Sponsored by

Global Risk Consultants®

CIR
CONTINUITY INSURANCE & RISK

Critical equipment risk management *Regulatory compliance and industry standards go only so far when it comes to the protection of critical equipment. Proactivity is a key ingredient in risk management if the severity and likelihood of losses is to be properly addressed. Graham Buck writes*

Beyond compliance *Michael Wood argues that going beyond regulatory compliance will not only reduce boiler and machinery risk, it will also ensure best practice in safety and reliability*

Critical equipment and risk

Global Risk Consultants®

Sponsored by

Critical equipment risk management

Compliance and standards go only so far when it comes to the protection of critical equipment. Proactivity is a key ingredient in risk management if the severity and likelihood of losses is to be properly addressed. Graham Buck writes

Insurance contracts involve the insured swapping the unknown cost of future loss for the known via a fixed insurance premium based on defined terms of coverage. That makes it incumbent on underwriters to understand the quality of risks assessed – and when insurance markets harden, the need for engineered risks is essential.

Historically, property loss control focused on fire risk, notes Mike Wood, regional B&M manager, global risk consultants EMEA at product certification and qualification specialist TÜV SÜD. Property risk surveys address fire loss but now extend to other exposures such as natural catastrophe.

The fire risk surveyor documents the likelihood of loss, how fire might develop or be extinguished and the worst foreseeable outcomes using various insurance definitions and assumptions. Fire risk engineering has matured, with organisations such as the National Fire Protection Association (NFPA) and Factory Mutual Group (FMG) developing internationally-recognised guidelines.

The training of fire engineering consultants has developed along similar lines, as evidenced by the cohesive level of experience of fire risk engineers. Wood has worked with fire engineers from various organisations during his career. "The majority were good consultants and their level of knowledge and experience was high. The way they applied the 'art and science' of fire risk engineering was also largely consistent.

"Assuming the worst if a machinery breakdown event occurs, it should not normally escalate where adequate protection features are in place"

"There were mavericks – some introduced moments of inspired brilliance while others just swam against accepted good practice. But in general the bar was set high."

Fire risk engineers evaluate common causes of fire inception, the resilience of installations in preventing escalation and other risk mitigation measures. This includes the human element and management as contributory factors in many fire losses. Examples include control of hot work – a frequent cause of fire outbreaks – and other simple factors such as good housekeeping which, if not managed effectively, can undermine fire protection systems and partitions separating areas and equipment.

What about the total cost of risk driven by other exposures? The boiler and machinery (B&M) risk engineering community is considerably smaller than fire, and traditionally focused on heavy industries with major machinery hazards and loss potential. In certain sectors such losses are particularly frequent and create an attritional drain of resources. Many fall below insurance claims level, but still impact the overall cost of risk.

Losses and insurance claims in the power generation industry over recent years have been heavily skewed to machinery breakdown-type events. One report found three in four claims to be B&M related, so the industry has a vested interest in understanding B&M-specific exposures and managing them. It needs engineers with the experience and knowledge to understand the causes of loss and prevailing risks.

That's easier said than done. The root causes of B&M-related losses in the power industry over recent years are legion. Challenges have included government support for renewables and green energy; changing operating modes; extended operating periods; the introduction of new materials and technology, changes levels of training and other related factors. A good B&M consultant is aware of these factors and their interaction with the plant's asset management and reliability (AM&R) strategy.

A B&M engineering survey, like any assessment, addresses the severity and likelihood of losses in the risk profile. The latter is largely influenced by ensuring that electrical, mechanical and control and instrumentation (C&I) AM&R programmes are taken as far as economically justified.

Control features

Assuming the worst if a machinery breakdown event occurs, it should not normally escalate where adequate

protection features such as electrical protection, boiler controls or turbine overspeed protection are in place. This makes assessing the adequacy of protection features for critical machinery key in any B&M survey.

Protection systems are becoming more sophisticated, with new technology self-monitoring and fail-safe, so an upgrade of existing protection systems may be recommended where economically justified.

A good example is low water level protection devices for boilers. For years floats were commonly used for this critical feature. Low water (dry firing) of boilers was a regular failure mechanism for boilers, creating dangerous conditions if not controlled. The floats were prone to sticking due to scale deposition on some boilers; often the direct cause of boiler damage including explosions.

Today's modern level protection relies on more reliable self-monitoring with automatic routine testing (SMART)-type devices, which are intrinsically safer and often installed with some level of redundancy. Testing methods and frequency are less onerous, but routine testing of critical safety devices must comply with industry best practice.

The question for risk engineers is whether to recommend improved testing methods, more frequent testing or replacement with new technology and capital investment. Again, it comes back down to economic justification but increasingly the level of competency of technicians is an issue as fewer 'hands on' engineers rise through organisations or come from other industries. Part of the B&M consultant's role is to help clients make the best decisions they can, based on available budgets and the level of risk.

Post-loss mitigation

Loss data relating to B&M events reveals that the property damage element is often far exceeded by business interruption. The likelihood of an event may be reduced by AM&R strategy and the severity kept in check by reliable protection features, but exposure to loss is still there.

Post-loss consequential impact can be mitigated by ensuring that critical spare parts inventories are adequate and available when needed. It also considers the effectiveness of work-arounds and contingency planning for critical loss scenarios when spare parts are unavailable.

Sparing philosophy is challenging. Get it wrong and the plant can tie up millions in spare capital which will never be used, while missing some that become critical. It's also a domain where recommendations start requiring more substantial investment than for other plant maintenance.

The plan should consider opportunities for pooling spares with other companies or third-party operations, which may make procurement of large capital items a viable option. These must be available when needed: many companies invest heavily in spare parts, stick them in a warehouse and forget them until they are needed. Adequate storage and handling procedures are essential for long-term reliability, or the investment is of limited value.

Finally, there may be work-arounds or contingency plans that aim to mitigate foreseeable loss events even where spare parts are unavailable. Risk engineers, asked to assess the credibility of proposed contingency plans, often find them to be ill-conceived and missing key elements such as transportation and craneage, or based on unsafe practices.

"Maintenance systems and procedures must be resilient enough to make improvement sustainable over time"

Reviewing the adequacy of spare parts inventories and contingency planning can allow realistic contingency plans to be developed and reduce the severity of loss events.

Sustainability

Much of the work described only succeeds in the medium and long-term when management systems behind them are sound. Too often recommendations are implemented successfully, but the problem re-emerges two or three years later.

As well as moving reliability programmes to a more proactive domain, maintenance systems and procedures must be resilient enough to make this improvement sustainable over time. This element is often overlooked by many risk and plant engineers. Symptoms get addressed, but not the systemic issues that created them.

Beyond compliance

Michael Wood argues that going beyond regulatory compliance will not only reduce boiler and machinery risk, it will also ensure best practice in safety and reliability

There is a common misconception across a number of industries that compliance with local statutory or jurisdictional regulations is enough to ensure safety and reliability. Many facility engineers and managers believe and support this claim, making it an emotive subject.

Compliance with such rules, however, must be seen in perspective. These requirements are almost always designed to improve human safety factors and not property loss control. They also rarely change unless there have been serious losses in that jurisdiction or territory. By their nature then they are reactive, as opposed to proactive.

Undoubtedly these regulations are indeed important; however, in proactive risk management practices they should be recognised for what they are – that is, the minimum legal requirements to operate a plant. It is up to the individual organisations to identify what best practices they'd like to implement to more effectively safeguard their operations and, by doing so, to reduce the likelihood of a boiler and machinery (B&M) loss at their facilities.

B&M likelihood reduction

In the B&M engineering world the likelihood of failure is largely influenced by ensuring that electrical, mechanical, control and instrumentation (C&I) asset management and reliability (AM&R) programmes are being taken as far as economically justified depending on the business case.

The term 'asset management' is often misinterpreted and misunderstood. This is a cradle to grave concept for machinery and equipment selection, design, installation, commissioning, through life health monitoring, maintenance, testing and inspection, sparing philosophy, end of life prediction and planning, and so on.

Asset reliability is evaluated based on our consultants' extensive experience with the specific hazards for a given occupancy, cross fertilisation of best practices from the same industry (and others), an awareness of new technologies and techniques for condition assessment and preventative maintenance and, not least, an awareness of past and recent loss history in the industry and the lesson learned from it.

And never has this subject matter been a more evolving science than today. Technology and materials advancements, new manufacturing techniques, asset health monitoring through digitalisation, IoT, big data, improved automation… new non-destructive and diagnostic tools, among others, are moving at a pace faster than ever before seen. What was once science fiction ten to fifteen years ago, or simply cost prohibitive, is becoming very real and affordable today.

This being said, it is also very critical to keep focus on what is economically justified. In today's market, some heavy industries (ie. power and mining) face challenges due to the fluctuating market forces, changes in the attractiveness of one technology over another (for example, the shift to green energy), fluctuating commodity prices, lack of capex budget and numerous other factors.

A 'good' B&M consultant needs to have hands-on, informed experience in this respect. There is a never-ending stream of recommendations we can provide, but we need to keep asking: is it justified, and if it is, what are the priorities of one thing over another? If uninformed decisions are made you will soon lose credibility in real world no matter how technically astute you are.

Now, you may ask (as I have been on many occasions), "why would our clients need that external overview on something that should be fundamental to their own operational excellence efforts?"

I have never met a client who did not start out by trying to attract the best operations and maintenance staff it could afford. Over my career, I have also had the pleasure of meeting some of the most experienced and talented engineers in our clients' facilities from various disciplines. For that reason, when I sit at any plant engineer or manager's desk, I always start on the basis that the expert in that plant or process will almost always be the person(s) sitting opposite me.

Still, the typical plant manager or engineer can have some limitations that he/she does not even perceive. Their role is meant to keep things running smoothly and as efficiently as possible, and often the role is performed well, and if not, the person simply doesn't last long in the position. But, a lot of that effort and experience revolves around planned interventions and outages, formal maintenance schedules and fixing things that routinely break down.

Thankfully, the majority of managers and engineers will never experience a major loss in their career. Talk to the typical plant engineer about a topic, such as a major electrical or mechanical failure and it is not uncommon to get a response, such as, "I have been doing it this way for 20-30 years and never had that happen!" Because of this, many will perceive such events to be almost inconceivable at their operations.

This is where the risk engineer can bring in some balance and a reality check of the situation because, of course, these events do happen. In fact, these events happen more often than most people will ever know. As risk engineers, we constantly learn about such events and many of us have impressive libraries of articles and images of "horror stories" such as transformer failures, boiler explosions, turbine overspeed events and others that remind us of these realities. We call these the High Impact, Low Probability (HILP) events, but we know that these can happen anywhere under the right prevailing circumstances, and as such, we are always considering their likelihood at any facility we visit. This may make us seem like paid pessimists at times, but it does bring a sense of realism to the view that is essential.

An experienced B&M risk engineer also brings a lot more to the table. Many plant engineers and managers will spend a lifetime working for one or two companies, possibly in one industry and may only work in half a dozen similar plants. Much of their experience and knowledge is moulded by the culture of the organisations they work for and the type of facilities or industries they know well. With that experience, their ability to think wider can be impacted.

The typical risk engineer, on the other hand, will more often than not have been exposed to many different types of industries, types of technologies, companies and cultures. It is also not unusual that this will involve work in hundreds of facilities in multiple countries around the world where local standards, cultures and compliance requirements are in effect. This provides a more holistic view of the inherent risks.

"What was once science fiction ten to fifteen years ago, or simply cost prohibitive, is becoming very real and affordable today"

As discussed at the beginning of this article, it is a simple fact that most statutory (jurisdictional) inspection requirements tend to be reactive in nature. They are predominantly based on life safety factors and are only introduced or updated based on loss history often after injuries or fatalities. But too often we find these being held up as the evidence that plants must be in good shape simple because they are compliant. But this compliance needs to be regarded for what it is; just the minimum legal requirement to operate a plant. Any "good" B&M consultant will certainly want to look beyond that and propose additional advice on what truly is considered to be best practice in industry.

A good risk engineer sees what best practices look like across many companies and industries, sees the impact of losses and learns the root cause of many of these losses. This collective knowledge makes the risk engineer a unique individual with a unique capability to analyse these hazards, identify risks and propose the best solutions.

To be effective, of course, this needs to be coupled with some good soft consulting skills. No self-respecting plant engineer wants to feel like he is doing a bad job so communication of ideas or new concepts that can provide them with 'an opportunity to improve further' is an essential part of the process. Done well, the risk engineer becomes a trusted advisor and the fresh pair of eyes that brings an entirely new and healthy perspective to even the best operations.

The good news is that many of the improvements we propose are also relatively easy and cheap to implement. We propose additional maintenance tasks, changes to frequency of tests, better management of data/follow-up and other action items, training, procedural issues and so on. And many of these are relatively inexpensive to implement. Indeed, many of these recommendations (in the likelihood reduction domain) can be considered almost human element-type interventions with little or no cost involved.

And it works. An effective B&M program can help achieve improved reliability and productivity over time, though the immediate impact can sometimes be less tangible than others. But, step by step, we push the likelihood of catastrophic events further away. And, of course, we can rarely take credit for losses that never happened, but that's the lot of a risk engineer.

We will never live in a world that is entirely risk free, and nor may we want to, but with the right approach we can work to make our clients operations more reliable and consequently often also safer.

Michael Wood
Regional B&M Manager
TÜV SÜD

TÜV SÜD

Global Risk Consultants®

Guiding You To the Summit

Helping clients on their strategic risk management journey since 1958.

- Fire Protection Engineering
- Boiler and Machinery Engineering
- Infrared Thermographic Surveys
- Natural Hazards Analysis
- Jurisdictional Boiler & Pressure Vessel Inspections
- Arc Flash Analysis & Training
- Property Valuation
- Process Safety
- Dust Hazard Analysis (DHA)
- Business Continuity Planning
- Loss Control Training
- Code & Project Services
- GRC Connect (client portal)

Global Risk Consultants Corp. 100 Walnut Avenue, Suite 501 Clark, NJ 07066
1 732 827 4400 contact-grc@tuvsud.com www.tuvsud.com/grc

TÜV®