JM

Johnson Matthey
Inspiring science, enhancing life

Informally speaking

A formaldehyde magazine from Johnson Matthey

- Sustainability: Is your ECS doing its job?
- Introducing two new large capacity plants
- Kanoria's winning formula
- From 6000 to 200 ppm - A success story
- Projects set new record in 2024

AUTUMN/WINTER 2024

Back to normal

In our previous issue we spoke a lot about growing optimism, but the picture has since taken a slight downward turn. We now see some regions with slower growth, the wars in Ukraine and Gaza are still not resolved, and the outcome of the COP29 meeting was not particularly positive. The US elections have also caused some uncertainties regarding world trade and how the US will position itself with regards to ambitions for achieving net zero emissions. In other words, everything is more or less normal. Sometimes they are looking up. Sometimes down. And as usual, the ability to adapt to new situations is what really matters.

Looking back we are proud to find that we have set a new record with 2.8 million tons 37 wt% formaldehyde capacity with **FORMOX**™ technology started up in 2024! That surpasses our second-best year, 2023, when 1.5 million tons were started up. Another positive related to our formaldehyde industry is that our catalyst plant expansion in Perstorp is almost completed when writing this leader, which matches very well with our ambition to grow with the market needs. Look for more on this in the next issue. We are also happy to bring you more information about our two new designs for large capacity plants on page 4.

As for growth, it is pleasing to see that Kanoria, a long-time customer in India continues to grow while also focusing on energy-saving and decarbonisation initiatives. You can find their story on page 12, where Mr. Ojha, Chief of Manufacturing & Projects, also praises our **JM-LEVO**™ Portal.

On that note, it is great to share that our ongoing development of the Portal continues, creating value for both you and us as it allows us to support you much more precisely and quickly, be it regular performance optimisation or troubleshooting. On page 10 you can read how we have now made it very easy to share data in a totally automated and secure way.

In addition, a new architecture has been implemented during 2024 that now enables us to better serve our customers in our fastest growing market, China.

In this issue you will also find a success story from our Technical Service, who was able to assist NCSP, a previous "non-customer" in Saudi Arabia that was experiencing a serious issue with formic acid. It is really pleasing to receive this good feedback from Mr. K. Sivasankaran, Plant Manager, and to have won NCSP's trust to become a customer of ours.

Opposite you can read about JM's newly announced Nature Strategy. Along these lines we strongly recommend two articles on pages 6 and 8 about the Emission Control System and how to ensure that it is operating well and contributing to a cleaner and more sustainable world.

Looking ahead, we will be asking for your feedback in our biannual survey which will be conducted in the spring/summer of 2025. We encourage you to participate in the survey as it helps us in our continuous improvement work and to focus on the areas which we need to prioritise and also benefit you.

Lars Andersson and Ronnie Ljungbäck
Global Market Managers Formaldehyde

Finally, we look forward to continuing to serve you and we also hope to connect either in person somewhere in the world, at our upcoming conferences, or in the personal meetings between our teams. Here's to an exciting 2025 for all of us.

Content

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This document is printed on Essential silk paper, which contains material sourced from responsibly managed forests and is Elementary Chlorine Free (ECF). We are helping The Woodland Trust and The Woodland Carbon scheme, which aims to improve the landscape of Britain by planting more trees and protecting our national heritage of precious ancient woodland.

Johnson Matthey announces **Nature Strategy**

Johnson Matthey (JM) recently announced its new Nature Strategy, outlining the company's commitments and actions to minimise its environmental footprint, promote circularity, and enhance the local environments and communities where it operates. The strategy sets ambitious goals for the responsible use of natural resources and reinforces JM's commitment to restoring biodiversity.

As part of the strategy, JM focuses on reducing the ecological impact of its products, technologies, and global operations through targets that aim to reduce waste, conserve water, increase recycling, and implement biodiversity protection plans at local sites. Today, JM is proud to share these commitments as a central element of its long-term sustainability vision, highlighting its responsibility to protect fragile ecosystems and natural resources.

Commenting on the launch, **Anne Chassagnette, JM's Chief Sustainability Officer**, states:

"We are fully aware of the impact our products, technologies, operations and supply chain have on nature. To reflect this, we have set ourselves ambitious targets for our operations. I'm delighted to launch this new strategy which confirms our commitments as a responsible business to sustainability, circularity, and the long-term future of the planet."

> **"We are fully aware of the impact our products, technologies, operations and supply chain have on nature"**
>
> **Anne Chassagnette, JM's Chief Sustainability Officer**

This strategy will see JM working closely with partners, Non-Governmental Organisations (NGOs), and key stakeholders to ensure its commitments are both measurable and adaptable as environmental policies and expectations evolve.

To learn more about Johnson Matthey's Nature Strategy, read the full statement

Watch the full nature strategy launch film

BY

Nicole Watson
Marketing Communications Representative

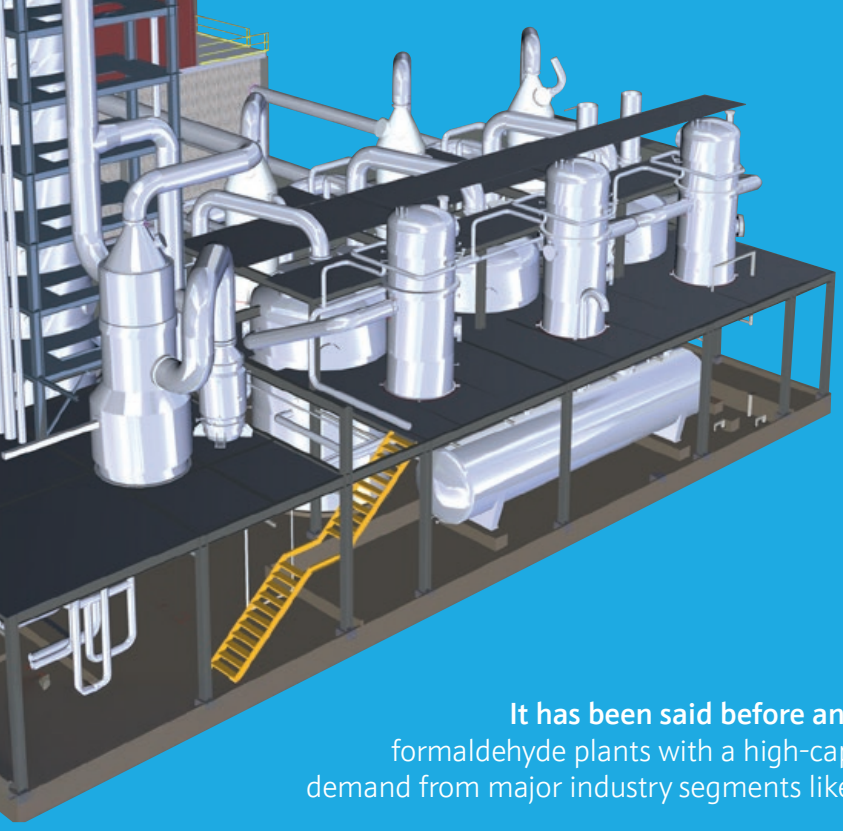
On the front page:

Projects has a 'big' year - read more about this on page 14.

Upcoming conferences...

Formaldehyde Europe,
20-22nd May - Helsingborg, Sweden

Formaldehyde Americas,
Autumn 2025, date to be announced soon



Introducing new plant designs for large capacity demand

It has been said before and it's worth saying again: We see a clear trend for formaldehyde plants with a high-capacity output for a single location to meet growing demand from major industry segments like construction, automotive, textile and agriculture.

Historically this has not been the case due to the problem of transporting high concentration formaldehyde longer distances. That is why formaldehyde is produced relatively close to the downstream consumers. This problem remains, but the constantly increasing demand for formaldehyde downstream products is driving development and constant striving towards more sustainable, efficient and large-scale production.

Knowing that large scale of things generally also means lower cost through more efficient utilisation of materials and land, it is not surprising that we now see increasingly large downstream plants becoming more common. To meet the need of these larger downstream (BDO, POM, MDI, polyol, etc.) plants, we have expanded our plant portfolio with two new members.

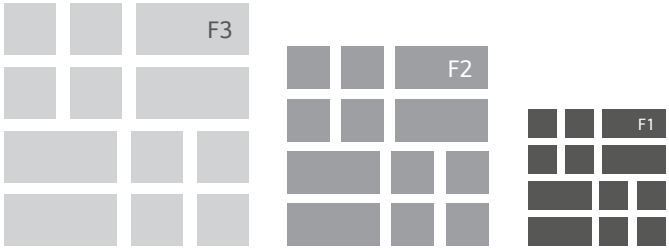
You might have first read about the FY3 and FX4 plant designs in the previous issue of Informally speaking where our Global Commercial Licensing Manager, Fredrik Rietz, gave a first glimpse at these new giants. Now we have come further in the work with the new designs, and we can give you more important details, such as dimensions, capacities and flexibility.

Standard plants

We have worked successfully with our standard plant concept ever since it was first introduced in the 1990s. Three standard sizes of reactors with their associated peripheral equipment configured in a similar fashion regardless of reactor size. For sizes 2 and 3, twin reactor plants share common equipment such as absorber and ECS (Emission Control System), which are sized for the total capacity. We have essentially kept this philosophy for the FY3 and FX4 plant designs, meaning that you will get well proven, reliable, high performance **FORMOX** technology also in our latest designs.

The new FORMOX members

The FY3 is designed with triple size 3 reactor lines sharing one common absorber and one ECS, which means these two vessels are in fact new and will handle the total capacity for all three reactor lines. The plant layout is, as you can understand, a bit



Since the 1990s we have offered standard plants using proven designs with equipment from evaluated and approved vendors

different from the normal FS/FT layouts. The staircase has been simplified, meaning less material is needed, but the safety and accessibility aspects have not been compromised. The large capacity absorber is designed to keep it transportable with no need for major on-site assembly. The common HTF tank serves all three reactor systems utilising one pump and one electrical heater.

The FX4 is configured entirely with standard size 3 equipment and has a more traditional layout. Thanks to the two absorbers, the FX4 has tremendous flexibility, making it possible to operate with only one reactor. It can be installed with three reactors initially, adding a fourth reactor at a later stage when more capacity is needed. This plant design grows with your needs.. The modular layout provides for easy add-ons when your business and capacity needs expand.

Plant design	Capacity* range [mtpd]	Footprint [m]	Reactor lines	Absorbers	ECS
FY3	500-1250	35 x 42	3	1	1
FX4	300-1670	38 x 48	4	2	2

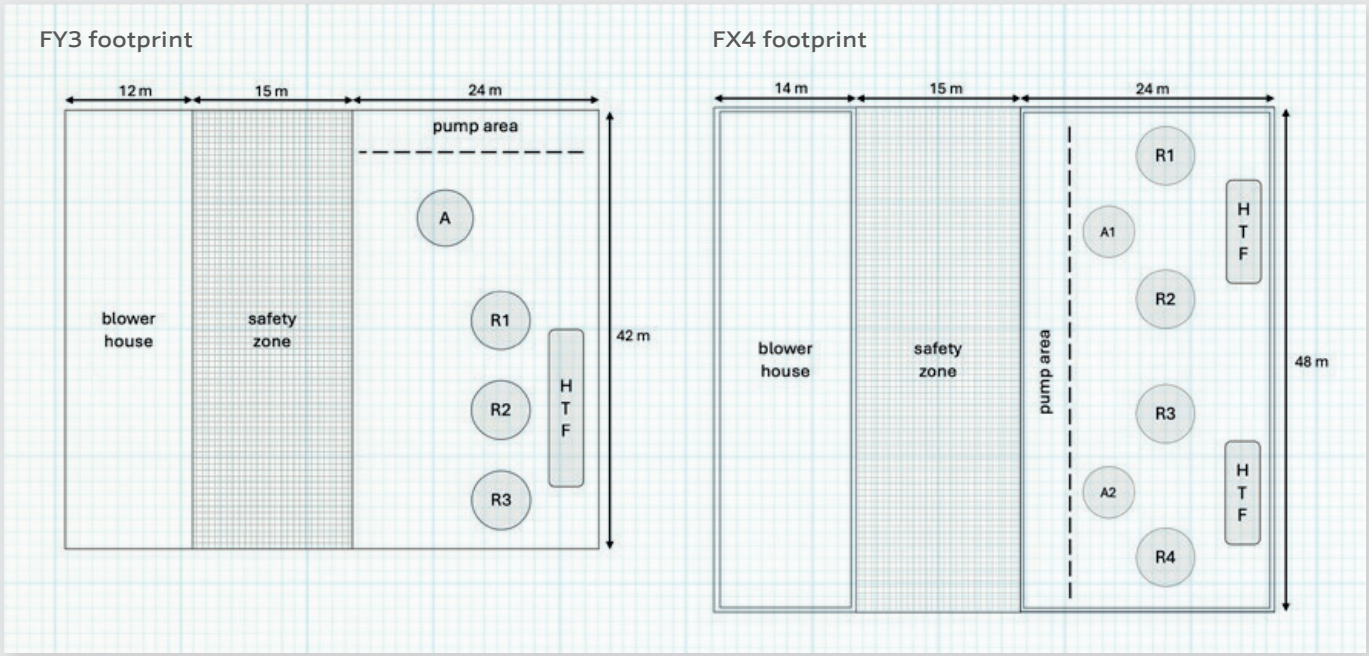
* Capacity 37 wt% formaldehyde

Options:

- Powersaving by using turbocharger for pressurisation
- Steam pressure to fit site conditions
- Setup for max or min steam output
- Superheated steam suitable for turbine operation

The FY3 plant with three reactor systems side by side, along with a common absorber, ECS and HTF tank

The FX4 plant has four reactor systems, two absorbers and two Emission Control Systems



The layouts show the FY3 and FX4 plants with the extra 15 m distance between the plant area and the blower house, which is necessary for China.

Bigger is better

Both the FY3 and FX4 offer high outputs, well-suited for the latest demand from downstream producers. We have catered for the possibility to reload one or more reactors during operation, which further increases flexibility. In comparison with other standard size plants, these larger capacities and compact designs require a smaller total footprint and lower total CAPEX to build. In these respects, big is better.

We are very proud to now have the FY3 and FX4 plant designs in our portfolio and we will continue to develop our plant concept and adapt to market needs as we strive to keep our leading position also in the future. If you are interested and would like to know more about the two latest members of the **FORMOX** plant portfolio, please contact your JM representative or myself.

BY

Lars Andersson
Global Market Manager
Formaldehyde - Plants

ECS in focus

Why stack emissions may be higher than they should be

Being able to show authorities that emissions at your formaldehyde plant are sufficiently low is becoming increasingly important. In some regions it may even be a prerequisite for being allowed to operate the plant at all.

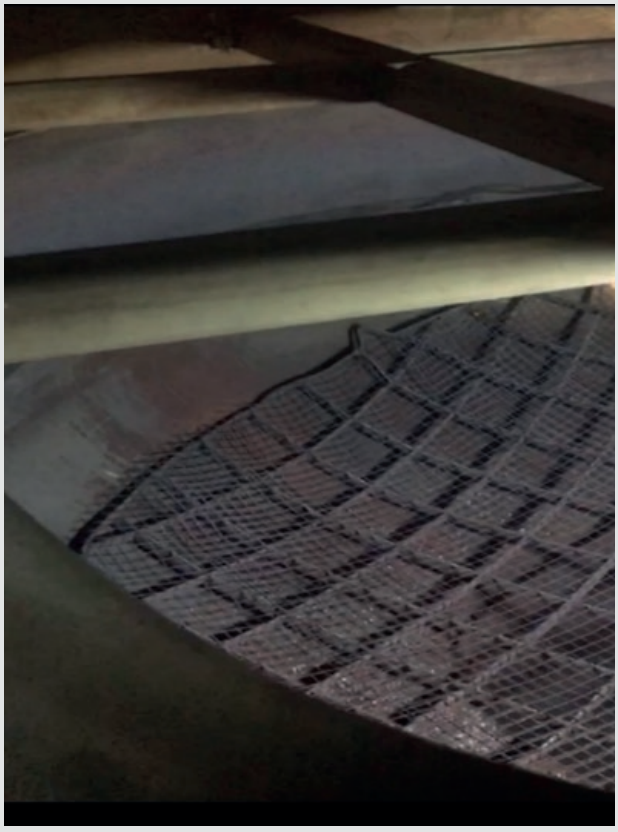
For this and other reasons, all **FORMOX** formaldehyde plants come equipped with an Emission Control System (ECS). Nonetheless, there are scenarios where your ECS may not be performing as well as it could or should be.

The ECS in a modern **FORMOX** plant consists of a shell and tube preheater and a catalyst bed. The size of the bed needed is based on the volume gas flow. This means that if more gas is added to the system, the amount of catalyst must be increased.

Plants pressurised with a fan or a blower are less sensitive to pressure drop and can have a deeper catalyst bed and a smaller cross section area compared to non-pressurised plants or plants with a turbocharger. In some instances, additional waste gas streams from other processes can be added to the ECS to help minimise the site's overall emissions.

Proving ECS performance

The performance of your ECS can be shown by reporting ECS delta temperature, single point measurements or continuous monitoring. If your ECS is not performing as well as it should be, here are some of most common causes to be on the lookout for:



Collapsed overheated net

Disturbed two-layer catalyst bed

1 High temperature increase over the catalytic bed (ECS delta temperature)

The maximum temperature in the ECS is set by the vessel design temperature. A high ECS delta temperature, i.e. well above 300°C, will limit the preheating temperature before the bed and this can affect the conversion over the catalyst. The high ECS delta temperature can be caused by poor main reactor optimisation (poor yield), poor absorber performance, or high concentration side streams. Palladium catalyst is less sensitive to the preheating temperature and can be used as a first layer in the catalytic bed.

2 Leaking ECS preheater

The concentration of pollutants to the ECS is much higher than the acceptable levels in the stack. Even a small leak in the shell and tube heat exchanger will affect the ECS performance. It is recommended to leak test the ECS preheater with fixed intervals.

3 Holes in catalyst net

A hole in the net will result in a hole in the catalytic bed. More gas will escape uncleansed through the hole due to the low pressure drop and the stack emissions will be affected. We recommend inspecting the catalytic bed during every reloading of the main reactor. It is also recommended to inspect the lower safety net on turbocharger plants to find possibly leaked catalyst before it gets into the turbine. The net should always be carefully inspected before adding new catalyst to the empty ECS.

4 Disturbed bed (rat hole)

Flow spikes can move the catalyst around. When this happens, the gas will find the spot with the lowest level (lowest pressure drop) and continue to move the pellets. A "rat hole" can be formed having the same effect as a catalyst net hole. It is important that the bed is even and if a hole is found then it must be dug out to make sure that there is not any damage to the net.

5 Contamination

Flooding in the absorber can reach the catalyst in the ECS and form ash layers on top of the bed. The ash can be removed with a vacuum cleaner. Other pollutants can reach the ECS catalyst through the fresh air intake. Sometimes these pollutants can be removed by running the catalyst at a high temperature, or by washing it with pure water, but this should not be done without first consulting with JM. A catalyst change is needed if the problems remain.

If you are uncertain about how well your ECS is performing or experiencing any of the above problems, you are always welcome to discuss it with your JM Technical Service representative.

BY

Ola Erlandsson
Senior Process Specialist

Would upgrading your ECS help meet tighter requirements on emissions?

The answer depends on several factors, but for some formaldehyde producers the answer is very likely "Yes". In this article, we take a look at why you should consider it, and what such a decision can involve.

Fast developing legislation

In most countries and regions in the world, legislation on emissions reduction is developing fast as the requirements for greenhouse gas (GHG) emissions from all sectors of society are tightening. For producers of formaldehyde, this may mean having to update production facilities and abatement systems to fulfil future demands. Currently in Europe, the catalytic Emission Control System (ECS) is considered as Best Available Technology (BAT) for managing emissions from a formaldehyde unit.

Long experience of upgrades and replacements

JM has for decades offered customers various ways to upgrade their existing plants. Lately the ECS, an integral part of the **FORMOX** formaldehyde process for many years now, has come more and more into focus due to tighter requirements on emissions.

Background

Historically, upgrades and complete replacements have been carried out for a variety of reasons, including:

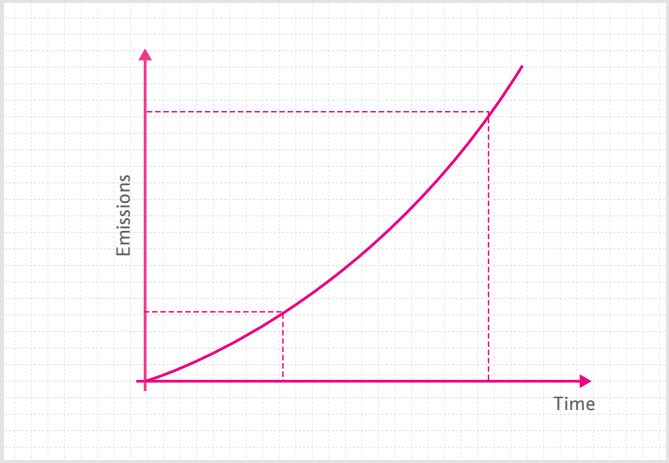
- to replace individual vessels or entire ECS unit due to age or malfunction,
- to add an ECS to plants not equipped with waste gas treatment,
- to increase unit capacity,
- to improve emission efficiency,
- to equip unit with energy recovery,
- to include additional energy functionality such as steam superheating,
- to incorporate more waste gases from sources such as HTF and tank farm venting.

Step one

To give the customer the best possible support, and depending on the type of upgrade, JM will usually propose a feasibility study before an upgrade offer is made. The aim of the study is to identify bottlenecks and required modifications, and also to find the most cost-efficient way of reaching the objective of the ECS upgrade.

Important considerations

Depending on the required maximum allowable emission levels set by the local authority, there are different ways to meet the requirements. At a given amount of catalyst, production rate and typical levels of pollutants, the emission levels after the catalyst bed are a function of catalyst lifetime. The stricter the requirements, the shorter the time becomes before the maximum allowable levels are reached.



In practice this means more frequent reloading. If more catalyst space is available in the ECS reactor, the frequency between reloading can be increased by adding more catalysts.

However, more catalyst means higher pressure drop which in some cases can be a restriction.

If incorporation of other waste gases is applicable, apart from the issue of catalyst volume, the customer will also have to think about the flow, pressure, temperature, composition and concentration of pollutants of the new streams in consideration. Most importantly, the customer will also have to ensure that the new streams are safely below the lower explosion limits.

How JM can help

JM has a long and solid history in providing customers with flexible and reliable solutions for abatement of waste gas from formaldehyde production. Our technology is designed and implemented to minimise environmental impact and is approved in all countries with leading environmental legislation.

If you are interested in learning more about how to upgrade your abatement system at your plant, please contact your local JM representative.

BY

Claes Lundström
Senior Consultant -
Plant & Revamp Sales

JM-LEVO tips and reminders

How to get the most out of the **JM-LEVO** Formaldehyde Portal

Did you know that...

Since the first launch of JM-LEVO Formaldehyde in 2020, we have continuously engaged with the increasing number of users to ensure that the developments are meeting the expectations of our customers.

One item that is brought up time and again is the process for uploading data. Most users have quickly developed a smooth process to extract data from their Distributed Control System (DCS) into the template that is to be used to upload the data on the Portal (Figure 1). However, some seem to struggle with this and do not share the data as frequently, as the "manual" upload of the spreadsheet is considered too time consuming. Others are finding it difficult to prioritise among other plant-related activities.

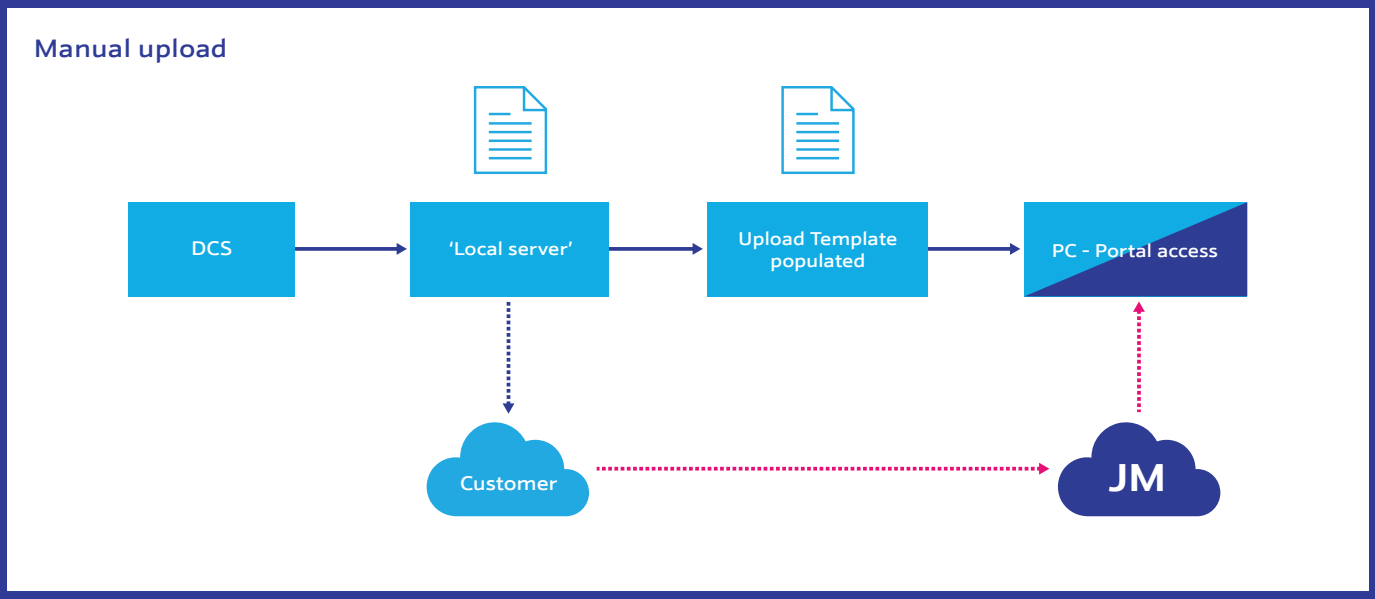


Figure 1: Flow for data extraction from DCS to **JM-LEVO** Formaldehyde Portal via manual upload template

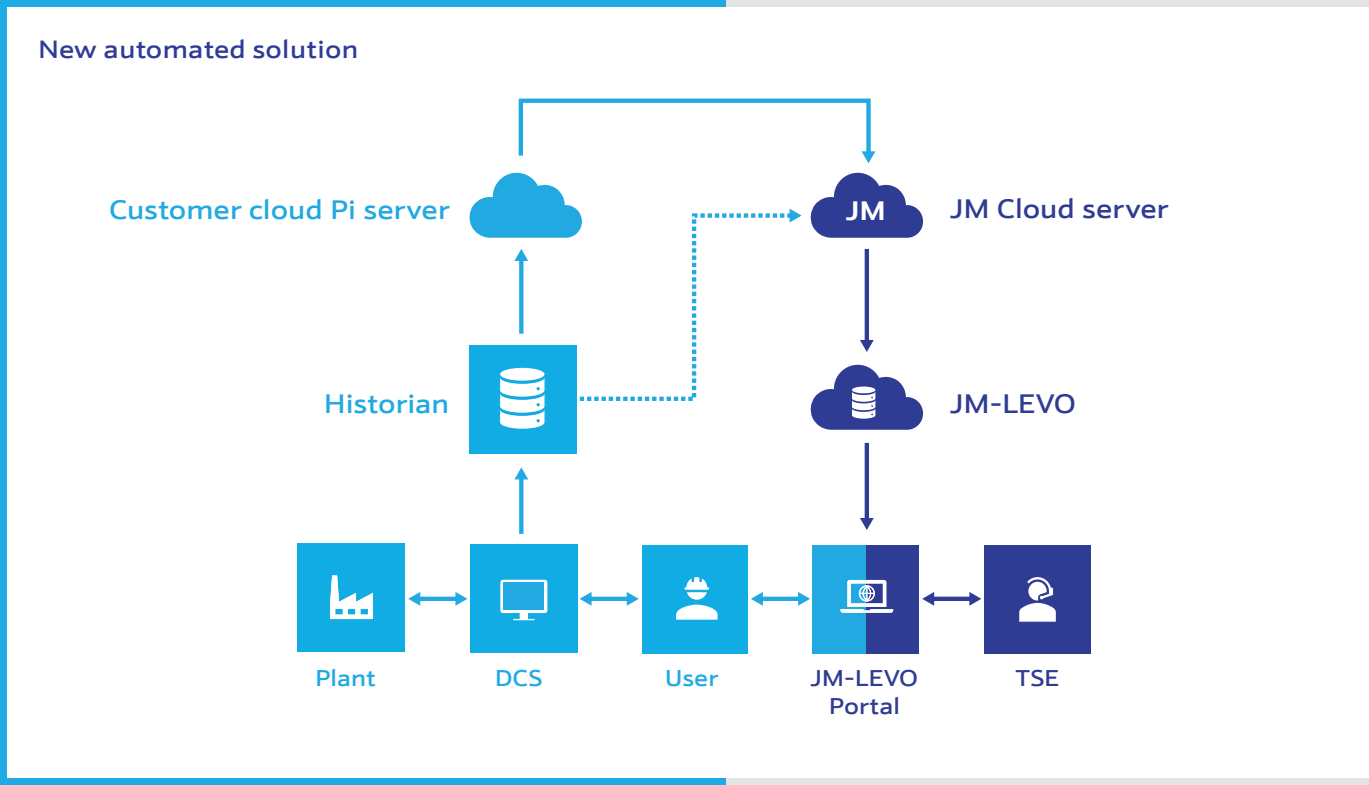


Figure 2: New, fully automated ADI solution with secure, mono-directional flow of data extracted from DCS to **JM-LEVO** Formaldehyde Portal

New ADI solution

To address this obstacle, we have developed a new solution that enables Automatic Data Ingestion (ADI), with no manual procedure (Figure 2). Once the data sharing process is set up, it becomes fully automatic. Of course, the user remains in full control and can modify any aspect of the process at any time. This includes changing the parameters to be shared and the frequency of the data exchange, as well as stopping or pausing the process.

The data flow is mono-directional, which means that the data are only transferred FROM the user TO the Portal. There is no information that is pushed from the Portal (or JM-Cloud) to the user's system. This solution replaces the manual upload of the data spreadsheet.

Alternative solution

Another solution for securing the extraction of the data from the DCS to your internal network can also be discussed. We have developed an architecture together with a DCS supplier to access DCS data in a secure way. The data can then be uploaded to the Portal, either via the manual upload, after populating the spreadsheet template, or via ADI and "cloud connection". This will depend on your internal architecture and where the data related to the operation of your formaldehyde process are stored, i.e. on a local server, a local computer, in the cloud, etc.

If any of the above solutions could be of interest, please do reach out. We would be happy to set up a short call with both our IT Solution architect and IT Development expert that could explain our solutions to your IT colleagues. We will be able to provide any technical details of this solution as well as to answer any questions or concerns that you may have.

BY

Dr Philippe Thevenin
Global Technical Services Leader – Formaldehyde

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

At Kanoria Chemicals in India, sustainability, safety and innovation all add up to success

Kanoria Chemicals & Industries Ltd. is a leading manufacturer of chemical intermediates and specialties in India, with a focus on products for infrastructure and construction. The company has a long-standing association with JM dating back to 1988, when discussions began for a first formaldehyde plant at the Ankleshwar site using **FORMOX** technology. The plant was commissioned in 1990 and, in the years since, five additional **FORMOX** formaldehyde plants have been commissioned at various sites across India.

"We operate three chemical manufacturing facilities specialising in the production of alcohol-based intermediates and Phenolic Resins," says Mr. Sanjay Kumar Ojha, Kanoria Chemicals' Chief of Manufacturing & Projects - Chemical Business. "We also have diversified business interests in automotive and industrial electronics and textiles."

Safety plus innovation...

Mr. Ojha says the company's facilities are state-of-the-art and strategically located near ports and consumption centres to optimise logistics, which enables cost-effective, high-quality production. He is also pleased about their strong emphasis on safety and on research and development for both processes and products:

"We are proud of our world-class manufacturing practices, advanced automation, and exceptional environmental, health, and safety standards. Our Ankleshwar facility also houses an R&D centre recognised by the Department of Scientific and Industrial Research, further solidifying our reputation for innovation."

"We are proud of our world-class manufacturing practices, advanced automation, and exceptional environmental, health, and safety standards"

... plus sustainability...

Over the years, the company's commitment to sustainability has been widely recognised, making it one of the few companies in India awarded the Responsible Care certification.

"Kanoria Chemicals is deeply committed to sustainability and has implemented a range of energy efficiency and decarbonisation initiatives," says Mr. Ojha. "By embracing renewable energy sources such as solar, wind, and hybrid power, we aim to reduce our environmental impact while enhancing operational efficiency. We also prioritise water conservation, waste management, and sustainable sourcing of raw materials, aligning with global sustainability goals. These efforts are part of a continuous drive to enhance our green footprint while remaining competitive in the marketplace."

Mr. Sanjay Kumar Ojha and JM's Mohamed Khire-Dinn during a meeting in August, 2024

About Kanoria Chemicals

Founded in 1960, Kanoria Chemicals & Industries Limited is a market leader in formaldehyde, hexamine, acetaldehyde, pentaerythritol and has a significant and growing presence in phenol formaldehyde resins. Its chemical manufacturing facilities are located in Ankleshwar (Gujarat), Visakhapatnam (Andhra Pradesh), and Naidupeta (Andhra Pradesh.) In addition to holding key certifications including ISO 9001:2015, ISO 14001:2015, ISO 45001:2018, and RC 14001:2015, the company proudly carries the Responsible Care Logo awarded by the Indian Chemical Council.

The Kanoria Chemicals team outside its newly commissioned **FORMOX** Formaldehyde plant in Ankleshwar

... equals success

Today, the company has a strong presence in the western, southern and eastern regions of India, and Mr. Ojha says that the cooperation with JM over the years has brought several benefits:

"Kanoria Chemicals has greatly benefited from JM's advancements in formaldehyde technology, including the latest catalyst developments and optimised loading services.

We have also been utilising the **JM-LEVO™** Formaldehyde Portal for several years and have found numerous benefits, including streamlined access to plant parameters and prompt analysis. The Portal has proven to be a vital tool in ensuring efficient plant operations."

Looking ahead, the company is planning an expansion into the northern region of India as well, with a focus on introducing a variety of new products to the market.

BY

Mohamed Khire-Dinn
Regional Sales Manager
METIA

Mr. Sanjay Kumar Ojha
Kanoria Chemicals Chief of Manufacturing & Projects - Chemical Business (CM&P-CB)

Projects has a BIG year

In the previous issue of Informally speaking we introduced our entire Projects department, team by team. In this and coming issues, we want to shed some light on why this group of people represent one of the biggest differences for customers between JM and the competition.

To begin with, the work they do is complicated. Making sure an entire formaldehyde or UFC plant is properly designed, built and installed according to specifications, regulations, and customer or site-specific requirements, is no easy task. Neither are revamps or upgrades. There is plenty of room for error, especially with today's increasingly tight deadlines to consider. And when things don't work out as intended, the people who do this complex work also need to be on top of their game to make it right.

And that's just the work that customers see. Behind the scenes they do so much more. Like supporting the Licensing Team in technical discussions, conditions, scope and customer related questions prior to contract negotiations. Or assisting Technical Service for solving issues that might arise long after a plant has been started up. Not to mention the internal collaboration with R&D that will ultimately impact future projects.

Turbocharger a perfect example

This edition of Informally speaking is full of good examples of this type of "behind the scenes" contributions. Whenever JM introduces technology or improvements designed to help customers achieve better and more sustainable production, you can be sure that the Projects department has had something to do with it.

"Our job is not only carrying out the many ongoing projects that customers have ordered," says Stefan Wedman, head of JM's Detailed Engineering team, "but also to come up with ways, based on our experience with those projects, to improve the technology and performance moving forward."

As the perfect example, Stefan mentions one innovation now in its second generation:

"Fifteen years ago JM was the first to introduce the Turbocharger. But it didn't just appear. It was preceded by years of figuring out whether or not it was a good idea, as well as how to do it. And after introducing it we have spent more years figuring out how to make it better too, which we have done with the new generation."

According to Stefan, one productivity-boosting idea often leads to another, which is definitely the case here.

"Fifteen years ago JM was the first to introduce the Turbocharger. But it didn't just appear. It was preceded by years of figuring out whether or not it was a good idea, as well as how to do it."

"The turbocharger paved the way for developing our High Pressure Plants," he says. "And that has in turn paved the way for designing even larger plants. The plant shown on the front cover is one of the largest we've built to date and is a precursor to the new even larger FX4 design to come."

In August, veteran Karl Lundh (left) handed over leadership of the Mechanical & Piping team to Fredrik Bengtsson before heading into retirement

One of the largest formaldehyde plants produced to date, in Nantong, China

A BIG year

One thing that everyone in the department can absolutely be proud of is all the new capacity that Projects was instrumental in starting up during a record 2024.

"It's been an incredible year," says Jonas Lindborg, Chief of Projects. "As of early December, we've started up 2.8 million tons of 37 wt% formaldehyde capacity!" According to Lars Andersson, Global Market Manager Formaldehyde – Plants, that represents a new record for capacity using **FORMOX** technology started up in a single year. The previous record was 1.5 million tons, set in 2023.

Record or not, this achievement is a tribute to the work done by the various Projects teams already prior to this year just to design and coordinate so much new capacity, as well as during the year to ensure that it all went online according to schedule.

Great collaboration pays off

In the Spring/Summer edition we showed a photo of one of these projects in which three plants at the same site were all started up within just a few weeks. That is also something that's never been done before. All three are turbocharged FT3 plants, and the feedback from the customer could not have been better.

"We got a very high score in the customer survey for that project," says Simon Smrtnik, head of the Process Engineering team. "The customer gave us a perfect 5 out of 5 for all things related to documentation, project meetings, delivery and shipping, equipment, installation, commissioning and start-up – which of course is highly satisfying."

Both Stefan and Simon agree that the Project team in Beijing deserves a huge amount of credit for this and for all the other plants that they started up during the year. Including the one in Nantong, Jiangsu Province, China, which is one of the largest ever built and extra challenging.

"For that project," says Stefan, "we delivered earlier than we thought we would have to, which made it more complicated. The commissioning was a big and important collaboration between the Beijing team and our teams here in Perstorp."

Members of the Projects team during one of the plant start-ups

With many more success stories to write about, look for more from the Projects department in the coming issues of Informally speaking.

BY

Charles Hodgdon
Editor

How JM's Technical Service helped one customer overcome a tough formic acid problem

The National Company for Sulphur Products Ltd., or NCSP, is located in Saudi Arabia and recently became one of JM's newest customers. But JM's story with NCSP actually began years ago. Mr. K. Sivasankaran, Plant Manager at the company, spoke with us about the company, the first interaction with JM, and about a tough problem with formic acid that they were finally able to solve with the help of JM's Technical Service department.

Background

NCSP was established in 2000 to provide quality sulphur products at competitive prices for meeting the growing domestic and regional demands on chemical products. It has since set up two industrial complexes, one in Riyadh and a much larger one in Dammam. Production is focused mainly on sulphuric products such as sulphuric acid, sulphonated products and sulphur bentonite, but they also produce a wide range of resins and other formaldehyde products.

More about NCSP

The National Company for Sulphur Products (NCSP) was established in 2000 with the vision to build unique chemical plants to produce prime chemicals, utilising technologies from renowned producers and local raw material resources. Throughout the past decade, NCSP had established a 32,000 m^2 industrial complex in Riyadh and a 152,000 m^2 complex in Dammam, each incorporating multiple production plants and reactors producing a wide range of products.

The challenge

In 2017 NCSP began work on a greenfield project that was completed in 2021. The project involved a formaldehyde plant of a non-**FORMOX** design from another vendor, using catalysts from another vendor as well. Following a catalyst reload, NCSP soon discovered problems. Measurements showed that the product contained high amounts of formic acid, as much as 6,000 ppm (!) already at start-up. NCSP suspected that the catalyst was the cause.

Help from JM

Mr. Sivasankaran called to mind the time he attended a JM formaldehyde conference on Bali, in 2023, where he connected with Philippe Thevenin, JM's Global Technical Services Leader – Formaldehyde:

Mr. K. Sivasankaran, Plant Manager, NCSP

"We were invited to join the conference even though we were not a customer of JM as we had chosen another plant design from start. Everyone at the conference was very welcoming and it was a much different experience than other industry conferences. There I met Philippe and had a good conversation with him."

"The plant has been running smoothly ever since we started it up again and solved the problem in early 2024"

NCSP's Dammam plant team

Based on that experience, Mr. Sivasankaran contacted JM to see if they might be able to help with the formic acid problem. Alejandro Pérez (Alex), Principal Technical Service Engineer, took the lead.

"Alex performed a lot of technical analysis. Ola Erlandsson and Birgitta Marke were also very helpful," says Mr. Sivasankaran. "On the supply chain side, Katarina Andersson also got involved and followed our progress every day, providing support when needed."

Identifying the cause

Questioning whether the catalyst could be the cause, it was analysed by a local firm as well as by JM. The results from both were more or less the same: no contamination was found, the catalyst had aged normally, and therefore it was unlikely to be the cause of the problem.

The next step would be to reload the reactor with catalyst from JM and to perform a series of measurements. But first, an inspection had been carried out and had revealed a number of various deposits as well as signs of rust. NCSP cleaned the affected areas before the JM catalyst was loaded.

Following start-up of the plant, which was now loaded with new catalyst from JM, high levels of formic acid were once again found. Therefore, it did not appear likely that the catalyst was the root cause. At that point, JM asked NCSP to take several samples from different points in the plant and analyse the formic acid levels to try to pinpoint where exactly it was being formed.

Analysis showed that the cause may instead have been a result of the cleaning measures that were used in one section of the plant, where formic acid content showed to be significantly increased. Given the particular design and materials used in that section, the normal cleanser was having an undesirable effect on certain components, which in turn led to an adverse reaction following start-up.

The solution

JM then suggested an alternative, multistep cleaning procedure which included oxalic acid for the affected section of the plant. The procedure was implemented, and a successful result was confirmed immediately upon start-up, showing a more normal level of just 300 ppm in the product.

Results

"The plant has been running smoothly ever since we started it up again and solved the problem in early 2024," says Mr. Sivasankaran, "and the formic acid is now down to just 200 ppm. JM has been very helpful and supportive the entire time, and now we are purchasing catalyst from them as well, so now we are a JM customer."

To ensure continued success, NCSP uses the **JM-LEVO** Formaldehyde Portal to share data on a regular basis.

BY

Mohamed Khire-Dinn
Regional Sales Manager, METIA

Safety design
Oxygen response

A formaldehyde plant relies on low oxygen to prevent deflagration during operation. For this reason, it is very important that the oxygen content being measured accurately reflects the present concentration in the plant. In this article we look at a number of considerations that can affect that accuracy, as well as what do about them.

The first thing to keep in mind is that there is always a delay before a changed oxygen concentration in the recycle gas is fully detected by the oxygen analyser. The delay is made up of several different parts:

- Gas travel time from the air injection point in the recycle line to the sample loop gas outtake after the recycle fans. This delay is small, provided the correct piping/tubing design has been implemented, and is also of less interest as the methanol has not been added yet.
- Sample gas travel time in the sample loop from the recycle line to the branch of the gas going to the analysers. This part of the sample loop should be as short as possible. The return line part of the sample gas loop is not part of the delay.
- Travel time for the gas to the analysers through the plastic hose, flow rotameter, sample cooler etc.
- Oxygen analyser response time.

Sample loop orifice in pressurised plants

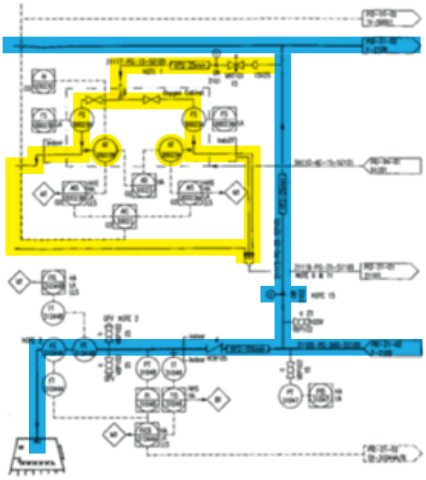
The orifice in the sample gas loop should be located close to the take-off from the recycle gas line so that the gas velocity is as high as possible. It is important that the orifice is not blocked. A blocked orifice will give stable oxygen readings but a very long response time. The orifice should be inspected. A blocked orifice will not show on the sample gas flow meter.

Sample loop orifice in non-pressurised and turbocharger plants

The orifice should be placed after the branch off to the analyser so that there is always a sufficient feed pressure to the analyser. A blocked orifice here will also give stable oxygen readings but a very long response time.

Vent gases from oxygen analyser

It is very important that the vent gas from the analysers is released to atmospheric pressure so that the measuring cell does not see any pressure variations. The measuring cell can get a low pressure if the vent hose is connected to the air blower suction without proper separation. The analyser will then show a lower oxygen value than in the recycle gas, resulting in a high risk of a deflagration.



Oxygen analysers and sample lines

A restriction or condensate in the vent hose can cause an overpressure in the measuring cell and the analyser will then give a too high oxygen value.

Conclusion

- The first part of the recycle loop should be as short as possible.
- The hose to the analyser should be as short as possible.
- The orifice in the recycle loop should be inspected.
- The vent gases from the analysers should be released at atmospheric pressure.
- The system should be free from any unnecessary blockages.

BY

Ola Erlandsson
Senior Process Specialist

MOLYBDENUM UPDATE

After a relatively long period of price stability, could a roller coaster be approaching?

In my previous Mo update (see Spring/Summer 2023 edition), there had been quite a dramatic rise in late 2022 and early 2023, with the price reaching above 30 USD/lb. It then settled down to around 20 USD/lb and has since remained quite stable at around 20-22 USD/lb. Reading the predictions from various analysts, most of them seem convinced that the price should remain above 20 USD/lb during 2025, perhaps reaching 25 USD/lb. As mentioned in the leader, however, there are some uncertainties as to which way the market price is heading.

Most molybdenum comes as a by-product of copper mining, and new Mo-only as well as new combined mines are in the pipeline. Due to uncertainties in the global economy, however, there have been delays, particularly in the West, so the supply side has not improved significantly.

China is the biggest producer and consumer and, due to good demand, has also increased its imports, which partly explains keeping the price up. Another reason is that copper mines, due to price levels not meeting expectations, have not increased production, causing molybdenum to become short. The relative scarcity has even led to Mo officially being listed as a critical mineral in countries like Australia, Canada, China and Japan.

Good growth expected

The outlook for molybdenum, as earlier projected, remains bright. Growth in demand is expected to be above 4% over the next years according to different sources. There is still a major shift towards electric vehicles, though perhaps not as strongly as two years ago, which drives demand. And because molybdenum, like formaldehyde, is quite versatile, its use in making lubricants, fertilisers, electronics, inks and of course, catalysts, provides more options to use Mo.

Recycling is vital

I would here like to remind about the double importance of you returning your spent catalyst, and keeping it good condition. That means keeping it dry and storing it in agreed containers (drums or big bags) making sure it is protected from rain or bad weather. Your spent catalyst is a valuable raw material, and the ceramic rings can be reused, so therefore we want to kindly remind you of the importance of this process. Recycling the spent catalyst for reuse is the most sustainable way to process molybdenum and maintain a low LCA result for our catalyst.

Due to the situation on the supply side and the impact from Cu pricing on the Mo availability, it is a bit difficult to predict the price level. Depending on whom to listen to, a range from 20 to 30 USD/lb is expected. Personally, I believe we will see a level of 20-24 USD/lb, but I may be too optimistic.

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. However, as we have all experienced over the past two years, inflation and the cost of energy affects everyone and everything. And as mentioned, you also play an important role in keeping catalyst prices stable by returning your spent catalyst to our catalyst recycling facility in good condition and according to our specifications.

BY

Ronnie Ljungbäck
Global Sales & Market Manager
Formaldehyde – Catalysts

Projects and start-ups

Three plants for Inner Mongolia Junzheng Chemical Industry Co., Ltd. in Inner Mongolia, China were all started up in one go in June of 2024.

The Hengli plant II for Hengli Petrochemical (Dalian) New Material Technology Co., Ltd. in Dalian, Liaoning, China was started up in October 2024.

An FT3 plant was successfully started up for Xinjiang Xinlianxin Energy Chemical Co., Ltd at their site in Changji City, Xinjiang province, China in October 2024.

A large formaldehyde plant for DP Engineering Plastics (Nantong) CO., Ltd., Nantong, Jiangsu Province, China successfully went on stream in October 2024.

New projects

Agreements have been signed with customers in:

- Inner Mongolia, China, for an FT3 plant.
- Changshou, Chongqing, China for an upgrade of an FT3 plant.
- Germany for an upgrade and equipment replacement of an FS2 plant.

Ongoing projects

In the design phase:

- One FS1 UFC plant for a customer in Turkmenistan.
- Three FT3 plants for a customer in Yumen, Gansu, China.
- Two FT3 plants for a customer in Qingtongxia, China.

In the shipping or construction phase:

- One FS3 plant to Australia.
- One FT3 plant to Tangshan City, Hebei, China.
- One FT3 plant to Chuzhou City, Anhui Province, China with planned start-up in December 2024.
- Two FT3 plants to Jingzhou City, Hubei Province, China with planned start-up in February 2025.
- Two FT3 plants to Nanchong, China with scheduled start-up in December 2024 and March 2025.
- One FS2 UFC plant to Egypt with Suez Methanol Derivatives Co as the end user.
- One FT3 plant to Korla, China with scheduled start-up in 2025.
- One FT3 plant to Nantong City, Jiangsu province, China with scheduled start-up in March 2025.
- One FT3 plant to Fujian Province, China, the second on this site, with scheduled start-up in January 2025.
- Two FT3 plants to Shanxi Province, China with planned start-up in early 2025.
- One FS3 plant for a customer in Europe with planned start-up in 2025.
- Three FT3 plants to Xinjiang, China, with planned start-up in 2025.

Start-ups

- The project with three FT3 plants for Inner Mongolia Junzheng Chemical Industry Co., Ltd., in Wuhai, Inner Mongolia, China, had all plants started within June of 2024.
- The FS2.5 plant to a customer in India went on stream in August 2024.
- The expansion of an existing FS3 formaldehyde plant in Poland to a combined UFC-plant went on stream in September 2024.
- The second of two FT3 plants for Hengli Petrochemical (Dalian) New Material Technology Co., Ltd., in Dalian, Liaoning, China went on stream October 2024.
- The two FT3 plants to Wujiaqu City, Xinjiang, China went on stream in October 2024.
- The large formaldehyde plant to DP Engineering Plastics (Nantong) CO., Ltd., Nantong, Jiangsu Province, China successfully went on stream in October 2024.
- The FT3 plant to Sichuan Province, China, the second on this site, was started in October 2024.
- The FT3 plant to Xinjiang Xinlianxin Energy Chemical Co., Ltd in Changji City, Xinjiang, China was successfully started in October 2024.
- The replacement of an ECS Steam Generator to Thailand is scheduled for start-up in December 2024.
- The FS1 High Pressure plant to The United Kingdom is scheduled for start-up in Spring 2025.

Training

In July 2024 JM conducted operator training for Xinjiang Xinlianxin Energy Chemical Co., Ltd at their site in Changji City, Xinjiang province, China. The training took place in connection with the start-up of the second FT3 plant for the Xinlianxin group.

In September 2024 JM conducted operator training also for Tongde Kechuang Material Co., Ltd, in the city of Xinzhou, Shanxi province, China, where two FT3 plants are under construction.

New faces

Perstorp

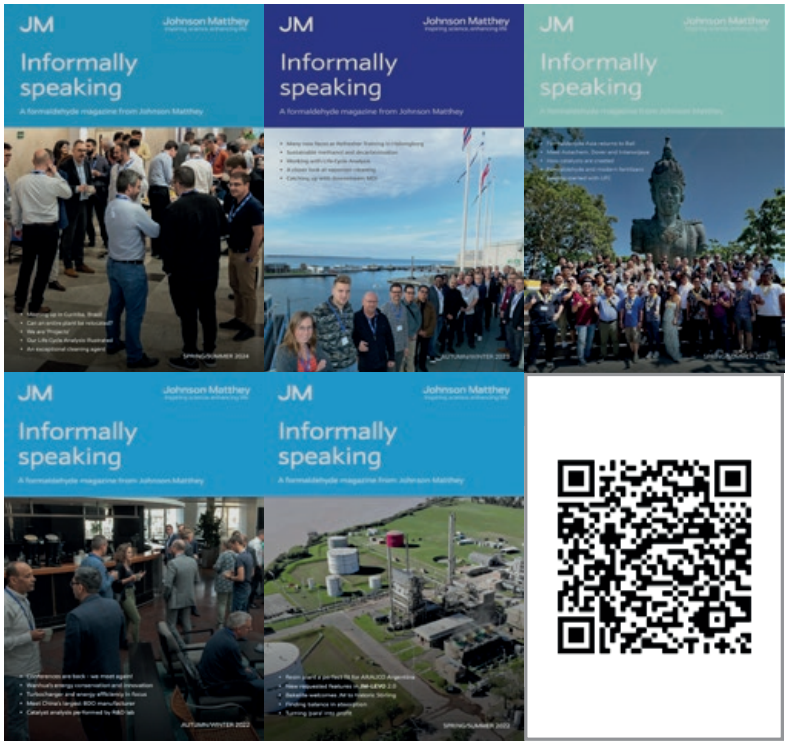
Nilspetter Sandén
Project Manager

Solmaz Hajizadeh
Senior Scientist

Pengyu Xu
Senior Scientist

Beijing

Tenley Xiong
Project Engineer



Scan the QR code above for access to previous editions of Informally Speaking

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

Supporting our customers

Johnson Matthey seek to cultivate a long-term, mutually beneficial relationship with our formaldehyde customers. Helping you to achieve a trouble-free, profitable operation using our established **FORMOX**™ process technology and catalysts.

In addition to our Centre of Excellence and catalyst production in Sweden complemented by our comprehensive sales and engineering team in China, we have regional sales and technical service & support teams in the Americas, Asia and the Middle East to help meet every customer need and query.

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Johnson Matthey's catalyst R&D program is intensive with ongoing projects. We have the capacity for sophisticated simulations, advanced pilot studies and even full-scale testing at selected plants. Our aim is maximum efficiency, to give you the most formaldehyde output for the least input of methanol.

With a range of solutions available, our team will help you select the right path for your journey.

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