

A formaldehyde magazine from Formox

# Informally Speaking

Spring/summer 2014



# **Formox record year;**  
-new plants and projects

# **Formaldehyde**   
**Americas 2014**

# **Shale gas in the US**

# **Adding more value with  
Technical Support**

# **Illuminating catalysts  
with XRF**

# Looking back, and ahead

Welcome to a new issue of Informally Speaking! If you have received the magazine before, you will notice several changes compared to previous issues. The new look is in line with the visual identity of Johnson Matthey, our owners since just over a year ago. But just as before, this issue is packed with articles giving you the latest updates on the formaldehyde market, technical developments and the legislative landscape.

The first 12 months with Johnson Matthey have been exciting. We can look back on record catalyst sales and a new, all-time high in demand for new installations of the Formox™ process. Macro-economic data point to a steady increase in the demand for formaldehyde, and with many plants expected to come on stream in 2014-16, we are preparing for an expansion of our manufacturing capacity for KH catalysts. In this issue, I would like to share with you the events of our Formaldehyde Americas 2014 Seminar, which took place in Las Vegas in early April. I also encourage you to read the summary of the presentation on the important work of the ACC Formaldehyde panel, which is supporting the US government in defining the criteria for tomorrow's indoor air quality.

The CAP 3.0 concept was launched in 2012 and several customers have already tested it with excellent results. If you think this could be something for your plant, then please contact your JM Formox Regional Sales Manager. A growing number of plants and customers worldwide has resulted in an increased demand for technical support. I am therefore happy to announce a strengthened organization for our Technical Support function. Headed by Tomas Nelander, the Technical Support team will work closely with JM Formox Regional Sales Managers, helping to ensure cost-efficient, safe and trouble-free production for our customers.



I wish you enjoyable and informative reading, and a very pleasant summer!

Mårten Olausson  
General Manager,  
Formox AB

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# Innovation through collaboration

As a part of the Johnson Matthey family, Formox has gained additional possibilities for synergies and development. “We have already kicked off a number of exciting collaborative projects which will lead to opportunities to improve and expand our technology offering even more,” says Mårten Olausson, General Manager at Formox AB. “Through support from Johnson Matthey Research and Development, we have been able to increase our focus on catalyst innovation with the aim of bringing to market the next generation of Formox™ catalysts.”

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Formox has launched joint development projects with its sister company, Johnson Matthey Davy (formerly Davy Process Technologies). The intention is to launch a new reactor concept and to be able to offer a combined multi-stage plant technology for converting methanol via formaldehyde to downstream chemicals. “Another area where we are collaborating is ECS catalysts, where we are combining efforts to be able to offer a Formox™ honeycomb ECS catalyst designed for metal oxide plants. This will be especially useful in combination with the Turbo-charger,” explains Mårten.

## Improved logistics and dedicated Technical support

In the logistics and distribution area, Formox has benefited from the global network of sales and distribution centers within Johnson Matthey, which enabled a seamless transition at the time of

acquisition. “We are working together to strengthen our warehousing & distribution capabilities in China,” Mårten says. Technical support is a key factor for customers when it comes to selecting a catalyst supplier.

“We have therefore recently strengthened our capabilities in this area by setting up a Technical Support team, a group of highly experienced employees dedicated to supporting customers in everything related to plant performance,” Mårten says.

## Maintaining great relationships

The most common questions asked by customers when the acquisition was announced were related to existing relationships with Formox and its sales, technical service and engineering teams. “I am very pleased to see that we have been able to retain the structure so that our customers have the same contacts as before. There are a few exceptions,

for example in geographical areas where Formox was not present but operated through Perstorp. There has also been a minor change involving Formox staff that moved on to new challenges within the organization and handed over responsibility to fellow team members,” says Mårten. All in all, this has helped to solidify the great relationships that Formox enjoys with its customers.

“Because at the end of the day, it's our customers that we are here to serve!” emphasizes Mårten.

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BY



Anna Rundblad,  
Communication Coordinator,  
Formox AB

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At the end of March 2013, Johnson Matthey Plc, the UK based specialty chemicals company, acquired Formox AB and the Formox™ formaldehyde plants & catalyst business from Perstorp AB. The acquisition of Formox is an important step in Johnson Matthey's strategy to develop new business areas that build on skills in advanced catalysis and technologies. Johnson Matthey has a strong technology base in hydrogenation catalysts for the chemicals industry and now, with Formox, it has presence in the large and growing market of oxidation catalysis.

**Read more at [www.matthey.com](http://www.matthey.com)**

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# Formaldehyde Americas 2014

## Rewarding seminar in Las Vegas



Formox's annual formaldehyde seminars have become a popular opportunity for customers to gain valuable information about the market, new technologies and trends, network and share experiences with colleagues in the business. This year the seminar was held April 7-9 at the JW Marriott Resort outside Las Vegas, USA.

The wide-ranging program included updates on the methanol and formaldehyde markets, Formaldehyde Panel 2014 Update, presentations on High Performance Plants, ECS Catalysts, CAP 3.0 as well as technical and safety matters. An advanced training program was held on the final day, and there were lots of opportunities for informal meetings and discussions.

### What our customers say about the seminar

"It's excellent to have an opportunity to know the new trends, like CAP 3.0, and realize that there are several improvements in the plant that can be made. It's also very interesting to share the experiences of other plant owners," says Hector Alanis, Masnova Quimica. "I really enjoyed this conference. We learned a lot and I hope to come back in the future," says Aaron Graham, Arclin.

"The seminar helps us improve our operation; the examples are very helpful," says Eulalio Jimenez, Masnova Quimica.

### What other topics would you like to see on the agenda?

"Accident case study," says Kim Hong-Gon, SK Innovation.

"More real issues from plants," says Tihomir Bozovic, SI Group.

"The venue is very good, but more information about the Middle-East market would be nice," commented Nima Boustani, Shiraz Chemical Industries.

"The choice of topics was perfect for the amount of time," says Leigh Pollard, Wood Chemicals.

### The formaldehyde market in the US – from a customer point of view

**What impact do you see the current methanol prices having on the formaldehyde demand?**

"The methanol prices have started coming down after a jump in pricing last year. However, prices in North America and Europe are still higher than other global regions creating arbitrage on methanol and formaldehyde based derivatives and this has forced global producers to move their production around," says a spokesperson from Momentive Specialty Chemicals.

"So far our customers have absorbed the price increase in our formaldehyde based resins, but there is a concern that the high phenol formaldehyde resin prices could make the alternate product MDI more attractive" says Gilbert Lorrain, Tembec.

"To date, demand for our products made from formaldehyde has remained steady since we have absorbed the increases and insulated our customers from it. Ultimately, as we move to recover our margins, we realize there is the potential



of alternative technologies becoming more economical. Therefore, the impact will be slower long-term growth rates as customers reformulate to these alternatives,” says Donna Kling, Vice President & General Manager, Paints & Coatings Division of GEO Specialty Chemicals.

### **With shale gas production in North America, do you see the chemical industry in the US being able to withstand the competition from other markets?**

“The US shale gas will be a big boost for the US chemical industry, says Ron Huizing, Senior VP – Engineering, Arclin. “Shale gas production is beneficial to the whole industry. Industries are growing faster than the GDP rate and this is visible based on the emerging chemical market growth in the Gulf region of North America,” comments a spokesperson from Momentive Specialty Chemicals.

“Absolutely. It has already had a positive impact on our energy costs, and it will have an even greater effect if the flow-through results in lower cost raw materials,” says Donna Kling.

“The shale gas is a good resource in order to be more competitive on the global market. The US is considered as one of the main technically recoverable shale gas producers, and will definitely withstand the competition from other markets,” says Eulalio J Ortiz, Masnova Quimca.

### **With methanol production moving to the US from Chile, what impact do you see this having on pricing?**

“This has very little impact as the majority of the production in Chile was being shipped to North America. The movement to North America will lead to full utilization of the capacity compared to Chile,” says Momentive’s spokesperson.

“I hope the price will get lower in North America,” says Eulalio J Ortiz.

“The first Methanex plant will help [stabilize] methanol price by increasing domestic supply. The second one may help in reducing methanol pricing,” Gilbert Lorrain continues.

“The methanol supply/demand balance is forecasted to remain tight at least through 2017. Even with more methanol production in the US, it is likely much of this will be used as a means to convert natural gas into an exportable product, mostly going to China to support DME demand. The amount of new methanol capacity to come online by 2017 is expected to help alleviate, but not eliminate, some of this tightness. Methanol pricing at that point is forecasted to retreat to about \$1.50/gal, believed to be ‘sweet spot’ to meet current reinvestment economics,” Donna Kling says.

### **How is the demand for formaldehyde in your industry?**

“The demand is expected to grow with housing demand growing. Housing demand has been slow for the first quarter this year due to the cold weather. Demand for formaldehyde in other industries is also strong and expected to grow,” Momentive’s spokesperson explains. “Merchant sales of formaldehyde into the northeast US market are not expected to see a major gain in spite of an improving economy. Much of this regional demand moved to southern US or Mexico during the global recession. The remaining business is smaller users who have local

needs or make value-added specialty products. We are currently forecasting 2-3% GDP growth for this business.

Our internal demand for formaldehyde is expected to grow 4-5% per year as demand for GEO’s specialty triols grows. However, new business development efforts are currently focusing on two potential projects that could increase our internal demand by 50%. The success of those projects is uncertain at this time,” Donna Kling says.

“In our industry, the key factor is new housing construction. All economic indicators show an increase of this indicator, thus increasing the OSB demand and PF resin demand. The recovery is slow but is happening,” Gilbert Lorrain says.

“The demand for formaldehyde in our industry will increase. There are some projects to increase capacity of panel production,” Eulalio J. Ortiz continues.

BY



Atul Shah  
Business Manager  
Nafta at Formox AB

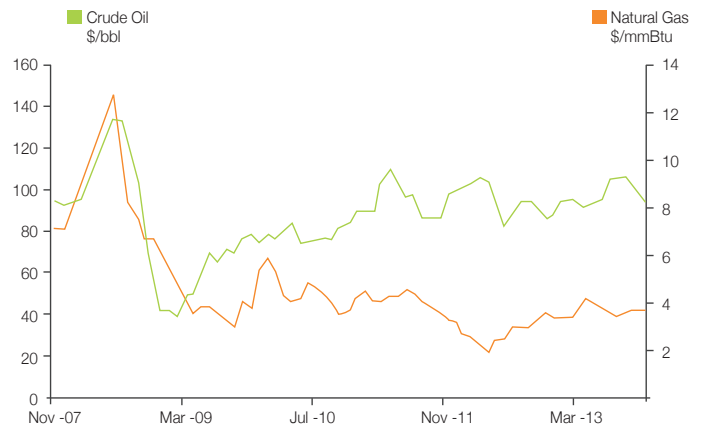


# Shale gas in the USA

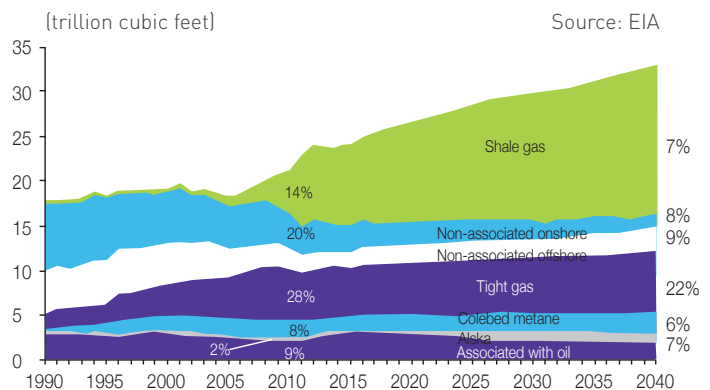
Shale gas is defined as natural gas that is trapped within shale formations. Energy is a global commodity and is typically priced based on the price of crude oil. Since 2008, however, the price of natural gas in North America has become disconnected from the world crude oil price (Figure 1). The typical price of natural gas is roughly one third of what industrial users in Europe or Asia are paying, and the availability of lower cost shale gas is now transforming the chemicals and transportation fuels marketplace.

As seen in Figure 2, an estimated 30 tcf of dry natural gas will be produced in the USA by 2040, with nearly 50% coming from shale gas. This abundance of lower cost natural gas is now enabling the restart (Lyonndell Basel) and relocation (Methanex Chile) of older methanol assets. It is also stimulating over \$100b of new investment in the transportation fuels and chemicals areas, including GTL (Gas to Liquids) and MTG (Methanol to Gasoline) projects, new export facilities for LNG and new power generation, as well as new ethane crackers and ammonia and methanol projects. The view is that the US will become a net energy exporter by 2030.

You have heard of the Bakken field in North Dakota, which is producing sweet crude oil as well as shale gas. Other major fields are the Eagle Ford and Permian Basin plays in Texas, and the Marcellus play in Eastern USA. The Bakken field has the added benefit of supplying oil, around 1m bbl/day, making North Dakota now the 2nd largest oil producer in the USA after Texas. This is an increase from 100,000 bbl/day back in 2005. This crude oil is exported to the West Coast by rail, utilized in Eastern refineries via rail and piped to the Gulf Coast refineries where it is now competing with the heavier crudes from Venezuela and Mexico. Shale fields that produce "wet gas" consisting of ethane and propane are more economic as these valuable liquids are now being shipped north to petrochemicals facilities in Sarnia, Ontario and stimulating possible new investment. The Marcellus shale play is one example, where new, nearby ethane crackers have been proposed. Dry gas from the shale fields is not as economic, but is collected and transported via the US gas pipeline system and the major source of new investment opportunities in natural gas. While the price for natural gas will likely remain in the \$3-5/MMBTU range for the foreseeable future, additional shale gas exploration will likely require a higher gas price to justify the higher capital cost investment in drilling these complex, horizontal wells. Furthermore, the complex geology of these fields is still a young science, so further knowledge of the well depletion rates are required to enable the field developers to undertake the new capital spend.



US Dry Natural Gas Production



BY



Julian Morris,  
Johnson Matthey



# ACC Formaldehyde panel

Jackson Morrill made a much appreciated presentation of the ACC Formaldehyde Panel during the Formaldehyde Americas seminar in Las Vegas. We provide here a short summary of the content.

Formaldehyde is naturally occurring and is one of the most studied chemicals on the planet. The risk profile is generally well known and exposure limits have been well-characterized for both home and work environments. Still there is large debate over formaldehyde, and a number of government agencies continue to seek unnecessarily stringent restrictions on formaldehyde that do not reflect the weight of the scientific evidence. This poses a potential threat to all use of formaldehyde without making the surroundings any safer for humans.

The ACC Formaldehyde Panel was formed in 2010 to meet the different questions facing formaldehyde producers and users. The Panel is actively conducting research projects and is committed to ensuring the best available science is used for regulatory decision-making. The main activities for 2014 will be related to EPA's IRIS assessment and final rule on formaldehyde emissions in composite wood products and the National Academy of Sciences review of the NTP's 12th report on carcinogens.

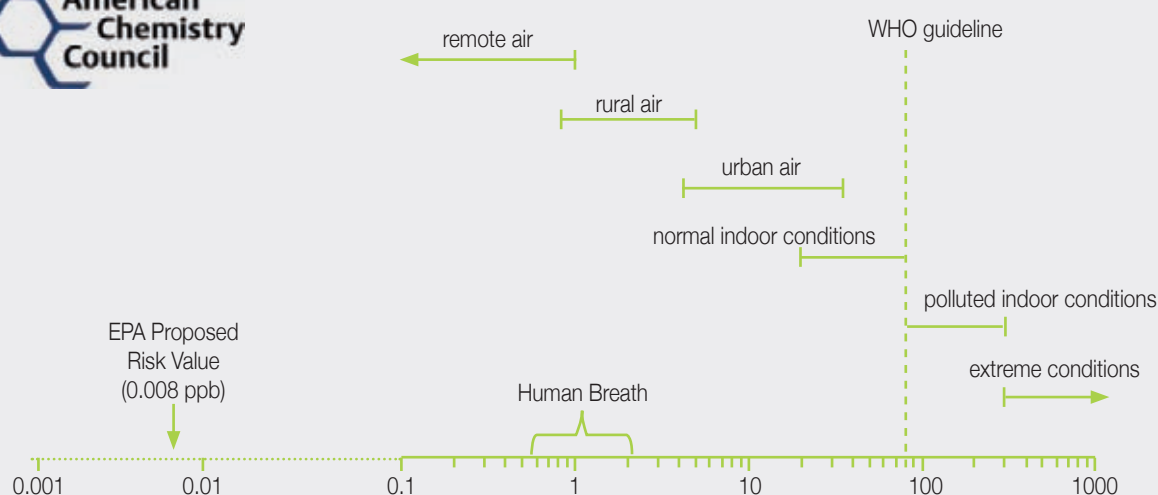
This year will be critical for formaldehyde, and organizations like Formacare in Europe and the ACC Formaldehyde Panel in the US need all the support they can get. We all feel confident that we can contribute to the science debate regarding formaldehyde.

**"The main activities for 2014 will be related to EPA's IRIS assessment and final rule on formaldehyde emissions in composite wood products and NTP's 12th report on carcinogens."**

BY



Ola Erlandsson,  
Manager Technology,  
Formox AB



## Formaldehyde air concentration (ppb)

Figure 1-2 Formaldehyde concentration in various environments. Abbreviation: WHO, World Health Organization. Source: Salthammer et al. 2010. Reprinted with permission: copyright 2010, American Chemical Society.

Graphic adapted from NRC. 2011. Review of the EPA Draft IRIS Assessment of Formaldehyde. At p. 13.

# The FORMOX CAP™ 3.0(T)

## Concept

We have now travelled the world with our latest product, CAP 3.0, explaining at our different conferences all the benefits it brings you. Having reviewed the data and feedback from customers who use it, we are really happy! We first introduced the CAP 3.0 concept and the KH-CAP 3.0 INI CAT – a catalyst placed in the top of the CAP load where aging is most pronounced – in 2012. Looking back, we have gained a lot of positive experience since then.

With the new CAP 3.0 concept we have been able to operate at a methanol concentration of 11.0 vol% and higher. In fact, the upper limit has not yet been exploited, but this appears to be more related to oxygen limitations. Productivity benefits were perhaps over-emphasized, since changing a plant design from 10 to 11 vol% takes time and is perhaps not an option in many plants. Although we said it is possible to operate CAP 3.0 at 11 vol% in methanol inlet, so far this has not been reported as the previous normal operating point has been kept.

### Longer lifetime – better performance

What has been reported, however, are improvements in lifetime and a slower pressure drop development (lower power consumption), as well as a more stable yield compared to CAP 2.0 – all just as we predicted. If you don't need higher productivity you can operate as before, be it 9, 9.5 or 10 vol% in methanol inlet, and you will still see the differences in terms of improved lifetime and performance, i.e. slower pressure drop development and more stable yield.

In some cases, because CAP 3.0 will give somewhat higher DME formation in the latter part of the run, we have had to add a layer of our PPd-47 palladium-based catalyst into the ECS reactor. This increases the operating window of the ECS as the DME has a higher energy value compared to CO, which is normally the component with the highest concentration. The CO formation with CAP 3.0 is normally similar to or lower than that of a CAP 2.0 load, but the higher energy content of the DME causes a higher delta temperature increase in the ECS.

### CAP 3.0(T) - opportunity to be evaluated!

Unfortunately not all plants are suitable for the new CAP 3.0 concept, at least not yet. But for our Formox plants we have been able to change an earlier recommendation stating that only tubes longer than 1400 mm could use our CAP 3.0 concept. Thanks to our ongoing development work, we can now also include 1400 mm tubes! This makes CAP 3.0 loads possible for a much wider range of users. As always, it is important to have the correct plant data, particularly regarding the reactor, when designing a CAP 3.0 load. Please contact your Formox

representative to discuss whether or not your plant is suitable.

So if you're looking to increase productivity, or simply want the best and latest technology to lower operating costs and increase catalyst lifetime, please contact us to discuss the possibilities for applying our best fit of CAP 3.0!

BY



Ronnie Ljungbäck,  
Global Market Manager  
Catalysts, Formox AB





# Illuminating catalysts with XRF

Quality control, troubleshooting and research projects – all elemental analysis previously obtained through external partners can now be carried out at Formox using a newly installed X-ray fluorescence instrument from PANalytical.

How does a catalyst work? How can we tune its performance? What deactivates a catalyst? One answer to these questions lies in the chemical composition of the catalyst, i.e. the elements it is made of. Iron molybdate, for example, is made of iron, molybdenum and oxygen. Changing the relative amounts of the different elements gives rise to new structures, which will have different catalytic properties. Another way of modifying the performance is the addition of extra elements. Some elements enhance performance, while others deactivate the catalyst. Sodium, for example, is a known poison for iron/molybdenum catalysts already at low levels. Controlling catalytic activity therefore translates into controlling the chemical composition. There are several methods for determining the chemical composition of a catalyst. The method we at Formox have chosen for our laboratory is called X-ray fluorescence, or XRF. The advantage of XRF is that it can determine the concentrations of the major constituents (iron and molybdenum) as well as the trace elements (such as sodium) at the same time. A routine analysis requires about 100 catalyst rings.

## How XRF works

A typical fluorescence spectrometer consists of an X-ray source, a sample holder and a detector. An X-ray beam illuminating a material at certain energy will cause some atoms to absorb and re-emit X-ray radiation. This is called fluorescence radiation, which is directed to a detector and analyzed. The energy of the fluorescence radiation will depend on the element; its relative intensity on the amount. Therefore, fluorescence analysis reveals not only which elements are present in material, but also their concentrations.

## Different uses

Quality control, research projects and customer technical service all require analysis of the chemical composition. In quality control the aim is to ensure that all catalysts leaving Formox have the same top-notch quality and performance. This requires a very robust and repeatable analysis. A development or troubleshooting project on the other hand, is more of a detective work. A typical case might be a deactivated catalyst. Is it poisoned? Does it contain extra sodium, for example, not present in the fresh catalyst?

The aim is to pin down the root cause of the deactivation and to recommend ways to avoid deactivation in the future. Analysis of chemical composition is something that we at Formox have always done. With the recent installation of our own XRF instrument in the laboratory, however, we now have much more capacity and can study more catalysts! It is a great tool that strengthens the catalyst testing facilities at Formox.

## Did you know?

Fluorescence is also used to analyze art masterpieces. Because X-ray fluorescence is a non-destructive method, precious objects can be illuminated without harming them. One example is the Mona Lisa by Leonardo DaVinci. Fluorescence analysis has revealed how layers of paint create that world-famous smile.

BY



Kaisa Kisko,  
Catalyst Specialist,  
Formox AB



# Formox Plant 12 month review

## – record capacity sold!

The last 12 months have been challenging from many perspectives, and for us, the acquisition by Johnson Matthey has been the most dominating. We are therefore extra happy to also be able to call it a record year in terms of plant sales.

Having recovered from the 2008 crisis the formaldehyde industry now expects about 4% growth in global demand yearly. Formox plant sales do fluctuate, and big differences from one year to another are not uncommon. The last 12 months turned out to be a year when factors coincided to generate record sales for new plants.

### Record sales

In 2011 Formox had a very successful year in plant sales with a total capacity of nearly 2.2 mMT 37% formaldehyde sold which was the record at the time. Going into 2013 we had no particular reason to expect anything but normal demand for new capacity. However, the high continued demand in China for formaldehyde for BDO was a surprise to us. When we summarized the BDO market in Informally Speaking autumn/winter 2011, we saw a risk of oversupply in the near future, but also noted several new applications and rising domestic

demand. Now we see that demand for new capacity has indeed continued and most of the new projects in China are for downstream BDO production. Thanks to our team in China, Formox will supply much of the formaldehyde capacity required and we can note a record year also for plant sales in China.

In total, projects effective during this year amount to nearly 3 mMT of installed capacity. This corresponds to approximately 20 large, single line plants and nearly 5% of the world market and more than the worldwide increase in demand. Of this total amount more than 50% of this capacity is intended for BDO applications alone.

### Turbocharger

As reader of Informally Speaking you should be well familiar with our future-proof concept for reduced power consumption in our plants, the turbocharger. We are very happy that the second turbocharged formaldehyde plant will be started later this year. It is a twin

installation with two parallel reactors in one plant, making it an important technical reference.

### Future

So, will there be any remaining demand for new capacity following this record sales year? We think so. To a large extent, the high sales this past year were due to an extraordinary situation in China. Our expectations for the coming years are that growth in formaldehyde demand will follow overall market development and, over time, follow GDP growth. We expect the rising importance of shale gas exploration in the US during the last years also will influence demand of formaldehyde as the US market serves as a driver globally.

### BY



Fredrik Rietz,  
Global Market Manager  
Plants, Formox AB



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# Projects & start-ups

## New Projects

- We are pleased to confirm an agreement with BASF PETRONAS Chemicals Sdn Bhd, Malaysia, for supply of a new FS1 plant.
- Xinjiang Xinye Energy Chemical Co., Ltd, located in China, has signed an agreement for a FS3 plant.
- An agreement has been signed for supply of an FS2 plant.
- An agreement for a FT3 plant to be located in Asia has been signed.
- An agreement has been signed for supply of two FT3 plants.

## Ongoing projects

- Works on two FT3 plants to be located in China is in the shipping phase.
- Works on two FT3 plants for Xinjiang Tianzchi Chengye Chemical Industrial Co., Ltd (part of Xinjiang Tianye Group) are proceeding well, with start of installation this summer. The plants are being built in Shihezi City, China.
- The project for an FT3 plant for Xinjiang Markor Chemical Industry Co., Ltd. in Korla, China is proceeding well, with start of installation this summer. This will be their third Formox plant in Korla.
- The FS3 plant for ISP Marl GmbH (an affiliate of Ashland Inc.) in Germany is in the construction phase.
- The project for a new FS1 UFC plant to a client in the Middle East is in the construction phase.

- The FT2 plant to be supplied in the Middle East is progressing well.
- The new FS2 UFC plant for Campact UK (a subsidiary of Egger) is in the construction phase, with the start-up scheduled for later this year.
- The project for CHONGQING CHANGFENG CHEMICAL INDUSTRY Co., Ltd, Chongqing, China is progressing well.

## Start-ups

- The second FS3 plant for Henan Coal & Chemical Industry Fine-Chemical Co., Ltd., Hebi, China went on stream in September.
- Two new plants (FS3 + FT3) for Polyplastics Asia Pacific SDN. BHD, Malaysia went on stream in November.
- The new FT3 plant for Shaanxi BDO Chemical Industry Co., Ltd., China, their second Formox plant on this site, was started in January.
- The supply of an upgraded reactor to a client in South America was successfully started in May.
- The FS3 plant for Tangshan Zhonghao Chemical Co.,Ltd., China is scheduled to go on stream shortly after the publication of this issue of Informally Speaking.
- The new FT3 plant to be supplied to Yantai Wanhua Polyurethane Co. Ltd., China is scheduled to go on stream shortly after the publication of this issue of Informally Speaking.





# High performance plants

## – what are they?

Every Formox customer has its own view of what a high performance plant is, determined by the customer's individual cost and demand structure. So, how does this fit with Formox's standard plant range concept when all customer needs are different?

First comes safety, which overrides all other requirements. Secondly, and I think this is relevant for all customers, are investment level and delivery time – two main reasons why we have standard plants ranging from FS1 to FT3, or from 70 MTPD to 836 MTPD capacity. Thirdly, the standard range allows for some adaptation depending on specific needs regarding product quality, standards, safety regulations, feedstock variations, steam requirements, power costs, etc. Therefore, in the end, all plants end up being individual and based on each customer's specific requirements.

### Define performance and measure product quality

What is our view of a high performance plant other than it should be a good fit with our customer's local demands and requirements? Again, safety first, in terms of both working environment and the environment. The five main items

defining the performance of the plant, as well as main measuring points for product quality, are shown in the tables. Over the last years we have been working hard with the CAP development in order to improve yield and extend lifetime at high operating rates, as well as to reduce power consumption, which I think is reflected in table 1.

Formox now offers solutions that can even make the plant a net producer of electricity. High yield and low power consumption also reduce the carbon footprint, thus improving environmental performance. Another update is our performance package – also available as a retrofit – that will help our customers to further optimize production cost in “real time,” based on actual raw material cost.

### Improved flexibility and future updates

Another area we have improved is feedstock flexibility. We can now offer plants

and CAPs, that can operate with feedstock other than just 100% pure methanol. Also, we continuously optimize the layout for safety and maintenance, and provide valuable technical support.

Conclusion: Safety first. After that, our aim is to offer a plant that will give our customers the lowest “total cost of ownership,” but at a low investment. More updates are to be launched in the years ahead, and because market expectations always move forward, our plant design will never be “finished.” Your input is important to us. What improvements would you like to see in the next generation of plants?

BY



Andreas Magnusson,  
Global Product Manager  
Plants, Formox AB

<b>Methanol consumption</b> (kg/MT 37wt%)	423-426
<b>Steam</b> (kg/MT 37wt%)	750-800
<b>Power</b> (kWh/MT 37wt%)	-50 to 70
<b>Catalyst lifetime</b> (MT37wt% / kg cat)	20-27
Operating range (%)	38-100

Formaldehyde		FS/FT
Concentration*	wt %	45-57
Methanol in product	wt % in 37% HCHO	0.3 – 1.0
Formic Acid	ppm in 37% HCHO	<300
UFC 85		
Methanol	wt%	<0.2
Buffer capacity	ml	< 15
pH	7 – 8.5	
Viscosity	cP @ 25°C	200 – 250

# Formox Technical Support

## - Adding even more value

Technical Support is an integrated part of Formox and a key global strategy for keeping our customers satisfied through cost-efficient, safe and trouble-free production.

The foundation of our technical support includes Training & News, Feedback and Performance review. Formox enjoys a unique position as a global formaldehyde technology provider with a Technology team responsible for research and development, and a Process Engineering team for ensuring solutions based on in-depth knowledge and for offering the latest findings. This enables us to combine our plant and catalyst expertise with experience from customers' operations around the world to provide Formox customers with reliable technical support.

### New for 2014

This year we are strengthening our Technical Support organization by introducing dedicated technical resources through regional Sales & TS teams. The initiative is aimed at adding even more value by teaming dedicated technical experts together with Regional Sales functions. Thus, Formox will offer increased contact with the customer through well-known, dedicated regional technical experts. We strongly believe that implementing this new concept will enable quicker response, strengthen customer relations and create an organization with clear responsibilities ready to grow with growing customer needs.

Heading the initiative as Formox's new Global Technical Support Manager is Tomas Nelander. Tomas's latest assignment was as Technical Support Manager in China at our Formox Beijing office. His main task will be managing the Technical Support team in close collaboration with the Regional Sales Managers, and a special responsibility for SEA.

**"This enables us to combine our plant and catalyst expertise with experience from customers' operations around the world to provide Formox customers with reliable technical support."**

### Customer survey and improved website

Other steps we will be taking this year to make our technical support better and add even more value are conducting a global customer survey and remodeling our website. The survey will include topics about how customers prefer to find answers to questions and requests, and the website improvements will focus on interactive communication with customers and partners. Look for more about these later this year.



BY



Lars-Olle Andersson,  
Business Manager,  
Formox AB

# Plant Design and Safety

A formaldehyde plant is a fairly basic chemicals plant, involving only a few unit operations. There are relatively few vessels and the complexity is limited. Nevertheless, it is necessary to ensure that the plant can be operated in the safest possible way. Formox's philosophy is to have safety built in already in our standard plant design.

## Standards & Norms

Design in accordance with established safety standards and norms makes a good basis for a safe and trouble-free operation. We have provided designs that have been approved by the world's leading chemical producers all over the globe. We think it is essential to provide a plant design that meets all possible HSE regulations, making access to necessary permits easier.

## Safety review & classification

**Ex Zone 2, IIB T2**

In the design phase we use the HAZard and OPerability (HAZOP) review as an important tool. The HAZOP allows for a very structured review of the entire plant, which helps identify any potential risk. We also conduct a Safety Integrity Level (SIL) review giving us the SIL level for the standard plant. It is also necessary to define the hazardous area classification (Ex) for the plant. The plant's Ex classification determines the necessary classification for all electrical equipment and instruments in the plant. It is important to remember that we recommend a classification for the plant, but it is always the plant owner that makes the final classification.

## The 5 layer philosophy

To minimize the risk for plant accidents or environmental discharges we use several levels of safety barriers. The principle is to have a sound and safe basic design, and then add an intelligent and robust control system. Unfortunately, instruments can fail and operators can make mistakes, which is why it

is also absolutely necessary to add a trip system and hardware for handling any disturbance that has managed to breach the initial three barriers.

## Better safety through training and education

It's important to remember that despite all the built-in safety of a well-maintained, well-designed plant, plants are still operated by individuals capable of making mistakes. History has shown that many serious accidents in chemical plants could have been avoided by focusing more on process safety incidents. Therefore, a necessary complement to the plant's built-in safety is to ensure that operators have the correct competence by getting appropriate education and training. It is also highly recommended to have a procedure for following-up Process Safety Events. If you want to know more about safety in our plant design or if you feel there

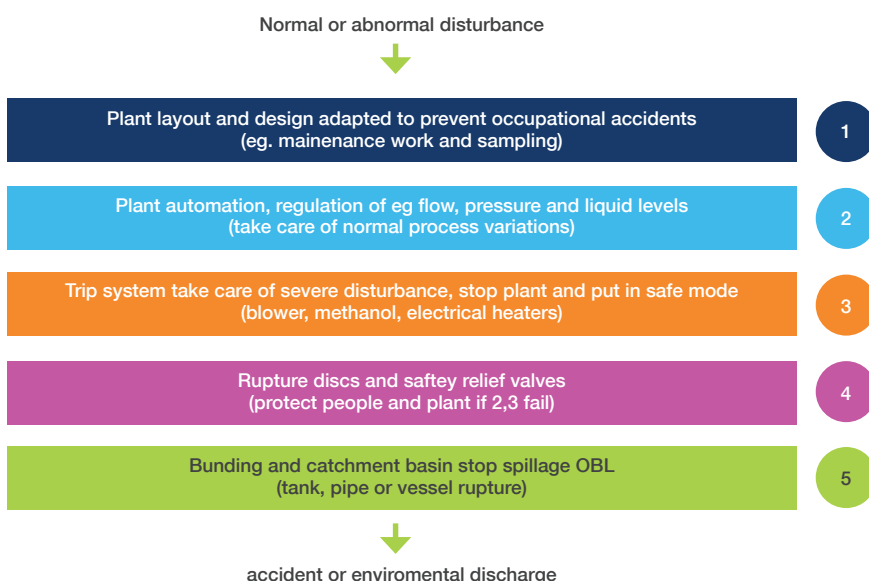
is a need for additional training for your operators, contact your Formox representative to discuss what options are available.

**"We have provided designs that have been approved by the world's leading chemical producers all over the globe. We think it is essential to provide a plant design that meets all possible HSE regulations, making access to necessary permits easier."**

BY



Lars C Andersson,  
Regional Technical Support  
Manager, Formox AB





# The reality of risks in the chemical industry and HTF risks

Many believe it is more dangerous to work in the chemical industry than other workplaces, probably due to a few spectacular accidents and a general fear of chemicals. In truth, the chemical industry has fewer fatalities than manufacturing in general; closer in fact to retail.

Compared to operators of a new chemical plant, those who build the plant run nearly five times greater risk; eight times greater for those who will transport the raw materials and the product. Why? Perhaps because ongoing risk evaluations have been performed longer in the chemical industry than in many other areas. Chemical industry fatalities are still rapidly declining and have more than halved over recent years, proving that continuous safety work has an effect.

## Risks in formaldehyde plants

Fires, explosions (deflagrations), carbon monoxide poisoning and suffocation are all major risks associated with formaldehyde plants, with fire being the dominating risk for both humans and the plant. A fire's effect depends largely on what fuels it. During operation, only a few kilograms of methanol and formaldehyde vapor are present inside the plant and are quickly consumed if the plant is stopped. Heat transfer fluid (HTF), on the other hand, involves

a permanent inventory of several tons with the potential to completely destroy the formaldehyde plant, including the steel. There are two types of HTF fires.

### Fires inside the reactor caused by a leaking tube

A reactor fire will start around an HTF leak in one of the reactor tubes. The temperature indicators after the reactor will trip the plant when a high temperature is detected. The fire should then die out once the oxygen is consumed inside the reactor. The reactor fire-fighting system ( $N_2$  or  $CO_2$ ) should be activated if the fire continues and high temperatures ( $>$  HTF temperature) are seen in the top of the reactor dome. Do not start the fire fighting system if the blowers are still running!

### Pool fire inside the plant containment

The HTF in the reactor normally operates above the flash point. If hot HTF ( $>$  112°C) leaks out into the plant containment a pool fire could start,

although the plant's EX classification should prevent ignition. It is probably wise to cover leaked HTF with foam until it has cooled to below the flash point. A pool fire must be extinguished using external resources like fire trucks, foam guns, etc. as no systems inside the plant can handle it.

### What to do

Though the risk of an HTF fire is small, a few simple precautions can further reduce it.

- Check the lower tube sheet for small HTF leaks during every catalyst reloading
- Go through the procedure for starting the reactor firefighting system with the operators
- Check the integrity of the plant containment
- Check the fire truck access to the plant under different wind directions

BY



Ola Erlandsson,  
Manager Technology,  
Formox AB



"A reactor fire will start around an HTF leak in one of the reactor tubes. The temperature indicators after the reactor will trip the plant when a high temperature is detected. The fire should then die out once the oxygen is consumed inside the reactor."

# Formox information online

## – how would you like it?

Since about a year ago Formox has been a subsidiary of Johnson Matthey, a specialty chemicals company and a world leader in sustainable technologies. Side-by-side with other sister companies, we belong to Johnson Matthey's "Process Technologies" division. Currently the Formox website is [www.formox.com](http://www.formox.com), but all of this information is also mirrored at our division website, [www.jmprotech.com](http://www.jmprotech.com), where Formox has its own pages.

"We will be reviewing and updating our jmprotech web pages over the next six

months to make them even easier for you to find the information you need," says Anna Rundblad, Communications Coordinator at Formox. "We want customers to feel comfortable navigating these pages, and we also want to present more updates and news on the web and to offer a version in Chinese as well."

### Tell us what YOU want

"During this process I would be very happy to receive any input from customers regarding the type of information you want to be able to find at our web-

site," says Anna. "It's important for us to know how you would like to use the website and what information is most useful to you. So please e-mail me at [anna.rundblad@matthey.com](mailto:anna.rundblad@matthey.com) with any suggestions or requests you may have. Thank you."

BY



Anna Rundblad,  
Communication Coordinator,  
Formox AB

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



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

## Formox expands in China

Formox's first plant in China was sold in the early nineties. It took another ten years before Formox would open an office there, together with Perstorp. "The world was showing a lot of positive interest in the region's potential for becoming an important international business center," says Lars-Olle Andersson, Business Manager at Formox. "So Beijing was the location for Perstorp, and a natural location also for Formox." Formox Beijing has grown since then and now offers specialized functions in technical support, sales and projects. After Formox was acquired from Perstorp in 2013, the Beijing team moved to Johnson Matthey's large new office in Chaoyang district.

### Who are the customers?

"Currently our customers are mostly in the chemicals industry, such as BDO, MDI, POM and Para," says Grace Gu, Office & Marketing Manager at Formox Beijing Office. "Recently we have begun making offers to the wood industry as

well – a very big segment in China where formaldehyde is used for resin applications."

### What functions does your team provide?

"Today we have eight people at our office working in different areas," says Grace. "There's the Sales team with Eric, Huamin and Vivian; the Office & Marketing team with myself and Cheng; the Technical support team with Jianguang and of course, the Process engineering team with Guofeng and Pengwei."

### What are Formox's next goals in China?

- "To continue to grow the business and organization by further development of the Formox brand and offer in the Chinese market, including more extensive project and engineering support"
- "To develop in the wood industry and realize sales to wood plants in China"
- "To host a Formaldehyde Conference in the spring of 2015"



Front row from left:  
Zhang Cheng, Grace Gu, Vivian Wang, Dong Pengwei  
Second row from left:  
Zhang Huamin, Sun Guofeng, Eric Li, Zhang Jianguang, Charles Yu (previous intern)

BY: Anna Rundblad, Communication Coordinator, Formox AB

# Formox participates at Methanol conferences

As formaldehyde is a major downstream product of methanol, Formox's view on the current and future state of the formaldehyde market is of interest to many. For example, it is important that suppliers of raw materials to our customers have as accurate a picture as possible of the future demand for formaldehyde and, consequently, for methanol. Our intention is to therefore participate at various conferences and seminars worldwide, partly to talk about the formaldehyde market, technology and regulatory issues, but also to learn about the methanol market and industry as these highly influence our customers.

## JM Catalyst's IMTOF Conference

In early July I was invited to give a

presentation at JM Catalyst's IMTOF conference (International Methanol Technology Operators Forum) held at The Cumberland Hotel in London. The conference covers a wide spectrum of topics ranging from the latest updates on the methanol market and technical inventions, to various aspects of operating a methanol plant. As Formox is new to the JM family, my presentation was an introduction to the formaldehyde market and to Formox and our technology.

## IMPCA 2013 Asian Methanol Conference

In October I was invited to speak at the 16th IMPCA 2013 Asian Methanol Conference organized by Methanol Market

Service Asia (MMSA) and held at The Shangri-La Hotel in Singapore. Here as well, I was asked to talk about Formox's view of the formaldehyde market and the latest technical updates.

Want to know more about these conferences? Please feel free to contact me: [andreas.magnusson@matthey.com](mailto:andreas.magnusson@matthey.com)

BY



Andreas Magnusson,  
Global Product Manager  
Plants, Formox AB

# Mo update

Since the latest edition of Informally Speaking in September 2013, the price of molybdenum (Mo) has been very stable, between 9-10 USD/lb. It did jump to just above USD 14/lb at the time of writing this update, but this peak is believed to be temporary. As reported in the previous edition, the outlook appeared less optimistic going forward into 2014-15 with Mo expected to stay within the 9-15 USD/lb range for an extensive period of time, which was lower than earlier anticipated. Recent information from various analysts suggests the cited levels are very likely to prevail over the next few years.

The explanation for this is that considerably large mines, both copper and molybdenum, are coming on stream in 2014 and 2015, creating an oversupply of Mo to the market. This may force less profitable suppliers to adjust/decrease production in order to keep the price up.

Another factor that may influence the supply and pricing situation are objections



by the World Trade Organization (WTO) to China's export restrictions on molybdenum. Removing the export tax would influence the flow and trade balance by allowing more molybdenum to be exported out of China. Analysts, however, downplay the impact as other taxes such as a mineral resource tax will likely be increased or imposed to minimize exports, more or less maintaining status quo.

Formox is also trying to maintain status quo in the sense that we strive to maintain reasonably stable net prices regardless

of possible market changes due to new mines, novel usage scenarios or other impacts to the global flow of molybdenum. Your efforts to return spent catalyst as well as our efficient catalyst recycling system help to make this possible!

BY



Ronnie Ljungbäck, Global  
Market Manager – Catalysts,  
Formox AB



# Hua Hin seminar 2013

## Lost and found

Please find below a nice picture from last year's conference in Hua Hin, Thailand, which we accidentally missed publishing last year.

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## Upcoming seminars

The next scheduled major seminar will take place in Sweden, Europe, in spring 2015. We are also planning a seminar in China during spring 2015.

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# Reminder for DeltaV users

Emerson provides 5 years of software hotfix support and Microsoft security update testing for each major DeltaV software version. DeltaV version v10 was released in early 2009, and has now moved to a "Retired" lifecycle status at the 1st of February, 2014. The current version of DeltaV software is version v12. Under "Retired" status, Emerson will continue to provide full technical support for DeltaV version v10 applications,

but will not be issuing any new DeltaV hotfixes or testing any Microsoft updates for version v10. DeltaV hardware installed in version v10 systems will continue to be supported per Emersons published Product Support Guideline.

It is important to note that Microsoft has officially retired the Windows XP operating system during April, 2014. In May Dell began phasing out workstations

that are certified with the XP operating system. Emerson has a comprehensive portfolio of system upgrade services, enabling customers to stay current with the latest technology and take advantage of new functionality within DeltaV. Emerson encourage you to work with your local Emerson Service Provider, who can provide you with system life planning assistance to help you continually manage your control system investment.

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## New...



Kaisa Kisko,  
Catalyst Specialist



Niclas Tjernlund,  
Process Engineer



Peter Strunk,  
Senior Process Engineer



Ulf Palmquist,  
Manufacturing Manager



Jan-Erik Andersen,  
Project Manager



Anna Rundblad,  
Communication  
Coordinator



Susanne Kappelin,  
Assistant



Pontus Ivarsson,  
Process Engineer



Tobias Lindén,  
Process Engineer



Fredrik Lövgren,  
Mechanical Engineer

## ...& left

Christian Luckmann,  
Mechanical Engineer

We are glad to have had Christian as our colleague and wish him the best of luck in his coming challenges.



# Formox trainings!

A formaldehyde plant's profitability and reliability is largely determined by the skill and care with which it is operated. Adequate skills and proper training of the personnel operating the plant is therefore of great importance in order to capitalize on the investment represented by the formaldehyde plant. For this reason, our customers are always invited to a training course prior to the commissioning of a new Formox plant. But there is also a need for further training

after the plant has been in operation for some time. This not only includes any new operators who may have joined your staff since the initial start-up training, but also experienced operators and other key personnel who may need to refresh and improve their skills.

1) This February Anders Malmberg and Simon Smrtnik lead a Standard training for Safco 5 in Jubail, Saudi Arabia.

2) Anders and Simon also held a Refresher training for Qafco 4 in Qatar, in February.

3) A training was held for Yantai Wanhua at Formox headquarters in Perstorp, also in February.

4) A Refresher trainings took place at Perstorp 6th-8th of May for about 30 customers from different countries.



## A formaldehyde magazine from Formox

The newsletter Informally Speaking aims to provide information about formaldehyde in an informal forum and is published twice annually by Formox 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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Formox

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