

JM

Johnson Matthey
Inspiring science, enhancing life

Informally speaking

A formaldehyde magazine from Johnson Matthey

- Many new faces at Refresher Training in Helsingborg
- Sustainable methanol and decarbonisation
- Working with Life Cycle Analysis
- A closer look at vaporizer cleaning
- Catching up with downstream MDI



AUTUMN/WINTER 2023

Building for the future

As informed in our Winter 2022 edition, we are expanding capacity at our catalyst plant to be able to meet the future demand of all our customers and ensure there is no disruption of supply. In terms of market conditions and growth in different regions, the situation has since changed – from very positive during 2022, to a less encouraging 2023-24. The question is, how long and deep will the present slight downturn be? From this point of view, we are very well positioned and prepared once the market picks up again, which we believe will happen during the second half of 2024.

After restarting our conferences last year, we were glad to welcome many of you to our Refresher Training in Helsingborg and Perstorp in November (see page 6). In 2024 we will host at least two more conferences – in Curitiba, Brazil and Nanning, China. These gatherings are such an excellent way to share experiences and information. Another is through our customer satisfaction (CSAT) surveys, which are conducted every two or three years.

Through our most recent CSAT survey in June-July 2023, one thing we found was that sustainability has risen in importance. See article page 4 for more CSAT results. We have also received a few requests about our Life Cycle Analysis (LCA) and have therefore included an article on this subject as well. Related to this you will find an article about green methanol, which is the most efficient way to decarbonize your formaldehyde production. See page 8 for more on JM's abilities in this area.

On a more sombre note, it was with great sadness that we received news in June that one of our dear and highly-esteemed former colleagues, Max Henning, had passed at the age of 85. Well known by many of you, Max was a very important part of building the growth of our business by selling formaldehyde plant licenses since the mid 1970s. We remember him in an article on page 17.

Finally, in this edition you will also find information on safety and on the versatile downstream product Methylene Di Isocyanate (MDI), as well as useful tips on vaporizer cleaning and how to get the most out of the **JM-LEVO** Formaldehyde Portal, our main tool for both optimising and simplifying your production.

We look forward to seeing you again in 2024.



Lars Andersson and Ronnie Ljungbäck
Global Market Managers Formaldehyde

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Editor: Charles Hodgdon,
Hodgdon Communications

Layout: House of Type, Teesside UK

Publication: twice a year



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.

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A building block for sustainability

Methanol is an important chemical used for producing hundreds of every-day products. It is also a cleaner-burning and safe alternative to conventional fuels and a potential enabler for decarbonisation in the otherwise hard to decarbonise air and road transport sectors. At present, however, methanol is mainly produced from synthesis gas obtained from fossil fuels, although both bio- and other variable degrees of greener methanol do exist today.

Going forward, the ability to use alternative, more sustainable feedstocks will be key to producing low-carbon methanol that can help decarbonise air and road transport, something Johnson Matthey is already providing solutions for. Renewable methanol is bio-degradable, its combustion releases fewer harmful emissions than traditional fuels, and it can be safely handled within the existing infrastructure. It is also an intermediate in the production of Sustainable Aviation Fuel (SAF) and bio-gasoline.

Good news also for formaldehyde producers

Dr. Zinovia Skoufa, Business Development Manager at JM, says, "As the production of renewable methanol continues to scale up, it will provide a long term, carbon-neutral solution also for chemical sectors, including formaldehyde production." In this issue, she shares some insights into how Johnson Matthey's

"We have a bright and green future, and the world is depending on us to deliver for this and for future generations."

Dr. Zinovia Skoufa, Business Development Manager

unique, 60+ years of experience in formaldehyde combined with our market leading solutions for sustainable methanol production, can enable the decarbonisation of formaldehyde production as well. For more on this, be sure to read her article on page 8.

BY



Nicole Watson
Marketing Communications
Representative

On the front page:

Refresher Training, November 2023

Read more about this event on page 6-7



Conferences coming up...

Formaldehyde South America 2024
March 4-7, 2024 in Curitiba, Brazil

Formaldehyde China 2024
April 17-19, 2024 in Nanning, China



SURVEY



Customer satisfaction survey 2023

In June-July of 2023 we conducted our most recent Formaldehyde-focused customer satisfaction survey, which we do every second or third year, depending on the circumstances.

The survey is to make sure we capture input, feedback, and possible trends on how we and our products are performing as per your perception.

For this latest survey we used a new service provider, with some differences in methodology, but that did not impact the overall result very much. Our Net Promoter Score (NPS) and Customer Satisfaction Index (CSI) remain high, and we are very happy and proud of that. So, we want to say Thank You! to those of you who participated and took the time to provide this precious information to us, which we will use to try and continue improving our overall performance.

Lower response rate

What we did notice, however, was that the response rate dropped significantly compared to previous surveys, which we would like to understand the reasons for. Especially since this is where your opinions can make a big impact on the future direction of the business and are therefore highly valuable.

One possible explanation that we believe may be related, is the fact that JM also conducts a general survey every October-November since 2018. If this is a factor, then perhaps we need to reconsider the timing for our Formaldehyde-focused survey. Another explanation may be the choice of a different service provider this time and the methodology they used. Of course, any thoughts you might have and would like to share on these or other explanations are welcome.

In any case, we are very grateful that you are willing to take your valuable time to respond to the questions in our survey. In the end we are trying to understand not only what we are doing well, but also where we need to improve, and your voice as input to this is extremely important.

Lower CSI and NPS – more room for improvement

Compared to the previous survey, both our CSI and NPS scores have dropped slightly. We believe this is related to the unfortunate situation with the increase in molybdenum (Mo) price, rising inflation, and other cost increases that have impacted us as well, all leading to a significant price increase in catalyst during the last 18 months.

How likely is it that you would recommend Johnson Matthey Formox (JMF) to a business partner?

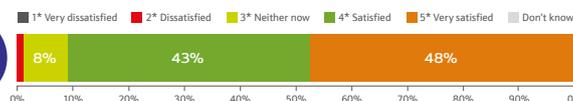
NPS
53

8,71 out of a possible 10 1 - Not at all likely, 10 - Extremely likely

A good NPS rating is usually one of 29, a rating above 50 is an excellent world-class rating!

How satisfied are you overall with JMF?

CSI
4,36



Our Net Promoter Score (NPS) and Customer Satisfaction Index (CSI) remain high (4.36 vs 4.55 and 53 vs 60 in 2021).

Going forward inflation should come back to better levels and the Mo price should also stabilise in the coming year, although the price has climbed to a higher level around 17 USD/lb compared to before 2022. By returning spent catalyst, you not only help to minimise the impact of Mo price increases, but also do the best from a sustainability point of view – see article about life cycle analysis on the next page.

As always, we know that we can always get better and some of the areas for improvement that were pointed out in the survey are innovation, technical support, and communication in general, to be able to respond faster to requests. We also noticed that more of you raised the importance of considering sustainability related to our products and services. Hopefully by the time our next survey is conducted you will find that we have been able to address a few of the points and areas of concern that you have raised.

Again, we thank you for your contribution and ask that you never hesitate to reach out to provide us with feedback, since that is the best way we can learn how we can improve.

BY



Ronnie Ljungbäck
Global Sales & Market Manager
Formaldehyde – Catalysts

Protecting nature and advancing the circular economy

At JM we are focusing our 2030 sustainability goals and targets around our core value of protecting the planet and people.

Our formaldehyde business closely monitors its performance to ensure it is fully aligned with both JM's sustainability strategy and the United Nations (UN) Sustainable Development Goals (SDGs).

One way of measuring this is by carrying out life cycle analysis (LCA). LCA is an environmental assessment of products and services, covering their life cycle from raw material to waste treatment. By using this tool, we now have data-driven sustainability insights for the formaldehyde business, and particularly for our catalyst manufacturing process.

Our **FORMOX** catalyst manufacturing choices demonstrate our commitment to minimising our environmental footprint and conserving scarce mineral resources. At our manufacturing site at Perstorp we have adapted the following sustainability practices for the **FORMOX** KH catalyst products:

- **Raw materials:** Recycling process to recover molybdenum from spent **FORMOX** (and from other origin) catalyst returns. The production of primary molybdenum involves the mining of molybdenite ore, followed by various processing routes (beneficiation) to obtain molybdenum in its metallic form. As such, metal extraction and refining require energy intensive stages, often fossil fuel based, leading to high greenhouse gas emissions. By recycling molybdenum from spent catalyst returns, JM's **FORMOX** catalysts have a 25-35% lower product carbon footprint than catalysts of the same composition manufactured without molybdenum recycling. The end-of-life catalyst recovery process also allows for the reuse of ceramic rings, preventing several hundred tonnes of waste from ending up in landfill every year. Our manufacturing practices demonstrate JM's commitment to conserving and recycling mineral resources within the formaldehyde business, in alignment with UN SDG 12: responsible production and consumption.
- **Energy use:** Green electrification of energy-intensive production stages, has reduced our reliance on fossil fuels.
- **Water use:** Wash-water and condensate are re-used, and wastewater is pre-treated on-site to allow for the recycling of raw materials.

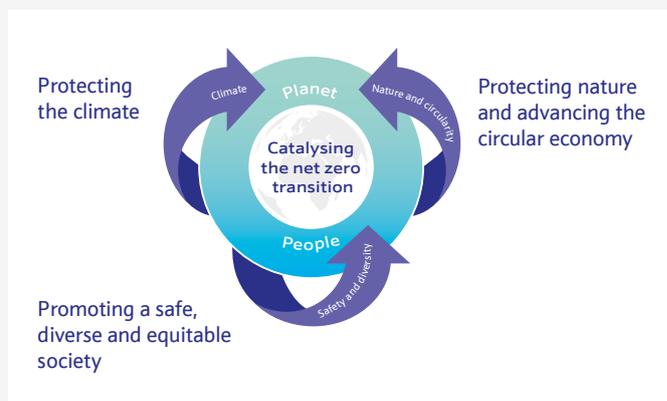


Figure 1: Johnson Matthey sustainability strategy

These actions align with the UN's SDG 12, which covers responsible consumption and production. If you require cradle-to-gate product LCA information for **FORMOX** KH catalyst products, please contact us.

We are working hard to reduce our environmental impact here at our Perstorp site, reducing our carbon footprint in the manufacture of your products. This in turn reduces your own footprint, making us a trusted partner to hitting your own sustainability goals.

We are also committed to reducing the environmental impact of formaldehyde production through the continuous development of our **FORMOX** process technology, which will be covered in a future issue.

BY



Jeanette Simpson
Sustainability Manager – Products & Services



Stefan Möllerström
Formaldehyde EHS Manager



Refresher Training 2023

21st – 23rd November, Helsingborg & Perstorp, Sweden

A few years have passed since the last time we held our Formaldehyde Process Refresher Training. It was in 2019, before the pandemic brought everything to a halt. So, we were really happy to welcome so many to the training this past November when we gathered at the Marina Plaza Hotel in Helsingborg for three days, including a visit to Perstorp to tour the formaldehyde plants and R&D facility. The total number of participants was 25, joining from 13 customers, mostly from Europe, but also from Qatar and the Philippines. New members of the JM team were also present, making it a good introduction for them as well to our close interaction with all the customer participants.

Day 1

After a nice reception Monday evening the training began Tuesday morning on the top floor of the Marina Plaza, which provided a nice view of the Öresund straight between Sweden and Denmark. I handed things over to Will Breeze, Regional Technical Service Engineer for Europe, for an introduction of what to expect in the days ahead. Then Paula Erlandsson, Formaldehyde specialist at Perstorp Specialty Chemicals, briefed us on safety procedures for the visit to the formaldehyde plants planned for Day 2. The remainder of the morning sessions were dedicated to a review of the formaldehyde manufacturing process, safety, and deflagrations, all led by Ola Erlandsson, Senior Process Specialist.

In the afternoon, Paul Walter, Regional Sales Manager, held presentations

and answered questions about both formaldehyde and emission control system (ECS) catalysts respectively. Peter Karlsson, Technical Service Engineer, took over from Paul and talked about catalyst loading and unloading, which led to questions from some of the participants and a discussion on JM's loading machine. Tomas Nelander, Technical Services Leader, wrapped up the day together with Will Breeze before ending the instructional part of the day.

In the evening we sailed back and forth across the straight aboard the ForSea ferry while enjoying a delightful dinner in the Waves restaurant. Many took the opportunity to brave the cold air out on the bow of the ship as it docked in Helsingör, Denmark, to take on passengers to Sweden. The night sky featured a beautiful moonlit cloudscape, and the lights of Helsingör reflected nicely off the sea.

Day 2

After breakfast a bus took us to Perstorp where we visited both our R&D unit and Perstorp's formaldehyde plants. During the R&D visit, we explored the cutting-edge laboratory facilities, including the catalyst development testing lab, and the pilot reactors for formaldehyde and ECS catalysts. We also had the privilege of engaging with the team involved in the x-ray fluorescence (XRF) catalyst sample analysis centre.

Immersing ourselves in the plant environment, we explored the history of the Perstorp site. Along the way, we

presented the portable carbon monoxide (CO) monitoring system, the caustic cleaning system, and the mobile environmental emission testing unit. Additionally, we were treated to a presentation on **JM-LEVO** Formaldehyde Portal, adding a comprehensive perspective to our experience.

Following lunch in the Persgården restaurant in Perstorp, we returned to Helsingborg for the afternoon sessions. Engineering Manager Simon Smrtnik gave an update on Plant technology, and Michel Bellais, Associate Specialist, Process Engineering, talked about absorber operation.

In the evening we enjoyed a delicious dinner at the French bistro, Madame Moustache, and had many laughs during a fun evening at Olympia Bowling. It was a delightful surprise to discover that the formaldehyde business isn't just about chemicals; it turns out we've got a few impressive bowlers in the mix!

Day 3

The third and final day of the training involved presentations by me, Ola and Tomas on optimising plant operation from both performance and safety perspectives, common problems that can arise, and troubleshooting. There was a lot sharing by the participants, good discussions and a quiz led by Will. At the end of the day diplomas were handed out and we all said farewell to each other for this time.



"This training has offered more and new insights with the fast-changing technology and new research and developments of formaldehyde production which definitely can be of great help in making us sustain and continuously improve our production process."

**Darwin Roa, Production Manager,
RI Chemical Corporation**

"The technical training was a huge learning experience. During the training, new insights were gained, and existing knowledge was refreshed. In addition, we enjoyed the evening activities where we got to know the other participants in a relaxing way."

**Jetske Descamps, Process specialist,
UNILIN Resins B.V.**

"I and my colleagues enjoyed very much the training, topics and discussions with other participants. We discovered a large formaldehyde business group from different countries and different continents with their queries and desires. Such trainings are good opportunities to get professional and valuable discussions which only happens within a relaxed environment."

**Sorin Musca, Team Leader Formox Group, S.C. EGGER
Technologia SRL**



Thanks for a great experience

This was an excellent group and the spirit of cooperation everyone brought was noticeable right from the start, which made my job much easier. Everyone contributed to creating a positive and fun environment, asking good questions, commenting on future projects and joining in the discussions. And judging by the highly positive feedback, it feels as if everyone found it both valuable and enjoyable.

We thank you all for an exceptional few days.

BY



Alejandro Perez
Principal Technical Service
Engineer

Renewable methanol and the decarbonisation of formaldehyde production

Formaldehyde production currently consumes more than a quarter of the world's methanol production. This methanol is produced mainly from synthesis gas obtained from fossil fuels. At JM we are leading the way and supporting our customers with transitioning to low-carbon methanol.

Methanol is a highly versatile chemical used to produce everything from plywood, paint, and adhesives to clothing and pharmaceuticals. It improves our quality of life and is also a cleaner-burning and safe alternative to conventional fuels and a potential enabler for decarbonisation.

In addition to formaldehyde production, methanol is used as a precursor for making high-value chemicals such as olefins (Methanol-to-Olefins, or MTO) and aromatics (Methanol-to-Aromatics, or MTA), which are then converted into plastics. Sustainable methanol therefore emerges as a key low-carbon intensity platform molecule that can enable sustainable chemicals production.

A major step towards sustainable methanol

Johnson Matthey is the world's leading methanol synthesis technology and catalyst supplier. As the world transitions to a net zero future, JM is playing a pivotal role in decarbonising the methanol value chain through development and deployment of its cutting-edge methanol solutions that deliver the highest yields using the most sustainable process designs to date.

One example of this can be found in the recent announcement that JM's methanol technology has been chosen to produce sustainable methanol for Project Air, an industrial initiative in Sweden by the Perstorp Group. The project will create one of the first large-scale sustainable methanol plants, having a capacity of 200,000 tonnes of sustainable methanol per year. When completed, it will reduce CO₂ emissions by 500,000 tonnes per year, equivalent to the annual emissions of around 340,000 new cars running on fossil fuel. You can read more about Project Air in the Autumn 2021 issue of *Informally speaking*.

Using captured carbon and renewable hydrogen

Methanol can be produced by direct hydrogenation of carbon dioxide with renewable hydrogen. JM's eMERALD™ Methanol technology enables production of low-carbon methanol from captured carbon dioxide and hydrogen produced by water electrolysis using renewable energy. The technology offers high feedstock efficiency – hydrogen (~99%) and carbon dioxide (~99%) – via tailored methanol converter and catalyst design to suit the CO₂-to-methanol duty.

A high degree of heat integration ensures the heat of reaction is recovered, therefore minimising the need for external heat import to the plant. JM's latest catalyst with enhanced hydrothermal stability has been developed to achieve sustained, high methanol productivity over a significantly longer lifetime, maximising profitability for our customers.





Alternative methods using biomass or MSW

Bio-methanol can also be produced from renewable synthesis gas obtained from the gasification of biomass or municipal solid waste (MSW). This route reduces the amount of waste destined to landfill and incineration and replaces natural gas and coal-based feedstocks, enabling the production of more sustainable fuels and chemicals with a lower carbon footprint.

JM has optimised the design of the methanol synthesis loop and combined it with our highly robust methanol synthesis catalyst. This results in sustained, high feedstock efficiency that enables our customers to get the most out of the biomass feedstock and make more methanol for longer. The process can incorporate green hydrogen, thereby approximately doubling the amount of methanol that can be produced with the same quantity of feedstock, eliminating the conditioning step, and reducing the carbon intensity even further.

At JM, we are passionate about methanol, and we are proud to offer the most efficient and reliable solutions in the market. Using our unrivalled expertise and know-how, our goal is to drive profitability for our customers, ensuring you are cared for on your methanol journey.



If you are interested in learning more about how JM can assist you with technology for renewable methanol, please contact me at Zinovia.Skoufa@matthey.com, or visit our [web page](#) for methanol alternative feedstocks.

BY



Dr. Zinovia Skoufa
Business Development
Manager

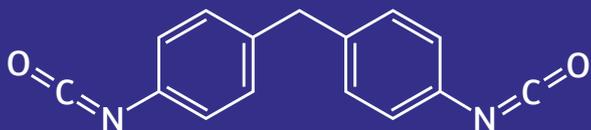
Formaldehyde and MDI – a good relationship

Welcome back to another article in our series about interesting and important products downstream formaldehyde.

This is actually the seventh issue in a row where we write about downstream products, and when reviewing older issues, I noticed that it was more than 10 years ago that we had an article about Methylene Diphenyl Diisocyanate, or MDI. Back in 2012 we concluded that the demand for MDI had virtually doubled every 10 years for the previous 20 years. Has this trend continued until today? Keep on reading and let's see!

What is it?

Methylene Diphenyl Diisocyanate or MDI is an aromatic diisocyanate, which means it contains two isocyanate functional groups. Its chemical formula is $C_{15}H_{10}N_2O_2$, and it is available in various forms, including pure MDI and polymeric MDI (PMDI), each tailored for specific applications.



It is known for its reactivity and ability to cross-link with polyols, and by doing so it plays a significant role in the production of various polyurethane (PU) based products.

A PU refers to a type of polymers built up by organic units joined by carbamate links. Unlike other base polymers such as polyethylene (PE) and polystyrene (PS), PU is produced from

many different starting materials. This makes it possible to produce PUs with different structures leading to many different applications. Basically, PUs are made by reacting an aromatic isocyanate, like MDI or toluene diisocyanate (TDI) with a polyol. Depending on the desired properties for the wanted application, a specific polyol, isocyanate and additives are selected.

How is it made?

MDI exists in different forms – crude, pure and polymeric where the most used is a mixture of 4,4'-methylene diphenylamine diisocyanate (MDA) and its isomers. MDI is synthesized through the reaction of aniline and formaldehyde to produce the compound MDA, which is then converted into MDI. The manufacturing process is rather complex and involves several steps.

The first step is the reaction of aniline and formaldehyde, using hydrochloric acid as a catalyst to produce 4,4'-Methylenedianiline and other diamine precursors, as well as their corresponding polyamines. In the second step these amines are treated with phosgene (phosgenation) to form a mixture of isocyanates. After that a distillation yields a mixture of oligomeric polyisocyanates, known as polymeric MDI, and a mixture of MDI isomers which has a low 2,4' isomer content. And finally, further purification leads to fractionation of the MDI isomer mixture.

A complex process, yes. But it also makes it possible for the manufacturers to develop different grades of the product to suit all possible requirements for different applications.



What are the applications?

MDI is a versatile chemical, finding its use in numerous industries. The major application of 4,4'-MDI is however the production of rigid PU, and foams account for approximately two thirds of all PU. A good example is the construction industry where rigid PU foam, which provides excellent thermal insulation properties, is used for insulation in buildings and appliances. In refrigeration equipment, it helps preserve temperature and energy efficiency. It is also an important component for the packaging industry.

Another area is for use as flexible PU foam for furniture and bedding, providing comfort and resilience. In a similar way, MDI contributes to the manufacturing of comfortable and durable shoe soles for the footwear industry. In the automotive industry it is used in the manufacturing of different automotive parts, like seat cushions, headrests, and sound insulation materials, due to its durability and lightweight properties.

It is also used as an adhesive in various applications including wood (wood binders are used in OSB production where it competes primarily with UF and PF resins), plastics, and metals, as well as in the production of sealants for buildings and vehicles. It also plays an important role in high-performance coatings, providing resistance to abrasion and chemicals in applications such as industrial flooring. In addition to these, other important uses include electrical potting compounds (sealant) for circuit boards and electronic assemblies, and in fibers such as spandex and polyurethane laminate.

MDI and sustainability

MDI can contribute to sustainability efforts by enhancing energy efficiency, promoting recycling, reducing emissions, and supporting green building practices.

When used in building insulation and refrigeration, MDI helps reduce energy consumption by providing effective thermal insulation. This results in lower energy bills and reduced greenhouse gas emissions. PU products made with MDI are often recyclable and can be used to create new products, reducing the need for virgin materials. The recycling potential can extend the lifespan of MDI-based products and minimize waste. MDI is used to produce lightweight components, leading to fuel efficiency and reduced emissions.

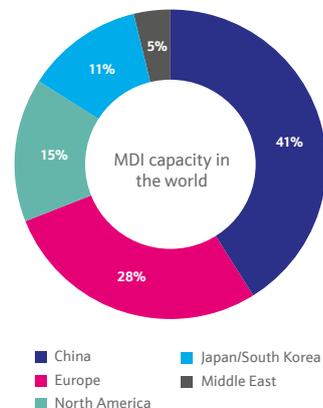
Furthermore, MDI-based products such as adhesives, sealants, and coatings often emit less volatile organic compounds compared to traditional alternatives. Ongoing research in polyurethane chemistry seeks to develop more sustainable formulations and production processes. Innovations such as bio-based raw materials and water-blown foams are making MDI-based products even more environmentally friendly.

As the industry continues to evolve, it is likely that MDI will play an even more significant role in environmentally conscious and sustainable product development and manufacturing.

Who produces it – where and how much?

Today MDI production is a global industry where the top MDI-producing countries include China, USA and Germany. The five major players – Wanhua, BASF, Covestro, Huntsman and Dow – dominate the market, with almost 90% of the installed capacity. China has the largest installed capacity, about 40% of the total, followed by Europe and North America.

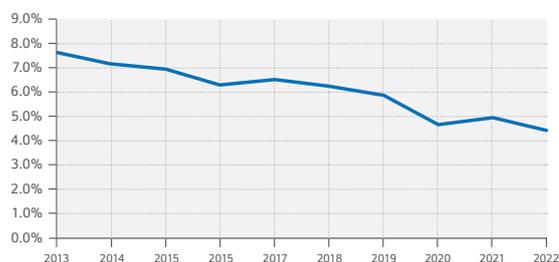
The present global installed capacity is somewhere between 10 and 10.5 million metric tons per annum (mMTPA). This corresponds to about 4 million mMTPA 37% formaldehyde, a very awe-inspiring number, making MDI one of the more important drivers for the global formaldehyde business.



So what about global growth of MDI?

Remember the question I asked at the beginning of this article: Has MDI demand doubled during the last 10 years? No, it has not. In fact, the demand growth has slowed in recent years to around 4.5% on average. Still a very good number, but indicating that growth has normalised and is close to what we see for other similar downstream products.

Global MDI demand growth 2013-2022



Looking forward, the MDI market is expected to experience robust growth over the next 5 to 10 years, underpinned by the expanding of many of the applications mentioned before. Sustainability, lightweighting, and enhanced energy efficiency typically will drive the demand for MDI-based products. The industry's adaptability and ongoing innovations in polyurethane chemistry will ensure the expansion will continue.

And finally, if you are wondering whether **FORMOX** technology is a good match for MDI production, we believe it is. About 50% of all formaldehyde used for MDI production originates from a **FORMOX** plant!

BY



Lars Andersson
Global Market Manager
Formaldehyde - Plants

Caustic - an underestimated risk?

All UFC plants and many formaldehyde plants are using caustic continuously. Caustic is also often used during paraformaldehyde removal. But the risks associated with caustic are sometimes underestimated.

Safe handling of caustic is, as usual with chemicals, described in the Safety Data Sheet (SDS). However, there are some specific things regarding caustic that can be described in more detail.

Burns skin if left untreated

Caustic solution has a very high pH of ~14 and is corrosive. It will give chemical burns if left untreated on bare skin. The skin has normally an acidic pH of ~5 and some buffering capacity. This will give some initial protection from caustic spills on the skin. There will still be a reaction between the skin's fatty acids and oils and the caustic that will produce soap. The effect will be that the skin feels slippery as if there was soap on it.

Manufacturing of soaps - Definition

- Chemically soap is a sodium or potassium salt of fatty acids of long carbon chains
- Soaps can be directly obtained from oils or fats by hydrolysis in the presence of a base to form soap and glycerol

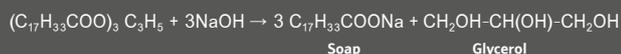


Figure 1. How soaps are manufactured

It is important to immediately begin washing with water to remove the caustic before it burns through the skin. The caustic will give large, slow-healing wounds and continue to eat itself deeper if it reaches the flesh below the skin. The same will happen if the caustic is spilled on an open wound. The flesh does not have the buffering pH that the skin has. A small caustic burn will hurt but not in the same way as with acids. The pain is initially more like an irritation and comes much slower compared to concentrated acids. This can result in a perception that there is no sense of emergency to wash it off, and that is a risk in itself.

Risk for blindness

The eyes have a pH of ~7 and are extremely sensitive to caustic spills. The eyes must be washed immediately with water, contact lenses removed, and the eyelids should be raised if possible. The washing should continue until the person is under medical care. There are examples where the washing was stopped when the pain was relieved, which resulted in blindness. Concentrated splashes in the eyes will in most cases lead to blindness.

How to protect yourself

Know the risks, use common sense, and:

- Always wear safety glasses in plants that have a caustic system.
- Always wear goggles when working with a caustic system.
- Make sure the location of the safety shower is known and that the shower is functioning. Pay special attention to the water temperature (not too hot or too cold) during short and long use.
- Wear a personal wash bottle if a safety shower is not available.
- Always add caustic slowly to prevent splashing from boiling.

Note that in some places caustic can be available for household use. The risks are the same at home.

BY



Ola Erlandsson
Senior Process Specialist

JM-LEVO tips and reminders

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

BY



Dr Philippe Thevenin
Global Technical Services
Leader – Formaldehyde

Did you know that...

You can easily compare current performance (e.g. yield, methanol feed, etc.) with past performance across different catalyst loads, different reactors, and different plants. This is achieved using the Load Comparison feature, where you also have access to any process data that you have shared with us in the past. Presently, this comparison is limited to a single site, but we plan to expand this functionality across multiple sites in the future.

Access to historical operating data is possible thanks to the transfer of previously shared information into our new **JM-LEVO** database. To get the most out of this feature, we can offer to upload the older process data that you may have from your past loads. If you have not shared your process data in the past but would like to take advantage of this feature, we can assist you by adding past data to the **JM-LEVO** Formaldehyde Portal's database.

We are happy to help

The only support we ask of you is that you provide the process data in the same format/template as you are using today for your current catalyst charge. We will then arrange the addition of these previous runs on your behalf.

Do not hesitate to reach out to your JM representative if you have any questions or would like to have additional information on how to share historical data.

MAINTENANCE

Protect the catalyst during prolonged standstill

During any period of non-operation, it is critical to ensure that the catalyst in the main reactor remains moisture free. The risks of condensation are high during extended periods of inactivity and is a particular concern in regions that experience temperature extremes and high humidity.

If the catalyst was to come into contact with water in the liquid form, such as from condensation, the physical properties of the catalyst will be altered and may lead to reduced catalyst performance. Where the catalysts are in contact with the walls of the reactor tubes, corrosion may occur.

The simplest method for preventing moisture from condensing is to maintain a temperature in the reactor of minimum ambient +5°C, but preferably +10°C, by heating and circulating the HTF. This has been demonstrated to be effective over extended periods of time and aids with a quick restart.

However, if the power costs associated with maintaining the HTF system at elevated temperature are too high, the alternative is to isolate the reactor by blinding on the process gas side. The reactor

can be purged with dry air to remove residual moisture. Special care should be taken for sites in regions with high ambient humidity and large daily temperature differences.

BY



Tomas Nelander
Global Technical
Services Leader -
Formaldehyde

Improve your vaporizer cleaning procedure

A common problem for many formaldehyde producers is the buildup of paraformaldehyde on the vaporizer shell side after some time of operation. Paraformaldehyde in the vaporizer will lead to lower efficiency of the heat exchanger and an increased risk of a fire during start-up. The pressure drop in the process gas will also rise which will increase the power consumption in the plant. Thus, high priority should be given to remove any paraformaldehyde formed in this location.

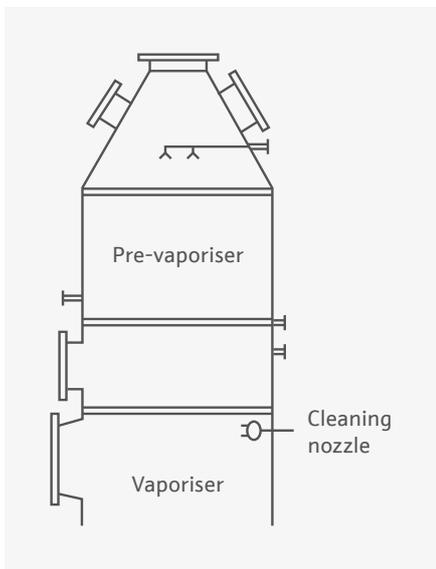


Figure 1: Location of cleaning nozzle

As the top part of the tubes are cooled by liquid methanol, this is also where the highest risk of paraformaldehyde formation exists.

The vaporizer has a nozzle on the top of the shell side intended for circulating hot caustic solution during cleaning (see figure 1). The problem for some plant operators has been cleaning the very top area of the tubes, just beneath the tube sheet. This is because a small air pocket may be created when caustic solution circulating in the vessel is removed through this nozzle.

Simple way to improve cleaning

One solution to enable the caustic solution to reach all the way to the top of the tubes is to add a tilted pipe to the nozzle – see figure 2. This will result in a completely submerged tube bundle and allow the caustic solution to dissolve the paraformaldehyde in the very top part of the bundle. However, to avoid pressure buildup in the vessel it is important that the pipe used to let the caustic out of the vaporizer is bigger than the pipe/nozzle where the caustic is introduced. This solution has been tested and shown to have great results – see before and after images in figure 3.

It is recommended to inspect the vaporizer once every year and if paraformaldehyde is found to be present, caustic cleaning is the most efficient way to remove it.

In our current vaporizer design, the methanol enters the tubes from the top, and the hot, formaldehyde-rich gas from the reactor flows in a counter direction on the shell side.

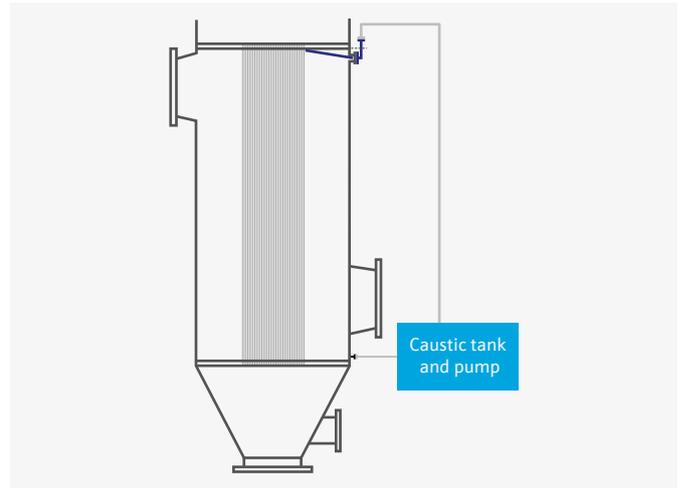


Figure 2: Solution with tilted pipe



Figure 3: Vaporizer - before and after cleaning

Remember to clean the vessel as soon as you start to see any paraformaldehyde in the vaporizer, as old paraformaldehyde will be harder and much more difficult to remove than new paraformaldehyde.

BY



Tomas Nelander
Global Technical Services Leader - Formaldehyde

More detailed cleaning instructions can be found in TI-document 169 *Removal of paraformaldehyde from the vaporizer* available in the JM-LEVO Formaldehyde Portal. If you do not yet have access to the Portal, please contact your JM representative for help.

Projects and start-ups



New **FORMOX** FT3 plants in Inner Mongolia (left) and in Henan province China (right), are two of the many recent start-ups that took place this autumn.

New Projects

Agreements have been signed with customers in:

- Tangshan City, Hebei, China, for an FT3 plant.
- India, for an FS2.5 plant.
- Poland, for expansion of an existing FS3 Formaldehyde plant to a combined UFC-plant.
- Sichuan Province, China, for a second FT3 plant on this site.
- Fujian Province, China, for a second FT3 plant on this site.
- Thailand, for replacement of an ECS Steam Generator.

Ongoing projects

In the design phase:

- Yumen, Gansu, China for three FT3 plants.
- Qingtongxia, China for two FT3 plants.
- Chuzhou City, Anhui Province, China for one FT3 plant.
- Wujiaqu City, Xinjiang, China for two FT3 plants.

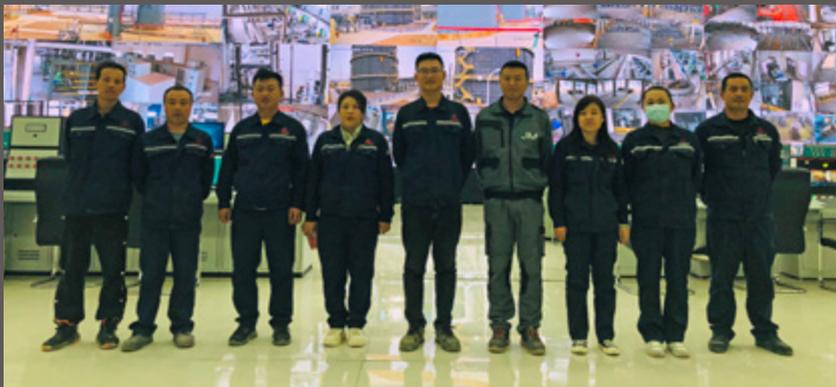
In the shipping or construction phase:

- Jingzhou City, Hubei Province, China for two FT3 plants.
- Nanchong, China for two FT3 plants.
- Egypt for an FS2 UFC plant with **Suez Methanol Derivatives Co** as the end user.
- Korla, China for one FT3 plant.
- Changji, China for one FT3 plant.
- Nantong City, Jiangsu province, China for one FT3 plant.
- The project with one FS3 and one FT3 plant for a customer in Nantong, Jiangsu Province, China.
- FS1 High Pressure plant for a customer in United Kingdom.
- The project with two FT3 plants for a customer in Shanxi Province, China.
- The FS3 plant for a customer in Europe is in the construction phase.
- The project with three FT3 plants for a second customer in Wuhai, Inner Mongolia, China, is proceeding well with planned start-up in spring of 2024.
- The project with a customer in Xinjiang, China, for three FT3 plants is in the construction phase with planned start-up in 2024.

Start-ups

- The project with an FT3 plant to a customer in Hebi, China, went on stream in September 2023.
- The project with **Foresa, Industrias Químicas Del Noroeste, SA** to double the capacity of their plant in Caldas de Reis, Pontevedra, Spain to an FT2 plant, was started in October 2023.
- The replacement HTF condenser for a customer in Mexico went on stream this autumn.
- The project for supply of a replacement ECS reactor/preheater for a customer in Germany is scheduled to go on stream in January 2024.
- The two FT3 plants for a customer in Dalian, Liaoning, China are scheduled to go on stream in January and March of 2024 respectively.
- The project with a customer in Wuhai, China, for three FT3 plants is proceeding well with two of the plants started this autumn and the third scheduled for start-up in spring 2024.

Training



In October 2023 JM conducted Operator training for Sanwei Holding Group Co., Ltd in Inner Mongolia, China. The training took place in connection with the startup of their three new FT3 plants.

Operator training was conducted in July 2023 for Hebi Longyu New Material Co., Ltd in Henan province, China. The training took place in preparation for the startup of their new FT3 plant, which was successfully started up in September.



Also in October, JM conducted Operator training for Hengli Petrochemical New Material Technology Co., Ltd in Liaoning province, China. The training took place in preparation for the startup of their two new FT3 plants.

Remembering Max Henning – Mr. Formaldehyde

It was with great sadness we received the news that our former colleague and dear friend Max Henning had passed. He left us Tuesday, the 13th of June, when the Swedish summer is at its best.

The nature honored him in the best possible way this June, and hopefully he could enjoy and appreciate the warm, bright summer evenings, the clear greenery, the beautiful and fragrant flowers right to the end.

Max managed to turn 85 years old in March and he devoted a substantial part of his long life to his work with formaldehyde in one or another form.

It all started in January 1964, when Max was about to be hired by Skånska Ättikfabriken AB, that later became Perstorp AB. He started to prepare himself and his wife Görel for moving roughly 400 kilometres to Skåne in the south of Sweden, leaving Värmland and his job at Bofors behind. They soon settled in the small village of Perstorp, where I believe they moved to five or six different homes over the years. For a while in the 1990s we were neighbours, as his house was in the block next to mine.

Later that spring in 1964, he started his new job as assistant production manager at the newly built formaldehyde plants in Perstorp, the first commercial-scale plants utilising the new **FORMOX** technology. This means Max came in early and soon played an important role in building the Formox business to what it is today: world-leading. Max used to describe his first time at the plants as a bit diversified. His time in the formalin factory was shared with time in the development pilot and, when needed, as a stand-in in the other production units on the site. This was the best possible school to get knowledge and a good understanding of the formaldehyde chemistry and technology.

The first years in the 60s were very eventful. The formalin capacity in Perstorp was increased year by year, and Max was busy getting everything in place and in operation. During 1965-66, the first Formox licenses were sold to Spain, Chile, England and Israel. Being the production manager at the time, Max was engaged to make sure the operating personnel of the new licensees were professionally trained in the plants in Perstorp.

Max had amazing social skills. He quickly made many new friends and formed a strong network with the licensees and other formalin manufacturers. He gained more knowledge, skills, friends and contacts in the early 70s, when many more Formox licenses were sold, and Max, in his role as production manager, had to step in and multitask again. This time to assist in starting up new Formox plants all over the world.



Young Max at work



Bob and Max

He now took his first step towards being a real globetrotter, collecting passport stamps from Finland, Germany, Austria, Brazil, Venezuela and more during this hectic period. Then in 1975, Max started as the salesman for new Formox licenses and later, for complete Formox plants. It is probably in this role that he is remembered by most of us who are still around. When I started at Formox as a process engineer in 1989, Max was seldom in the office. He was travelling most of the time! I know he kept track of all his travels and calculated how many times his Formox adventures took him around the globe. I cannot remember the number now, but it was impressive.

Max sold formaldehyde licenses and plants for 27 years, until he retired in 2002. During this period, an incredible 73 licenses/plants were sold; in average almost 3 per year. It is not surprising he earned the nickname, "Mr. Formaldehyde", for this extraordinary accomplishment. To be fair, he was not alone. In the late 80s, a long-lasting and very fruitful teamwork with the Scottish gentleman, Bob Crichton, started. Together Max and Bob made a fantastic work and at the same time developed a strong and special friendship that lasted until the end. Many are the stories we

have heard. After retiring, Max continued to keep contact with his old colleagues and came to visit us now and then. He recovered well after a successful bypass surgery and continued to be active at the golf course at high age. Max never lost his friendliness and openness, or his curiosity and interest for the world of formaldehyde.

Now you are gone Max, but you will be remembered in our hearts always.

BY



Lars Andersson
Global Market Manager
Formaldehyde - Plants



New faces

Perstorp



Samar Holisaz
R&D Engineer



Shefali Solanki
Process Engineer



Ronny Hallebrand
Supply Chain
Manager



**Christoffer
Lindström**
Senior Instrument
Automation Engineer



**Frida Alexandersson
Dabstam**
Site Administrator

Beijing



Eric Yu
Senior Technical
Service Engineer



Zeling Quan
Process Engineer

New Regional Sales Manager for APAC



Prior to joining JM, Van Fu Shen from Malaysia worked in Formaldehyde production for 10 years at one of JM's customers in the region.

"It is my great honour to have been given the opportunity to join JM as a Regional Sales Manager, working with Eddy Lee until he retires and carrying on from there. My previous experience working alongside JM has given me great understanding of the product and technology, which will help me to support and assist customers in the future. Whenever the opportunity arises, I enjoy traveling to new places in different countries as it enables me to learn and experience new cultures and meet different people."

New Regional Sales Manager for METIA



Mohamed Khiredinn from Egypt has over 24 years of experience in the oil and gas industry, which began with Ethylene production in the United Arab Emirates.

"I began my career as an operations engineer and have since also worked with process engineering and in plant operations within a refinery setting. I have experience working globally with Methanol production as well, with Methanex corporation. Now as a Regional Sales Manager at JM, I will be responsible for the Middle East, Africa, Turkey, and India, specializing in Formaldehyde technology. Away from the office, I find solace in exploring the wonders of the underwater world through diving and snorkeling."

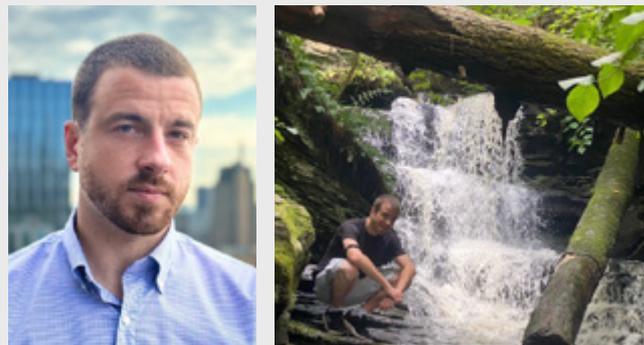
New Regional Technical Service Engineer for Americas



Lucas Freitas is a Chemical Engineer with experience from GPC Quimica in Brazil and Hexion in Canada where he drove process enhancement and project implementations.

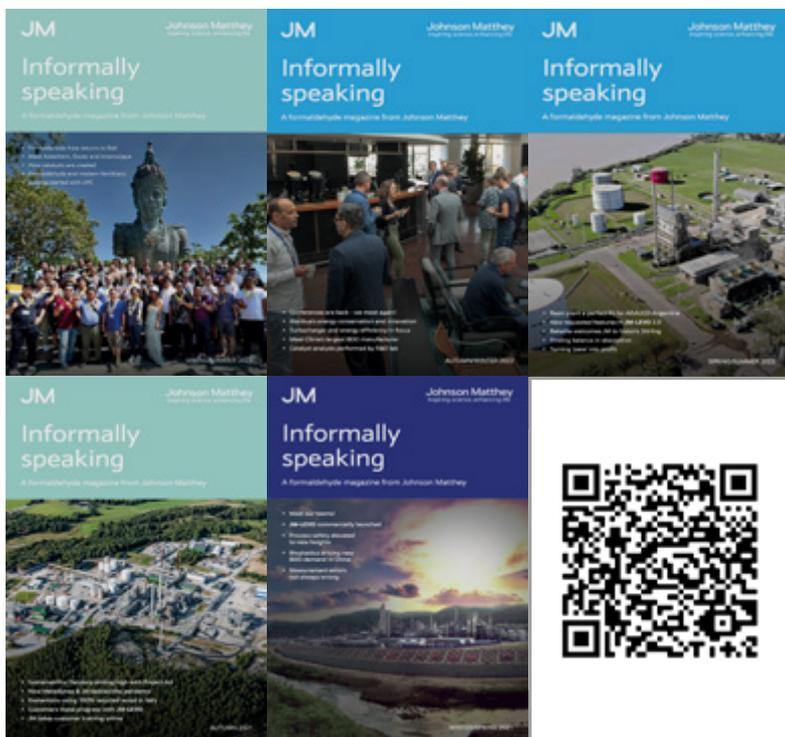
"One of the things I enjoy most about my work is assisting in the resolution of challenges and observing the team's growth in the process. As part of the Technical Services Team, I am eager to continue this journey within the formaldehyde network, working collectively towards a safer, more sustainable, and profitable industry. Beyond work, I love doing outdoor activities with family and friends – especially fat biking in winter!"

New Technical Sales Representative for Americas



Andy Hicks started his career as an analytical chemist in JM's Clean Air Division and has a background in chemistry, statistics, and technical service.

"My career started with XRF testing of JM automobile catalysts and grew into sorption testing of novel catalyst materials. I left the lab to work in technical service with Gelest, part of Mitsubishi Chemical Group, providing application support to a wide customer base for the silane, silicone, and metal-organic product lines. I really enjoyed the customer facing aspect of this work, which has led me back to JM to fully dive into sales. Outside of work, I enjoy travelling, running, hiking – I'm always looking for my next adventure."



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.

Johnson Matthey Formox AB
 SE-284 80 Perstorp, Sweden.
 Phone: +46 435 380 40
 e-mail: formox@matthey.com
www.matthey.com

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JM

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