formaldehyde plant will have an annual capacity of 1,500,000 tonnes per annum and will be among the largest single site facilities for formaldehyde production in the world.
- The FT3 plant, built in Qinyang Yongrun Technology Development Co., Ltd, Qinyang city, Henan province, China, signed with China Chemical Sedin Ningbo Engineering Co., Ltd is approaching the commissioning phase.
- Works on an FS1 plant to a client in Southeast Asia is in the design phase.

Start-ups

- The FT3 plant for Oilfield Gas Chemical Technology Co., Ltd of Shaanxi Yanchang Petroleum (Group) Co., Ltd in Yan'an City, Shaanxi, China was successfully started in September.
- The project with revamp of a pressurisation unit to a client in China was implemented last autumn.
- The project for an FS3 plant for Hubei Yihua New Material Co., Ltd. went on stream in November.
- The FT3 plant to Shangdong Shengquan New Material Co., Ltd, China, was successfully started in February, 2021.

NEW FACES

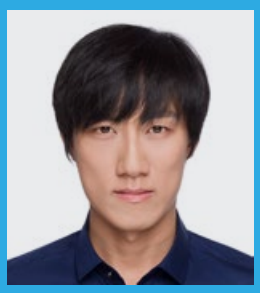
Perstorp

Heidi Hallenborg
Supply Chain Coordinator

Jimmy le Hegarat
Production Manager,
Catalyst Plant

Beijing

Wilson Wang
Head of Project



George Zheng
Project Planner

Mo update

Though we did not comment on molybdenum pricing in the previous issue, that does not mean that nothing has happened. Since the start of the pandemic in January 2020, the price dropped almost 40% before it hit bottom around 7 USD/lb in July 2020. Since then, the price has gradually increased and reached 12.5 USD/lb by late February 2021. And the only way is up, or?

When the pandemic made its impact last year, demand for molybdenum slowed considerably. This was due in part to falling oil prices, which dealt a blow to the oil and gas sector, one of the largest end users. A general slowing down of construction and infrastructure projects was also partly responsible. As a result, the price of molybdenum fell, causing a few primary mines to close. However, the combination of a still strong demand and record imports from China has kept a decent demand up during 2020.

> "Looking ahead, the outlook for molybdenum is bright, with growth in demand expected to be well above 3% over the next 5 years"

Looking ahead, the outlook for molybdenum is bright, with growth in demand expected to be well above 3% over the next 5 years according to various analysts. One indicator they base this on, aside from the industries already mentioned, is the major shift towards electric cars that lies ahead for the automotive industry. And because molybdenum, like formaldehyde, is quite versatile, its usage in lubricants, fertilizers, electronics, inks and of course, catalysts, provides more optimism. The portion of recycled molybdenum is also expected to increase, which is in line with how we at JM have been working with spent catalyst for decades.

During 2021 and after the pandemic, due to the good demand outlook from before, the price is expected to continue rising, probably up to levels around 13-14 USD/lb, before falling back during the later part of 2021. That is, if output from existing mines will be sufficient and/or new capacity will come on stream as expected. What may of course influence the price is a possible booming demand post-Covid, but also available stock levels and, to some extent, seasonal variations.

I would expect the price to hover between 10-12 USD/lb during most of 2021, and possibly to rise to around 12-14 USD/lb in the later part of the year. Especially if we see a kick in demand during the second half. Otherwise, it will likely remain around 10-12 USD/lb until end of the year.

This is my present view, and as usual we always do our best to keep net prices as stable as possible no matter what fluctuations are occurring on the market. And of course, you also play an important role in keeping catalyst prices stable by returning spent catalyst, in good condition and according to our specifications, to our catalyst recycling facility!

BY

Ronnie Ljungbäck
Global Market Manager
Formaldehyde Catalysts

TRAINING

Customer personnel at two new projects receive training

JM conducted onsite training for two teams in China in August of 2020; the first in Zhijiang City, Hubei province, and the second in Zhangqiu City, Shandong province

A formaldehyde magazine from Johnson Matthey

The newsletter Informally Speaking aims to provide information about formaldehyde in an informal forum and is published twice annually by Johnson Matthey for its customers and contacts in the formaldehyde business. The information included herein is part of our customer service and in no way entails or implies any undertakings, legal responsibilities or liabilities.

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Inspiring science, enhancing life

Simplify your formaldehyde production with **JM-LEVO**

Managing your plant operations and formaldehyde production as conditions change can be a challenge.

The **JM-LEVO**™ Formaldehyde Portal provides you with the tools to efficiently monitor, adapt and optimise your processes in line with changing priorities and business requirements. The Portal demonstrates our commitment to make formaldehyde production simpler for producers and operators worldwide.

The portal was built after listening and understanding the key challenges faced by formaldehyde producers. It allows you to:

- improve performance and optimise operations as business conditions change
- enhance data sharing methods and automated reporting
- receive instant recommendations and insights supporting optimal plant operation
- gain access to our expertise and wealth of technical documents
- lean on historic data and proprietary models to reduce risk

Please contact us at formox@matthey.com for more information

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