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Machine Safety: The Correlation between Safety Systems and Productivity

In today's economic environment, manufacturers are under immense pressure to contribute value to the organization's bottom line by cutting costs and improving productivity wherever possible. In such an environment, it is unfortunately far too easy for organizations to singularly be focused on improving manufacturing productivity at the expense of employee safety. This Analyst Insight will focus on how the industry leaders are looking at new ways to improve productivity without compromising safety. This research will highlight the role that business processes and safety technology assumes in improving safety and productivity in industrial plants.

Aberdeen Research Methodology

Aberdeen's November 2011 report, [*Integrated Safety Systems: Ensuring Safety and Operational Productivity*](#) uncovered that the top pressure driving organizations to focus on safety was the need to be in compliance with regulations and reduce the number of safety incidents (64% and 49% respectively). In a demanding economy, how exactly do manufacturers overcome these challenges?

From September to October of 2011, Aberdeen surveyed over 120 executives about the current state of their safety program and technologies they use to support their safety initiative. To gain a better understanding of survey participants' demographics, please refer to the sidebar.

To better understand how the most successful companies are implementing the latest safety technology, Aberdeen used four key performance criteria to distinguish the Best-in-Class from Industry Average and Laggard organizations. Respondents were divided among three categories based on their aggregate performances in these four metrics. Table 1 displays the average performance of Best-in-Class, Industry Average, and Laggard organizations.

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% Overall Equipment Effectiveness (OEE) ▪ 0.09% repeat accident rate ▪ 0.2 injury frequency rate ▪ 2% unscheduled asset downtime

Analyst Insight

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

Survey Demographics

Aberdeen's November 2011 [*Integrated Safety Systems: Ensuring Safety and Operational Productivity*](#) report examined the use, the experiences, and the intentions of 126 enterprises. Responding enterprises included the following:

- √ **Job title:** The research sample included respondents with the following job titles: CEO / President (6%); EVP / SVP / VP / Partner / General Manager (7%); Director (7%); Manager (29%); Staff (30%); All Others (21%)
- √ **Industry:** The research sample included respondents from the following industries: Oil and Gas (36%); Industrial Equipment Manufacturing (14%); Food and Beverage (13%); Energy (13%); Chemicals (11%); Metals, Mining, Minerals (5%); Consumer Packaged Goods (3%); Automotive (3%); Aerospace and Defense (2%)
- √ **Geography:** The majority of respondents (52%) were from North America. Remaining respondents were from the Asia-Pacific region (15%), Europe (16%); South/Central America (8%) and Middle East, Africa (9%)

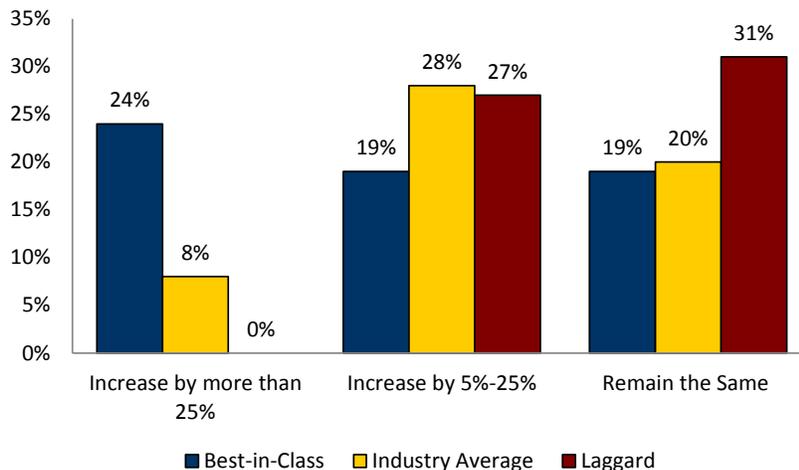
Definition of Maturity Class	Mean Class Performance
Industry Average: Middle 50% of aggregate performance scorers	<ul style="list-style-type: none"> ▪ 83% OEE ▪ 0.64% repeat accident rate ▪ 0.4 injury frequency rate ▪ 4% unscheduled asset downtime
Laggard: Bottom 30% of aggregate performance scorers	<ul style="list-style-type: none"> ▪ 75% OEE ▪ 4.54% repeat accident rate ▪ 3.9 injury frequency rate ▪ 12% unscheduled asset downtime

Source: Aberdeen Group, November 2011

The Best-in-Class are better equipped to create a safer working environment for their employees while gaining 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 0.2 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 12% rate. In short, these industry leaders are able to provide a safer working environment for their employees, while simultaneously improving productivity and achieving higher operational efficiencies.

Additionally, it's worth noting that over the next 12 months, Best-in-Class companies are more likely than their competitors to have plans to increase spending by more than 25% (Figure 1). Safety technology is expensive, and Best-in-Class understand the value of safety systems and the impact safety technology can have on ensuring safety and productivity.

Figure 1: Spending Intentions by Maturity Class



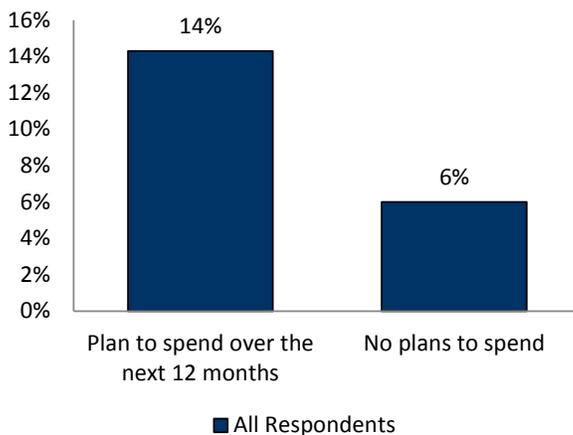
Source: Aberdeen Group, November 2011

Key Performance Indicators Definitions

- ✓ **Overall Equipment Effectiveness (OEE)** is a composite metric accounting for availability, performance and quality
- ✓ **Unscheduled asset downtime** is measured as the amount of unscheduled asset time the asset is offline against the total asset availability
- ✓ **Injury frequency rate** is expressed as the number of injuries recorded per 100 full-time employees per year
- ✓ **Repeat accident rate** is measured as the ratio of repeat accidents over the total number of accidents in the year

To better understand the direct impact that safety technology can have on an organization's financials, Aberdeen identified two groups of manufacturers, those who plan on spending for safety technology versus those that have no plans to spend on safety technology (Figure 2). As shown in Figure 2, organizations that have plans to spend on safety technology are outperforming those who have no plans by a factor of 2. In a volatile economy, that kind of difference stands out.

Figure 2: Operating Margin Performance



Source: Aberdeen Group, November 2011

In the next section, we will explore the key business and technology capabilities of the Best-in-Class that enable them to achieve such performance benefits.

Best-in-Class Technology and Business Capabilities

Traditionally, manufacturers separated their safety technology from the standard plant automation system. Many manufacturers still value this approach, where they have dedicated personnel who monitor and control the safety systems. The idea was that by implementing such architecture, there would be less risk of the safety system being compromised by events on the control system. This approach generally costs more and raises a number of complex design and integration issues.

Aberdeen's November 2011 report, [*Integrated Safety Systems: Ensuring Safety and Operational Productivity*](#) uncovered that with the recent changes to safety standards and technology advances, this isolation between the two systems might not necessarily be needed. In fact, the research revealed that Best-in-Class companies are 48% more likely than Laggard companies to integrate their safety system with their standard control system without sacrificing productivity or worker safety (Figure 3).

Spending Intentions in the Next 12 Months

More than \$ 1 million

- ✓ Best-in-Class (24%)
- ✓ Industry Average (13%)
- ✓ Laggard (12%)

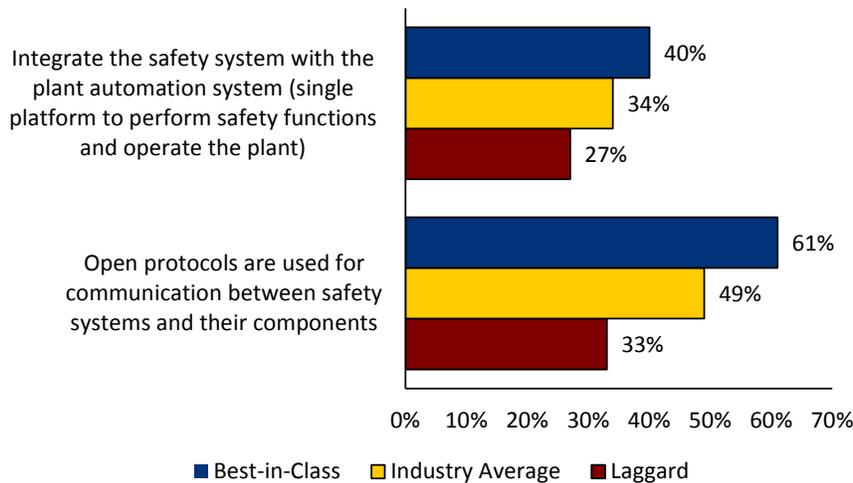
\$500,001 - \$1 million

- ✓ Best-in-Class (5%)
- ✓ Industry Average (13%)
- ✓ Laggard (4%)

\$100,000 - \$500,000

- ✓ Best-in-Class (5%)
- ✓ Industry Average (12%)
- ✓ Laggard (20%)

Figure 3: Safety System Architecture



"Initially there was a feeling that if we concentrate too much on safety, then manufacturing productivity will decrease and deadlines cannot be achieved. Management took a stand and stressed the importance of safety and that it cannot be compromised. This strategy worked and now safety is part of the culture. "

~Parag Dabir,
Automation Engineer,
Energy Company

Source: Aberdeen Group, November 2011

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 recent advances in networking, manufacturers can ensure the same level of availability, reliability and security through the use of open protocols (such as: PROFI-safe, CIP Safety, FOUNDATION Fieldbus SIF, Safety over EtherCAT, to name a few). These open protocols greatly improve the level of integration and interoperability between standard and safety control systems. In fact, 61% of Best-in-Class companies are seeing the benefits of using open protocols as their networking protocol. This seamless communication provides manufacturers with better visibility into the 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.

While the Best-in-Class are leading the pack with adoption of the latest technology advances, they wouldn't have been able to do so without their unique business capabilities (Table 2).

Table 2: Business Capabilities

Business Capabilities	Best-in-Class	Industry Average	Laggard
Executive sponsorship enabling the success of safety initiative	71%	68%	67%
Established cross-functional team responsible for aligning maintenance, production, safety and corporate goals	75%	55%	50%
Integration of safety early in the machine design phase	74%	51%	50%

Source: Aberdeen Group, November 2011

The Best-in-Class differentiate themselves through their ability to establish a corporate program focused on safety. The Best-in-Class are creating such a culture in multiple ways. First, they are more likely than their competitors to have safety at the top of the executive agenda. It is extremely difficult to change the culture without having a true budget holder driving the philosophy of "safety first" before anything else. In addition, the Best-in-Class also understand that safety needs to be ingrained from the top floor to the shop floor. Safety cannot be managed in a silo'ed manner and thrown over the wall to the next group to deal with. Indeed, Best-in-Class companies understand the importance of managing in a holistic manner and are establishing cross functional teams (from safety, maintenance, manufacturing, production to corporate) to implement the strategic decisions made in the board room. Collaboration between these groups enables the ability to identify and share best practices across various job roles, functions and groups. Finally, the Best-in-Class are more likely than their competitors to incorporate safety early in the machine design phase. Often, it is the case that machine designers will incorporate safety after the machine is near the development stage. At this point, it might be too late to incorporate critical safety functions that are needed to ensure safety of people, products and processes.

Key Takeaways

Aberdeen's research has seen the progression and adoption of integrated safety systems in the manufacturing environment. Best-in-Class companies recognize the many benefits that an integrated safety system can deliver. Before an organization plans on implementing an integrated safety system, they need to understand that it takes a combination of organization restructure and the ability to have real-time visibility into manufacturing operations. Indeed, a well implemented safety system can do much more than simply emulate the functions of a traditional safety system. As shown through the analysis, it can ensure both safety and productivity.

“By integrating our safety system and control systems, it made the development and implementation of our safety system significantly easier. In addition, the tangibles that we’ve able to achieve through cost savings have been great. However, we’ve also been able to achieve the intangibles such as the long term benefits from easier operation and maintenance of our safety systems, which makes the recent upgrade worthwhile.”

~Vice President of Field Services
Energy Company

For more information on this or other research topics, please visit www.aberdeen.com.

Related Research	
<u>Integrated Safety Systems: Ensuring Safety and Operational Productivity</u> ; November 2011	<u>Environment, Health and Safety: Managing Risk and Compliance in Manufacturing Operations</u> ; April 2010
<u>Compliance Management in Environment, Health and Safety</u> ; March 2011	<u>Asset Performance Management: Aligning the Goals of the CFO's and Maintenance Managers</u> ; November 2009
<u>A Risk Management Approach for Improving Safety and Productivity</u> ; February 2011	
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