

A Risk Management Approach for Improving Safety and Productivity

Safety has always been a critical measure of success for any industrial organization. There are of course risks to an organization's brand equity, but also risks of penalties, fines, erosion of shareholder value, plant shutdowns and in some cases even fatalities if a safety incident were to occur. Companies that are not able to comply with safety procedures in an effective fashion are at risk of losing their competitive advantage. Indeed, in order to reduce the risk of another high profile adverse event like the BP oil spill or Massey mine explosion, risk needs to be effectively identified, quantified, visualized, prioritized, and mitigated in both assets and operating procedures. Aberdeen's latest research found that the Best-in-Class are able to improve productivity without compromising safety by integrating safety and operational systems through a risk management approach. This research will highlight the roles business processes and technology enablers play in improving safety and productivity in industrial plants.

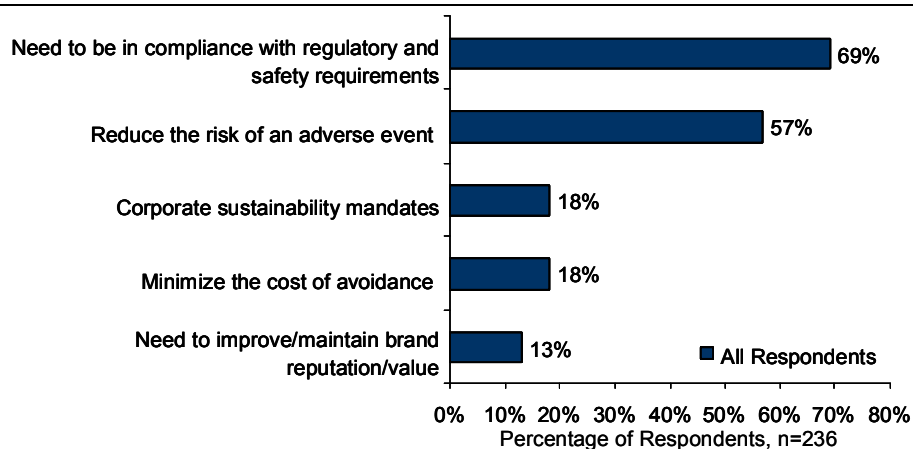
Analyst Insight

Aberdeen's Insights provide the analyst perspective of the research as drawn from an aggregated view of the research surveys, interviews, and data analysis

Business Context

In today's economic environment, it is unfortunately far too easy for many manufacturers to become singularly focused on cost cutting and increasing production efficiency. These are obviously critical areas but can not be at the sacrifice of employee and process safety. In a survey of 236 manufacturing executives, Aberdeen finds that the top pressure driving manufacturers to focus on safety is the need to comply with regulations and the need to manage and reduce the risk of adverse events.

Figure 1: Pressures Driving Companies to Focus on Safety



Source: Aberdeen Group, October 2010

Safety issues are becoming an increasingly important business concern. As safety standards continue to evolve, stakeholders are directing their focus to staying ahead of these regulations. The consequences of not being in compliance with safety regulations are drastic, resulting in penalties, fines, damage to brand image, plant shutdowns, and even in some cases fatalities. Indeed, the risk of a safety event, not only threatens machine operators but also the organization's bottom line.

An interesting trend to notice in Figure 1 is the difference between the top two pressures and the remaining pressures. While the other pressures are important in the context of an overall safety program, manufacturers are twice as likely to face the pressure of ensuring safety compliance and managing the risks of these incidents as any of the other three pressures. The main takeaway from this finding is that if safety compliance is being ensured and the risk of an adverse event is being controlled, the other market pressures will often also be addressed.

The Maturity Class Framework

Aberdeen used four key performance criteria to distinguish the Best-in-Class from Industry Average and Laggard organizations. The four KPI's used to determine Best-in-Class performance are critical to measure the success of the safety program and plant safety. These KPIs not only take into consideration the metrics around safety of the workforce and workplace, but also consider metrics that distinguish organizations that are performing as leaders in operational metrics, including availability, productivity and throughput. Respondents were divided among three categories based on their aggregate performance in these four metrics. Table 1 displays the average performance of Best-in-Class, Industry Average and Laggard organization:

Table 1: Top Performers Earn Best-in-Class Status

Definition of Maturity Class	Mean Class Performance
Best-in-Class Top 20% of aggregate performance scorers	<ul style="list-style-type: none"> ▪ 90% OEE ▪ 0.2% Repeat Accident Rate ▪ 0.05 Injury Frequency Rate ▪ 2% Unscheduled Asset Downtime
Industry Average Middle 50% of aggregate performance scorers	<ul style="list-style-type: none"> ▪ 85% OEE ▪ 2.4% Repeat Accident Rate ▪ 0.9 Injury Frequency Rate ▪ 6% Unscheduled Asset Downtime
Laggard Bottom 30% of aggregate performance scorers	<ul style="list-style-type: none"> ▪ 76% OEE ▪ 10% Repeat Accident Rate ▪ 3.0 Injury Frequency Rate ▪ 14% Unscheduled Asset Downtime

Source: Aberdeen Group, October 2010

Definition for the Key Performance Indicators

- √ **Overall Equipment Effectiveness (OEE):**
Composite metric accounting for availability, performance and quality
- √ **Repeat Accident Rate:**
Measured as the ratio of repeat accidents over total number of accidents in a year
- √ **Injury Frequency Rate:**
Expressed as the number of injuries recorded per 100 full-time employees per year
- √ **Unscheduled Asset Downtime:** Measured as the amount of unscheduled time the asset is offline against the total asset availability

The Best-in-Class are better equipped to create a safer working environment for their employees but are also able to gain a competitive edge in the market place. In fact, across the board, Best-in-Class manufacturers were able to effectively manage safety incidents by realizing a 0.05 injury frequency rate, while at the same time performing at 90% OEE. These manufacturers were also able to achieve a 2% unscheduled asset downtime rate, while their peers in contrast experienced a 14% rate. In the case of certain industries (such as the oil and gas industry), even a 1% or 2% decrease can have a very significant impact; a 12% advantage can translate into millions of dollars saved.

"Engaging management to be part of the process has been of the greatest benefit. Our level of awareness has increased, more people are taking it seriously and our Repeat Incident Rate (RIR) has dropped while reporting has gone up."

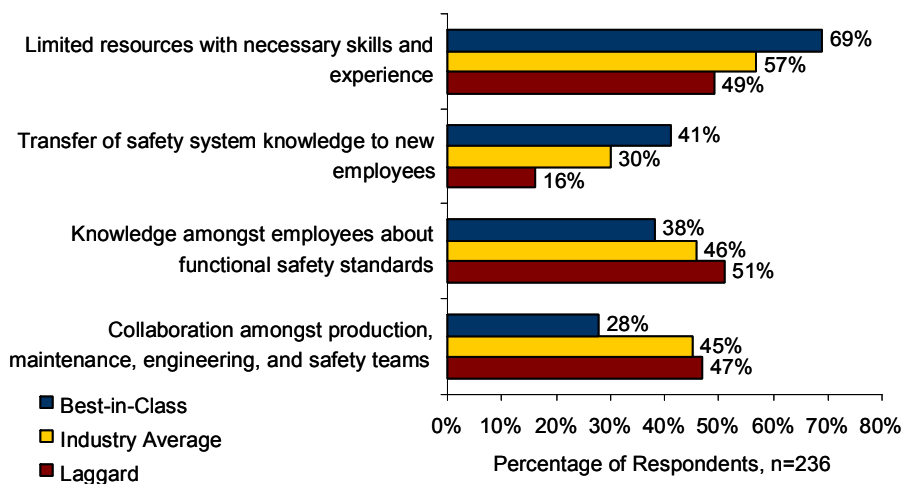
~ Director of EH&S,
Oil and Gas Company

Companies that are performing below Best-in-Class performance should use this research to understand the best practices implemented by the Best-in-Class, and use these learnings in their strategic as well as tactical actions. This research can also be utilized to get sponsorship from the senior management on the value of implementing the capabilities and technologies highlighted in the rest of the report.

Challenges with Implementing a Safety System

Before diving into the best practices and intricacies associates with creating a safer plant, it is of interest to understand what kind of challenges organizations are facing with it comes to implementing a safety system.

Figure 2: Challenges



Source: Aberdeen Group, October 2010

An interesting trend to note is that Best-in-Class companies are more mature with their safety system adoption and therefore are more challenged with limited skilled resources and the transfer of knowledge about safety systems to new employees. This is partly due to the reason that last year, the manufacturing industry suffered severely economically, and therefore in order to cut costs, many manufacturers reduced their headcount. Therefore, as production picks up, Best-in-Class manufacturers are

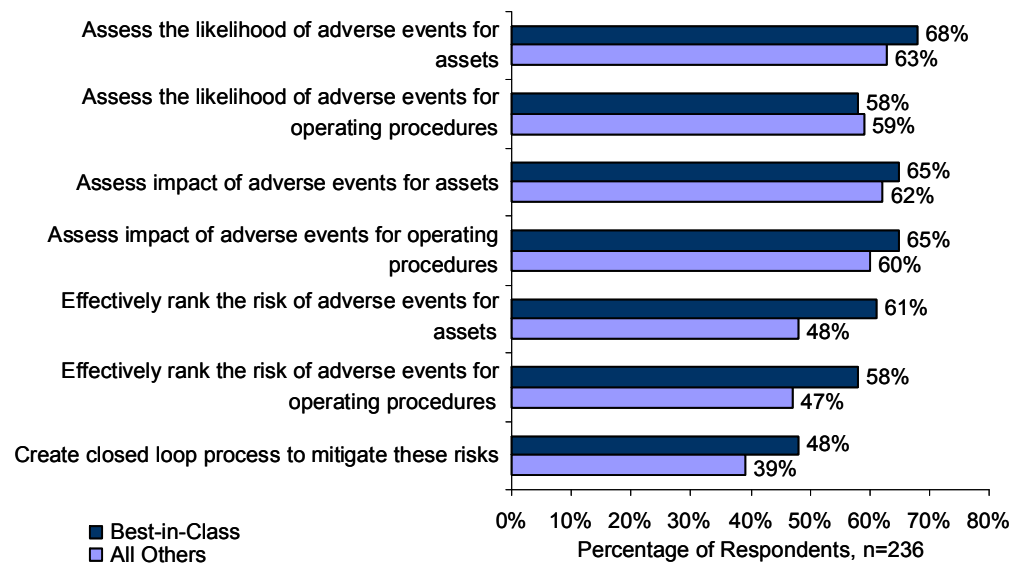
challenged in finding individuals with the right skill sets that have since retired or moved to other plants. Safety systems and control systems are often far from intuitive, and finding an operator with the right skill sets can be very challenging.

On the other end of the spectrum, Laggard organizations are challenged with the basic problems that come with implementing a safety system, such as: basic employee knowledge about functional safety standards and collaboration across the organization. Indeed, Best-in-Class companies understand that a safety system cannot be managed in an independent and siloed manner, but rather in a holistic view.

Differentiating Capabilities for Best-in-Class Performance

Aberdeen found that the implementation of a proactive risk management strategy is a key factor in effectively addressing these top level pressures and improving performance. In fact, Best-in-Class companies are 32% more likely than their competitors to have a proactive risk management strategy. What does a proactive risk management strategy look like? Aberdeen finds that manufacturers that have an effective risk management strategy are more likely to have taken the steps shown in Figure 3.

Figure 3: Effective Risk Management Approach



Source: Aberdeen Group, October 2010

At the highest level, this risk management approach focuses on four major aspects of managing risk: identification, quantification, prioritization, and mitigation. Taking such an approach provides decision makers with a clearer picture of all the risks throughout their industrial plants (whether the risks are associated with their aging assets or the unsafe operating procedures)

and allows them to be better equipped in defining strategies to address and mitigate these risks. In addition, Best-in-Class organizations are also more likely than their peers to adopt all four key aspects of risk management. Missing even one of these key capabilities can result in gaps and can expose operators and maintenance technicians to unsafe operating conditions.

Conducting a risk analysis in an industrial plant without a formal risk management strategy and the supporting risk management capabilities can be challenging because of the variables in an industrial environment that are often difficult to define and quantify. However, with a detailed and proactive risk assessment strategy, manufacturers can chart the course for improving plant safety and plant productivity.

Business Capabilities

While companies with a high level risk management strategy rely on the four key aspects of risk management mentioned in the previous section, these organizations also must rely on a number of different business capabilities to effectively enhance safety and production performance in their manufacturing facilities.

Table 2: Business Capabilities

Capabilities in Place	Best-in-Class	Industry Average	Laggard
Executive sponsorship enabling the success of safety programs	82%	71%	64%
Established cross-functional team responsible for aligning maintenance, production, plant safety and corporate goals	57%	55%	43%
Centralized view of data from the safety system and automation system	53%	49%	37%

Source: Aberdeen Group, October 2010

An effective organizational structure is a key capability for improving plant safety. To enable real change in the culture, an organization needs to have a long term vision for plant safety, environment and social stewardship, and therefore needs to appoint an executive to execute this vision. Our research uncovered that 82% of Best-in-Class companies have an executive sponsor driving safety initiatives. In addition, having the support of executives is important when it comes to making investments in what are often expensive upgrades to assets, safety systems, and plant automation systems.

Although having executive sponsorship is important, manufacturers also need to ensure that the strategies established in the boardrooms are implemented across the complete network of industrial facilities. To accomplish this, Best-in-Class manufacturers are establishing roles and

"Safety is driven from the top of the organization. Safety is at the top of mind of our executives to our plant managers. The challenge is balancing production requirements, maintaining a high standard of quality while making sure everyone is working safely."

~ Engineer,
Consumer Packaged Goods

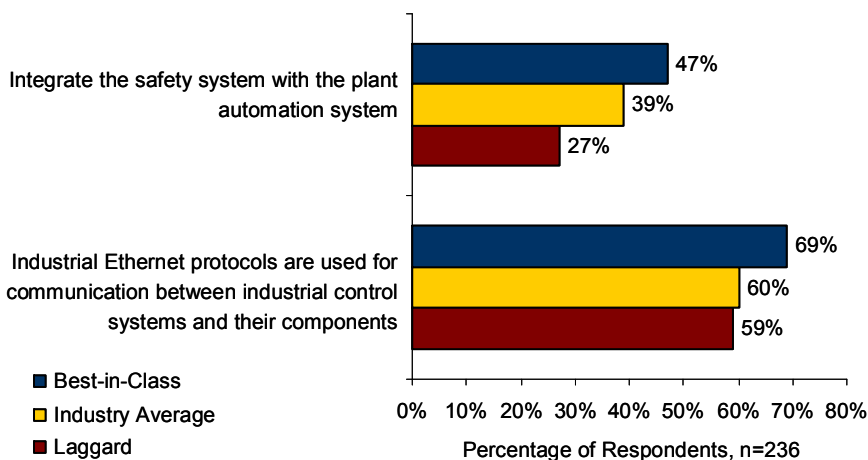
responsibilities across functional teams to align not only safety goals, but also maintenance, production and corporate goals. Indeed, these manufacturers understand that safety needs to be ingrained from the shop floor to the top floor. Plant safety cannot be managed in a siloed and independent manner, but rather in a holistic manner. These manufacturers are ensuring that all functional heads (safety, maintenance, production, corporate) get a seat at the table when it comes to strategic decisions with improving safety on the manufacturing floor and are sharing best practices across the different departments.

Finally, to effectively manage all the safety issues in manufacturing operations, organizations need to equip their employees with visibility to safety data. Best-in-Class manufacturers are 43% more likely to have a centralized view of the data from the safety system and plant automation system. Many manufactures use two separate monitoring interfaces to view the data from their safety system and plant automation system. This forces operators to manage two disparate systems, therefore making it harder for operators to predict and obtain real-time visibility into unsafe operating conditions. By having a centralized view of the data, machine operators are more alert to pending hazards on the manufacturing floor.

Technology Enablers

Traditionally, manufacturers separate their safety technology from the standard plant automation system. Many manufacturers still value this approach, where they have dedicated personnel who monitor and control safety systems. In doing so, there is less risk of the safety system being compromised but it is an approach that generally costs more and raises a number of complex design and integration issues.

Figure 5: Safety Automation Architecture



Source: Aberdeen Group, October 2010

Aberdeen's research uncovered that when it comes to integrating the two systems, a majority of manufacturers are still separating the two. However,

an interesting trend to note is that 47% of the Best-in-Class are being progressive and are integrating the two systems. Several years ago, this adoption rate would be far lower. With recent changes to safety standards and advances in technology, many manufacturers are looking to integrate their safety system and their plant automation system onto one single platform, which delivers major benefits. A single platform means lower hardware costs, reduced software and support costs, because the same software can be used and the operator can control both systems through a centralized portal. In addition, a single platform also means a centralized view of the safety data, rather than managing two disparate systems. A single platform yields the ability to perform defined safety functions while simultaneously efficiently operating the plant and therefore improving productivity and minimizing accidents.

Integrating safety systems with standard controls systems is one sign of the technology breakthroughs in this space. Another is communication integration using non-proprietary protocols. In the past, seamless communication was practically impossible, because there wasn't a single network that was able to integrate safety and standard control systems, and simultaneously transport massive amounts of data across the plant floor networks. This has since changed with the introduction of Industrial Ethernet, a networking standard that allows safety controllers on the same communication network as standard controllers. Industrial Ethernet greatly improves the level of integration and interoperability between standard and safety control systems. In fact, 69% of Best-in-Class companies are seeing the benefits of using Industrial Ethernet as their networking protocol. This seamless communication provides manufactures with better visibility into reasons for and frequency of safety events. An added benefit is that controllers from different suppliers can be interconnected throughout a plant. Thus, allowing manufacturers to combine best-of-breed products to produce the most efficient safety and control system, rather than being restricted to specific vendor products.

Companies should look to make the move to a single platform for their safety and control system, and using Industrial Ethernet as their communication standard to effectively manage the massive amounts of complex safety data. This approach also provides operators with the ability to proactively manage risks and respond to events before an adverse event occurs.

Key Takeaways

While compliance and the need to reduce the risk of an adverse event are the primary drivers behind many companies' focus on safety; this research shows that those having taken the steps to establish a formal risk management program are better able to improve plant safety and realize superior operational performance. These manufacturers are able to do so through a blend of business capabilities and adopting the latest safety technology.

In order to close the performance gap, Aberdeen recommends manufacturers *that are performing at Industry Average or Laggard levels* to:

- **Establish a formalized risk management strategy.** Implement a risk analysis to identify quantity, prioritize and mitigate all risks in both manufacturing assets and operating procedures. Not being able to manage these risks can lead to the possibility of penalties, fines, erosion of shareholder value, plant shutdowns and in some cases even fatalities.
- **Ingrain safety into the culture.** This vision of safety needs to be developed at the top level. It is difficult to implement changes in strategy, processes, and collaboration without the buy-in and support of true budget and authority holders.
- **Implement a single platform to perform safety functions and plant operations.** A single platform approach minimizes the need to manage two disparate systems and minimize hardware, software and labor costs.
- **Adopt Industrial Ethernet as the networking protocol.** Industrial Ethernet allows seamless transport of data between safety control and standard control devices. This seamless communication allows manufacturers to gain greater visibility into their safety data.

"Safety is an inherent culture of the company. Safety has been, and continues to be, the main focus of all of our operations and this mindset is supported at all levels within the company. Employees are positively recognized for identifying safety risks."

~ Engineer,
Mid-sized Aerospace and
Defense Company

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Related Research	
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