informally speaking

THE FORMALDEHYDE NEWSLETTER FROM PERSTORP FORMOX autumn/winter 2007

SPECIAL REPORT
from the Scientific Conference in Barcelona:

What does science say about formaldehyde?

Photo courtesy of Susanne Gehrmann

in this issue...

Cautious optimism

As we all know, formaldehyde has been under attack in the past couple of years, largely due to reclassification by the IARC. FormaCare in Europe, and FCI in North America, have responded – in the form of sponsored yet independent scientific studies. In September, a large group of international scientists convened in Barcelona to report their findings. You'll find an extensive report in this issue of ***informally speaking***. Let me summarize by saying that we are pleased to find substantial grounds for cautious optimism.

We also have reason to feel optimistic about growth in Russia, of which we are fortunate to have some first-hand experience. This issue brings you reports from two of our customers there.

As always, the world is changing, as is Perstorp Formox. In our organization, we have decided to combine all sales – plants as well as catalysts – in one department under Marie Grönborg. We feel that this will help to streamline our sales process, including the link to Technical Support, where Marie has her background and a deep understanding of what is needed. We are constantly looking for ways to shorten the paths between our various disciplines, from process and catalyst development through sales and on to technical support. This is in order to provide even faster and better service to each of our customers.

We have sought to fill this issue with lots of useful information and advice, including a few tips from one of our most experienced operators. And I'd like to call special attention to the announcement about an opportunity to join a training session in March. Although ***informally speaking*** provides a lot of good advice, nothing can quite take the place of face-to-face!

Mikael Ekblad
General Manager
Perstorp Formox

Russia

– sustained and major growth?

By far the biggest country in the world geographically, although considerably smaller than the former USSR it was part of. A declining population yet continued strong economic growth, and likely to continue. Political stability, but tremendous changes on every level of society. This is Russia today. For some inside info, we spoke with **Anna Yevdokimova**, who, together with Ronnie Ljungbäck, is the principal Perstorp Formox representative for Russia, at her Moscow office.

How do things today compare with 10 years ago?

"When you visit from the outside, you tend to see tremendous changes, but even those of us who live here find that you can't recognize parts of Moscow after six months! The declining population is a big problem. It creates a vacuum that is being filled by immigration from the former Soviet countries. This includes many illegal immigrants, especially in the construction business.

"The gap between Moscow and the rest of the country is growing all the time, with some 80% of the country's wealth located in the greater Moscow region. Banks and industry are concentrated in this area. Living in Moscow is becoming unsafe due to traffic and crime increases, but salaries are high so people come to seek their fortune.

"We'll be having parliamentary elections in December and a presidential election in the spring. There's orderly transition and little unrest. This political stability is a great benefit to society and to industry."

How is the state of industry?

"Although Russia has plenty of money to invest, there is still too little advanced technology, and Western countries are not always willing to invest in new technologies here. This is a clear limitation. In certain areas there is a move to downstream production, but we still have huge sales of raw materials. The common attitude seems to be 'Why should we invest in local production when we can buy elsewhere?'

"Fancy shopping malls are springing up like mushrooms after rain, but unfortunately there's not as much in the 'real' sector.

"The chemical sector, however, is following the same rate of growth as our GDP – some 7-8% annually. And this is likely to continue for the foreseeable future. We're big on exports of things like fertilizers and solvents. And we're also seeing rapid development in the automotive sector, first with Ford, then Toyota. This industry is centered in the St. Petersburg region, in Vsevolozhsk [the Russian equivalent of Detroit, but harder to pro-




Clockwise from top left, this page:
A modern department store in Moscow; inside the famous GUM department store at Red Square; outside GUM; a detail of the amazing cupolas of St. Basil's; an open market; traditional Russian dolls; a well-decorated officer; a sculpture of swimming horses; the Kremlin wall; the Moscow River keeps on rolling along; the Kremlin viewed from afar.

nounce…]. We can expect this industry to drive the development of the chemical industry. And in some areas, certain really successful businesses [see Metafrax article, page 4] have been quick to adopt the latest technology as a way to achieve fantastic growth.

"We're also seeing activity in the far east – Vladivostok, Kamchatka, Habarovsk – thanks to good port facilities there. The government is interested in developing this area, so a lot of federal funds are being channeled to this region. But you have to remember that it takes seven [7] days to get there by train from Moscow. It's a big country!"

The primary contact persons for Russian customers are Ronnie Ljungbäck from Sweden and Anna Yevdokimova from our Moscow office.







Metafrax just keeps on rolling

In the most recent article about Metafrax in this newsletter – the autumn/winter 2003 issue – the Russian company had just purchased the third of three (!!!) Perstorp Formox plants for their site in Gubakha. They have now purchased a 4th, this time as part of a joint-venture with Dynea, for a site in Zukhova-Orzekhovo, in the greater Moscow region. Metafrax has thus gone from a minor HCHO producer to become Russia's biggest, and a place in the world's top 10 – in just 5 years! **Mr Vladimir Daut**, General Manager, tells how.

Three Perstorp Formox plants at the Metafrax site in Gubakha, where winter temperatures can reach –50°C!

What's the basis for this phenomenal growth?

Mr Vladimir Daut

"Our main site, in Gubakha, is close to our natural gas reserves, from which we make methanol. Russia is one of the few markets in the world where the major HCHO producers are also in a position of being able to sell methanol!

"Our first Perstorp Formox plant started up in 2003, the next in 2004 and the third in 2005 [plus a Dynea plant after that], so we've added an incredible amount of capacity in 5 years! In Gubakha we make and sell UFC. We also sell to our competitors, which is perhaps more common to do in Russia than on most other markets.

"Last year we finalized a major renovation of our methanol capacity, increasing it by 200,000 tons, bringing us up to 1 million tons. And we have the same objective as before: to utilize as much methanol as possible, by going into downstream production. We're aiming to use as much as 400,000 tons for captive production, but right now we're at 300,000 tons.

"Our joint ventures to produce resin with Dynea are a step in this direction. We have one JV in Gubakha, called Metadynea, and now the new one in the Moscow region, called Karbodyn, which is being built on the site of one of Russia's oldest chemical plants, Karbolit [80% owned by Metafrax]."

What other trends do you foresee?

"Our strategy is to continue building up penta [pentaerythritol] capacity. The present capacity here is not big enough to meet demand, and we aim to increase our production up to 18,000 TPA. When the latest Perstorp Formox formaldehyde plant is ready, our total HCHO capacity will be up to 800,000 tons.

"We believe that the UFC market will flatten out – stabilize – next year. Further demand for HCHO for wood is difficult to forecast, but there will certainly be more for chemicals. One growth area for wood, however, is in the Vladivostok region, with its access to both ports and Siberian wood.

Mr Daut together with the Chairman of Metafrax, Mr Armen Garslyan

"Globalization is also a trend here in Russia. And with it, the trend for the smaller players – the ones using older and less efficient technologies – to be knocked out. Metafrax, however, has tripled its turnover in the last 5 years and will continue to grow.

"I also think we'll be seeing continued major growth of industrial resins, particularly in the region near Moscow, in order to be closer to the end users: big international manufacturers of mineral wool insulation materials like Rockwool, Isover and others.

You're quite a Perstorp Formox customer…?!

"We like to work with Perstorp Formox. The technology is good, and we have a good relationship, also on the personal level and daily basis."

Facts about Metafrax

- Founded in 1955, privatized in 1993.
- Main location in Gubakha, at the western edge of the Ural Mountains, some 1500 km east of Moscow
- New joint venture (Karbodyn) with Dynea near Moscow
- Approx 3,000 employees
- Major producer of methanol
- Russia's largest producer of HCHO, now in the top 10 worldwide
- Annual sales approx. US$ 250 million

Transformation at TOAZ

TogliattiAzot is a company that straddles two worlds – the old USSR and the new Russia. Originally part of a state-owned enterprise called KuibyshevAzot, the government decided it should become a separate company some 27 years ago. The story comes from **Dr Sergei Afanasiev**, Innovation Department Manager at TOAZ, as the company is also known.

Dr Afanasiev

Can you tell us something about the history of TOAZ?

"We started out as part of a state-owned company in the Soviet era. The Company was set up as part of the drive for nitrogen – to produce ammonia-based fertilizers. We were then privatized in 1992, which gave us a lot more development opportunities."

Is ammonia still the principal product at TOAZ?

"Yes, we're among the biggest producers in the world, with a capacity of around 3 million tons. That's around 7-8% of the world's total – and some 15% of the world's mineral fertilizers. We ship from here by rail to both northern and southern ports, and we've also built an ammonia pipeline to the Black Sea, more than 2000 km away."

What other areas of business are you involved in?

"We work in very different areas! We produce over a million tons of methanol. We'll soon be boosting our UFC production to 200,000 tons. We produce heat-resistant tubes for use at 1000°C, for production of both methanol and ammonia. We're at 900,000 tons of urea, soon to be 1 million. We have a big plant for wood-based panels, and we were the first in Russia to use UFC for resin production. We have big production of CO_2, as liquid and dry ice. We make products for car production, furniture, fiberglass pipes, we have our own bank, and we even produce beer!" [Editor's note: Quite a good brew, too!]

What about your use of formaldehyde?

"We have a number of formaldehyde-based products, from UFC, building materials and furniture to chemicals – polymer technology, fire retardants and other fire-protection materials from UFC. All of this will increase, of course, when our new [Perstorp Formox] UFC plant goes on stream and our capacity will be more than tripled. So we have a pretty good position on the Russian UFC market. We're hoping to increase our in-house consumption and develop downstream business further."

Dr Afanasiev's book

Why did you choose Perstorp Formox technology?

"We've been buying your catalyst since 2000 – well, we've tried other suppliers, but have found Perstorp Formox to be the preferred choice. So we knew your level of quality and service, and we also knew that you have one of the leading technologies, as I've explained in my book. [Dr Afanasiev is also a professor at a university in the region and has written several books, including *The Chemistry & Technology of UFC*, the one he refers to here.]

A technical meeting with Ronnie Ljungbäck (right) and Dr Afanasiev (center, left side), the interpreter Lilya Zakirova and plant manager Alexander Astashkin.

"We could have built our own plant [TOAZ has 4 HCHO plants using their own oxide technology], but it would have taken longer, so to save time, we went with your plant. Perstorp Formox has so much more experience than anyone else. We analyzed all of your achievements in this area, had close contacts with your specialists, compared price and quality – and we were not mistaken!

"Your reps in Moscow are always ready to help us, which we appreciate very much. There's an exceptional level of understanding compared with other collaboration partners. And we really like Fred [Thuresson]!"

How important are environmental issues?

"Very important! Requirements on emissions reached the point where we had to acquire higher resin technology or shut down. We were the first to use the new technology, which is now also used by dozens of others.

"The demands are likely to become even tougher, but there's broad acceptance throughout industry – you have to comply with the law! In terms of board for furniture, we can perhaps expect the use of melamine to improve the properties – as soon as Russia has its own melamine production. And we hope to be into this production in two years or so." ■

The new Perstorp Formox plant was in the final stages of construction at the time of this photo in September.

The Volga River, with the ToAz dock in the background.

Facts about TogliattiAzot

- Founded in 1979, privatized in 1992.
- Main location in Togliatti, near the Volga River, about 1000 km due east of Moscow.
- One of the world's leading ammonia producers ("azot" means "nitrogen" in Russian).
- Over 10,000 employees in the corporation, fewer than 60 working with formaldehyde.
- First Perstorp Formox plant under commissioning.
- Produces a very broad variety of other products.

SIZE is everything!

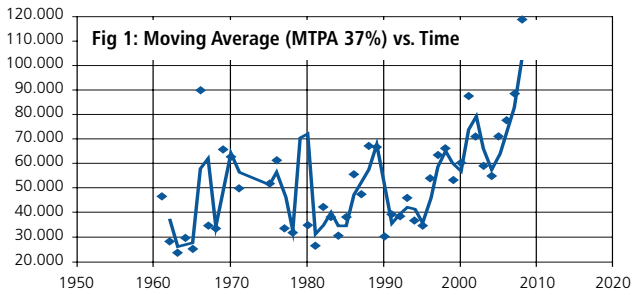
(Or is it?)

By Bob Crichton

During the first half of the 20th century, the capacity of individual formaldehyde plants steadily increased. Technological improvements contributed, but the key factor was the availability of synthetic methanol. The market for the downstream products we all know today simply could not have developed as long as methanol was a by-product of charcoal production.

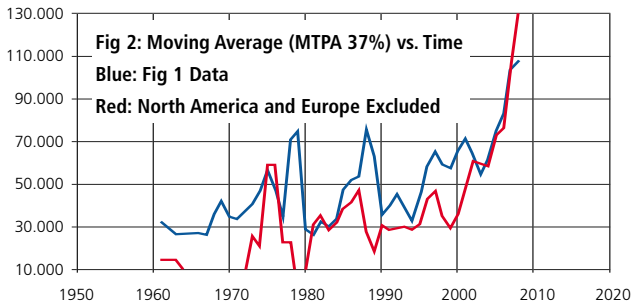
When your editor first suggested an article on how plant sizes have changed in more recent times, it seemed like an interesting idea. As usual, he was right; it proved not only interesting but surprising.

What we expected to see was a continuation of the historical trend. But in actual fact, at least over the last fifty years, the average capacity (37% basis) stayed much the same – 50kTPA (+/- 20k). It was only relatively recently that the average plant size* started to increase again – and it is still accelerating (Fig 1).



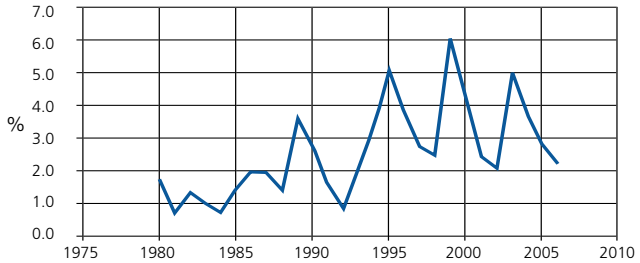
Fortunately for you (not that I feel so fortunate), I was involved with the formaldehyde industry over much of this period. Looking back, it is certainly true that the first few plants I was involved with were in the 50 kT range. And though inquiries over this period covered the full range, only those in the 30 to 60 kT range tended to be built. Indeed it was in recognition of this fact that Perstorp Formox rationalized its plant range around these capacities – 100 and 200 MTPD.

But the global average does not tell us the whole story; there was also a regional dimension – most of the smaller designs were installed in Asia. In North America and Europe, plants were larger. And there was a good reason for this: small plants were quite simply uneconomical in volume markets, as the formaldehyde price was not high enough to give a reasonable payback. This can be seen in Fig 2 where the global average is compared with that for the "rest of the world" – i.e. excluding Europe and North America. As you can see, the average capacity in the "rest of the world" was much lower, at least until relatively recently. But today the average capacity in the "rest of the world" has reached world levels and is also accelerating. Clearly, the regional factor is not the only one in play.



So what happened around 1995 (or five years later in the case of the rest of the world) to cause such a rapid increase in average plant size and why is everyone now building larger plants?

Fig 3: % New Capacity Added Each Year



Well, we know that around this time the rate at which capacity was added doubled, from 2% per annum to 4% (Fig 3). But this is not the cause, rather the effect of something else. What we have seen is a repeat of the 1920s and 30s – a surge in demand. But this time it was driven by the market, not by methanol, and formaldehyde consumption rose across all sectors and all regions – but particularly in China.

Enlarged demand is a double-edged sword – it allows plant operators to benefit from the economies of scale but at the same time attracts other operators, promotes competition and erodes margins. The first plant in a "virgin" territory can afford to be small – margins are good as it competes against imported derivatives such as dried resins and/or UFC. But when the market expands and other plants are built, margins are eroded; eventually new plants need to be big if they are to be competitive – and preferably not only bigger but better.

So does this mean that small plants are out? Well, yes and no; there are still some market regions where, for a variety of reasons, the economics will support a small plant – at least for a time. And it is for this reason that Perstorp Formox retained the smallest reactor size in the current range. But in recognition of the fact that most such plants will eventually need to grow, even these small plants now have built-in expansion capability. And we would like to think that design innovations such as these have also played a part in driving up the average capacity. For example, in 1984 the largest single-reactor plant (the most economic plant in terms of investment per MT of capacity) was 40 KTPA. Today the largest single-reactor plant is currently 3 times that capacity and has expansion capability to 180 KTPA. So perhaps we at Perstorp Formox have also played our part in accelerating the plant size trend!

* This analysis is based on all plants in the database – regardless of process type. The average capacity is calculated as the total capacity added in a given year divided by the number of plants started up. The older data are not always reliable; the start-up date and the original capacity are not always known (due to expansions and debottlenecking). Countries like China and India also distort the picture; there are known to be a large number of small plants in both countries but full data are not available. As a result, the average might be lower than indicated in this article.

6 TIPS from our operators to yours

Perstorp Formox has supplied more than 100 plants worldwide, including five at the Perstorp site in Sweden, which represents an awful lot of experience and expertise. While the operating manuals supplied with a plant are comprehensive and supported by training programs, there is a lot of information to bear in mind and some of the details may be overlooked from time to time. In order to bring some of these details to the surface, we asked one of our most experienced operators, **Björn Petersson**, to share a few practical tips with our readers – who hopefully include many of our customers' operators. Here are six useful reminders to consider each time you change catalyst loads:

1. Remove and blow clean the **methanol nozzles** with compressed air and check for wear. This will ensure the right spray distribution in each nozzle, thus giving maximum utilization of the reactor.
2. Change the **oil in the blower** in connection with reloading or at least once a year.
3. Check that the **fire-extinguishing line** in the reactor is free from blockage. If you ever need it, you really need it! Note that the line must be disconnected during the reloading process. Follow your local regulations.
4. Check the **strainers in the methanol line** and make sure they are clean.
5. See that the **protective plastic of the rupture disc** is intact.
6. After shutting down to reload, let the blower cool the reactor, then drain the **HTF oil** to its storage tank as quickly as possible (at 100°C). Remember to set the circulation valve at the maximum fresh air intake to the blowers. Continue blowing until the reactor is cooled to 50-60°C before opening the reactor. This method is not only faster, it removes the HCHO smell from the catalyst.

Better transport documents

Lucia (left) and Anne

Perstorp Formox customers – particularly those in China and the rest of Asia – can expect to see improved transport documents for catalyst orders from now own. Why? Because as from November 1 we're processing these documents ourselves! ("We" in this case being **Anne Eliasson** and **Lucia Bengtsson**!) Anne tells it like it is:

"We used to have a contractor doing this for us, but the results were unfortunately not always satisfactory. Now that Lucia and I are handling the documentation ourselves, we expect to reduce the volume of information and the lead times for getting the shipping documents to our customers. We'll thus be able to supply faster information about the shipment status and hopefully this will enable the customer to get a head start on import declarations. This can help prevent a scenario where the goods have arrived at the customer's port before the customer has the documents.

"Please feel free to get in touch with us if you need any further information or clarification!"

Salt CAP report card

In the spring/summer 2006 issue we reported that one of Europe's leading HCHO producers, Sadepan, had switched to CAP loading plans in many of their salt-cooled reactors. Here's the trend since then:

- One customer after another with a salt-cooled process has switched to CAP.
- Every completed CAP load has been followed by a repeat order, and no one has "switched back".

We've also noticed that High Inlet is usually being used to reduce electricity consumption (same MeOH feed, reduced airflow), and sometimes to boost capacity (same airflow, higher MeOH feed rate).

Plants that had been limited by pressure drop find the former particularly useful, as the lower pressure drop over the reactor extends catalyst life.

Another "salt" producer switched to Perstorp Formox and CAP at one of their plants in the beginning of 2007. They're very pleased with the increased capacity and the higher yield, and have indicated that they may switch to Perstorp Formox and CAP in their other reactors as well.

Hotspot problems?

by Marie Grönborg

Perstorp Formox recommends using thermocouples to measure the reaction temperature in the catalyst in the reactor – a helpful tool when optimizing plant and catalyst performance throughout the catalyst lifetime.

If readings from these thermocouples are much higher than expected, there may be something wrong in the operating of your plant, e.g. too low airflow, poor cooling in the reactor, non-homogenous MeOH distribution in the gas flow etc.

Jumping, spiking or rolling hotspot problems are probably due to:

- incorrectly loaded thermocouple tubes
- catalyst disintegration due to aging, causing voids or high back-pressure in the thermocouple tubes
- too slow increase of HTF temperature early in the load, causing too high activity of the top layer of mix/catalyst later in the lifetime.

The reasons for high hotspots could be:

- too low HTF level
- poor MeOH distribution in the gas flow, or uneven distribution of airflow in the reactor.

What should you do about it? Sorry, there's no simple answer – it depends on the cause of your problem. We suggest that you tell us all you can about your particular case, e.g:

- When did the hotspot problem start? At what specific production?
- Which thermocouples are showing excessive values? Only one point? Several points in one tube? Or in several tubes?
- What are the temperatures? Where in the reactor and at what height in the tubes are the hotspots?
- Are the high temperatures spiking? Are they slowly increasing and decreasing or are they constantly high?
- How do the temperatures behave after changing the airflow and/or methanol flow?

Once we have this info from you, we can probably help you solve the problem quickly!

The active role of inerts

by Johan Holmberg

For as long as people have been producing formaldehyde, there has been a desire for higher productivity and lower cost. The latest contribution – the CAP concept – can handle methanol inlet concentrations of up to around 10 vol%, provided that the loading plan is properly and individually designed. This design is a critical step for the obtaining a good yield and catalyst lifetime.

Key variables

The key variables in the design of a loading plan are the length of the mixed and pure layers, as well as the dilution of the catalyst in the mix. These variables are strongly dependent on the size and geometry of the inert material. Diluting the active phase with some inert material is an established technique for handling the heat generated. But dilution of an active phase is not as easy as it may seem. The size, geometry and type of inert material must be kept constant. If any of these are changed, the loading plan must be changed. And of course the inert material must be truly inert.

If the rings are not totally inert, i.e. if they have an active surface and a non-selective component somewhere, part of the methanol or formaldehyde will be converted into CO. The outcome of this would typically be a lower yield and a higher DVC. To be able to return the spent material to Perstorp Formox for reprocessing, the rings must also consist of a material able to withstand the rather severe conditions of the molybdenum recovery process.

The bulk density and size of the inert rings must be constant so that the mixes will meet expectations. Since dilution is done on a volume basis (while the mixes are prepared on a weight basis), a change in size or bulk density of the inert rings will result in a changed dilution of the active phase. For inerts used by Perstorp Formox, a change in bulk density or size is always noticed during our inspections. If inerts with an increased bulk density were used, this would result in an over-active mix, which would either limit the inlet concentration of methanol or cause poor performance. Vice-versa, using inerts with a lower bulk density would result in an insufficiently active mix, which would typically result in poor catalyst performance and severely shortened lifetime of the load.

Geometry lesson

The size and geometry of the inert material should ideally be the same as for the catalyst. However, the rings must also be of a size suitable to use with both KH-26 and KH-44 catalyst types. Based on these criteria, the rings are chosen to give an optimal distribution of the mass flow, an optimal heat transfer and still an acceptable pressure drop over the reactor for both types of catalysts supplied.

It should be noted that if either the geometry or the size of the inert material were different, both the heat and the mass transfer in the tubes would be quite different. Basically, the flow distribution would be different due to wall effects, which would also influence the heat transfer. Also, if the size difference between the catalyst and the inert rings changes, the dilution will change. If, for example, larger inert rings are used, a greater fraction of the flow will pass near the wall, resulting in a lower temperature and thus more unconverted methanol. As a result, you will typically have to decrease the blending of the catalyst in order to obtain a sufficient degree of conversion, the result of this being that you will have to purchase more catalyst and can expect an increased pressure drop.

Smaller inert rings give an increased pressure drop in combination with worse heat transfer, which would limit the maximum inlet concentration of methanol.

Conclusions

So what's the message here? Mixes ensure high-quality loading – and give you the opportunity to run at a high inlet concentration of methanol. But it is also necessary to understand that the geometry, composition, size and density of the inerts used are important factors and have an impact on the performance! Perstorp Formox products are well tested and known to perform well in the loading plans we design, but mixes based on inert rings different from those presently used by Perstorp Formox might be able to perform satisfactorily as well. However, a different inert ring than used by Perstorp Formox would possibly require changing the loading plan in order to prevent the risk of short lifetime, low yield and high DVC.

Consequently, when using Perstorp Formox inert rings you can always expect good performance. But if you intend to use a different inert ring, discuss it with your Perstorp Formox representative so that you can be certain we can reprocess your spent material and so that we can design a proper loading plan and let you know how to best prepare the mix!

New catalyst manual

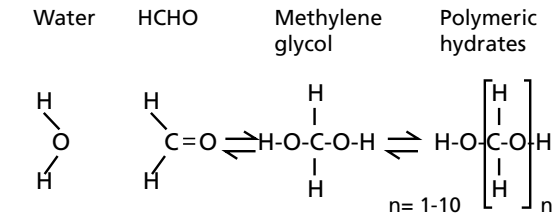
Perstorp Formox is pleased to announce the publication of a new catalyst operating manual. You'll receive a copy with your next catalyst purchase!

Preventing para

by Birgitta Marke

The double bond between the carbon and oxygen atoms is what makes the formaldehyde molecule such a useful building block. It really knows how to react and the crosslink is used in many applications. Formaldehyde absorbed in water (formalin) is a polymer, consisting of 2-10 formaldehyde molecules. The average chain length is about 4 for a 55 wt% formaldehyde solution. If the temperature drops, the chain length will increase and the solution will develop longer and longer "chains", eventually causing precipitation of paraformaldehyde (para). Once there is nucleus, it will continue to grow. That, at least, is the theoretical explanation of para formation in a formaldehyde solution. Let's look at the more practical side.

Liquid phase

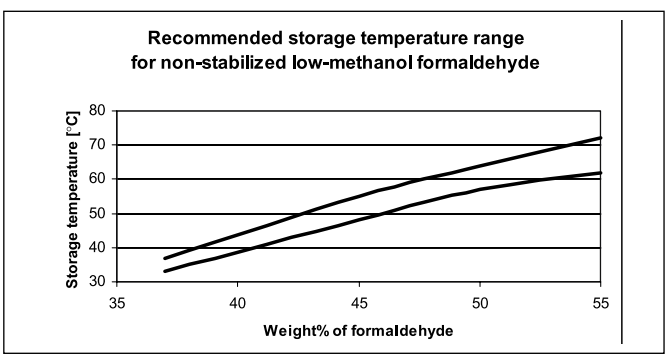


What can we do to prevent para? There are some obvious ways, e.g. to lower the concentration, but unfortunately most of us need to produce concentrated formaldehyde (50 – 57 wt%). Another way is to store the HCHO at sufficiently high temperature to avoid para formation, but not too high, since formic acid formation increases with increasing temperatures.

In storage tanks

So what is a good temperature to store formaldehyde at? Unfortunately, there is no exact figure. It depends on your storage tanks and how long you need to store it. Use the graph below as a guideline. Where climate conditions require it, bear in mind that storage tanks should be insulated and include heating and agitation. We also suggest insulating the bottom of the storage tanks to prevent cold spots, since that is where para tends to start to grow. For strong formaldehyde solutions, we also recommend top-mounted agitation, since it is otherwise difficult to prevent standstill areas. Moreover, we recommend cleaning and inspecting storage tanks once a year.

Always keep the temperature of the solution at least *seven degrees Celsius* (7°C) higher than the formaldehyde concentration percentage for concentrated formalin (>50 wt%).



For formaldehyde solutions with a lower concentration than 50 wt%, the temperature should be around five degrees Celsius (5°C) higher than the formaldehyde concentration. If the formaldehyde concentration is less than 37 %, the temperature is not critical since it is unlikely that para will be formed from diluted solutions.

In absorbers

What can you do to prevent para formation in the absorber? Here are a few pointers:

- All surfaces in the bottom section of the absorber have to be wetted by formaldehyde solution. If the concentrated gas from the reactor finds a dry surface, para will be formed. The wetting of this section can be achieved by spray nozzles or by liquid circulation over a packed section.
- Ensure good performance of distributors (no plugged holes etc) and correct circulation flows to ensure good wetting in the packed sections. Too low a flow could cause para to form in the packed section. Too high a circulation rate can result in overflowing of the distributor, giving liquid entrainment to the tray above, which increases the formaldehyde concentration, resulting in para formation.

- Ensure that there are no malfunctioning trays (loose caps on bubble-cap trays, missing inlet weirs, outlet weirs, trays that are not level, broken downcomers etc.)
- If there is a methanol interlock, and a quick restart is not possible, stop the blowers to prevent cooling of the liquid in the absorber. The temperature in the absorber drops quite fast if there is only process gas and no absorption is taking place.
- Standstill areas must be avoided. Strong (>37 % by weight) formaldehyde solutions must be protected from so-called "dead legs" and "dead zones". If dead legs are unavoidable, the necessary high temperature must be maintained by heat-tracing. The dead leg should be opened on a regular basis, e.g. a by-pass over the level controller should be opened once every shift or – even better – leave the by-pass slightly open.

Never had a problem?

Last but not least, the plant manager who has never had to clean with hot water, steam or caustic

- has probably always operated at a low concentration or
- is relatively new at the job or
- will sooner or later get an unpleasant surprise….

Taking the BULL by the horns

La Sagrada Familia – Gaudí's landmark symbol of Barcelona

The arena: Barcelona, Spain, a country once known for its bullfighting.
The time: September 20-21.
The reason: A scientific conference on formaldehyde, hosted by FormaCare for the purpose of taking the bull by the horns – subjecting to the scrutiny of science the IARC recommendation to reclassify formaldehyde as a class 1 carcinogen.
In attendance: Distinguished toxicologists and epidemiologists as well as representatives of various scientific bodies, international authorities and the chemical industry, some 100 participants in all (including the editor of *informally speaking*).
The outcome: Read about it here. This concerns YOU!

BACKGROUND

The 2004 recommendation by the IARC (International Agency for Research on Cancer, a branch of the WHO) to place formaldehyde in the severest category of carcinogenicity was largely based on the findings of a single study, the so-called Hauptmann or NCI study (conducted by Hauptmann *et al* and commissioned by the NCI [National Cancer Institute] in the US), which had looked at a huge number (>25,000) of industrial workers whose jobs exposed them to formaldehyde. The study, made in 2003-4, had found that 8 workers in the 1960s had died of nasopharyngeal cancer (NPC), a very rare form of cancer in the nose. Six of the 8 workers had worked at the same plant, in Connecticut, USA.

The "expected" number of fatalities due to NPC in the general population is 16 per 100,000, which makes 4 per 25,000. Since the number of cases in the group studied was 8, i.e. twice the "expected" rate, this led Hauptmann *et al* to the conclusion that exposure to formaldehyde was a statistically significant cause of NPC. And their report in turn was instrumental in leading the IARC to recommend reclassification, from class 3 ("possibly carcinogenic in humans") to the severe class 1 ("carcinogenic in humans").

A number of scientists, not to mention the formaldehyde-related industry, found cause to dispute the conclusions of the NCI study, and the need was felt to join forces in order to be able to finance additional studies that might possibly shed further light on the issue by obtaining more facts. As a result, FormaCare was formed (in 2005) as a sector group within CEFIC (the European Chemical Industry Council) in order to share the financial burden of funding the costly scientific studies. In parallel, the Formaldehyde Council (FCI) was formed in the US for the same purpose. Since 2005, studies commissioned by FormaCare have generated some 15 scientific papers, and the conference in Barcelona was called in order to review and discuss the new findings.

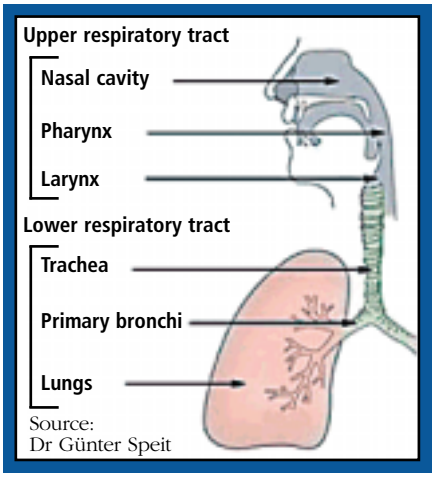
DAY ONE

Professor Elke Anklam (representing the EU Commission) officially opened the conference, noting that the reason for the gathering was "to discuss all new research in order to achieve a platform for a balanced look at formaldehyde, to gain new insights into formaldehyde and to overcome misconceptions."

REACHing towards understanding

Before the discussion of formaldehyde specifically, the conference began with a presentation by **Dr. Juan Riego Sintes**, also from the EU Commission, who outlined the principles or REACH (which stands for **R**egistration, **E**valuation, **A**uthorization and Restriction of **Ch**emical substances), the EU program to assure that all chemical substances imported or produced in quantities greater than 1 ton per company per year are properly assessed and registered.

"REACH is needed because the current chemicals manage-



Source: Dr Günter Speit

ment system is inefficient for dealing with the most problematic substances, making it difficult to identify risks," says Dr Riego Sintes. Of some 30,000 existing substances, only a small percentage are known well, and the EU is seeking to assure sustainable development, which would require protecting public health and the environment. At the same time, REACH shifts the responsibility – and the burden of proof – for all chemical substances from the authorities to the industry.

It should be noted that the impact of REACH is not limited to manufacturers within the EU, but also applies to substances exported to the EU from elsewhere. Dr Riego Sintes also drew attention to the important registration deadline of December 1, 2008. "If you have registration obligations, don't miss this deadline, otherwise the process will be much more complicated!" He suggested that producers should develop partnerships with suppliers and downstream, but above all to start collecting data *now*.

Questioning the findings

The next speaker was **Professor David Coggon**, of the MRC Epidemiology Resource Centre at the University of Southampton. Dr Coggon went straight to the heart of the matter, raising serious questions as to the validity of the NCI study.

Even without looking at the mechanisms involved, Dr Coggon felt that the premises of the study were highly questionable. Of 10 plants involved in the NCI study, one single plant ("Plant 1" in Wallingford, Connecticut) accounted for 6 of the 8 cases of NPC. That one plant also exposed workers to other chemicals not found at the 9 other plants. "That fact alone makes it likely that the cases of NPC were unrelated to formaldehyde," claimed Dr Coggon.

He found other problems with the findings of the NCI study. "If the nasopharynx were a likely site of contact with inhaled formaldehyde, and thus of NPC, one would also expect an excess of sinonasal cancer, but this was not the case in any of the industrial cohort studies!" Dr Coggon noted that wood dust might have been a confounder in the study results.

Looking at other forms of cancer, e.g. leukemia, which had also been implicated in some studies, Dr Coggon noted that "since formaldehyde is so reactive, it seems unlikely it could ever reach the bone marrow before reacting, thus making it unlikely as a cause of this type of cancer."


Prof. Coggon

Further NPC doubts

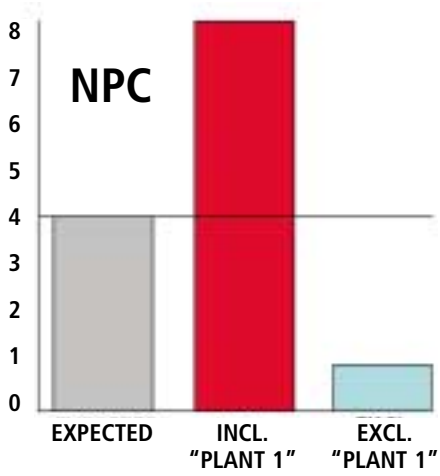
The next speaker was **Professor Hans-Olov Adami**, of the Harvard School of Public Health and Karolinska Institutet in Stockholm. Dr Adami pointed out that there is skeletal evidence of NPC dating back many centuries in certain places, e.g. China and Iran, and that it is an "enigmatic malignancy". Although it is only the 23rd most common cancer in the world, it is the 4th most common in Hong Kong [where there are no formaldehyde plants]. Dr Adami pointed out that interpretation of the study data has been hampered by "imprecise exposure data, potential confounding, and the clustering of cases in one plant." Dr Adami found little reason to point the finger at formaldehyde. "Given the unresolved gaps in understanding NPC, there is a clear need for large-scale, population-based molecular epidemiological studies to elucidate how environmental, viral and genetic factors interact in both the development and prevention of this disease."

A further step with Hauptmann

Next up **was Dr Michael Hauptmann,** senior statistician at the Netherlands Cancer Institute in Amsterdam, The Netherlands, the principal author of the above-mentioned NCI study. Dr Hauptmann reported on ongoing updates of the original study, covering the period 1995-2004, as well as a study of the effects of HCHO on embalmers in the funeral industry [where exposure levels can be as high as 20 ppm, compared to 0.3-4.0 ppm at HCHO plants]. The studies have not yet been concluded.


In the front row, 2nd from left, we find Betsy Natz of FCI. That's Detlev Caljus, FormaCare, 3rd from left.

Photo courtesy of Susanne Gehrmann



The vertical axis in the above graph is the number of NPC cases per 25,000 population. The gray bar shows the number of "expected" cases in the general population, i.e. regardless of exposure. The red bar is the total number of cases in the NCI study, while the blue bar is from the same study, but excludes "plant #1", where workers were also exposed to carcinogens not found at the other 9 plants. The IARC reclassification was largely based on the red bar! If based on the blue bar, would the conclusion have been that HCHO prevents cancer?!

"Non-robust"

The next speaker was **Dr Peter Morfeld** of the Cologne University Medical School in Germany. He was also straight to the point. "Hauptmann *et al* missed an important interaction in the exposure variables, which prohibits a generalization of the plant 1 findings to the other plants investigated. Clearly, the results of the reanalysis of the NPI study do not support the suggestion of a causal association with formaldehyde. The decision [of IARC] should therefore be reconsidered." He also pointed out that studies by Marsh and Youk (2005) had drawn entirely different conclusions from the same data as in the NCI study. "If the model is not correct, how can the findings be generalized?"

Looking specifically at the IARC judgment of the Hauptmann study, Dr Morfeld found that "sensitivity analysis demonstrated considerable uncertainty," thus undercutting the "quite certain" findings of the IARC. The IARC claim – that it was improbable that bias was involved – was also questionable due to missed interaction. Finally, Dr Morfeld felt that the generalization made by IARC carried little credence due to interaction and "low robustness", i.e. insufficient and unreliable data.

Checking out a confounder

The next speaker, **Professor Gary Marsh** of the University of Pittsburgh, had undertaken to find out what was really going on at that plant 1 – deeply involved in the silver and brass processing industry, unlike the other plants in the NCI study.

Reexamining the data, the Marsh study found that 4 of the 6 NPC deaths at the plant occurred in workers employed for less than one year. Moreover, the excesses were observed in parts of the plant where there was no use of HCHO. Additionally, no new NPC cases were observed in the update period (1993-2003). Dr Marsh's conclusion? The mortality excess in the Wallingford cohort "may not be due to formaldehyde exposure, but rather reflected the influence of …possible exposure to several suspected risk factors for upper respiratory system cancer (sulfuric acid mists, mineral acid, metal dusts and heat)."

Prof. Marsh

Those confounded confounders

In scientific studies, a "confounder" is something that can in itself cause disease (e.g. smoking), carries a risk at least as high as the substance being studied, and can be related to the risk in question. A confounder thus makes it difficult or impossible to interpret results with sufficient reliability. For example, if the people who develop an illness on exposure to substance X turn out also to be smokers, then smoking is a confounder when trying to establish the potential hazard of substance X. When people are exposed to multiple confounders, how is it possible to say which substance is the culprit?

Panel discussion, Day 1

The first day of the conference was rounded off with an open discussion, with questions from the floor to all of the speakers. Dr Marsh noted the difficulty of measuring historical data, since not all of the factors we measure today were measured then, but were sometimes based on personal, subjective decisions. He noted that "Plant 1 was a unique site with many processes and awful conditions" and that "NCI's study didn't do quantitative studies of exposure to other substances." Dr Hauptmann admitted that there is "no doubt there are a lot of uncertainties, but it was the best that could be done in 1984."

Dr Coggon noted that "the excess was not concentrated in the people with the longest [HCHO] exposure, so that makes the link very suspicious." This view was reinforced by Dr Marsh: "Longer formaldehyde exposure doesn't add to the incidence of cancer, which doesn't make it a carcinogen in my book!"

Dr Adami observed that he was "fascinated to see what statisticians can do with virtually no data. Without modern, large, well-designed studies, there can be no basis for calling formaldehyde a carcinogen." Dr Morfeld added that a quantitative view shows that "the risk is not great."

Dr Coggon pointed out that "there is nothing wrong with hazard classification as long as it leads to better handling. We already know how to handle formaldehyde and the risks, which are very low if handled properly."

DAY TWO

The second day's session was chaired by **Professor Hermann Bolt**, Director of the Institute of Occupational Health at Dortmund University, Germany. [It should perhaps be noted at this point that the IARC re-

HAZARD, RISK & BALANCE

People sometimes use "hazard" and "risk" more or less interchangeably, but they are in fact quite different – a difference that is crucial to a balanced look at formaldehyde.

A hazard is something that represents a *potential danger*. Having a hungry lion in your home would be extremely hazardous.

A risk is the *likelihood* of something hazardous actually happening. The risk of having a hungry lion in your home is extremely low.

A balanced view is one that takes into account *both* hazards and risks when deciding what actions are needed. You probably don't invest heavily in a security system for your home that is based on keeping out hungry lions, despite the great hazard they theoretically represent. A balanced study of chemicals is simply one that looks at both hazards and risks, then advises accordingly.

Photo courtesy of Susanne Gehrmann

This discussion panel consisted of Drs Adami, Hauptmann, Marsh, Morfeld and Coggon.

Useful definitions

Mutagenicity: permanent transmissible changes in the amount or structure of genetic material.

Genotoxicity: potentially harmful effects on genetic material which are related to Mutagenicity.

Cytotoxicity: harmful effects to cell structure and function, ultimately causing cell death.

Source: Dr Günter Speit

classification is based only on NPC; insufficient evidence was found for leukemia. But FormaCare wanted to investigate anyway, as they expect an upcoming issue….]

What about leukemia?

The first speaker was **Professor Heinz-Peter Gelbke**, for many years with BASF as the senior vice-president in charge of safety and toxicology, also formerly a professor of toxicology at universities in Heidelberg and Karlsruhe. He noted that formaldehyde causes no genotoxicity in distant sites (i.e. parts of the body removed from direct exposure) in animals, but that there is evidence of cytotoxicity in the noses of rats. "Tumor incidence and precursor effects are, however, on an extremely steep dose-response curve." While formaldehyde could be considered a possible carcinogen, there is also a safe level. Dr Gelbke claims that the conditions of exposure to formaldehyde today lead to the conclusion that "no significant contribution to human cancer risk is expected."

Regarding possible associations with leukemia, Dr Gelbke found no sound biological basis. Since formaldehyde is so reactive, it "will only act on tissues of first contact", and its "rapid metabolism prevents distribution of formaldehyde throughout the organism."

Causality?

A guy caught 20 flies and divided them into two groups of 10. He took each fly from the first group, placed it on a table, said "Boo!" and it flew away. Then he took each fly from the second group, pulled its wings off, placed it on the table, said "Boo!" and it remained there.
His conclusion: If you pull the wings off a fly, it can't hear.
A study which is based on the a priori assumption that wing removal has a causal relationship to hearing impairment, and which refuses to take other factors into account, might indeed draw such a conclusion.
What conclusion might be drawn from a study which is based on the a priori assumption that formaldehyde is carcinogenic, and which refuses to take possible confounders into account?

A contrary claim

The next speaker, **Dr Judith Shaham** of Tel Aviv University in Israel and a working group member of IARC, reported that their studies among workers exposed to formaldehyde did show that it could affect the frequency of chromosomal aberration, especially in a protein called p53, and that HCHO can therefore be regarded as mutagenic and genotoxic. Dr Shaham declined, however, to share the details of the studies with the other scientists present.

Self-repair

Professor Günter Speit of the University of Ulm claimed that "IARC is mixing up local and systemic genotoxicity". He first reported on extensive genotoxicity studies, showing that repeated treatments of certain cells with HCHO could induce adaptive protection against DNA-damaging effects (also called DPX = DNA protein crosslinks). In fact, "all cell types studied so far repair DPX." While Dr Speit admitted that HCHO has genotoxic properties, he also pointed out several strong arguments against it being a cause of systemic genotoxicity:

- High reactivity at the site of contact
- Efficient defense mechanisms
- Toxic effects only observed in the upper respiratory tract
- Blood concentrations of HCHO not increased after inhalation
- Negative *in vivo* bone marrow genotoxicity tests – even after long, high exposure

His conclusion is that "genotoxic effects reported in biomonitoring studies are most likely not related to the assumed formaldehyde exposure."

Pushing the limits

Next at the lectern was **Professor Roland Grafström**, professor of biochemical toxicology at Karolinska Institutet in Stockholm. He reported on attempts to transform study cells using HCHO, i.e. push the limits in order to generate a tumor-producing line. The cells studied failed to "cooperate". "High exposure actually causes terminal differentiation – cell death – instead of cancer," reports Dr Grafström. "In other words, when you increase the dose, the cell-killing effect wipes out transformation."

Dr Grafström advised all possible prudence, however. "Don't wait for the results of new studies, but keep expo-

Yes or know
– the "problem" of science

There is a natural desire in the human species to seek – even insist on – simplistic answers, black or white, no matter how complex the question or how complex reality is. The simplistic answer to the question "Does formaldehyde cause cancer?" must be yes or no. The scientific answer, however, will normally begin with a multitude of "It depends on what you mean by…", causing some people to react with "Why can't you just give me a straight answer?!"

So the "problem" of science is that science wants to know – but knowledge is never 100% complete. When you have thousands or millions of variables, plus interactions between them, it seems likely that a categorical yes-or-no answer is at least partly wrong. So a scientist may say "Nothing we have seen so far indicates…" or "Our findings fail to support a conclusion that…" or "It is highly doubtful that…" – instead of yes or no.

Isn't science frustrating?!

sure as low as possible – in the home, at the workplace, in the environment."

Understanding how it works

"There is a critical need to understand how formaldehyde causes mutations and their relationship to exposure," says **Professor James Swenberg**, professor at the University of North Carolina. Since the human body produces its own formaldehyde (endogenous exposure), and formaldehyde occurs naturally in much of the food we eat, "there is always a background, the level is never zero." Extensive studies have enabled Dr Swenberg and his team to identify and characterize the macromolecules involved in DPX. "These will be used to investigate endogenous versus exogenous [external] formaldehyde exposures" in ongoing and future studies. "Only one study shows that peak exposure could be important; all others point to cumulative exposure."

Rats & mice

Dr Frieke Kuper, from the toxicology department at the Dutch company TNO, reviewed studies of rats and mice exposed to HCHO and the association with leukemia and lymphoma. The studies found no association in either species with either cancer, apart from a possible association with lymphoma among female mice – not males and not rats – subjected to long-term inhalation.

Another study looked at HCHO and NALT (nose-associated lymphoid tissue) and found increased development in rats only – but no correlation with the lymphoma in female mice. Surprisingly, further studies found a *decreased* risk for cancer in individuals with any type of allergy, but no conclusive relationship. The possible implications for humans were not investigated in this study.

Her colleague, **Dr Ruud Woutersen**, reported on setups for animal studies concerning leukemia and lymphoma, probably the next research project related to HCHO.

What levels are safe?

The final topics of the conference dealt with occupational exposure limits (OEL). **Professor Gerhard Triebig** of Heidelberg University, Germany, looked at the role of sensory irritation in determining what is safe. "Eye irritation is the most sensitive parameter," he noted. Dr Triebig found that the irritation level could be measured objectively in three ways:

- Redness of the eye (using digital slit-lamp photography and a grading scale)
- Blinking frequency (using a new measurement method)
- Nasal flow and resistance (using active anterior rhinomanometry). The conclusion: "Only 0.5 ppm, with peaks of 1.0 ppm, is considered an effect level, … and 16 hours after the end of exposure, subjective symptoms returned to control levels, indicating the reversibility of effects."
  [FormaCare recommends an OEL of 0.3 ppm to be on the very safe side.]

WHERE DOES THAT LEAVE US?

Several important conclusions could be drawn from the findings presented and the evidence about formaldehyde available so far:

- The link to NPC is highly doubtful.
- The link to leukemia is highly improbable.
- No mutagenic effects have been observed.
- The threshold for sensory irritation is lower than that leading to cell death.
- Today's OEL threshold (within the EU and many other countries) is below the sensory irritation level.
- Further studies are underway.
- Is IARC able to go back on its decision in the light of all these findings?

Are you helping?

The much-needed scientific studies of FormaCare (www.formacare.org) and FCI (www.formaldehyde.org) are funded by the member companies. Has your company joined? If not, now would be a good time….

It wasn't easy getting all of the speakers together in the same photo! Here at least are Drs Shaham and Kuper (front row) and (left to right in back row) Drs Morfeld, Swenberg, Woutersen, Speit, Gelbke, Triebig, Adami, Grafström and Bolt.

Photo courtesy of Susanne Gehrmann

Projects & start-ups

Four more projects have reached completion since the last issue of ***informally speaking***, but many new and ongoing projects are keeping us very busy! Here's an update:

New projects

We have signed contracts for three new projects since last issue.

- A plant has been sold to **Formosa Plastics Corporation** in Taiwan.
- An FS2.5 plant has been sold to **Karbodyn** (a joint-venture between **Metafrax** and **Dynea**, see separate article page 4).
- As a result of the relocation by Celanese subsidiary **Ticona** of its Kelsterbach production facilities to the Industrial Park Höchst site nearby, made necessary by the expansion of the Frankfurt Airport, Perstorp Formox has been contracted to supply two FT3 plants to meet the formaldehyde requirements of the new site.

Ongoing projects

In addition to the above new projects, we currently now have eight (8!) other ongoing projects:

- Construction of the FT3 plant **Yunnan Yuntianhua** in China is well underway, and the plant is expected to be started early 2008.
- The project for **Lucite International**, Singapore, is on track.
- The plant for **S.K. Petrochemical** in South Korea is currently under construction and will be put on stream early 2008.
- The **Nafta Lendava** project in Slovenia is proceeding at a higher speed again, now that authority approvals are in place.
- The project for **Xinjiang Markor Chemical Industry** in northwestern China is proceeding and is due to start up in the spring of 2008.
- The project for an FS2.5 plant to be built by **Shaanxi BDO Chemical Industry Co., Ltd**, to be located in Weinan City in the Shaanxi province of China is running on schedule.
- Another FS2.5 plant has been sold to **Yunnan Yunwei** Company Ltd, located in Zhanyi in the Yunnan province. This project is also running on schedule.
- The third project sold this spring, an FS3 plant for a company in Europe, is also underway and on schedule.

Start-ups

Two plants have been started since last issue of ***informally speaking***, and two are on their way to be started as the issue is being printed:

- The first Perstorp Formox plant in Japan – at **Kuraray** – went on stream in June.
- The plant for **Faplac S.A** in Puerto San Martin, Argentina should go on stream just after publication of this issue.
- The plant for **Togliattiazot** in Russia (see separate article on page 5), should be on stream as this issue goes to press.
- The second line of the FT3 plant at **Ningbo Wanhua**, China should also be up and running by the time this issue is published.

MeOH update

The following article was kindly provided by Ronaye Beck, Methanex

It has been a dynamic year for methanol prices with ongoing changes to the global supply and demand balance. High prices in Q1 of this year encouraged some high-cost incremental supply and an increase in methanol exports from China due to high price differentials between the Chinese domestic and export markets. High prices also suppressed some methanol demand, leading to a rebalancing of the global methanol market. Lower prices in Q2 led to the shutdown of approximately 1.3 million MT of high-cost methanol supply and increased methanol demand in energy applications. The market appeared relatively balanced with stable pricing at the end of Q2 and beginning of Q3.

Throughout Q3 however, approximately 1.7 million MT of methanol production was lost due to planned and unplanned outages by several producers. These outages, combined with continuing strong demand, caused a severe shortage of methanol to occur near the end of the quarter. Global inventories dropped significantly and spot prices have escalated dramatically in recent weeks. Contract methanol prices rose sharply in October and are expected to remain high for the remainder of the quarter as spot market prices continue to rise. The Methanex US Gulf Coast Non-Discounted Reference Price (MNDRP) for October was US $565/MT compared with US $319/MT in September. In Europe, the Methanex European Posted Contract Price (MEPCP) for Q4 was the equivalent of US $553/MT compared with an average of US $308/MT for the previous quarter.

High methanol prices are expected to continue for the remainder of the year. Global inventories are well below normal levels and an extended period of high operating rates is necessary to rebalance supply and demand. High methanol prices however will again encourage an increase in methanol exports from China, helping to resolve the supply and demand imbalance. Non-traditional demand for methanol in energy applications such as fuel blending and the production of Dimethyl Ether (DME) continues to progress, but will be challenged in this high price environment. Going forward, demand is expected to remain relatively strong due to persistently high energy prices, and methanol prices will remain above-average as underpinned by global energy prices.

* * *

Methanex Disclaimer: This article contains forward-looking statements which, by their nature, involve risks and uncertainties that could cause actual results to differ materially from those contemplated. Please see the Methanex Corporation quarterly reports for more information.

Faces & Places

Here's an update on our team changes since the last issue of ***informally speaking***:

- **Marie Grönborg** is now head of our new department covering sales of both plants & catalysts.
- **Anna Wemby Björk** has returned to Perstorp Formox as manager of our Process & Technical Support Engineers.
- **Daniella Cheng**, with a degree in chemical engineering from Chalmers, joins our team of process engineers. She was born in China but has lived in Sweden since she was 14.
- **Henrik Lendrup** has also joined our team of process engineers. After graduation from Chalmers University, he worked some years at Stora Enso.


Marie


Anna


Daniella


Henrik

Olle Johnsson has left us after many years for a position at Kemira. **Andreas Magnusson** has left us for a job at Alfa-Laval. **Andreas Olsson** has taken a job at AarhusKarlshamn.

We wish Olle and both Andreases all the best at their new companies!

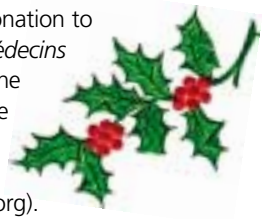
Training

Xinjiang Markor Chemical Industry (left) sent a delegations of trainees from China to rainy Sweden in August, and Puerto San Martin (Faplac) sent two trainees in June (just missed the last issue).

Season's greetings!

All of us at Perstorp Formox would like to wish all of our customers, suppliers and other readers of *informally speaking* a joyful holiday season and a peaceful and successful 2008.

This year, we're again making a donation to Doctors without borders (a.k.a. *Médecins Sans Frontières*) in recognition of the outstanding job they do to alleviate human suffering under difficult conditions (see www.doctorswithoutborders.org).



Are YOU interested in refresher training?

If enough licencees are interested, Perstorp Formox will hold a refresher training course in Sweden during **the week commencing 10 March**. The course will cover subjects like process review, safety, absorber operation, maintenance etc.
Would anyone from your company like to participate? Then please inform your contact person without delay! Please also let us know if there is a particular topic you want us to include in the program.

Seminar news

The next round of formaldehyde conferences hosted by Perstorp Formox is as follows:

- **Formaldehyde Americas 2008** – to be held in Toronto on April 21-23. If you plan to attend, please sign up without delay!
- **Formaldehyde Europe 2009** – to be held in Helsingborg and Perstorp, Sweden. The conference will include a visit to our own plants, and participants will have the opportunity to meet most of the Perstorp Formox team.
- **Formaldehyde Asia 2010** – the exact time and venue have not yet been decided. Information will be announced in this box in a future issue of ***informally speaking***.

Also refer to our website (www.formaldehyde.com) for further details!

informally speaking

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