IMOA®
INTERNATIONAL MOLYBDENUM ASSOCIATION

NEWSLETTER
JANUARY 2004

Membership

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The company specialises in the recovery of molybdenum from spent catalyst.

IMOA Website

An extensive revision of the site has been taking place to improve access to a wealth of information about IMOA and the moly industry. The new site is expected to go live by the end of February and improvements will continue to be made at regular intervals.

AGM 2004

In response to a kind invitation from IMOA members Metherma and F W Hempel to host this meeting in Düsseldorf, the 2004 AGM will be held in the Hilton Hotel during the week beginning 6 September. Whilst the Executive Committee will finalise the programme at its Spring Meeting, an outline is as follows:

Monday 6 September
Meetings of the Executive and HSE Committees. Dinner hosted by IMOA.

Tuesday 7 September
AGM in the morning, with lunch.
Free afternoon.
Evening function (possibly a boat trip) hosted by Metherma and F W Hempel.

Wednesday 8 September
AGM in the morning, with lunch.

This programme follows the successful example of other conferences to allow more time for business discussions and to avoid the rush of a one-day AGM.

The date has been carefully selected to avoid clashes with trade fairs in Düsseldorf, other conferences etc.

Further details, including registration and hotel reservation forms, will be circulated in due course and posted on the website.

IMOA Co-Organises Stainless Steel Session at SAE World Congress.

The International Stainless Steel Forum (ISSF) and IMOA are jointly organising the first technical session devoted exclusively to automotive applications for stainless steel during the 2004 Society of Automotive Engineers Congress and Exposition in Detroit March 8-11.

The SAE Congress is the premier technical conference for automotive engineers. Our all-day technical session, "Stainless Steels: The New Light Weight Option," will be held on Wednesday March 10, 2004 and comprises 10 papers covering a range of applications and enabling technologies.

The programme of the stainless steel session can be downloaded from the IMOA website in the "Events" area.

We will augment the presentation of the papers with question and answer panels for both the morning and afternoon sessions and SAE will publish a "Special Publication" book of all ten papers, which will raise the stature of the papers while providing supplemental distribution.

In addition, Mr. Pascal Payet-Gaspard, Commercial Director of Ugine & ALZ, will represent the stainless steel industry by participating on a panel on "Materials Innovation" on Tuesday, March 9, 2004.

We will issue direct invitations via email to a targeted list of automotive engineers, purchasing influencers and decision makers, which we obtain from SAE.

You can help by providing us with appropriate additional names (with email addresses) of auto industry contacts you or others in your organisation may have, whom you think would be good prospects to attend the session.

Moly does the Job

Alloy 59 Keeps Fine Chemical Production On-Line

This case study has been provided by Larry Paul, Technical Marketing Manager, Thyssen Krupp VDM USA, Inc. and edited by IMOA consultant John Grocki

SUMMARY

A fine chemical production plant uses a metallic separation column in the production of DCNB (1,2 dichloro-4-nitrobenzene). Chemical plants can be complex and are often integrated; therefore, equipment reliability is essential to maintain production and economic viability. An example of a modern chemical plant is shown in **Figure 1**. A separation column at the DCNB production facility was originally constructed of Alloy 625. The Alloy 625 had a service life of three years before it failed by general corrosion in the inlet region of the column. In an attempt to increase the life of this equipment, testing of more corrosion resistant alloys was recommended. This testing focused on the Ni-Cr-Mo family of alloys, based on their success in similar applications.

THE PROCESS

The process stream enters the column, which is packed with trays, and the DCNB is selectively removed. The inlet temperature is 140°C (284°F) and the starting composition of the process stream consists of 83% water, 14.3% sodium bisulfate, 0.02% acetone, 0.46% isopropanol, 0.06% copper sulfate, and 0.04% DCNB, and 1.5% of other organic compounds.

THE CORROSION

General corrosion caused failure of the Alloy 625 near the inlet section of the column after 3 years of service. There was no evidence of pitting or other forms of localized corrosion. In order to determine the best material for this application, a test rack was placed in the inlet area on the column tray. An example of a corrosion test rack with corrosion coupons of various alloys is shown in **Figure 2**. After 312 hours of exposure, the rack was removed and corrosion rates of the test coupons were determined.

While laboratory testing gives general information on the behavior of alloys in standard environments, process streams are generally complex mixtures and can also contain trace levels of impurities that might affect the corrosion resistance behavior of materials. Therefore, it is always recommended that testing of materials in the actual process stream be performed whenever possible.

THE SOLUTION

The test results showed that the higher molybdenum containing alloys were more resistant to corrosion. The results of the corrosion coupons are given in **Table 1**. The corrosion rate as a function of molybdenum content is plotted in **Figure 3**. From Figure 3 it can clearly be seen that the higher molybdenum alloys provided better resistance in this process stream. Alloy 59 (UNS N06059), which contains 16% Mo, performed better than the other Ni-Cr-Mo alloys tested. The corrosion rate of the Alloy 59 in the inlet column was 1/3 that observed on the Alloy 625.

THE COST SAVINGS

When calculating the cost of a material for new applications, it is best to consider the life cycle costs. This approach not only considers the initial cost of the material, but also the associated fabrication, installation and future replacement costs for using the selected material over it's expected life cycle.
The simplest way to calculate the life cycle cost of a material is to consider the total installed

Material	UNS Number	Material Number	Molybdenum in Alloy %	Corrosion Rate µm/a	
				Inlet to Column	Base of Column
Alloy 625	N06625	2.4856	9	90	55
Alloy 22	N06022	2.4602	13	50	50
Alloy 59	N06059	2.4605	16	30	30

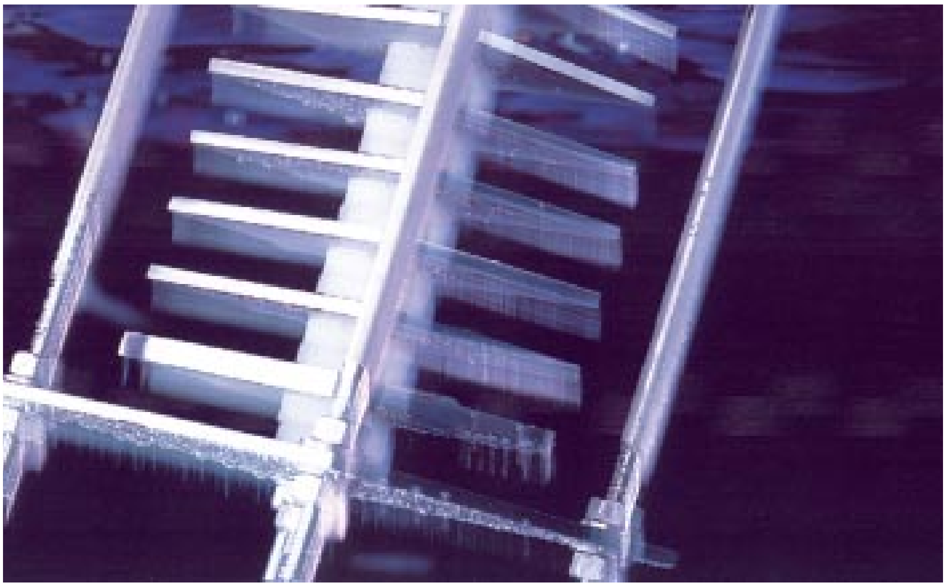
Table 1. *Comparison of corrosion rates of alloys tested for 312 hours in the DCNB column.*

Figure 1.

Example of a modern refinery plant

Figure 2.

Example of corrosion coupons on test rack.



cost over the life of the equipment. The life cycle cost for using the alloys considered for the separation column are given in **Table 2**. The slightly higher initial cost of the Alloy 59 material is more than justified. The Alloy 59 material will be almost 1/ 3 the cost of the Alloy 625 and 60% less than the Alloy 22 when time of service is considered. This evaluation does not consider the costs associated with fabrication, erection and installation or the cost of future replacement parts, or disposal costs for replaced equipment. In addition, the cost of lost production in critical applications, such as fine chemical production, can often be enormous and outweigh all other costs. Therefore, it makes sense to use the best material available for such applications.

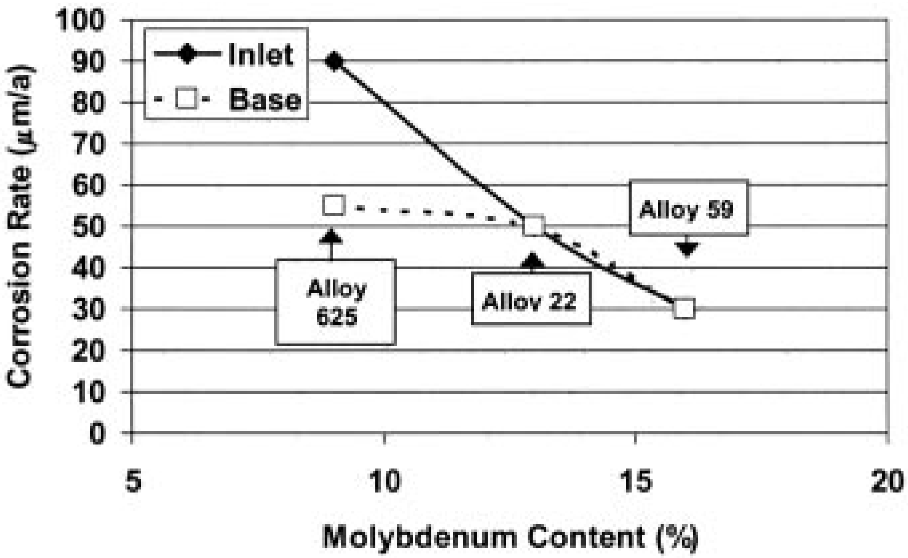


Figure 3. *Corrosion rates in the DCNB column plotted as a function of molybdenum content of the alloy.*

Alloy	Relative Price	Relative Service Life	Relative Life Cycle Materials Cost
625	1	1	2.7
22	0.98	1.8	1.6
59	1.10	3	1.0

Table 2. *Relative costs and life cycle costs of materials only*

New 7 World Trade Center Uses Type 316 Stainless Steel

This article has been contributed by Catherine Houska of TMR Stainless (Consultants to IMOA).

The stainless steel and glass exterior surfaces were designed in collaboration with artist James Carpenter. Molybdenum-containing Type 316 stainless steel was selected, because the building will be exposed to both coastal and deicing salt and moderate levels of urban pollution. The owner desired a building that would remain attractive over time and provide a long service life. Molybdenum alloying additions increase a stainless steel's resistance to corrosion and staining by salt and pollution.

The original 7 World Trade Center building consisted of an office tower, electrical transformer vaults and access ramps to the World Trade Center's service levels. Like the twin towers across the street , this 47-story building completely collapsed as a result of the events of September 2001. Immediate reconstruction was required, primarily due to the need to rebuild Manhattan's power grid.

As the first building constructed on the site, it will be highly visible. The architects, Skidmore, Owings & Merrill (SOM), were challenged by the owner, Silverstein Properties, to improve upon the original building's function and appearance.

The building is currently under construction. The first 26 meters (85 feet) of the office tower will contain the Con Edison electrical transformer vaults, which require a significant amount of ventilation. Offices will occupy the higher floors of the building. Because it will function as both an industrial facility and an office building, there were unique design challenges.

SOM's rendering of the new 7 World Trade Center.

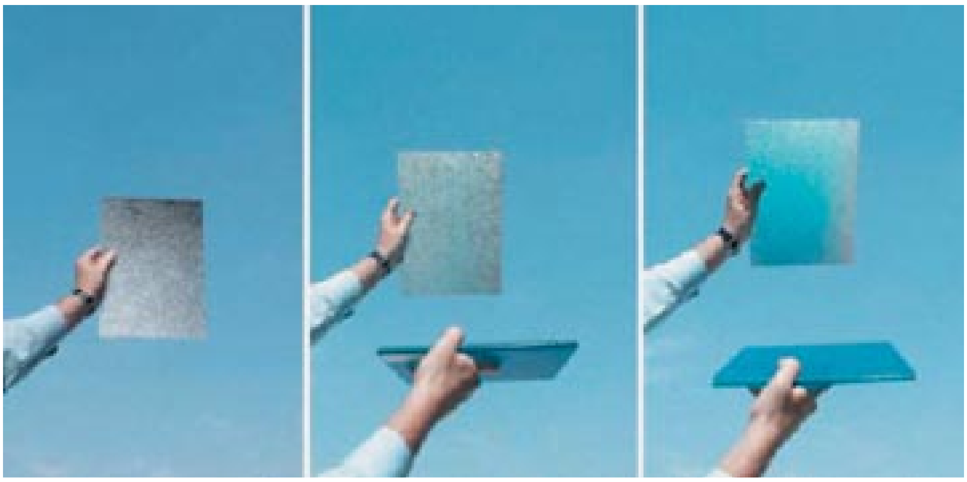
A rendering of the spandrel and blue-colored Type 316 panels that will be used between each floor in the office tower.

SOM and James Carpenter used the different purposes of the upper and lower building to create a study in reflected color, light, and depth, which will add a sculptural element to the building. The exterior of the office tower on the upper floors will be comprised of floor-to-ceiling clear glass with concave,

Type 316 spandrel panels between the floors. The spandrel panels will be embossed with a light pattern that simulates abrasive blasting and then corrugated. The horizontal corrugation pattern will enhance light reflection. Below each panel there will be a horizontal sill made of blue, electrochemically colored, Type 316. The blue color will reflect onto the concave spandrel panels giving them bright, bands of reflected color. The owner plans to wash the stainless steel panels when the windows are washed to prevent dirt and salt accumulation.

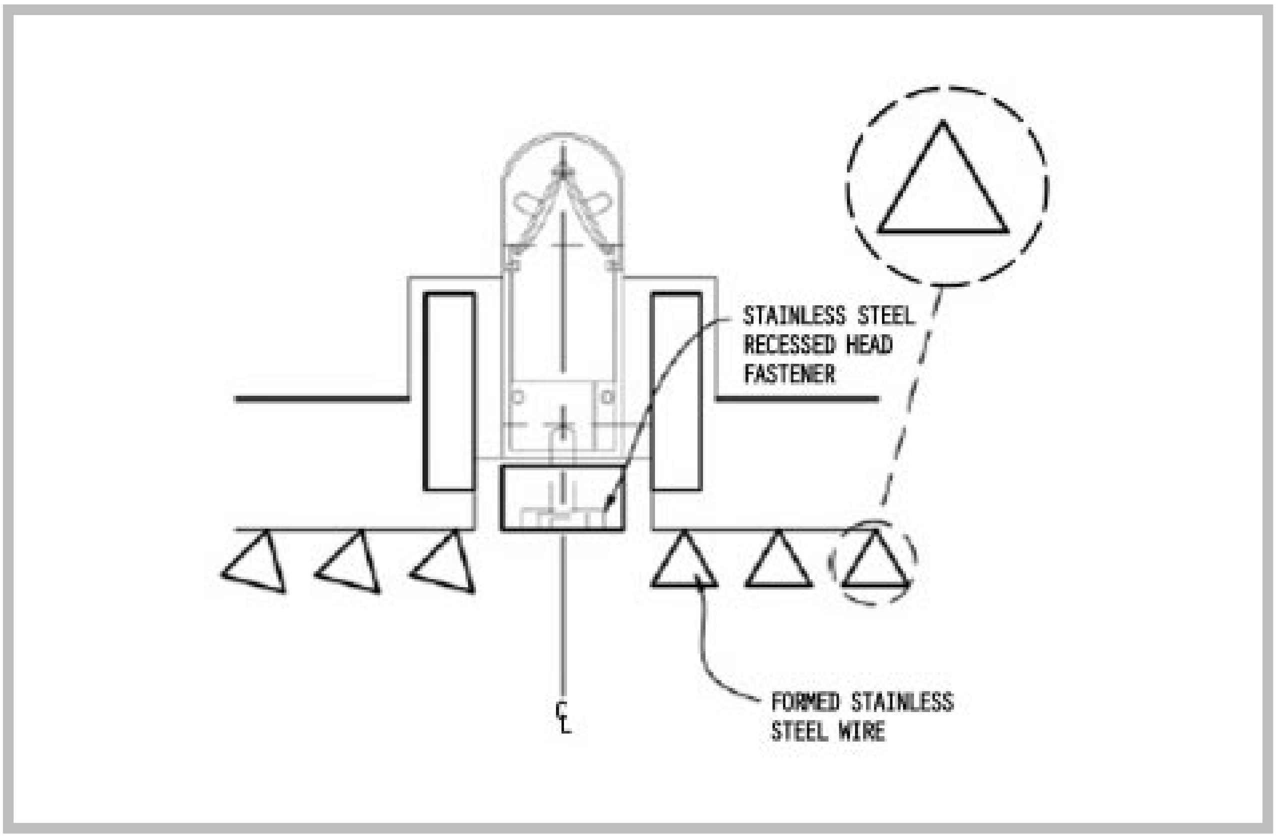
The exterior walls surrounding the transformer vaults have to accommodate high airflow requirements. Welded Type 316 mesh was selected. Woven mesh was not considered, because there are tiny crevices at each point where wires cross and Type 316 can be susceptible to crevice corrosion when exposed to salt.

Welded mesh had previously been used only in industrial locations, so SOM and Johnson Screens created a more aesthetically pleasing product. By using custom triangular wire profiles, by changing wire orientation and finish, and by varying wire density, a surface with varying reflectivity was used to create depth, surface variation, and visual interest. The two layers of Type 316 stainless steel wires are separated by a 165 mm (6.5 inch) cavity. The inner layer is lit at night with blue and white LED sources. The color is programmed to shift in color tone from day to night and the surrounding surface pulses and moves subtly through the night because of the wire profiles and their orientation. The welded mesh will also be cleaned on a regular basis.



Placement of the blue panels was determined by varying the panel angle relative to the spandrel to obtain optimal reflection onto the spandrel panels.

Day (left) and evening (right) views of the welded mesh encircling the bottom 26 meters (85 feet) of the tower.



All pictures courtesy of Skidmore, Owings & Merrill.

Light and color variation was obtained by varying the wire shapes and their orientation within the welded mesh.

The IMOA Newsletter does not accept advertising but is delighted to bring to the attention of readers an excellent publication and a well-informed news service in return for both having been provided free to the Secretary.

The Economics of Molybdenum

Published by Roskill Information Services towards the end of 2003, this new edition provides an up-to-date market analysis of consumption, production and resources with detailed statistical tables.

The Report covers

- Factors which will guide molybdenum over the next decade
- Forecasts for demand in the major end-use markets
- Activities and policies of the major producers
- Changes in world production patterns
- Economic, political, technological and environmental developments affecting the industry
- Outlook for prices

and is available at a price of £1400/ US$2800/ € 2450 from:

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Metal Pages

Metal-Pages provides a news and information service for the non-ferrous metals and ferroalloys industries including comprehensive coverage of both molybdenum and ferromolybdenum.

The service incorporates news, analysis, contact directory, commission free marketplace, prices, industry information and a daily e-mail summary of stories and proposals profiled to the individual subscriber's requirements.

With many metals and ferroalloy prices enjoying a bull run in 2004 it is essential that you keep informed. Metal-Pages provides you with the information to inform your decision-making and in an exclusive offer to members of IMOA we are offering a discount of 15% to our subscription fees for members who take out a subscription to Metal-Pages before the end of March 2004.

If you are interested please contact sales@metal-pages.com for further information or register on our website www.metal-pages.com if you would like to take a free trial of our service.

New IMOA Publications

In October 2002, IMOA published brochures geared towards the architecture, building and construction (ABC) market and these have now been revised. The guide "Which Stainless Steel Should I Specify for Exterior Applications" gives an overview of the material selection process for demanding outdoor applications. Additionally, there are three case studies that illustrate different demanding environments and good and bad material selection.

Hard copies are available from the Secretariat or electronic copies may be downloaded from IMOA's website

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