



Euromel[®] Melamine Technology

 **EUROTECNICA**
MAKING SUSTAINABILITY PROFITABLE

Part of the Proman Family

Eurotecnica

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Join the world's largest melamine network

Cover image
Night view of XLX
Euromel® Melamine
Plant, Xinjiang, China
- World largest single-
train HP melamine
plant, 60,000 MTPY

Below
Eurotecnica head
office in Milan, Italy

Established in 1962, Eurotecnica Group is known for its leading position as a technology provider, designer and implementer of melamine production plants.

Eurotecnica is part of the Proman family of companies, a global leader in natural gas derived products and services, with assets in Trinidad & Tobago, USA, Mexico, Germany, Italy, Switzerland, Portugal and Oman.

With 40 years of experience in the melamine sector, Eurotecnica has transformed it from a market of a few players to one that operates worldwide.

More than 5 million tonnes of Euromel® melamine have been cumulatively produced at plants licensed by Eurotecnica Group.

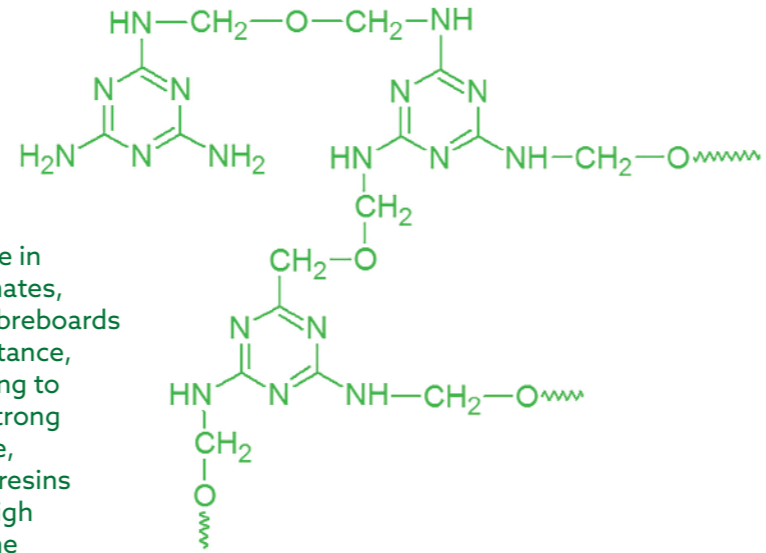
Urea-melamine easy integration, total zero-pollution, low energy consumption, and superior reliability, are all top-notch features of the proprietary Euromel® melamine process (proven fourth generation now available).

Today twenty-two melamine plants, which account for more than 730,000 MTPY in licensed nameplate capacity, are based on the Euromel® melamine process.

As a responsible independent technology provider Eurotecnica Group is committed to giving any customer and licensee access to the most up-to-date technology and the freedom to commercialize the melamine produced to any end user around the globe.



Melamine



Top right
Melamine-
formaldehyde
resin molecule

Below
Use of melamine
in household and
lifestyle products.

Melamine is a constant presence in everyday life. Dinnerware, laminates, flooring, and medium density fibreboards owe their hardness, flame-resistance, mar-resistance and waterproofing to melamine. Being able to form strong stable bonds with formaldehyde, melamine confers MF and MUF resins unique features thanks to the high nitrogen content (66% wt) of the molecule, which is essential for the flame retardant and fire-resistant properties in the finished goods. If exposed to intense heat they give off nitrogen without producing toxic gases, diluting oxygen and inhibiting the combustion. New aircrafts interiors, for instance, make use of melamine-based flame-retardants in order to comply with the most stringent safety requirements.

Melamine resins are produced by the condensation polymerization reaction of melamine with formaldehyde to yield melamine-formaldehyde (MF) resins. Continued efforts to reduce formaldehyde emissions have a positive effect on melamine consumption, since melamine is a strong formaldehyde binding agent.

Implementation of stricter limits on formaldehyde emissions by the California Air Resources Board (CARB) set lower emission levels for the formaldehyde in composite wood products (such as plywood, particleboard, medium-density fibreboard MDF). CARB Phase 1, followed by stricter Phase 2, has been taken as reference by Japan and Europe, which are enforcing similar laws. Class E1 boards have become the industry standard in Europe; they are defined as panels having a limit of ≤ 0.1 ppm formaldehyde content/emission. E0 boards, featuring emissions which are one-tenth those of E1, are also becoming available.



Right
Side view of XLX
Euromel® Melamine
Plant, Xinjiang, China
- World's largest single-
train HP melamine
plant, 60,000 MTPY





Above
QAFCO Melamine Plant - Mesaieed, Qatar. View of Euromel® Plant, the largest melamine plant in the Middle-East

Right
Grupa Azoty ZAP - Pulawy, Poland. View of Euromel® Melamine Complex (M-II and M-III)



Melamine market

Melamine is a 2 million MTPY market, it expands and covers a wide spectrum of growing applications.

Across the past 20 years, the world yearly demand for melamine has grown at a rate of 5.5% on average, showing an upward trend confirmed by analysts in their 20-year span forecasts.

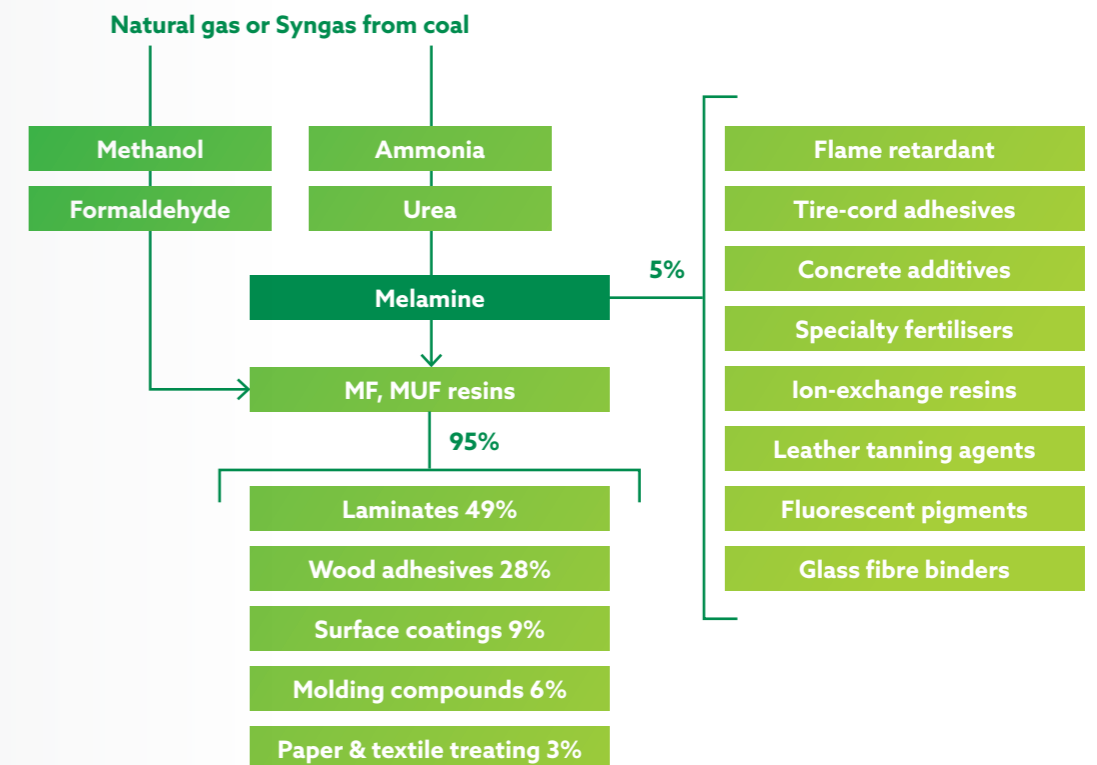
A global growth rate of approximately 5% can be considered as a prudent prediction, because some regions such as India and the Middle East show a double-digit growth rate.

Also, the melamine industry is experiencing a thorough transformation.

In the past, the melamine market was highly concentrated and production facilities were located near the main end-users, largely in Western Europe.

Nowadays the trend is to locate the melamine plants where low feedstock costs, proximity to the markets and presence of qualified technical staff are available.

Western Europe, US, and Japan host melamine plants perceived to be obsolete and polluting, no longer welcome by the local communities that push for their closures.



Euromel® Melamine

Euromel® is the melamine exclusively produced at plants licensed, designed and implemented by Eurotecnic Group. Cumulatively, several million tonnes of Euromel® melamine have been produced to-date – a sign of its superior quality.



Eurotecnic Group's licensees and producers typically sell Euromel® melamine US\$100 above the conventional melamine per-ton-price. Not just because Euromel® melamine is distributed all over the world and very well known by the final users (our customers' customers) but most importantly because Euromel® melamine is a top-quality melamine.

As such, Euromel® can grant the three features that any final user desires: purity, consistency and reliability.

Purity is a must, especially when melamine goes in the manufacturing of laminates, an industry characterized by high capital intensity. Purity is broadly identified by melamine minimum content and APHA index (an index indicating colour and transparency of the melamine resin, the lower the better). Euromel® always features a melamine content above 99.8% wt. and APHA lower than 20.

Consistency ensures higher incomes to the melamine producers as well as greater efficiency in the manufacturing processes of the end-users.

Reliability results in stable economic performance for the melamine producers and better production planning for the end-users.

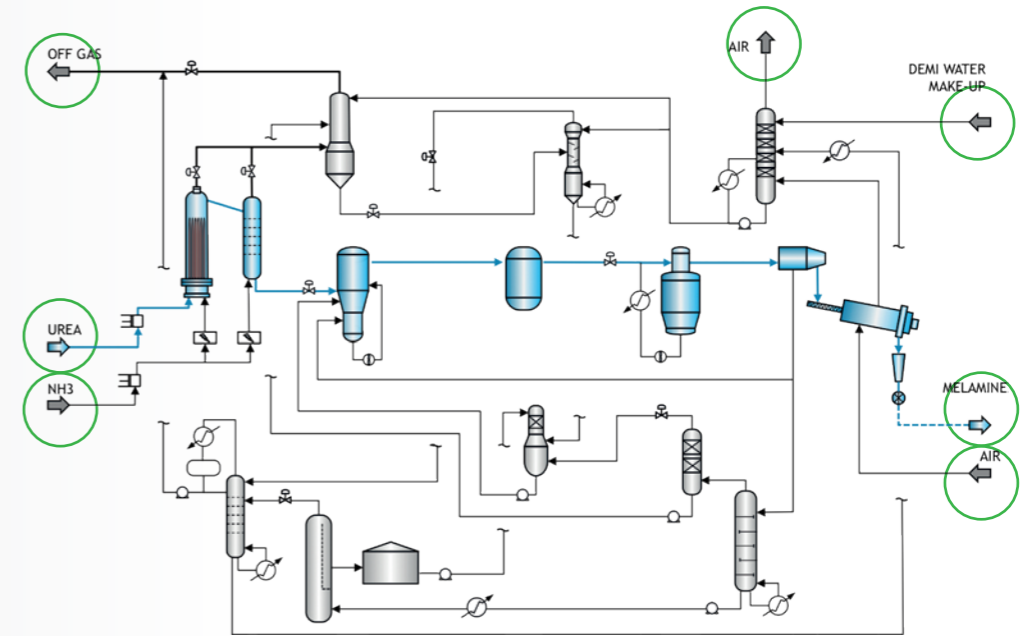


Euromel® Melamine Process

The state-of-the-art technology



Euromel® melamine process only points of materials in and out



Originally introduced in the 1960s, this high-pressure non-catalytic technology was ahead of its time and considered truly innovative because it was the first high-pressure melamine technology ever implemented in a commercial-scale plant.

Across the years, the Euromel® melamine process has enjoyed some remarkable improvements that make it a unique technology, thanks to a skilful R&D department and cooperation with all licensees.

Environmental compliance, low energy consumption and absence of add-on chemicals for purification (that typically generate safety and environmental concerns) contribute to the lowest OPEX throughout a considerably extended time span.

Energy Saving

The last generation of the Euromel® Melamine Process (the fourth one or G4) has witnessed a phenomenal reduction in energy consumption that has no equal in this industry. Eurotecnica's vast experience in the design and implementation of melamine plants has been extremely useful in finding ways to further reduce energy consumption.

Reduced CAPEX

The G4 Euromel® Melamine Process has been completely re-engineered and revised in order to reduce the number of critical components, simplify others and, in general, reduce the investment cost extensively without compromising the quality of the equipment and materials used. Therefore, the Euromel® Melamine plants are particularly cost-effective.

Total-Zero-Pollution

There are no environmental regulations for the melamine industry worldwide that allow the discharge of any liquid or solid pollutants into the environment.

Melamine purification in the Euromel® melamine process is performed by using ammonia only, a feedstock naturally available in - and fully recyclable to - any fertilizer complex.

Not being dependent on costly, hazardous and toxic add-on chemicals (such as caustic soda) or catalysts for reaction and purification, Euromel® melamine technology provides the priceless advantage of avoiding the generation of liquid and solid polluting effluents. This characteristic makes Euromel® the only melamine technology in the world featuring Total-Zero-Pollution.

Distinguished chemical fertilizer groups have selected the Euromel® melamine process because of the specific expertise of Eurotecnica in the melamine industry and for the total-zero-pollution feature granted by the Euromel® melamine process.

"...the [Euromel®] process completely recovers all the products and thus causes zero discharge. It means no raw materials are wasted and no solid, liquid and gaseous products are released into the environment. "

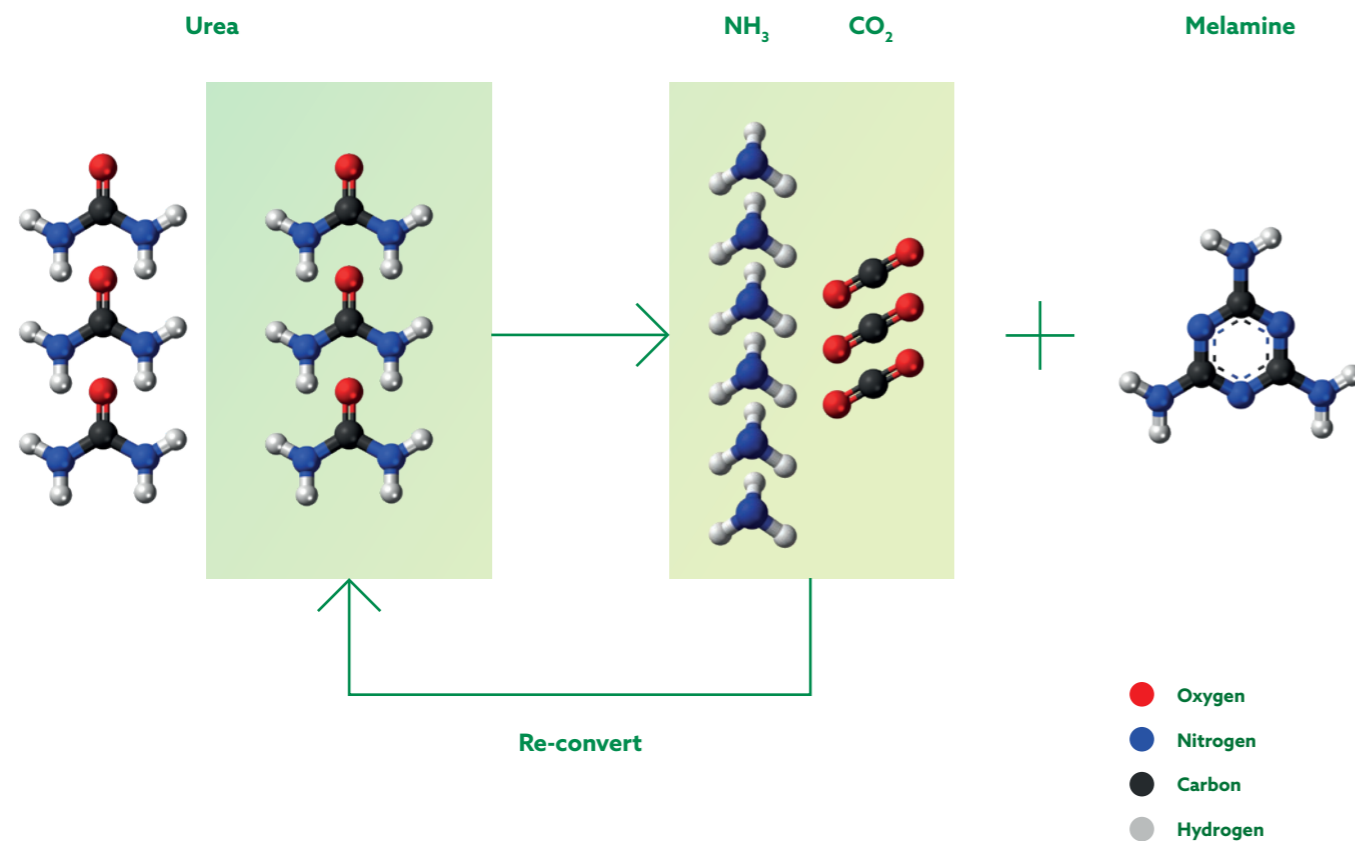
Qatar QAFCO Sustainability Report



Easy Integration within Urea Plants

Particularly welcome by nitrogen-based fertilizer operators is the ease with which the Euromel® melamine off-gas (rich in ammonia and carbon dioxide) can be accommodated within existing urea facilities. The off-gas pressure / composition adaptation to different circumstances provides an important advantage in terms of operating efficiency and CAPEX savings.

The versatility of the Euromel® melamine process to conform to any upstream complex is such that all Euromel® melamine units have been comfortably integrated within urea units based on the major urea technologies such as Saipem Snamprogetti, Stamicarbon, Toyo, Chinese.



Superior Reliability

Zhong Yuan Dahua, Puyang, China. Night view of Euromel® Melamine Complex (M I, M-II and M-III)



In a capital-intensive industry, such as the one related to Ammonia-Urea-Melamine, every additional day of production towards the theoretical 100% on-stream factor can contribute to reducing specific operating costs.

Eurotecnica Group's massive experience in this field has played an important role in improving the design of the proprietary Euromel® melamine process. Easy operation and minimal maintenance are features that only Euromel® Melamine technology can grant with the typical operating time between turnarounds taking around two years. A level of reliability this high is a key factor in the superior economical performances offered by this technology.

The simplicity of the technical solutions and preference for robust mechanical components, rather than unnecessarily sophisticated ones, are pivotal choices for the success of Euromel® technology.

Euromel® melamine plants are built to be durable and withstand a lot of situations and turbulence from outside battery limits.

Features only available with Euromel®, such as reactor bottling-in (the possibility to run the plant even if upstream ammonia/urea units are down) and high-biuret in the urea feedstock, also contribute to the plant's maximum flexibility.

Safety Records



Equally important for Eurotecnica Group is safety. Pre-emptive measures, proper training and fail-safe systems ensure that the Euromel® melamine process' remarkable safety record continues with every new licensed plant.



Technological Supremacy

The trend for building ever-larger urea plants involves the demand for larger and more OPEX-efficient melamine plants as well. To cope with this trend, Eurotecnica has developed and implemented the 60,000 MTPY single reactor single-train unit.

The world's largest single-reactor high pressure melamine plant at XLX, and the prompt award of a twin unit of the same size (both plants already implemented and successfully commissioned) are a brilliant example of how Euromel® Melamine Process boundaries have been pushed to unimaginable heights.

With a nameplate capacity of 60,000 MTPY (180 MTPD) each, the newest XLX melamine plants are another sign of Eurotecnica's capability to provide challenging technical solutions and set new milestones in the melamine industry evolution.

Euromel® technology development doesn't stop here. Once the conceptual design of the ultimate 80,000 MTPY single reactor single-train is completed, the technology is then offered, commercialized and implemented.



The Euromel® references list

A Unique showcase of remarkable projects

As many as twenty-two Melamine plants worldwide are based on the Euromel® Melamine Process.

No other company in the world can claim similar records in terms of market coverage, skilfulness and ability to turn a melamine initiative into a highly profitable and bankable investment.

When engaging Eurotecnica, any new investor entering the melamine industry is thus granted the highest level of expertise, professionalism and technological superiority.

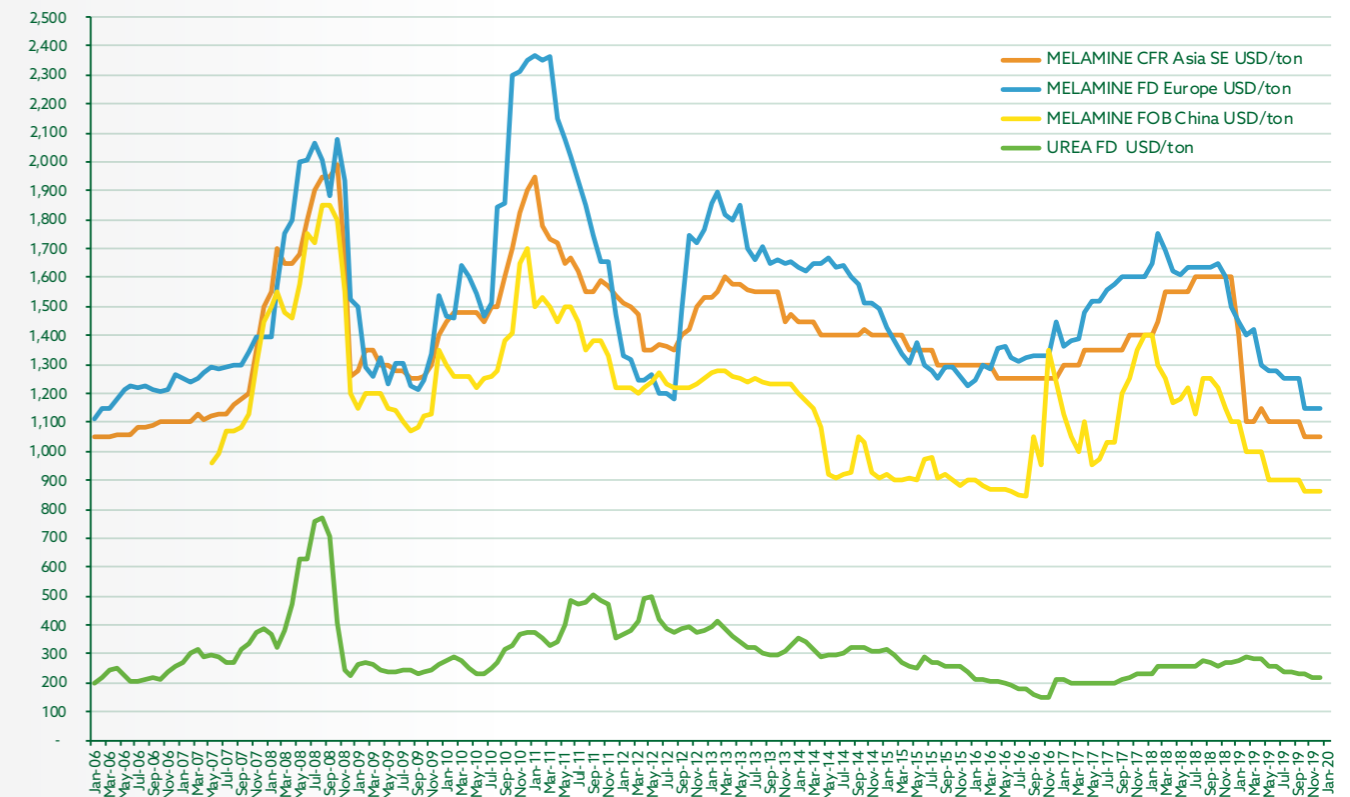
The production facilities of companies such as Qatar QAFCO, Grupa Azoty ZAP, Methanol Holding Trinidad, KHPC, Xinjiang Xinlianxin (XLX) Energy Chemical Co. Ltd., Zhong Yuan Dahua Cp. Ltd., and several more, rely on the impressive performances of Euromel® melamine technology to boost their complexes' profitability and to develop qualified jobs within the local communities.

Euromel® Plants & Licensees

	Capacity MTPY	Start-up
JAMG Group, CHINA	60,000	2021
Xinjiang XLX, CHINA	60,000	2018
Xinjiang XLX, CHINA	60,000	2016
Hubei Yihua, CHINA	80,000	2016
Petrobras, BRAZIL	40,000	on hold
Qatar Melamine Co., QATAR	60,000	2010
MHTL, TRINIDAD	30,000	2010
MHTL, TRINIDAD	30,000	2010
Petrochina, CHINA	30,000	2007
Jianfeng Chemical, CHINA	30,000	2007
Sichuan Chemical, CHINA	30,000	2007
Sichuan Chemical, CHINA	15,000	2000
ZAP Grupa Azoty, POLAND	30,000	2004
ZAP Grupa Azoty, POLAND	30,000	2001
Zhong Yuan Dahua, CHINA	30,000	2005
Zhong Yuan Dahua, CHINA	15,000	2002
Zhong Yuan Dahua, CHINA	15,000	2000
Khorasan Petrochemical, IRAN	20,000	2004
Sanming Chemical, CHINA	15,000	2001
Namhae Chemical, S. KOREA	15,000	1997
PT.Sri Melamine Rejeki, INDONESIA	20,000	1994
Kuwait Melamine Industry, KUWAIT	15,000	1980

From Urea to Euromel® Melamine

A prime investment opportunity



Going downstream is a natural option for any player in the nitrogen-based industry. Producing melamine is an opportunity for generating higher profits and, at the same time, hedging the seasonal fluctuations of the urea market.

Producing Euromel®, a top-quality melamine whose average selling price is 4-6 times the feedstock price, means immediate access to a global network of highly reputed producers using Euromel® Melamine Technology which reduces the investor's costs/risks associated with entering a new market.

Add-on chemicals (that generate safety concerns, pollution and additional OPEX and CAPEX) are never used in this process.

Depending on the set-up, a Euromel® melamine plant can be run either on urea or ammonia. Therefore one, or the other, is the only raw material consumed.

Whatever the technology used for the upstream urea unit, Euromel® Melamine Process ensures a Net Urea Consumption of 1.428 ton per ton of melamine (following the chemistry: $3 \cdot 60.06 \text{ g}\cdot\text{mol}^{-1} / 126.12 \text{ g}\cdot\text{mol}^{-1} = 1.4286 \text{ tonUREA/tonMELAMINE}$).

Urea feedstock is by far the largest cost item in the composition of a melamine plants OPEX, therefore its minimization can be extremely important.

The chart above shows the urea melamine prices history across a decade. It is a very informative and powerful tool for drafting an economical profile for a melamine production facility is based on Euromel® technology. Urea is the only raw material used in Euromel® technology, and a simple calculation proves its superior profitability.

Become a Euromel® Licensee

Join the world's largest melamine network

When you become a Euromel® licensee you will never walk alone.

In the first place, Euromel® is an industrial asset able to create immediate visibility and premium selling prices to any licensee.

Moreover, Euromel® network of licensees is a phenomenal vehicle for sharing technical know-how and operational expertise, maintenance practices and market information.

Eurotecnica's scope of work is trimmed to be consistent with your own needs. Throughout all steps of your project implementation path our technical staff is there for you, from classroom & on-site training to the construction phases, from the commissioning to the start-up, from the plant operation to the product sales support.

Join the world's largest melamine network, where passion, competence and dedication will make you feel home!



Engineered to perform

Built to be durable

Across a 40 year journey as licensors and contractors, we have been committed to protecting the environment through the continuous improvement of proprietary technologies, providing our customers sustainability without affecting profitability.

Eurotecnica Group's long-lasting reputation as a prime technology provider, engaged in the preservation of the environment through responsible design and innovative operational techniques, is an invaluable asset for our customers, partners, employees and shareholders.



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