
IMO A Annual Review

2010/2011



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IMOA Annual Review

Overview from the Secretary-General

This Annual Review details the progress we have made during the period July 2010 to June 2011.

It includes a review of the Association's activities over the past year in relation to the priorities that were set out in the Strategic Plan.

Health, Safety and Environment

The principal Health, Safety and Environment (HSE) activity over the last year has been the final effort to achieve compliance with the EU REACH Regulation for molybdenum metal and ten of its compounds. At the same time, the HSE team has tackled water-related regulatory issues in both the EU and USA and has continued its work in areas such as Life Cycle Inventory, and the hazard assessment of molybdenite ores and concentrates in relation to the EU Classification, Labelling and Packaging Regulation (CLP).

Market Development

Our Market Development team has continued to expand its research activities and embarked on new projects in alloy steels and stainless steels. Two of these are in conjunction with the Central Iron and Steel Research Institute, helping forge closer links with partners in China.

Our program demonstrating the value moly adds to carbon steels is already showing success and our new brochure 'Irons and Steels for Clean and Green Power Generation' has been well received. We have also published a brochure focusing on duplex stainless steel for the pharmaceutical industry.

Communications

Our targeted communications plan, which was initiated in January 2010, is continuing to gather pace.

Towards our goal of reaching a larger audience, we have developed a 'customer' account area on our website enabling anyone with an interest in molybdenum to register and manage the information they receive from IMOA. Already, more than 120 people have created an account. Other revisions have been made to the website and traffic has increased steadily during the year.

We have launched an e-bulletin under the banner 'MolyNews' and piloted it to promote our 'Clean and Green' brochure to targeted contacts in the alternative power industries.

Coverage in target publications has been successfully achieved by our schedule of press releases and we are also receiving and responding to an increasing number of media enquiries generated by our press engagement program.

Sustainability

The Association has identified the need to communicate molybdenum's contribution to sustainable development. The growing societal expectation of industries to demonstrate the sustainable nature of their products and their manufacturing operations is playing a significant part in materials selection and regulation and has become an important business imperative.

The key objective is to explain the benefits of using molybdenum and molybdenum-containing materials in sustainable design and technologies.

We will aim to promote molybdenum as a sustainable choice through a communications program aimed at users and other stakeholders.

Tangible, quantitative cases where molybdenum contributes to sustainable development will be presented as part of the program.

Statistics

IMOA has set itself the goal of being the most accurate and trusted provider of historical data on the molybdenum market.

Recently, this activity was extended to an in-depth, end-use analysis of the market, mapping all uses of molybdenum into eleven major end-use industry segments. The two-year study was completed in 2010 and it will be updated annually with the most current quantitative data.

The evaluation of first-use data on a quarterly basis is a spin-off from this work and has enabled us, for the first time, to release quarterly analyses of molybdenum production and use. We have now completed five quarterly statistical reports, the most recent of which features year on year comparisons of key data.

Membership

IMOA is continuing to grow. In 2011 we have welcomed five new members to the Association and the drive to expand the membership continues.

This year we have laid the foundation stones for some important projects to be conducted in the year ahead for the benefit of our members and the industry.

We welcome active participation by members in our efforts to promote the many benefits of molybdenum.

Tim Outteridge
Secretary-General

Health, Safety and Environment

Overview



Sandra Carey
IMOA HSE Executive

The principal HSE activity over the last year, and indeed throughout 2006-2010, has been the huge challenge to prepare extensive risk assessment dossiers for molybdenum and ten Mo compounds in order for industry to achieve compliance with the EU REACH Regulation.

The very significant long-term benefit of this activity is that it has generated a scientifically robust database about molybdenum products that is already being used in dialogue with global regulators in relation to other legislative initiatives. This type of data is essential to better ensure that future health and environmental regulations are scientifically appropriate and protective, without being overly conservative and unnecessarily burdensome to industry.

Over the past year, the IMOA HSE Committee has also continued its work and service to members in areas such as water-related regulatory issues, Life Cycle Inventory, and the hazard assessment of molybdenite ores and concentrates.

The latter was motivated by the EU requirement to report the manufacture/import of any hazardous substance to the European Chemicals Agency in compliance with the EU CLP Regulation no. 1272 on Classification, Labelling and Packaging of substances and mixtures.

All the IMOA HSE activities are managed and driven forward by the corporate representative members of the IMOA HSE Committee, its HSE Executive staff member and its consultants, to whom IMOA expresses its sincere gratitude for their dedication and professionalism.

Health, Safety and Environment

Another year, another set of HSE challenges for IMO A

REACH (Registration, Evaluation, Authorisation (and restriction) of Chemicals)

In excess of a hundred physico-chemical, human health and environment studies were funded by the REACH Molybdenum Consortium (MoCon), formed by IMO A in 2007, to generate the breadth and quality of data necessary to ensure an in-depth risk assessment could be conducted. In addition to the submission of successful REACH-registrations by MoCon members, other key deliverables from this project which cost in excess of US\$5 million, included:

In the case of MoCon hazardous substances (molybdenum trioxide EINECS 215-204-7/CAS 1313-27-5, and roasted molybdenite concentrates EINECS 289-178-0/ CAS86089-09-0) those uses were then safety-assessed for industrial settings, professional and consumer uses. Exposure Scenarios were generated detailing the operational conditions and risk management measures necessary to ensure the safe use of the substance. This documentation, as part of the e-SDS is transmitted throughout

Non MoCon-members can purchase access to the 'right to refer' to the MoCon REACH Registration dossiers for the sole purpose of their own REACH co-registrations. This on-line Letter of Access facility is available via: <http://www.molybdenumconsortium.org/letter-of-access.html>, together with a wealth of other MoCon REACH-related information reflecting the deeply diligent approach taken by the molybdenum industry to REACH compliance.

In 2011 MoCon also translated the e-SDS templates into 17 EU languages as a service to its members.



- The **Chemical Safety Report (CSR)** which is the document that summarizes the key data reported in the IUCLID file, the hazard identification and classification, and risk assessment (effects and exposure) of the substance. The CSR also contains Exposure Scenarios if the substance is considered hazardous.
- The **IUCLID database** which is the core software program containing the scientific assessment of all the studies screened and evaluated during the REACH process. The useability of this database is not restricted to the EU as it is designed to serve multiple geographic jurisdictions.
- The compilation of '**Lists of Identified Uses within the EU**' for Mo and the 10 Mo compounds.

the supply chain as a means of delivering the core REACH objective of safe handling and use of chemicals.

- The production of **MoCon e-SDS and PIDS templates**. Extended Safety Data Sheets (e-SDS), are required for hazardous substances, and PIDS (Product Information Data Sheets) are voluntary documents for non-hazardous substances. Members then tailor these templates to their company-specific requirements and EU markets. Given the multi-lingual nature of the EU, and REACH requiring the provision of an e-SDS in the language of the country where the product is placed on the market, in 2011 MoCon also translated the e-SDS templates into 17 EU languages as a service to its members.

Dissemination of Risk Assessment Data

Having generated the studies and risk assessment data, IMO A is actively working to disseminate this information by publication in peer-reviewed scientific journals and by presentation at international technical conferences. Peer-reviewed publications give the data enhanced credibility from a regulatory perspective. A first paper was published in 'Science of the Total Environment' in October 2010, and presentations (posters & oral) were made at the SETAC (Society for Environmental Toxicology and Chemistry) Conference in May 2011.



The outcome... was that molybdenum did not bioaccumulate in any significant manner in fish tissues.

Regulatory Activity

Molybdenum, together with other so-called minor metals, is increasingly coming under the regulatory microscope at the level of individual nations. Below are several examples of this activity and how IMO A has responded to these challenges within the past 12 months:

Germany

IMO A drew upon data from its recently generated aquatic research database to respond to a proposal in Germany for a maximum permissible level (MPL) of molybdenum in surface waters of just 7 µg Mo/L. It submitted freshwater and marine water PNEC-derivation data to demonstrate that there was no basis for setting such a low MPL. The German authorities responded five months later by deleting molybdenum from the list of contaminants for regulation. Mo was one of only six substances deleted as the list was reduced from 179 to 173 entries.

The Netherlands

The Dutch proposal centred on the derivation of a Maximum Tolerable Concentration of molybdenum for human health in food and water ($MTC_{hh,food,water}$). The table below shows their initial proposal and final figures after meaningful dialogue with IMO A over a 15 month period during which IMO A conducted a study seeking to specifically address their concerns:

$MTC_{hh,food,water}$	
Initial Figure	Final Figure
7 µg Mo/L	136 µg Mo/L

The figure of 136 µg Mo/L, published in edition no. 5615 of the Dutch Regulatory Journal 'Staatscourant', a factor of 19 times higher than the original proposal, took into account the data generated in an IMO A fast-



track study showing there was no Mo accumulation of significance in fish tissue. The Dutch concern was to set an appropriate figure to ensure that human health would not be adversely affected by consumption of fish containing the trace element Mo, so Dutch regulatory authority RIVM and IMO A worked side-by-side to enhance the scientific knowledge in this area.

IMO A Research into Bio-accumulation

Given that human health protection is a paramount concern to all, IMO A put a research program in place in the second half of 2010, conducted according to OECD protocols, to test whether bioaccumulation of Mo in fish tissue would occur if the concentration of molybdenum in the water was significantly higher than 136 µg Mo/L.

Concentrations of 1 mg Mo/L and 12.7 mg Mo/L were selected, the latter being the Predicted No Effect Concentration (PNEC_{freshwater}) for molybdenum, in other words a predicted 'safe concentration' level that was derived during the REACH project. The outcome of this four month project, conducted in the USA, was that molybdenum did not bioaccumulate in any significant manner in fish tissues at either concentration indicated above. The major benefits of this new knowledge are that:

- it is significant new data to demonstrate absence of risk to human health

- the figure of 136 µg Mo/L can be considered highly conservative, and IMO A would seek to review it upwards at the next opportunity
- it further underpins the robustness of the 12.7 mg Mo/L PNEC_{freshwater} as a 'safe concentration'
- organisms such as fish have a homeostasis mechanism to regulate the uptake and elimination of an (essential) element so that it does not remain within the organism to bioaccumulate. This in itself is not at all new knowledge, but the fact that the homeostasis mechanism remains intact at water concentrations of 12.7 mg Mo/L is a significant contribution to our understanding about fish tolerance to molybdenum



Mo in drinking water in the USA

A regulatory initiative by the US Environmental Protection Agency has placed molybdenum on their candidate list as a contaminant for potential regulation in drinking water. To date IMO A has made two submissions to contribute data and study analyses to the risk assessment process. Reports from new research during 2011 will be available during the second half of this year and will be submitted to the authorities for their evaluation.

Market Development

Overview



Dr Nicole Kinsman
IMOA Technical Director

IMO's market development activities have contributed to an impressive growth in the use of moly-grade stainless steels over the last decade.

In recent years we have begun expanding our activities from 'knowledge transfer' to targeted 'knowledge generation' and have embarked on a number of research projects to this end:

- Three alloy steel projects (with our partners Buderus, Salzgitter Mannesmann and Central Iron and Steel Research Institute (CISRI))
- Two stainless steel projects (with Ugitech-University of Grenoble and CISRI)
- One catalyst project (with the University of Michigan)
- Research on Chilean mining problems that could potentially be solved with molybdenum-containing materials (with Comotech)

Over the last year we have worked on expanding our collaboration with partners in China. For example, two of our research projects are being carried out by the Central Iron and Steel Research Institute (CISRI) in Beijing.

IMO is a member of Team Stainless, an informal network of development associations for stainless steel, chromium, nickel and molybdenum. Members include IMO, Euro-Inox, International Chromium Development Association, International Stainless Steel Forum and Nickel Institute.

In 2011, we took over the chairmanship of Team Stainless for the year and the responsibility of organizing its two meetings. The first was in March 2011 in London and the second will be in October 2011.

During 2012/2013 stainless steel reaches its 100th birthday of discovery/development. To celebrate this milestone IMO has been involved with other Team Stainless members in creating a large-scale mobile exhibition on stainless steels.

This year we are also developing messages on sustainability, explaining the benefits of using molybdenum-alloyed high-strength steels, corrosion resistant steels and materials with high elevated-temperature strength in terms of their impact on sustainable development.



Market Development

2010/2011 Work Program Highlights

China

In addition to the two research projects with CISRI we carry out two weeks of joint seminars with the Nickel Institute on Architecture, Building and Construction (ABC) and one week of seminars on chemical/pharmaceutical stainless steel applications.

We also co-sponsor a conference on the Application of Stainless Steel in Architecture in Guangzhou this November.

We are working with the National Taiwan University to organize a seminar on the benefits of Mo in steels in Taipei, Taiwan in November 2011, building on the experience we had with a similar event in June 2010 in Beijing, where we organized a successful International Seminar on Mo in Steels together with the CISRI and Antaika.

translated with the help of Euro Inox are all in the final layout stages and will be available as PDFs later this year.

Our new brochure on duplex stainless steel in the pharmaceutical industry is being translated into Chinese for the pharmaceutical seminars later in 2011.

IMOA once again chaired the NACE 114X technical exchange group on duplex and ferritic stainless steels during the NACE Corrosion Conference. This meeting has high attendance each year. It helps spread the word about the benefits of duplex stainless steels and how to use them.

Carbon Steels

Our carbon steel program is already starting to show significant success in its goal of demonstrating the value moly adds to carbon steels.

The projects aim to improve fundamental understanding of molybdenum metallurgy to enable the development of better performing products.

In particular, we are evaluating the beneficial effects of moly in steel grades where it is not currently used. The results of our project with Salzgitter Mannesmann so far indicate that a certain amount of moly not only makes it easier to produce arctic pipeline steel within specification but also improves application-related properties. In another project we have modified existing moly containing case-hardening steels to provide either better performance or to offer improved alloying economy. A conference paper highlighting our findings has been written in cooperation with the major forging steel producer Buderus Edelstahl.

During the year we attended a total of 25 meetings, including conferences and workshops, as part of our carbon steel programme.



IMOA Duplex Fabrication Brochure

Our Duplex Fabrication brochure has proved very popular and has been downloaded more than 40,000 times from the Euro-Inox, International Stainless Steel Forum and IMOA websites in English and Chinese. More than 1,000 downloads are made each month from the IMOA website alone.

The Japanese version of the brochure is available for download from the IMOA website and the French, German, Italian and Spanish versions which were

Together with our expert consultant we have produced documents, brochures and presentations, attended seminars and symposia, and visited steel plants to open positive discussions about molybdenum metallurgy.

We have launched research projects with partners to generate new and unique knowledge about moly that can then be used to promote molybdenum in steels in general.

Our carbon steel program is already proving to be effective as some steel makers are rediscovering technical and economic advantages of using moly, where previously they avoided alloy additions due to perceived cost.

Feedback from the automotive flat steel sector, for example, indicated that moly not only improves the strength-formability balance of multiphase steels but also the surface quality.



We have... written and published seven scientific papers on a broad variety of alloy steel types and applications.



We are initiating dedicated research projects to develop a body of knowledge, showing the benefits of using moly in automotive steels.

We are also in the process of organizing a symposium entitled 'Fundamentals and Applications of Mo and Nb alloying in high performance steels' in cooperation with Taiwan National University, China Steel Corporation and CBMM.

This event will take place on November 7-8 2011 in Taipei. The first day looks at the fundamental metallurgical effects of both elements while the second day focuses on dedicated applications. An elite group of lecturers from leading metallurgical institutions around the world have been invited to give presentations. With this event we intend to revive the style and quality of the former Climax symposia, including the publishing of the proceedings.

Clean and Green

Our first brochure on alloy steels, 'Molybdenum in Irons and Steels for Clean and Green Power Generation' has been printed and has been well received. Our expert consultant has also written and published seven scientific papers on a broad variety of steel types and applications.



Market Development

2010/2011 Work Program Highlights cont.

We have published eight articles which have reached nearly 200,000 ABC industry readers.



Stainless steel in Architecture, Building and Construction

IMO A's market development activities for the Architecture, Building and Construction (ABC) market over the past year have included workshops, magazine articles, website resources, literature development, targeted mailings and project specific technical support.

Some of the US and all of the international workshops and magazine articles are co-sponsored by the Nickel Institute.

Our expert consultant in this area has published eight articles in different industry magazines which have reached nearly 200,000 ABC industry readers. Five of these articles were reprints of previously published pieces in magazines that are circulated in different geographic locations such as India and China.

Two new feature articles have been submitted to a North American ABC magazine for publication in the autumn of 2011. There has already been interest in reprinting them in India and translating and printing them in China.

More than 1,300 decision makers attended our workshop and conference presentations in North America, China and Taiwan. A targeted North American postcard mail-out promoting new website resources reached a further 3,400 decision makers.

Two previously published North American feature articles on the specification of molybdenum stainless steels for deicing and coastal salt exposure and the Euro Inox Design Manual for Structural Stainless Steel were translated into Chinese by the Nickel Institute for distribution as brochures at the workshops and through websites.

IMO A Website

Over the last year we have seen an increase of unique visitors to our website from around 8,000 to 10,000 each month.

We have created a 'customer' database where non-members can create an account on the IMO A website to manage the information they receive from IMO A, such as newsletters, announcements, new literature, and so on. More than 120 people have signed up so far.

We have also updated the IMO A home page and included boxes with direct links to some important areas.

Sustainability

As part of IMO A's Sustainability Program we have begun a small research project on high strength steels (HSS) in construction with the Steel Construction Institute in the UK in order to find structural applications which can most fully use the strength of HSS.

The project also includes numerical studies to estimate weight savings for promising applications and recommendations for alternative solutions which most efficiently use HSS.

Income and Expenditure Account

For The Year Ended 31 December 2010

IMOA/Molybdenum Consortium

	2010	2009
	\$	\$
Turnover	3,416,419	4,024,793
Operational and administrative expenses	(3,681,962)	(3,174,738)
Operating surplus/(deficit)	(265,543)	850,055
Other interest receivable and similar income	3,791	13,379
Surplus/(deficit) on ordinary activities before taxation	(261,752)	863,434
Tax on surplus/(deficit) on ordinary activities	(568)	(2,007)
Surplus/(deficit) on ordinary activities after taxation	(262,320)	861,427

Balance Sheet

For The Year Ended 31 December 2010

IMO/Molybdenum Consortium

	2010		2009	
	\$	\$	\$	\$
Fixed assets				
Tangible assets		23,208		31,053
Current assets				
Debtors	54,834		251,040	
Cash at bank and in hand	5,720,327		5,553,776	
	5,775,161		5,804,815	
Creditors – amounts falling due within one year	(1,260,749)		(1,035,928)	
Net current assets		4,514,412		4,768,887
Total assets less current liabilities		4,537,620		4,799,940
Reserves				
Profit and loss account		4,537,620		4,799,940
Accumulated funds		4,537,620		4,799,940

Financial Commentary

The 2010 audited accounts presented here are consolidated figures for IMO and the Molybdenum Consortium and are subject to approval at the 2011 AGM.

Income from subscriptions and levies amounted to US\$3,416,419. Expenses of US\$3,681,962 resulted in a drawdown of US\$261,752 from the accumulated funds. 2010 project expenditure within the Molybdenum Consortium exceeded the year's levy income and was met by funds already collected during 2007-2009 for this four year project.

The combined accumulated funds at the year-end were US\$4,537,620. Of this US\$2,422,421 were attributable to IMO and US\$2,115,199 to the Consortium.

In the case of IMO, the year-end balance was consistent with the Executive Committee's policy of maintaining a buffer approximately equal to one year's expenditure. This mitigates the effect of fluctuating income and ensures that the obligations of the Association can be met.

A significant percentage of the Molybdenum Consortium reserves at the end of 2010 were committed to expenditure in 2011.

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