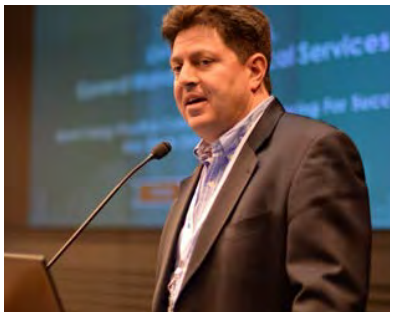
ENGINEERING FOR SUCCESS

ON FEBRUARY 10-11, 2015 WE HELD OUR THIRD ENGINEERING FOR SUCCESS SEMINAR IN ABU DHABI, UAE.

This biennial seminar is designed to help delegates understand new and emerging risks, and how risk engineering can assist in managing and mitigating these risks. This year, we also looked at market leading best practice, learning from experiences, developments in safety processes and ways in which risk engineering can help your business, both now and in the future. Here we share some insights from this seminar.

LEADING SEISMIC CHANGES IN PROCESS SAFETY



Oman Oil Refineries and Petroleum Industries Company (ORPIC) is one of Oman's largest companies and one of the fastest growing businesses in the Middle East's oil industry. Livio Accattatis, ORPIC's General Manager Technical Services, discussed the rapid improvements in process safety management (PSM) which have been made within the company.

Four main drivers for a change in PSM performance were described as follows:

- Adoption of "safety and environment first" as ORPIC's number one corporate value.
- A top management team sensitive to the importance of process safety and asset integrity.
- The occurrence of process safety incidents.
- Reliability issues at the plants.

The ORPIC approach to change was to "keep it simple." The 14 elements of the OHSA process safety standard (Process Safety Management of Highly Hazardous Chemicals - 29 CFR 1910.119) were used as the basis, with the theme "identify, understand, and control, monitor and sustain."

Among the PSM initiatives driving change were the implementation of recommendations from insurance surveys carried out by risk engineers.

Mr. Accattatis referred on a number of occasions to the need for a continuous "sense of chronic unease" – a characteristic of high-reliability organizations (HROs).

The need to track and analyze PSM leading indicators was emphasized, including the tracking of, for example:

- Operating limit excursions.
- Relief valve fail to danger occurrences.
- Trip overrides.
- Preventative maintenance compliance.
- Number of safety walks.

Resource limitations were recognized as a key constraint. Mr. Accattatis described the key to long-term success in the PSM journey as cascading a "process safety culture" within the organization.

ALARM MANAGEMENT

When we consider the aspects of hydrocarbon operations that have contributed significantly to property damage losses over the last 30 years, operator error and process upsets together make a significant contribution for up to a third of all such incidents; one need look no further than Piper Alpha (1988) and Texas City (2005) for examples.

As operators have looked to increase the efficiency of their operations, energy assets have become increasingly reliant upon on complex control systems, with levels of operator intervention reducing. Supervisory control is increasingly carried out by a "human-machine interface" or HMI. The operator is made aware of any equipment malfunction, process deviation or abnormal condition through an HMI-generated alarm, to prompt action or intervention.

The alarm is however only one layer of protection in mitigating the potential risks or hazards that might result from an unwanted plant deviation or abnormal condition. However, a poor or ill-defined response to that alarm can either exacerbate that risk, or compromize other layers of protection. A significant process upset may of course result in hundreds or even thousands of alarms, which then all need to be effectively managed.

Since the formation of the Abnormal Situation Management Consortium in 1994, there has been an on-going process in the industry to give better guidance on defining what are acceptable or manageable alarm levels; this has resulted in, for example, the EEMUA 191 guidance, and standards such as ISA S18.02 and 49 CFR 195.446.

Ideally, this guidance should be applied at the start of a project and the plant's alarm management processes honed at the plant commissioning phase, although in practice the true challenge of alarm management is often how to retrospectively apply the principles to existing plants. Once operation has been established, good practice is then to develop an ongoing process of operator training, alarm review, measurement and audit to ensure that alarm levels remain manageable to minimize overall levels of risk.

BEYOND BEST PRACTICE: LEADING LOSS PREVENTION

"Risk engineers are parasites" was not the message expected from the audience in this particular conference session; however, the analogy was used in terms of how best practice is collected, shared and disseminated by the Risk Engineering Community.

Ian Roy, Marsh's engineering leader for the Middle East talked passionately about the value of consistency across the whole spectrum of loss prevention techniques, illustrating the point using the investigation into the Longford Gas Plant explosion in 1998 and subsequent industry thinking.

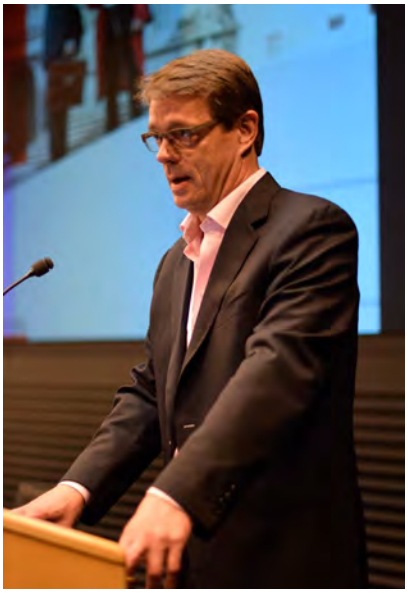
Marsh uses loss prevention benchmarking data to help clients understand their risk profiles. Being consistently good in all areas is better than being excellent in some and weak in others; Mr. Roy drew upon LNG facilities data from the Marsh database to illustrate this point. The best LNG site in the Marsh database is top in very few of the 44 topics we benchmark against; however, it consistently scores highly in each individual category and hence overall is the top ranked site.

The sharing of best practice is a core value of Marsh's Global Energy Risk Engineering (GERE) Team. Marsh uses a variety of techniques to disseminate best practice – its Loss Control Newsletter, client training seminars (often held in conjunction with insurers), position papers etc. We strongly advocate that clients consider best practice and implement those that deliver cost-effective risk reduction. Mr. Roy closed his contribution with a key message: *"Consistency in good practice supported by pockets of best practice in key areas is a winning combination!"*

"...Better to implement all Safety Management Systems adequately than selected parts excellently and others not at all..."

CENTRE FOR CHEMICAL & PROCESS STUDIES

THE VALUE IN VALUATIONS



In the event of a loss, the insured would expect reinstatement back to a condition enjoyed prior to the loss. It follows then that this principle of "new for old" coverage relies on declaring accurate plant property values.

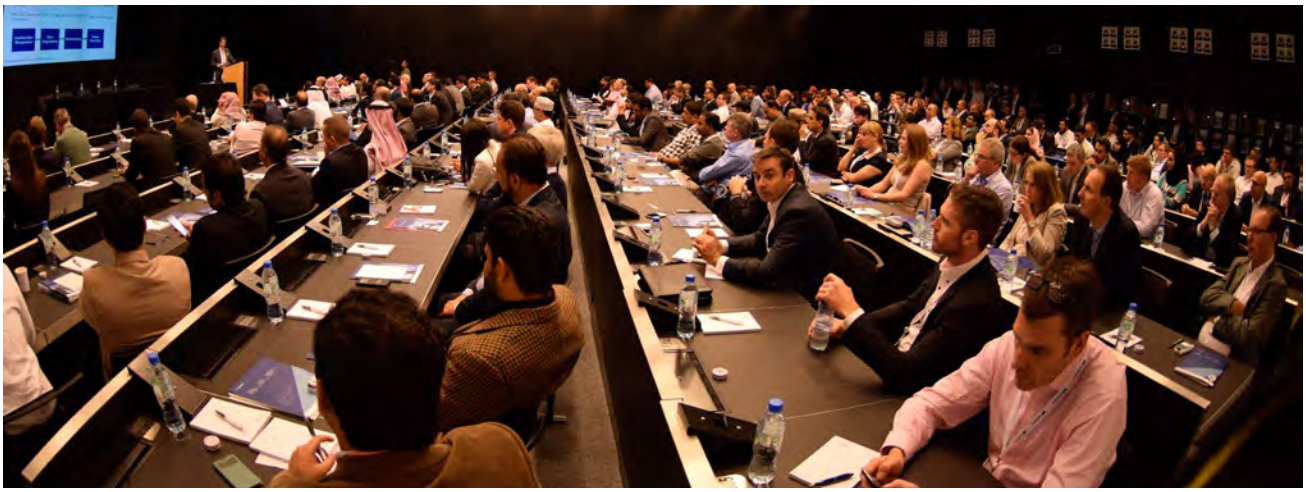
During this seminar session, Nigel Wilson, American Appraisal's Director of Insurance Services, outlined why the insurance appraisal of an asset is so important when considering the risk of being "under-insured," or indeed "over-insured." He also highlighted a number of significant additional benefits that a valuation offers.

Under-insurance carries with it the real risks of monetary loss, interruption to business operations, and reputational harm. Accurate values provided through a professional valuation exercise are central to mitigating these risks and ensuring no surprizes at the time of loss. Additional valuation benefits highlighted by American Appraisal included: increased accuracy of portfolio assets, using quality value data to engage and challenge underwriters from a robust position, facilitating allocation of risk across business units, and optimizing catastrophe modeling.

Valuation issues for risk managers were explored, highlighting difficulties in keeping pace with the change in assets as well as updating values using indices. Although indices do play a role in valuations, some surprising limitations and pitfalls of their application were explained, with a recommendation that beyond use of indices for say five to eight years, values should be re-established through a survey. Use indices intelligently and carefully was a key message.

American Appraisal gave further insight into how clients can develop an intelligent appraisal program, yielding benefits extending beyond simply establishing accurate values for a site. A case study was also given, revealing a significant miss-match in a client's pre-appraisal perception of value compared to the true value at risk.

Clearly, the link between values and ensuring a fair premium is paid, and the need to mitigate the risk of under-insurance is vital. The limitations of cost indices were also highlighted.



HOW RISK ENGINEERING BENEFITS MY BUSINESS

The Oman Methanol Company (OMC) started up in 2007, operating a one million tonnes/yr methanol plant in Oman, and employing some 200 personnel. The process utilizes steam reforming to produce synthesis gas, which is then converted to methanol; the latter is subsequently separated from water via distillation and stored for shipment via the site's jetty facilities.

Mr. Christiano Azevedo, OMC's Health, Safety, Security & Environment (HSSE) and Optimization Manager explained how OMC has been working closely with Marsh's Global Energy Risk Engineering Team, which has been instrumental in supporting risk management improvements at the site. Marsh's underwriting surveys have identified several risk improvement recommendations. In parallel, a bespoke benchmarking exercise carried out by Marsh in 2014, benchmarked hardware, software, and emergency response topics as manifested at the site, and provided a useful gap analysis for key areas of improvement. This helped OMC to prioritize and support the implementation of key risk improvement recommendations made during underwriting surveys. As a result, site response to the underwriting recommendations now stands at 92% marked as "complete," with the remaining 8% "in progress."

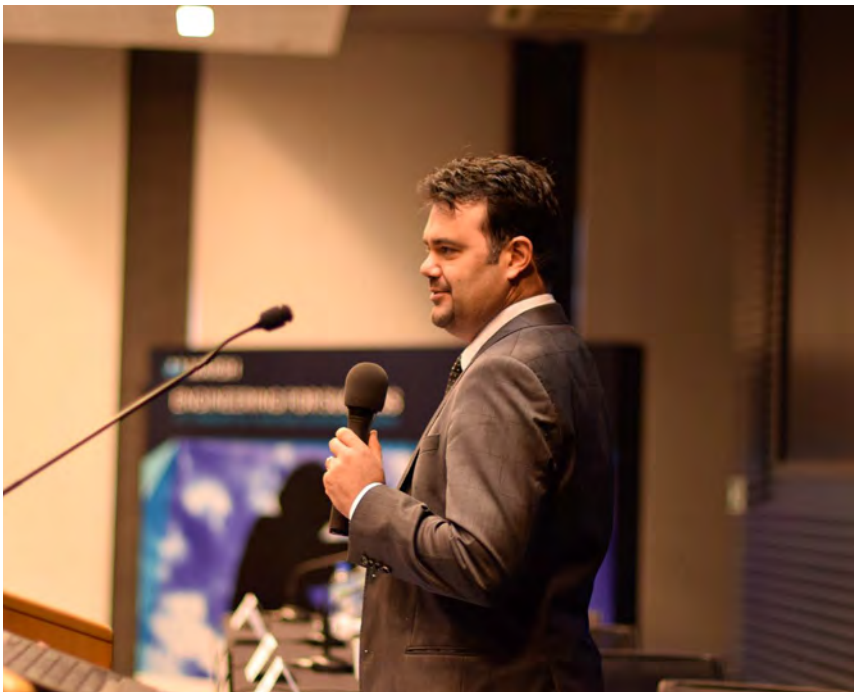
Risk engineering follow-up from underwriting surveys has included sharing information on key process safety management issues such as performance indicators. Marsh's position paper on process safety performance indicators (PSPIs) has helped OMC define and adopt them. Involving key operations personnel in the key performance indicator (KPI) definition process resulted in a set of process safety KPIs that were meaningful for the site and easily adopted by all.

The speaker then presented a series of examples where input from risk engineers, aided by the benchmarking process, helped support and implement key improvements on the site, including:

- Improvement to the site's fireproofing.
- Key hardware improvements in the methanol storage area.
- Improvements in the testing and performance of pressure relief valves on the site.
- Improvements in security measures, including process area internal security fence; headcount procedure utilizing a magnetic access system.
- Process hazard analysis improvements, including updating of P&I drawings.
- Improvements in fugitive emissions control.
- Emergency response and training; fire pump performance and testing.

Following the implementation of these improvements, the benchmarking study reflected an improvement of the site's performance into the first quartile of operating sites.

In closing, Mr. Azevedo concluded that risk engineering has helped improve the quality of the risk associated with OMC operations, provided independent assessment of plant and practices; shared important lessons from losses in supporting improvement efforts, and supported continuous improvement efforts through the provision of loss prevention seminars.



CHRONIC ISSUES: REFORMER RELIABILITY

A topical issue in plant reliability has been the management of fired heaters, including furnaces and reformers. Matthew Akhurst, Air Products' Director of Operations for MENA introduced a selection of chronic issues identified specifically with steam methane reformers; however, parallels can be drawn for other types of reformer technology, including auto thermal reformers and gassifiers.

The topics presented as common causes known to detriment reformer reliability were focused specifically on reformer tube leak and ensuing rupture, corrosion and metallurgy issues and incorrectly applied insulation. Mr. Akhurst indicated that the issues faced by Air Products throughout the course of its operating lifetime have now been successfully designed out.

Reformer tubes typically operate within the creep zone and the effects are so dramatic that an increase of 20°C potentially halves the remaining tube life. It is therefore critical that tube skin temperatures are monitored at multiple locations to check for localized hot spots.

Mr. Akhurst also explained that issues with corrosion are not uncommon and highlighted the point that there is a fine balance to strike between choosing the right metallurgy and overall operational economics. A wide range of damage mechanisms is possible, including metal dusting, stress corrosion cracking, thermal cycling, brittle tube fracture, and hydrogen embrittlement and high temperature hydrogen attack.

The third issue, which drew a lot of interest from the audience, originated from the humble topic of insulation. Incorrectly applied (over) insulation (internal and/or external) can actually create high thermal stresses due to the inability to dissipate heat. The speaker concluded that it is therefore critical to ensure that site installation procedures correctly reflect the strict requirements of the design.

EXTERNAL NETWORKING: A KEY DRIVER BEHIND NATPET'S SUCCESS

Being a stand-alone site, NATPET faced a number of challenges when starting up its business. Unlike sites that have the opportunity to benefit from the experience and expertise of a joint venture partner, NATPET had to overcome a number of hurdles which included lack of in-depth knowledge of critical elements of the technology employed, unavailability of lessons learnt and best practice, lack of industry data regarding long lead items, and operational challenges during commissioning. Despite this, NATPET is now successfully operating a 400,000 metric ton (MT) per year polypropylene (PP) plant in Yanbu. It produces its own high-quality raw material, propylene, through an integrated propane dehydrogenation (PDH) plant; its products are then sold to more than 97 countries.

How did NATPET manage its success in the midst of all these challenges? Matouq Jannah, Managing Director of NATPET, explained how the company realized that the only way to move forward was to establish a network with other PP and PDH plants globally. NATPET took it upon itself to establish such a network and is now coordinating a number of global PP and PDH plants, which include major players such as LyondellBasell, SABIC, and Dow.

Mr. Jannah concluded by sharing how the wealth of knowledge and experience in this network has benefitted NATPET in a number of areas. This includes resource sharing (including during turnaround and commissioning activities), sharing best practice, and lessons learnt and improved economics.

RISK ENGINEERING MOVING TO THE CENTRE OF THE PLACEMENT PROCESS

Liberty Specialty Markets have completely integrated and aligned their energy underwriters and engineers with their claims handling reports Mike Gosselin, their Chief Underwriting Officer - Energy and Construction.

Mr. Gosselin stated that "risk engineers are the eyes and ears in the business." This 15-month project has integrated data from 12 systems with the aim of adding value to clients through enhanced reporting, and database and analysis functions.

Mr. Gosselin highlighted that "to properly measure risk, we need to segment the type of facility we are insuring down to the location level." The location data management considers the natural catastrophe exposure as well as accumulation analysis. Assessment criteria have been selected and key category weightings are now broadly aligned with the cause of losses from the Liberty Energy Loss Database. For example, at refinery facilities, 64% of losses were attributed to mechanical integrity issues, and 19% to operations and standard operating procedures (SOP). The risk appraisal (RA) score is weighted in favor of mechanical integrity and operations topics.

Four new RA guidelines have been introduced, with the appraisal criteria aligned to the complexity of risk in order to offer better risk selection and differentiation. Portfolio segmentation is then aligned with scenario-based loss estimates, attritional losses, probable maximum losses (PML), estimated maximum losses (EML), and natural catastrophe losses. Engineered PMLs and EMLs for risk reviewed segments have been collated and automated loss estimates generated for non-reviewed locations using information from the Liberty Energy Loss Database.

The Liberty Energy Loss Database indicates a downward trend in the number of losses since 2011; however, the average quantum per loss has been increasing. Mr. Gosselin added: "Liberty believes in furthering risk management across all our insureds. If they prosper, we prosper. The value of risk engineering has changed from a service provider to an integral part of how we underwrite risk. Risk engineering input goes directly into how we price and manage risk. To effectively work with an insured on risk improvement, we need to take a longer-term view."

Mr. Gosselin rounded off his presentation by highlighting how the response to recommendations from insurance surveys is key to risk management. Liberty has developed a recommendations tracking database focusing on the progress of priority one and two items. The database allows historical trending, showing risk improvement through risk engineering. The database can also be used for benchmarking a site against others around the world.

BETTER BOILERS: DELIVERING LONG-TERM POWER PLANT RELIABILITY

Hub Power Company commissioned four 323 megawatt (MW) conventional thermal units in 1996. Ishikawajima Harima Heavy Industries (IHI), under license from Foster Wheeler, manufactured the boilers which are fired with residual fuel oil (RFO) containing a maximum of 3 .5% sulphur. The main and reheat steam conditions are 175 bar/541 °C and 51 bar/541 °C respectively.

Boiler tube leaks began to occur in the reheater in 2003 after only 35,000 hours in operation, and the incidents of leaks increased and spread to the superheater. These leaks were caused by fire side corrosion from the production of low melting point liquids containing vanadium, sodium, potassium, and sulphur contained in the RFO. These liquids dissolve the protective iron oxide layer on the tubes and promote grain boundary attack, resulting in pitting of the tubes.

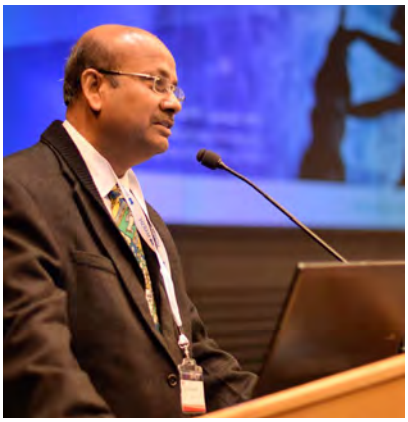
The number of leaks increased over time and caused a large reduction in the availability of the plants. Abdul Vakil Muhammed the chief technical officer of the Hub Power Company Limited (Hubco), explained that the company initially managed the problem through selective tube replacements.

For a long-term solution Hubco decided that a boiler modification was required, which involved reducing the tube surface temperature and upgrading the tube material with a stainless steel SA213TP347H .

Abdul informed us that the modification was successfully implemented in boiler number four without any reduction in boiler output or efficiency. Partial replacements have been carried out on the other boiler to date. There have been no leaks since the modification was implemented.

LOSS MITIGATION AND CLAIMS MINIMIZATION MEASURES: A CASE STUDY

An accident occurred on the vacuum gas oil (VGO) hydrotreater unit of the HMEL refinery at GGS refinery complex, Bathinda in Punjab, India. Prasanta Saha, General Manager – Projects, and Parthasarathy Srinivasan, Head of Finance for HPCL-Mittal Energy Limited (HMEL), gave an excellent presentation of their company's experience following this major loss.



The presentation concentrated on the efforts made by the company in collaboration with insurers to minimize the impact of the loss and return the refinery to full operation as soon as possible.

The refinery is a "zero-bottoms" environmentally friendly manufacturer with the capability to produce Euro IV compliant fuels. The fire on the VGO Hydrotreater was rapidly brought under control due to the effective actions of the on-site fire crews. The refinery has been built in compliance with national guidelines for refinery fire-fighting and fixed protection, which is believed to have minimized the overall impact of the fire.

The management team faced a number of significant challenges to delivering a rapid and incident-free restoration of refinery operations. The challenges included the large number of contractors required to carry out simultaneous tasks within a small area of plant, the high-risk nature of some of the work tasks required (including vessel entry and working at height), and the hot and humid weather conditions during the work period.

The strategy adopted to ensure safe delivery of these critical tasks was to establish 24-hour safety officer coverage of the work area, regular safety walks conducted by senior managers, and a focus on contractor managers to manage safety and a high standard of scaffolding during the construction activity. These measures resulted in only a small number of minor first aid cases and just one incident that required medical treatment.

The key to the success of the incident response, restoration, post-restoration, and settlement of the insurance claims was due to the application of the 5-T principle – trust, teamwork, timeliness, transparency, and traceability. HMEL was able to work closely with insurers in applying these principals to ensure a fast-track restoration process, adherence to program schedules and to cost estimates, and continuity of business operations. This resulted in a transparent claims settlement process on all sides and significant mitigation of the resultant loss to HMEL. Following the loss, the whole company worked as a team to restore the operation on the refinery. This required timely decision making at all levels within the company and round-the-clock working by key teams. Daily inter-department meetings were held to minimize any bottlenecks in the process.

A dedicated team was formed to manage the insurance claim and mitigate the loss. Forensic accountants were used to capture the critical data, identify the scale of the damage, and develop plans for restoration and start-up. The final claim presentation required hard work but was simplified by the sharing of critical information and a good level of trust between the company and its insurers.

QUANTIFICATION OF THIRD-PARTY LIABILITIES: CAN RISK ENGINEERING DELIVER VALUE?

History has shown that large-scale TPL claims can arise from hazards associated with onshore facilities, from vapor cloud explosions (VCEs) to toxic leaks to pipeline rupture. This workshop examined perennial questions relating to determination of appropriate third party liability (TPL) insurance limits in the onshore energy industry.

Ryan McGovern, a Marsh Risk Engineer in Dubai, introduced the audience to a number of major incidents from the sector which resulted in very large, unexpected, third party liability exposures. He concluded with a reminder for risk managers that the energy industry's inability to properly learn from such catastrophes has created an environment where liability limits are all too often significantly exceeded.

Ian Roy, a Senior Marsh Risk Engineer, then examined the methodologies and tools which Marsh can deploy in order to quantify the effects of a range of major accident hazards. Two key points that were stressed were the need to consider scenarios with extremely low probability of occurrence (10^{-6} to 10^{-7} per year) for TPL, and that operators with existing quantitative risk assessment (QRA) studies can leverage on the data they contain to improve the confidence in TPL loss estimates.

Sinan Geylani, Chief Underwriting Officer – Casualty at AIG in Dubai, outlined an underwriter's perspective on TPL quantification using some insightful analogies to help the audience understand that 21st century risks require 21st century data and analytics – which, due to the lack of risk engineering in the current TPL sphere, is often lacking. Following this, Hugh Forster, Property Practice Leader, Marsh Risk Consulting (London), presented an alternative to the quantification of TPL exposures, following a structured process of "high-level" risk identification throughout the entire company portfolio. While this approach will only produce loss estimates within "bands," the level of data analysis required is lower and therefore may suit certain corporations, particularly those with multi-site operations.

TESTING AND COMMISSIONING PANEL DISCUSSION: BUILD, START, ATTACH, RIGHT?

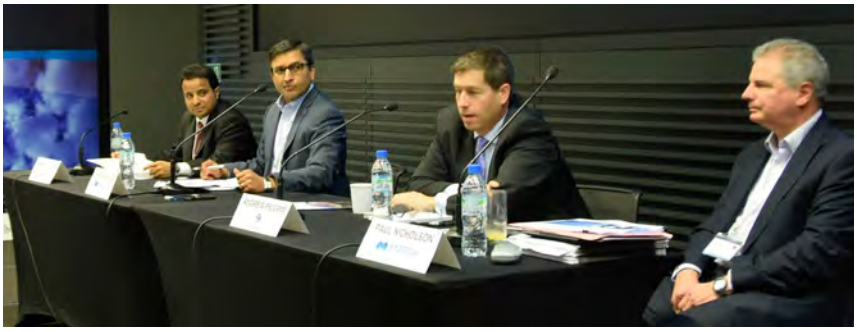
The smooth transition from construction to operational insurance cover remains a challenge for the energy industry. It often results in frustration for project owners, risk managers, insurance brokers and underwriters as each party strives to ensure outcomes that align with their interest. Paul Nicholson, Marsh's LNG and gas transformation leader, when explaining the project completion process and associated insurance interfaces, commented that "compliance with the project testing and commissioning clause defines the point at which the project is ready to transfer from construction to operational cover." The objective is for a smooth transition process with no gaps in coverage or additional premium being paid. The process will be further complicated by transition from delay in startup for business interruption cover alongside the property coverage.

Saad Al Olayan, SAMAPCO General Manager, shared his company's recent experience of the successful start-up of their 300 kta ethylene dichloride plant in Jubal KSA. The construction to operational insurance handover was completed smoothly and without market concern. This was achieved because the project was executed as planned with the provisional notice of acceptance signed after four months of of hot testing, although 100% design throughput was achieved within two weeks of the introduction of feedstock into the plant. Mr. Al Olayan highlighted 10 points that led to successful project outcomes, one of which was "stringent management control during commissioning and start-up." From the insurance side, there had been visits from Marsh and the insurer's engineers ensuring a full understanding of outstanding punchlist issues – and the plant was readily accepted by operational markets. Well-executed projects do not have testing and commissioning challenges.

An operational insurers testing and commissioning perspective was provided by Andrew Pilgrim, Zurich's Senior Risk Engineer for the Middle East. Mr. Pilgrim referenced the LMA5197 Property & Plant Testing and Commissioning Clause, emphasizing the requirement for demonstrating "100% contract design criteria" and"stable and controlled" operations over a "period of 72 hours." Some questions were posed to the audience: Are you confident that the unit is performing per design? Contractors are paid to deliver the project; is it not right that they be held responsible for deficiencies rather than operational insurers?

So why is it that problems can occur? Gaurav Bhatnagar, Head of Marsh Construction Energy and Infrastructure based in Dubai, explained that not all projects run smoothly. Challenges include:

- Last-minute instructions to brokers to transfer risk to operational cover (driven by operational insurance being less expensive than extending the construction all risk (CAR) insurance).
- A lack of accurate and relevant information regarding project status, acceptance of contractor non-conformances including incomplete punchlists.
- Inadequate demonstration of design performance.
- A lack of industry awareness and timely engagement with the owner's insurance organization.
- A mismatch between project contract terminology and insurance wordings.
- Failure to strategize for large complex projects requiring a phased handover.



One delegate sought the views of the panel about aligning insurance and lenders' requirements given similar performance demonstration objectives. Another suggested appropriate insurance clauses prior to contract signing.

In his closing comments, Paul Nicholson, a passionate believer in "getting it right from the start", suggested the only practical way forward is to ensure the early alignment of all parties. Mr. Nicholson suggested all parties follow a process of four "Cs" to ensure an effective handover process, namely "communicate, compromize, collaborate, and continuity of insurance cover." Were all parties to adhere to this approach, perhaps the handover from construction to operational insurance cover would no longer feature on the insurance manager's risk map.

VAPOUR CLOUD EXPLOSION MODELING – NEW PROJECT ANNOUNCEMENT

Marsh's Global Energy Risk Engineering (GERE) Team has long used a congestion-based vapor cloud explosion (VCE) model to predict EML values. The announcement that Marsh is proposing to collaborate with BakerRisk to design upgraded software for modeling VCE exposures demonstrates Marsh's commitment to enhancing its risk engineering capabilities further still.

THE SLAM UPGRADE PROJECT: MARSH'S NEXT GENERATION OF VAPOR CLOUD EXPLOSION MODELING

Marsh's existing software for modeling VCEs is called SLAM (Sedgwick Loss Assessment Model) and was developed for Marsh in the 1990s based on the CAM (Congestion Assessment Method) equations. This software is core to Marsh's risk engineering service and, after careful consideration, the team is planning an upgrade.

The new software will be exclusive to Marsh and to approved clients and underwriters. It will be a co-branded product in collaboration with Marsh's proposed project partner BakerRisk. The software will employ the Baker-Strehlow-Tang (BST) explosion model which will ensure a consistent, congestion-based approach to VCE modeling. The validation of the model against insurance industry loss experience is considered a corner-stone of the project process.

BAKERRISK: THE CUSTOMIZATION OF MAXLOSS WITH BAKER-STREHLOW-TANG (BST)

BakerRisk is an engineering and risk consultancy firm specializing in blast and explosion effects. It is based in Texas, USA, and works with clients worldwide advising on process safety and carrying out accident investigations. BakerRisk has its own testing facilities on which large scale explosion, fire, dispersion, and structural tests are performed. Marsh proposes to work with BakerRisk to customize BakerRisk's MaxLoss software to include the congestion-based Baker-Strehlow-Tang (BST) explosion model.

The Baker-Strehlow-Tang (BST) explosion model has been developed by BakerRisk based on large scale explosion modeling and industry loss experience. Three factors contribute to a BST assessment: fuel reactivity, congestion, and confinement. These factors are consistent with the congestion-based approach used in Marsh's current SLAM software.

BakerRisk coordinates an extensive joint industry project made up of 22 major energy companies, called the Explosion Research Cooperative (ERC). Tests run by the ERC focus on the prediction of blast loads and the response of structures to blast loading.

The final software is anticipated to be available in the first half of 2016 and will retain much of SLAM's functionality presented in a modern interface. Individuals or organizations interested in contributing to the model validation process are invited to contact Chris Price-Kuehne at Marsh (chris.price-kuehne@marsh.com).

The presentations delivered during the seminar are available at:
engineeringforsuccess.marsh.com

RISK ENGINEERING: WHERE TO GO FROM HERE

To close the conference, Jasper Clark, the leader of Marsh Energy's London Engineering Hub, gave some thoughts about developments in the field of insurance risk engineering.

One of the ways that the primary purpose of insurance risk engineering can be summarized is "…..to support the client placement in the market on a short- and long-term basis…by building a bridge between the operating business and the markets most suited to providing cover."

There are three key activities in risk engineering that typically support this purpose. Firstly, to represent and benchmark the quality of risk through the survey and market report writing process; secondly, to assist clients with setting their limits of insurance, primarily through the assessment and evaluation of EML values; and finally, the long-term improvement of the quality of the client's risks through the progression of Risk Improvement Recommendations.

To some extent, all providers in the risk engineering space execute these fundamentals, but Marsh believes that it can do this in a differentiated manner. It is recognized that market reports can always be improved, but Marsh is at the forefront of driving this improvement, engaging in close work with the underwriting communities in both London and the Middle East. In terms of EML modeling, Marsh believes strongly that its bespoke SLAM modeling technology offers the most accurate EML values for client decision making. In terms of improving the quality of client risks, Marsh is proud of the thought leadership publications and client seminars it delivers to assist this process.

Marsh is also able to go beyond the risk engineering fundamentals in a number of key areas, providing more holistic risk management support to clients as required. The ability to review major projects at a number of key stages of the process is a key example. The ability to perform detailed business interruption (BI) and contingent business interruption (CBI) analyses on behalf of a client is another; this is particularly relevant nowadays where BI exposures are often quoted as being multiples of property damage (PD). Clients are increasingly valuing the deeper analysis and understanding that our benchmarking process can give, drawing on our large global database of client and site information.

As with any other walk of life, risk engineering providers cannot continue to provide effective and relevant support to clients if they stand still. This need to continuously improve is a key driver behind Marsh's SLAM upgrade project with BakerRisk, a project that was announced at this conference. It is the reason why Marsh will develop further thought leadership publications during 2015, and is behind Marsh's aspiration to use its repository of site data in further novel ways to benefit clients in 2015 and 2016.

The ultimate test of the Marsh risk engineering services is the way they are viewed by our clients. Nowadays, many clients are mature operators, themselves having sophisticated process safety management and internal audit and assurance programs. Marsh recognizes that the services we offer must always strive to complement and add to these existing processes rather than duplicate them, using our size, scale, and insight to add client value with all of the work we deliver.

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ZURICH

Our Global Energy Risk Engineering (GERE) team leads the market in terms of size and depth of expertise, with 30 engineers based around the world.

- The GERE team is an integral part of the placement process, building the bridge between the technical world of energy assets and the commercial realities of the insurance market.
- Marsh's engineers are professionally qualified, with practical experience in the oil, gas and petrochemical industry, interfacing seamlessly with risk managers, operations departments and plant management, to understand, identify and assess risk exposures.
- Using GERE developed procedures and models, we can assess the risk of property damage due to fire, explosion and various other perils, along with the consequential business interruption and liability exposures. Combined with a detailed assessment of the hardware and management features of the risk, the end result is a quantitative risk profile of your business which is used to present the risk exposures to insurers, providing vital support to contractual negotiations.
- Further to this, through an independent review and assessment of your plant and practices, Marsh's engineers can help improve your company's risk quality, utilizing our world-wide experience, gained from working with clients in more than 50 countries.

Marsh's engineers use their expertise to produce regular publications on key risk issues. These and all of Marsh's other energy publications are available from your local Marsh contact and on our website at www.marsh.com.