Greetings from Division Director

Welcome to the first 2016 Mining and Metals Division (M&M) Fall Newsletter. As director, I am proud to be part of this release and I would like to thank the International Society of Automation for giving us the opportunity to relaunch this division globally.

This division is made up of a large group of people from many different countries with vast experience in the industry, key aspects that will help ISA increase the collaboration space between specialists, thus creating a global network of professionals around the Division.

During 2017 we expect to develop seminars, create links with associations and give space to division members and sections to participate in the activities to be scheduled.

Warmest Regards,

Francisco Soto
Director
ISA Mining & Metals Division

Greetings from Newsletter Editor

Greetings! My name is Don Root, and it is my pleasure to service as the Newsletter Editor for our new ISA Mining & Metals Division. In this newsletter, I am pleased to include introductions from each of our Mining & Metals Division volunteer leaders plus two excellent articles.

The first is a technical article by our division Director-elect Bas Mutsaers, who is the Global Pursuit Director Mining for PwC. In Bas’s article, he is talking about the convergence of IT an OT in the mining sector, and automation standards such as ISA95 have a major role to play. The second article is by ISA Society President Jim Keaveny has provided an article about the future direction of our society and some of the initiatives of our volunteer leadership.

Thank you for your interest in our newly formed ISA Mining & Metals Division.

Donald J Root
Newsletter Editor
ISA Mining & Metals Division
Introducing our Volunteer Leaders

We are pleased to announce a new leadership team for our ISA Mining & Metals Industries Division. Please welcome them to our division:

Director ...................................... Francisco Soto
Director-elect ............................. Bas Mutsaers
Newsletter Editor ....................... Donald J Root
WebMaster ................................. Ari Supomo
Section-Division Liaison .......... Carlos Mandolesi
Committee Members ................. Sandeep Vysvaraiu
                                      Michael Hughes
                                      David Howat

Leader Biographies

Francisco Soto is the manager of a R & D center in Chile, with more than 13 years of experience developing and implementing innovation projects for international companies, and labs. Supporting technological spinoffs, technology transfer contracts and raising R&D contracts with companies in mining and oil & gas. Has worked with several mining companies on the development of innovation products and solutions. Holds a Bachelor’s degree in Business from Universidad Tecnica Federico Santa Maria, Chile.

Bas Mutsaers is an innovative, results driven professional with extensive experience in setting and executing strategy, leading various high performance teams in the areas of consulting, engineering and software development across the Natural Resources, Energy (up- mid and downstream), and Utilities industries. This has been achieved in APAC (ANZ Region), India and Europe. Over 15 years leveraging ISA standards like ISA95/ISA99 with a strong global network and deep experience analysing, selling, designing, building, testing and deploying innovative industry-specific solutions. Leader of many Global complex migration and transformation projects and pursuits with strong solutions, systems and business process capability. Leveraged ISA standards across domains of ERP, EAM, MES, and Industrial Automation achieving IT/OT convergence by leveraging the ever-growing data of Sensors, People and Technology across the entire value chain and applying it in BI and Analytics solutions.

Don J Root, PE is a licensed professional electrical engineer with 33 years of experience in electrical power & control systems, mechanical design, and project management. He pioneered the use of PLCs in several industrial applications and is fully knowledgeable in US and international electrical codes that apply to environmentally-rated industrial locations areas. He is the author of magazine articles and book sections on the use of control systems and has been a guest instructor at Kansas State University. Don has seven years of P&L experience in a small high technology company and international experience executing projects in the People’s Republic of China, Thailand, Indonesia, The Philippines, Romania, Poland, Ecuador, Puerto Rico, and the Caribbean.

Ari Supomo has been in the process automation in the mining industry for all his professional life. Says Ari, “I joined ISA so that I can stay informed with the automation advancement. In addition, I can learn and apply automation best practices and standards from ISA to our mining sites. I believe there are great opportunities for the mining industry and companies to work and partner with ISA. My goal for the division is to improve the communication, participation, interaction and collaboration between ISA and mining society/community.”

Carlos Mandolesi is the owner of Sigma Automation located in Brazil, with 24+ years’ experience in industrial automation and networks and now with a strong focus in Industrial Internet of Things. Experienced in large projects in mining, metals, oil & gas and biofuels including customers like VALE, Anglo American, Samarco and Petrobras. Carlos is ISA District 4 (South America) Vice President and was elected to be a member of ISA Executive Board.

Graham Nasby, PE, PMP is the ISA’s VP-elect of Industries &Sciences. As VP-elect, he helps oversee twelve of the ISA’s global technical divisions. Graham is delighted to see that our Mining & Metals technical division is now being led by a new energetic group of volunteer leaders. Graham lives in Guelph, Ontario, Canada where he is the Water SCADA & Security Specialist at publicly-owned water utility.
Mining and IT-OT convergence

by Bas Mutsaers

It feels like a long time ago we started talking about IT-OT convergence, wireless technologies and a mature approach to Industrial Safety but the mining industry would still benefit from a stronger adoption of ISA standards to help accelerate the productivity journey.

It is the right time to adopt and adapt new ways?

Now ISA has recently formed a “Mining and Metals-division” it will be interesting to see what this will mean to the communication, standards and viewpoints that are generated around mining.

Recently some parts of the industry are starting to turn the corner with many resources shares up and most commodity prices up strongly due to continued demand in recent months. This is evidenced in metallurgical coal share prices and less evidenced but still significant in iron ore and precious metals prices.

Through the downturn, capital reduction and low availability of excess-cash has forced the productivity agenda at a level not seen before in mining. Productivity of current assets has seen a tremendous focus and thus the cost per ton for most of the volume in the market has strongly reduced (picture 1 on the right).

Commodity prices have now returned to the long-term trend based on the larger companies that kept focus on increasing volume in their current assets as depicted by the yellow areas in the 2nd picture. It is apparent this comes at the cost of the smaller less profitable assets that are naturally pushed to the right. Thus, these assets are not attractive in a saturated market even at the right cost point given their position on the curve.

The companies in the upper side of the cost curve (in red) typically do not have the same leverage to adopt a productivity agenda being typically smaller (or older) assets that are not as flexible or as efficient as Large Tier 1 ore bodies. These companies often have less access to power, water, transport or are of a higher complexity (ore body or processing needs). Several of these may also be nearing the end of their life and it simply does not make sense to sink any more money into these assets without an increased market demand or a lower cost base.

Capital Reduction

We’ve seen plenty of examples of entities that are now priced out of the market, and in temporary “care and maintenance” or up for are extremely low through significant capital reduction programs forced by the recent commodity prices. Many sites are operating both their mobile fleet and their comminution plant with “older equipment” and have renewal rates now below their depreciation value. As expected that cannot last and investment must return when demand increases.

Temporary under-investing in maintenance related drivers like Safety and Downtime need to be much more closely monitored and controlled to prevent surprises as these factors are ever more key to a lean and efficient production and the license to operate. Investors have growing expectations for a high level of predictability and low risk assets for their portfolio.

The need for good reporting and intelligence is greater than ever before to support an efficient operation not
only targeted for maximum production but also for maximum efficiency at variable throughput levels to be in position to serve more demanding clients at the right price point and quality without product give away.

It is these high performing clients that are adjusting their business models to be connected to the up- and downstream production. For integrated coal power plants this is the case as often these plants and their schedules are more often strongly connected to input variables of the mine as well as the output variables of energy consumers in an ever growing and smarter grid that demands production flexibility for which traditional plants and their original transmission lines have not been designed.

Adopt ISA95 modelling

How should these companies go about it? Having an experienced team can help beat name plate levels. It is the mature teams that have seen more unexpected cases and scenarios that can return their plant back to a desired state most efficiently. As naturally mining has a lot of variability across many parts of the value chain this is key for many mining companies. For these companies to be in position to control their entire process these teams have traditionally invested in detailed (and often canonical) reporting solutions.

Level 2 solutions address process control functionality but typically minimal product control functionality.

Level 3 solutions often address the more complex models but solutions typically are not as reliable when compared to PCS or SCADA solutions.

Over time both at Level 2 and Level 3 users create various reports for every role, every unit operation and every time horizon (hour, day, week, month). Reporting has typically been on top of their process control solutions supported by site or enterprise historians. When adopting ISA95 models Enterprise Architecture Teams will have a solid starting point for a connected organization and are likely to have sufficient control over their overall process.

ISA95 addresses the main and typical interfaces with also minimal interactions between typical operations and business processes for sound decision making. The other main benefit of ISA95 is that the integration of desired output or Capacity and plant or product Availability can be monitored and adjusted in time in what ISA95 defines as “The Production Schedule”.

The intent of the standard is that it links product and equipment availability as well as product constraints to quality constraints (read grade) simultaneously within one local or global model, depending on the level of implementation. When performing well the schedule of the pit considers the rate and metallurgy that will hit the commination plant before it will be ready for blending, shipment, smelting or other forms of handling depending on the commodity.

Further when looking at keeping the plant up and running people availability and asset availability can be considered along with the skills to perform specific tasks like having a complete team underground to perform safe operations under all circumstances. If someone critical leaves an area underground the schedule gives a heads up to the dispatching function and prevents drilling or hauling functions or operating procedures potentially going out of control.
Analytics

The model and scenarios above define the typical desired mining value chain relationships as well as the various domains via a layered model. For IT Enterprise Architects within our midst it is much like how TOGAF from the Open Group describes Architecture Development (ADM), functional business architecture, systems architecture, and required technology architecture.

Both TOGAF and ISA99 aim for separate domains from a safety perspective but ISA99 is specifically for the industrial automation domain. Based on this, many traditional operators would say the standards like these have been sufficient to design, build run and maintain an effective mining business. But not anymore!

Already we are seeing that through superior analytics users are able to pin point where to look for additional productivity gains across many more variables than traditional operations or complex models could have addressed.

Significant investment in this space is still expected and required to attain the next level of Productivity and Safety gains that can be achieved by understanding more variables and their relationships - holistically.

The industry today is still modelling product- and process variables locally for what one would call “unit” or “cross-unit” optimization like ball mill grinding or flotation.

Sometimes these functions are performed in multi variable controllers in the process control layer in other times the models sit in layer 3 or 4 per the ISA95 standard for other functional or historical reasons. In the last couple of years there has been an increased investment and uptake of this kind of models after executing an initial analytics Proof Of Concept (POC) often aimed to prove potential to traditional leadership. Still it is worth asking the question given the analytics hype: How many companies crossed the chasm and have performed global rollouts of models in each of their core functions?

Mining is from this perspective in the Early Adopters phase where Energy, Banking, Telecom and Retail industries might be a step ahead as the main majority have adopted analytics.

For mining processing, it is likely to be the energy industry (upstream and refining) where complex and mature models exist and where the basic unit operation functions are more repeatable and predictable. Direct application of these models is not always possible because mining has slightly different areas where variability appears across the value chain. This is often overlooked when automation or software vendors want to bring their solutions from other industries. It is also these attributes and variabilities that different commodities bring to the table that result in the need to address quite a different process-flowsheet and therefore poses the biggest challenge for today’s Tier 1 mining companies that all aim for a diverse portfolio to help reduce their financial exposure and risk.

How to start?

Targeting the core functions that all the assets have in common is a good starting point and the intent of the ISA95 standard.
Another benefit of the standard is that the definitions help communicate via a common language the complex business and operational issues of Analysts, Programmers and “Mining, Equipment and Technology Specialists” or “METS” that are key in running today’s mines but traditionally don’t have a strong IT background.

Already the ISA integration definitions for main integration points between core functions is defined using “Business to Manufacturing Market Language” or B2MML interfaces and is already proven to be effective. These interfaces help accelerate how mining systems should be communicating today both vertically and horizontally.

Additional to the benefits of the standard there are major technology advances in Analytics as well as in Process Control where OPC-UA is now applied efficiently in communicating data securely across domains where earlier protocols had integration and security challenges as they were not natively designed to solve that issue. Is the answer then in directly creating 1 large global connected model of functional modules and/or unit operations that represent the entire value chain?

The answer is “NO”. Analytics in early adopter mining companies has typically been more successful when approached locally before trying a more global approach as the colors represent above. After performing a couple of focused POC’s it becomes clearer how to scale and adopt models into the various functions for a more mature automated and global approach that considers parameters that you can take across the entire value chain. Teams need to learn how to collaborate and conclude what the data means before adjusting.

When confidence of the teams is going up it is still wise to start with a low fidelity approach to see cross value chain impacts of specific local process set point changes on the overall target functions before any heavy lifting is considered. Having a light “global” model with variables like Rate and Grade and maybe residence time of production is a good start before relating the many other possible variables. Having these parameters as a baseline it will become more obvious where perhaps model changes or over simplification might be causing sub-optimization.

**Light Control-Model**

The light model therefore is a good baseline to compare progress of the overall objective functions before investing more analytics dollars in larger and more complex multi variable (machine learning) models.

Having the base-line will be a good guide to see if still more value is achieved when building out the fidelity of sub- or global models. If after some early wins the “value per Analytics Dollar invested” reduces there is still the ultimate challenge and consideration to start connecting to even larger global models that go beyond the asset itself.

A good example of such model is the desire to blend from multiple Iron Ore sites in an area (like Pilbara, Hunter Valley, Minas Gerais) to optimize product give away initially with stockpile inventory but gradually reducing inventories and with that, costs. This is possible when models are mature and plants are more able to respond to output request through proper implementation of analytics findings (where traditional models produce-to-stock).

Another example to consider for some companies is optimizing rail capacity dynamically for multiple end-users or partners against contract variables and service levels.

These kinds of “super-models” in future could have an even larger overall impact on revenue versus trying to optimize product volume, quality or grade for any one specific site. Even more value can be captured for both producers and end users if over time real-time slot-booking (including penalties for any over or under delivery) can be applied as is the case in other industries.

**The Challenge**

Capturing such complex challenges is potentially not far away now combined technology and software solutions are starting to scale and initial good proof of concepts have already captured significant value. There have been some strong potential advantages for the more recent green-field assets to adopt new technology that have typically more and better sensor data. Those greenfield sites have typically adopted different and more dynamic reporting systems and architectures.

You would expect that these sites are positioned for better Analytics outcomes but from a traditional mining perspective these newer sites often struggle ramping up to name plate are through the lack of a mature team or having a predictable traditional canonical and functional/role based reporting solution to fall back on as budgets have gone to the latest and greatest Analytics Architectures and minimal money is spend on traditional reporting.
Two Level Approach

The case therefore of starting a lightweight hybrid reporting model AND a best practice analytics architecture would have strong preference going forward.

Mining Analytics initiatives would require mining experts also being more than a little computer savvy when needing to play around with big data servers and various non-traditional client tools to perform regression, clustering, decision trees and nearest neighbors machine learning algorithms (to mention just a couple).

It is the mature teams that have been playing in the sandpit for a while that start seeing how all this is “hanging together” for key bottlenecks in the pit or plant. For mining experts to be efficient in such environment it would require some real hands-on on the tools and training on how to use various machine learning models for achieving productivity results.

It takes a bit of time for these teams to understand basic requirements of first having high-quality data and for them to use one common language that can help point (with respect) Analytics Propeller Heads in the right direction. If focus is only on analytics tools it can take a while before the process is understood from the data.

Context

When IT and Analytics teams are sitting remotely it is hard for them to put data in the right context. When performing optimization projects remotely from the site it takes much more time or very significant and expensive experience to come with significant findings. “Not knowing” the physical process of the plant and its variability issues would still be reason number 1 why many analytics and improvement projects fail.

When good P&ID’s, process control charts and alarming limits are at hand and the physical design of the asset is available in 2D/3D drawings or models being remote will likely be much less of an issue. Still there is strong benefit of being local as experience tells that engineering artefacts of brownfield sites are not always kept up to date and plants continuously keep changing to achieve or improve name plate levels. Engineering Design Databases and drawings are a great source for Analysts that often need to call upon sites experts to understand issues or physical plant limitations.

It is a pity that traditionally the EPC’s/EPCM’s do not have much opportunity to jointly put effort in a longer start-up phase with Operations at that time not being available and teams having to rely on Process Control Vendors or SI’s that typically are not as intimate with the Metallurgy and Geology of the Reserve and more focused Hardware, Software and traditional Unit Control over Product Control and is an opportunity for the industry overall.

There must be the realization that having METS-expertise in these teams (both for Vendor and Operator) will make a huge impact. It is the experienced METS that can point out why issues arise through the (in)consistency of the metallurgy, geology, geo-tech, geo-chemical functions and how data and initial models can relate to functions like Planning, Scheduling, Operations, Maintenance and potential downtime.

Having an integrated team that talks to technology vendors that is at the same time intimate with Process, IT/OT Technology and even the softer side of People and Change processes will help the best companies adopt change rapidly and help them truly achieving high-performance.

Forced by the Productivity Agenda the majors are making inroads in creating some of these cross functional teams. To them it will soon be clear how production variables relate to energy and water use as well as how inputs relate to safer and more efficient operations. They will soon better understand how these parameters cause downtime directly or indirectly.

Collaboration with the METS
The teams that are persistent in their journey will ultimately find the physical or natural limits of equipment and its relationships to ore attributes like hardness. As in other industries the innovators and early adopters will soon be followed with the early and late majority that will include many of the Tier 2 players that are also starting to invest in this capability. By then software solutions will have matured as well as the processes that lead to fact finding, interpretation and modelling for this industry.

Embedding best practice

There is still significant challenge ahead before this is achieved. Recent research shows that only 50% of analytics projects gave a significant and expected upside.

Even though there are several references that achieved real savings still many projects only have achieved below-average results. Some other projects have been put on hold halfway until more process and ownership within the organization is defined.

Starting with poor data has also been a major reason for this. Additionally, projects like these are initially seen almost as technology projects “for Vendors to prove” and the industry to benefit. If it is a Vendor lead approach often when the project is finished the teams go back to old habits without embedding the new processes and learning points into their business. It is therefore that, like with quality and safety, analytics capability is soon to be a responsibility for many - and not only for the team that gets to play with it through the first initiatives and POC’s. Companies will need to involve vendors that provide the technology, software and methodology but must put their own governance into place to make Analytics part of their core operating model and business processes and systems. Not many resource companies are already at that level of maturity when it comes to analytics.

Theoretical Approach

Another factor that slows down adoption and progress is that analytics is approached very differently from traditional reporting and BI so should not be treated the same. Unlike reporting that is often predefined and without too many surprises Analytics projects bring up many theoretical ideas and suggestions. Often suggestions that theoretically make sense do not make good business sense. Practically implementing findings in a current investment climate and brownfield environment to capture the potential results is not always feasible.

Some findings are likely to be more structural in nature as through traditional reporting and BI the “easy stuff” has already been found through trial and error in this industry that has existed for many centuries.

To make money in the mining industry there has always been the need to truly understand the mining process. This has in the past lead to efficient mining operations and this will also be the case in the future. It is likely though that we will see a higher level of automation and machine learning models overtaking complex functions that Geologists, Lab Analyst, Maintenance and Operations teams deal with today. We will see central models and decentralized sub-models just because vendors will be looking to differentiate their technology products and services.

Therefore, investing in analytics and IoT technology (that is providing the sensors, the data and sometimes the control) is investing in understanding the process before deciding how to ultimately model and automate it for improved productivity, downtime and cost reduction.

Only companies that would go ALL-IN on the analytics journey would find all these dimensions and will be able to run...
their operations at the lower cost percentile that this technology opportunity opens.

By defining realistic benefit targets and acceptable risk levels companies will make the expected progress. Some will be benefiting significantly from their adjustments and will define a low cost and flexible operation that can respond to live commodity trading and risk management market data.

Currently it is only Analytics Technology that has the potential capacity to take those factors into consideration to allow putting in place high fidelity models that can react to any leading- and lagging indicators of the enterprise and that for any time horizon live.

Does that put other current software vendors out of business? Absolutely not. The IT and OT processes still must be run and controlled but it will be the vendors that have flexible roadmaps, open software and technology that clients will be looking for. These vendors can accommodate this new intelligence and help end users embed repeatable models into their software libraries and this puts these vendors first in rank to be the productivity partners of the future.

Keeping it Secure

Finally, mining will only be sustainable if current and new company IP is protected. After all mining involves significant money and with production highly affecting the daily share price people will be trying to have an edge and therefore mining systems have increasingly become a target for hackers.

Miners cannot sit back for this to pass as their growing range of autonomous equipment and complex expensive technology will need to be kept in the right hands. Intrusions need to have minimal impact if only to keep public trust and with that the license to operate.

It will be interesting to see how the adoption rate of ISA standards like ISA99 are combined with other Cyber and Enterprise Architecture Standards and how IT and OT environments might be able to merge into one seamless working environment without the need of any visible vertical layers nor accepting any visible horizontal silos.

The awareness of the benefits is there and these standards have now reached the board-rooms of most of the majors where previously only a hand full of SME’s would have. The cloud by now has far matured and more OT systems end up in the cloud being cloud enabled where IT systems have already gone this way in recent years. In this area software vendors are leading the way where clients are still playing catch-up.

It won’t be decades away before we see the first operations that leverage only one secure seamless and connected modular environment without all the layers that today are needed to achieve real time performance and security. Maybe ISA should create an initiative that aims for the next level in collaboration with Software Vendors, Technology Vendors and End users.

Until that time I can’t wait to see the benefits of a truly connected and optimized enterprise.

About the Author

Bas Mutsaers has been an ISA member since 2005 and Board member of the new ISA Mining & Metals Division. mutsaers.bas@gmail.com

Further Reading with ISA Standards

ISA95, Enterprise/Control Integration Committee
ISA99, Industrial Automation and Control Systems Security
ISA100, Wireless Systems for Automation
ISA88, Batch Control Systems
ISA101, Human-Machine Interface
ISA18, Instrument Signals and Alarms
ISA108, Intelligent Device Management
Ain’t No Stopping us Now!
By Jim Keaveney, 2016 ISA Society President

We just finished our Fall Leaders Meeting (FLM) and it was so invigorating spending time with our dedicated volunteer leadership teams. There was record attendance, many new faces, and an outstanding Honors & Awards Gala event. The Leaders Meeting Planning Committee developed a strong program that offered many opportunities to hone our ISA and work-related leadership skills.

I picked the song, “Ain’t No Stopping Us Now,” to kick off our opening session. I have never been so sure that we are on the right path to fulfill our mission and to create a new, “One ISA.”

We have fine-tuned our strategic planning process, which partners Executive Board Goal Champions with our staff leads to help develop the proper metrics and messaging. We also developed an evaluation tool to help us pinpoint which initiatives are no longer providing the desired value so that we can better invest in the future. Strategic Planning is also working with staff to develop information dashboards to help our volunteer leaders improve their performance and identify opportunities for improvement.

Make no doubt, there will be some bumps and wrong turns along this path, but we are creating a continuous improvement culture that sets a framework for sustainable growth and relevance.

The FLM was also a time to recognize volunteer and industry leaders. It was humbling to meet the honorees who have done so much for our industry and profession. It is you who contribute so much of your own time and talent to develop high-value ISA content, including standards and best practices. It is you who develop our training and certification programs and it is you who help create first-class symposia events. As an automation professional and consumer of many of the “products” ISA offers, I will always be grateful. Thank you for all you do for ISA and our great profession.

I’m going to continue my call for producing the next generation of ISA leaders. The Society needs you. We just completed our election cycle and are fortunate to have a great slate of leaders and contributors for 2017. But we need to build on this progress and do even better. Many of the positions were uncontested and one had no candidates at all.

Moreover, there were only three candidates outside of North America and there were no women. Granted, we do have a fairly senior group and that brings welcome experience and expertise. The quality of our incoming officers reflects that. However, the longer-term challenge of leadership development remains a significant one. Our Board needs to stay focused on positioning the Society for future success and relevance. If we want to become more global and reach out to younger and more diverse automation professionals, we have to find a way to attract these groups to the discussion table and to our association as a whole.

Verna Myers, principal of Verna Myers Consulting, offers some great insight. She uses the phase, “how to go from well-meaning to well doing.” Think about that one for a few moments. We often say that we create an inclusive environment, but is that really enough? Verna notes that diversity often connotes quantity, but inclusion is about quality. Stated another way, she states that diversity is being asked to the party while inclusion is being asked to dance.

It’s not about quotas, being politically correct, or a sole focus on race and gender. It’s about creating good business processes that actively engage all professionals of diverse and productive perspectives. This can be uncomfortable, but almost always yields better decisions and results. Groupthink is easier and enticing, but it will ultimately hold us back as an association.

I would also like to remind each of you that we have set up an e-mail address—facestowatch@isa.org—to receive suggestions on potential ISA leaders. Please contact me at President@isa.org to offer your suggestions, or to join the team. Better yet – let me know if you want to dance.

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