

Asset Performance Management

Driving Excellence through a Reliability Strategy in Real-Time

November 2008

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Executive Summary

The current economic downturn, looming global recession, volatile energy and commodity prices and increasing budget cuts have put pressure on companies to establish strategies just to stay competitive in business. For asset intensive industries, this requires getting the maximum value out of what companies have already invested in assets. This benchmark report will highlight how, even in such a challenging environment, Best-in-Class companies are able to reduce cost, maximize Return on Assets (ROA), and achieve a competitive advantage through an asset reliability strategy resulting in improved profitability and shareholder value.

Research Benchmark

Aberdeen's Research Benchmarks provide an in-depth and comprehensive look into process, procedure, methodologies, and technologies with best practice identification and actionable recommendations

Best-in-Class Performance

In the following analysis, Aberdeen uses three Key Performance Indicators (KPIs) to identify Best-in-Class performance. Across these metrics Best-in-Class manufacturers averaged:

- 89% Overall Equipment Effectiveness (OEE)
- 97% on-time and complete shipments
- 2% unscheduled asset downtime

Competitive Maturity Assessment

Aberdeen's survey analysis shows that the firms enjoying Best-in-Class performance share several common characteristics:

- The Best-in-Class are two-times as likely to adopt a risk based approach to assess the health and performance of an asset
- The Best-in-Class are four-times as likely to establish centers of excellence to promote best practices for managing asset performance across the enterprise
- The Best-in-Class are six-times as likely to provide on-demand asset lifecycle information to maintenance and production employees

"Our company is looking to reduce operating costs by reducing / eliminating unplanned downtime."

~ Kenneth Mclead
Maintenance Engineer
Redstag Timber Ltd

Required Actions

To achieve Best-in-Class performance, companies must:

- Align goals and metrics to foster collaboration between maintenance and production teams
- Invest in dashboards, analytics, mobile solution and automated workflows to provide real-time asset information to decision makers
- Connect operational performance with corporate performance to understand the impact of asset strategies on financial goals

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Table of Contents

| | |
|--|----|
| Executive Summary..... | 2 |
| Best-in-Class Performance..... | 2 |
| Competitive Maturity Assessment..... | 2 |
| Required Actions..... | 2 |
| Chapter One: Benchmarking the Best-in-Class | 4 |
| Business Context | 4 |
| The Maturity Class Framework..... | 5 |
| The Best-in-Class PACE Model | 6 |
| Best-in-Class Strategies..... | 6 |
| Chapter Two: Benchmarking Requirements for Success | 9 |
| Competitive Assessment..... | 9 |
| Implementing an Balanced Maintenance Strategy | 12 |
| Chapter Three: Required Actions | 17 |
| Laggard Steps to Success..... | 17 |
| Industry Average Steps to Success | 17 |
| Best-in-Class Steps to Success..... | 18 |
| Appendix A: Research Methodology..... | 20 |
| Appendix B: Related Aberdeen Research..... | 22 |

Figures

| | |
|---|----|
| Figure 1: Top Market Pressures | 4 |
| Figure 2: Best-in-Class Strategies | 7 |
| Figure 3: Asset Lifecycle Information | 12 |
| Figure 4: Maintenance Strategy | 13 |
| Figure 5: Technology Enablers | 14 |
| Figure 6: Remote Monitoring Capabilities..... | 16 |
| Figure 7: Integrating EAM with Business Solutions | 16 |

Tables

| | |
|--|----|
| Table 1: Top Performers Earn Best-in-Class Status..... | 5 |
| Table 2: The Best-in-Class PACE Framework | 6 |
| Table 3: The Competitive Framework..... | 9 |
| Table 4: The PACE Framework Key | 21 |
| Table 5: The Competitive Framework Key | 21 |
| Table 6: The Relationship Between PACE and the Competitive Framework | 21 |

Chapter One: Benchmarking the Best-in-Class

Business Context

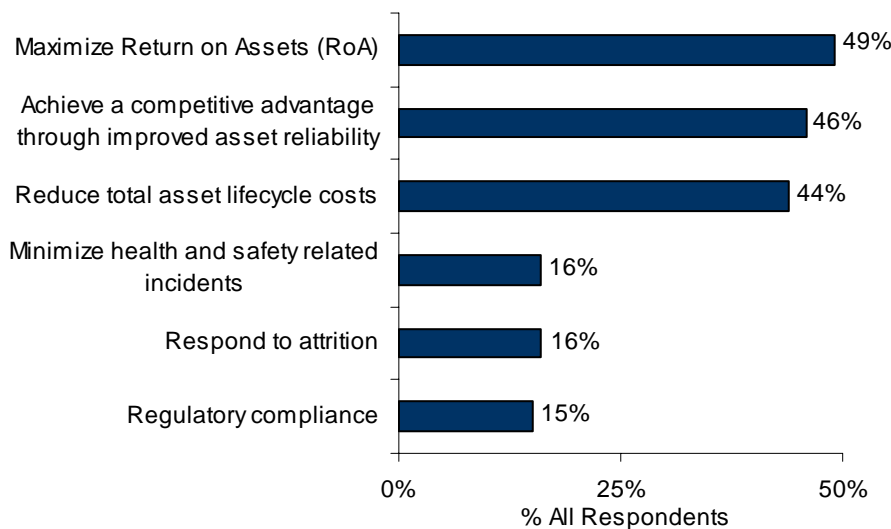
Companies have always been establishing initiatives to get more from their existing investments. This trend is even more pronounced in the current economic downturn. For asset intensive industries, this requires companies to expand the scope of assets and adopt a holistic strategy to manage the complete asset base. While most companies relate assets management to equipment maintenance, Aberdeen Group is seeing a trend in the marketplace where companies are establishing strategies to not only include plant equipments, but also facilities, automation, instrumentation, data, information technology, and most importantly— employees.

This report will highlight how Best-in-Class companies are able to improve not only operational performance but also corporate performance through the successful execution of Asset Performance Management (APM) strategies. This includes the achievement of process, organization, knowledge management, and performance management capabilities surrounding advanced asset management initiatives as well as adoption of technology to automate these capabilities.

Getting More from the Existing Assets Base

The top pressures driving companies to focus on asset performance management are not just specific to maintenance, but are related to the overall corporate goals of maximizing Return on Assets (ROA) and reducing costs.

Figure 1: Top Market Pressures



Source: Aberdeen Group, November 2008

Fast Facts

Best-in-Class enterprises significantly out perform Laggards in all three KPIs. These manufacturers enjoy:

- √ 30% improved Overall Equipment Effectiveness (OEE)
- √ 22% less unscheduled asset downtime
- √ 17% more complete and on-time shipments

While Aberdeen Group found that one of the top challenges companies are facing is that senior executives view asset management as a necessary cost of doing business, 46% of responding companies are getting top level mandates to implement asset reliability strategies to achieve a competitive edge in the market place. This is a fundamental shift required in many asset intensive companies; the change of culture from viewing asset management as cost center to viewing it as a competitive advantage.

While the top three pressures are important, the rest of the pressures cannot be ignored. Minimizing health and safety related incidents and adhering to regulatory compliance such as OSHA, EPA, and others is critical for companies operating in any industry vertical. Failure to effectively focus on such issues can result to production stoppage. Responding to attrition is an ongoing pressure in the industry, with the retirement of large numbers of experienced personnel and insufficient numbers of suitably qualified candidates available to replace them. Senior executives are facing a huge challenge to transfer on that knowledge from experienced employees to the new generation of workers.

"For processes operating at capacity, our primary goal is improvement in asset utilization, which increases capacity and hence gross profit with very little additional investment. The secondary goal is to reduce costs. For under utilized processes, the above priority is somewhat reversed. It is still an advantage to have an asset utilization focus, for improving product quality, service levels, decreasing emergency shipping costs, and for consolidation of assets."

~ David Brown
Director, Manufacturing
Hercules Inc

The Maturity Class Framework

Aberdeen uses three key performance criteria to distinguish the Best-in-Class from Industry Average and Laggard organizations. These are:

- **Overall Equipment Effectiveness (OEE)**, measured as a percentage of availability * performance * quality
- **Complete and on-time shipments**, defined as percentage of shipments delivered on time and complete as compared to original commitment
- **Unscheduled asset downtime**, measured as the amount of unscheduled time the asset is offline against total asset availability

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"> ▪ 89% overall equipment effectiveness ▪ 97% complete and on-time and shipments ▪ 2% unscheduled asset downtime |
| Industry Average: Middle 50% of aggregate performance scorers | <ul style="list-style-type: none"> ▪ 81% overall equipment effectiveness ▪ 92% complete and on-time and shipments ▪ 7% unscheduled asset downtime |
| Laggard: Bottom 30% of aggregate performance scorers | <ul style="list-style-type: none"> ▪ 59% overall equipment effectiveness ▪ 80% complete and on-time and shipments ▪ 24% unscheduled asset downtime |

Source: Aberdeen Group, November 2008

Respondents were divided among three categories based on their aggregate performances in these three metrics: the top 20% of performers (Best-in-Class), the middle 50% (Industry Average), and the bottom 30% of performers (Laggards). Table 1 displays the average performance of Best-in-Class, Industry Average, and Laggard organizations.

Best-in-Class companies are realizing significant performance advantages over Industry Average and Laggards. Best-in-Class companies achieve 30% improved OEE, 17% more complete and on-time shipments, and 22% less unscheduled asset downtime, as compared to Laggard companies. These improvements translate to millions of dollars of savings in any asset intensive company.

The Best-in-Class PACE Model

Maximizing ROA, reducing cost, and achieving a competitive advantage in such an uncertain economy requires companies to implement and execute a combination of strategic actions, organizational capabilities, and enabling technologies that can be summarized as shown in Table 2.

Table 2: The Best-in-Class PACE Framework

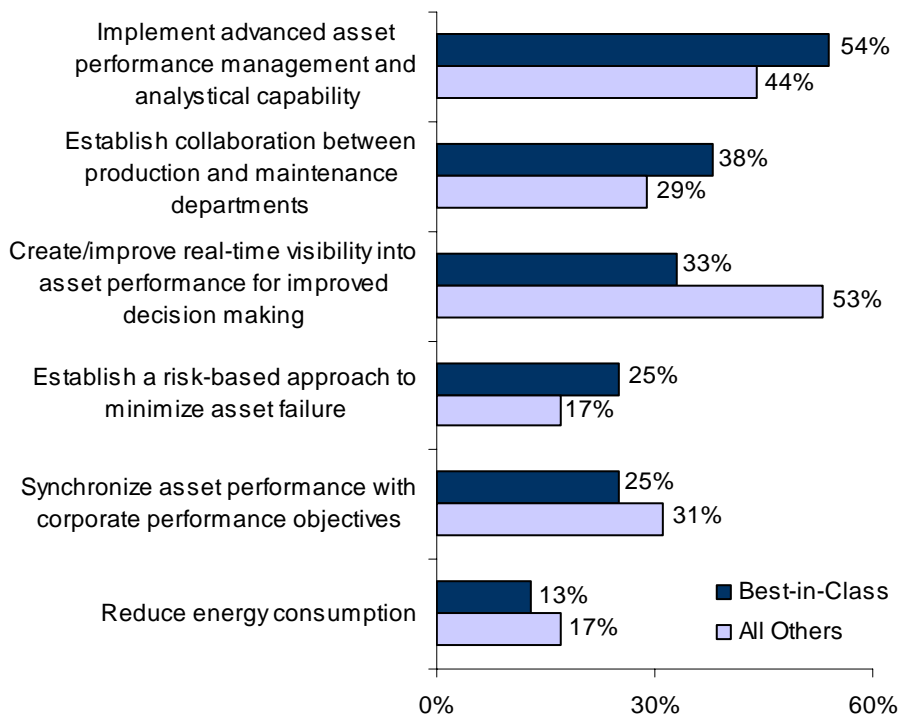
| Pressures | Actions | Capabilities | Enablers |
|--|---|--|--|
| <ul style="list-style-type: none"> ▪ Maximize ROA | <ul style="list-style-type: none"> ▪ Improve asset performance through advanced maintenance planning and scheduling strategies ▪ Establish collaboration across maintenance and operations ▪ Create / improve real time visibility into asset performance for improved decision making | <ul style="list-style-type: none"> ▪ Standardized processes for managing asset performance across the enterprise ▪ Executive focus on aligning asset performance and corporate performance ▪ Established continuous improvement teams for condition based and reliability centered maintenance activities ▪ Asset performance metrics are linked with financial metrics (PM) | <ul style="list-style-type: none"> ▪ Enterprise manufacturing intelligence ▪ Business Intelligence (BI) ▪ Asset analytics ▪ Asset scheduling ▪ Alarm management ▪ Master data management ▪ Reliability centered maintenance ▪ Condition based maintenance ▪ Energy management ▪ Asset performance dashboards |

Source: Aberdeen Group, November 2008

Best-in-Class Strategies

Best-in-Class companies are implementing strategies around leveraging advanced asset management capabilities such as Reliability Centered Maintenance (RCM), Condition Based Maintenance (CBM), analytics, and asset performance monitoring to address the top pressures.

Figure 2: Best-in-Class Strategies



Source: Aberdeen Group, November 2008

One of the top strategic initiatives for Best-in-Class companies is to enable communication and collaboration between the maintenance and operations teams. Traditionally, these departments had different (and sometimes conflicting) goals, with maintenance responsible for maximizing asset availability and operations responsible for maximizing utilization. Asset performance management is about having both these department work collaboratively to balance asset availability and utilization.

While establishing the right strategies is important, successfully executing these strategies requires the implementation of process, organization, knowledge management, and performance management capabilities in addition to the right technology. The next chapter will highlight the specific capabilities Best-in-Class companies are adopting to realize higher performance in OEE, on-time and complete shipment and to minimize unscheduled asset downtime.

"Some of the initiatives that are currently in place in our organization are Operational Excellence and Maintenance and Integrity Execution initiative. To ensure these initiatives get entrenched in the organization, health checks and audits are carried out at regular intervals. Benchmarking of producing assets is also carried out to identify gaps and define measures to close the gaps."

~ Emeka Maduekwe
Shell Global Solutions
International BV

Aberdeen Insights — Strategy

Asset Performance Management (APM) is a term that is not well defined in the industry. The main goal of APM is to synchronize operations, maintenance, IT, and corporate goals to improve profitability and shareholder value. This requires visibility into all aspects of the asset lifecycle in addition to having real-time information about the asset condition. Companies need to empower their employees with analytical tools to understand the value of both production and maintenance data to make timely and effective decisions.

A successful APM initiative requires organizations to operate beyond functional boundaries and balance asset availability and utilization by improving collaboration among maintenance and operations teams and close the loop by connecting asset performance to corporate performance. This will allow companies to maximize asset life and improve not only asset performance but also financial and operational performance.

Chapter Two: Benchmarking Requirements for Success

The success of asset performance management initiatives depends heavily on where in the maturity class framework an enterprise falls (Table 1). Maturity affects how an enterprise should leverage supporting technologies and other business capabilities, and in turn, goes a long way to translating the strategies presented in Chapter One to achieving corporate goals.

Competitive Assessment

Aberdeen Group analyzed the aggregated metrics of surveyed companies to determine whether their performance ranked as Best-in-Class, Industry Average, or Laggard. In addition to having common performance levels, each class also shared characteristics in five key categories: (1) **process** (the standardization and management of processes across the enterprise); (2) **organization** (corporate focus and collaboration among stakeholders); (3) **knowledge management** (contextualizing data and exposing it to key stakeholders); (4) **technology** (the selection of appropriate tools and effective deployment of those tools); and (5) **performance management** (the ability of the organization to connect asset performance to business metrics). These characteristics (identified in Table 3) serve as a guideline for best practices, and correlate directly with Best-in-Class performance across the key metrics.

Fast Facts

Best-in-Class manufacturers are more likely to adopt the following technology enablers:

- √ 84% more likely to adopt risk management
- √ 83% more likely to adopt remote monitoring devices / mobile solutions
- √ 45% more likely to adopt asset analytics

Table 3: The Competitive Framework

| | Best-in-Class | Industry Average | Laggard |
|-------------------------------|--|------------------|---------|
| Process | Standardized process for monitoring asset performance across the enterprise | | |
| | 54% | 43% | 26% |
| | Dynamically updated processes across the enterprise as new best practices emerge | | |
| | 29% | 20% | 13% |
| Organization | Maintenance procedures are based on risk based approach to assess the health and performance of an asset | | |
| | 63% | 33% | 28% |
| | Executive ownership and sponsorship for asset performance management strategies across the enterprise | | |
| | 57% | 47% | 17% |
| Performance Management | Established cross-functional team responsible with balanced asset, production and corporate goals. | | |
| | 33% | 29% | 20% |

| | Best-in-Class | Industry Average | Laggard |
|--------------------|--|--|---|
| | Center of Excellence responsible for promoting best practices for managing asset performance across the enterprise | | |
| | 42% | 25% | 9% |
| Knowledge | Asset performance data is collected in real time | | |
| | 50% | 38% | 26% |
| | On-demand asset lifecycle information easily accessible by maintenance and production employees | | |
| | 38% | 22% | 6% |
| | Centralized data warehouse to store asset performance data from different plants | | |
| | 46% | 21% | 19% |
| | Analytics are used to provide predictive insights based on the captured asset data | | |
| | 35% | 26% | 13% |
| Technology | Technologies currently implemented: | | |
| | <ul style="list-style-type: none"> ▪ APM – 38% ▪ EMI – 18% ▪ BI – 30% | <ul style="list-style-type: none"> ▪ APM – 30% ▪ EMI – 15% ▪ BI – 30% | <ul style="list-style-type: none"> ▪ APM – 24% ▪ EMI – 6% ▪ BI – 14% |
| Performance | Asset performance aligned to financial performance | | |
| | 52% | 36% | 30% |

Source: Aberdeen Group, November 2008

Acronyms

APM - Asset Performance Management

EMI - Enterprise Manufacturing Intelligence

BI - Business Intelligence

Standardizing Process and Continuous Improvement

Process capabilities are among the most difficult to implement as they require an inherent change in the way employees do things. Best-in-Class companies are standardizing processes for monitoring asset performance across the enterprise. This includes standardizing processes such as measurement of Key Performance Indicators (KPIs) across different plants, optimizing of asset utilization, and maintenance scheduling.

Establishing a standardized process is important, but can also become a barrier to continuous improvement if these processes remain unchanged for a long period of time. Best-in-Class manufacturers are capturing best practices to optimize asset performance across different plants and are able to dynamically update these processes and implement them across operations. For example, if a certain plant has a better method for monitoring assets, Best-in-Class companies have the ability to roll that example out across the enterprise. Organizations must be agile and flexible to changing asset management procedures.

The Best-in-Class are also nearly 200% more likely than Industry Average and Laggard companies to follow a risk-based approach to assess the health

"We have good corporate sponsorship and have been able to implement RCM. We are currently working to optimize our use of CBM technologies in support of our maintenance basics."

~ Kurt Oates, Manager,
Manufacturing Operations
Nebraska Public Power District

and performance of an asset. This includes having a risk-based inspection to monitor the condition of assets to identify the frequency of asset failure and the impact a failure could have on production. Having such information allows companies to quantify the risk of potential asset failure and prioritize it to appropriate employees so that timely actions are taken. Best-in-Class companies are thus able to minimize losses due to critical asset failure.

Fostering Collaboration with Executive Support

Organizational capabilities are critical for addressing the cultural challenges within the organization. Best-in-Class manufacturers are strategically organized to get buy-in from different stakeholders in the organization by raising awareness about the importance of asset performance management to overall corporate growth plans. They are establishing ownership and sponsorship from the executive level regarding their asset performance management strategies and programs. This is one aspect where Laggard companies need to focus, with a wide gap between the Best-in-Class and Laggard companies. Only 17% of Laggards have established senior executive sponsorship for their asset performance management programs.

Best-in-Class manufacturers are taking a collaborative approach towards managing asset performance by establishing cross-functional teams to synchronize production, maintenance, and corporate goals. Aligning goals is an approach to foster a culture of collaboration and reliability within the organization. This allows organizations to optimize production, inventory, and assets at an enterprise level resulting in improved profitability.

In addition to collaborating across different functional departments within a plant, it is also critical to have a communication channel to share best practices across different plants. Best-in-Class companies are nearly 1.5-times as likely as Industry Average, and four-times as likely as Laggard companies, to establish centers for excellence. This is critical as it helps manufacturers to scale operations based on successful initiatives undertaken in the past.

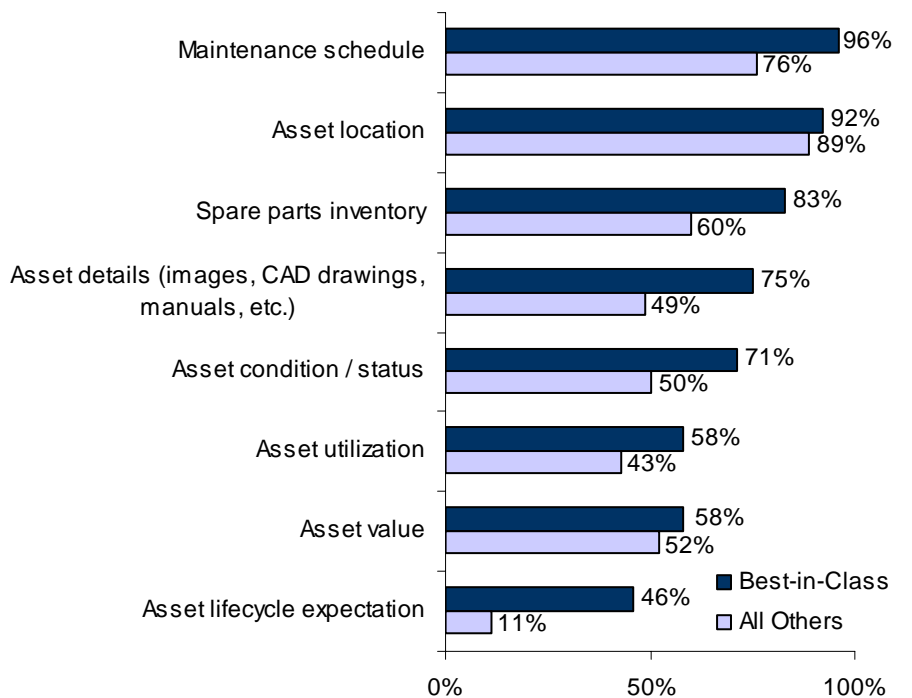
Knowledge and Performance Management

Knowledge management capabilities highlight a company's ability to gain real-time visibility into operations and maintenance, and act on the information intelligently and in a timely fashion. Best-in-Class manufacturers are monitoring and collecting asset data in real-time to ensure the success of the predictive nature of their maintenance programs. In addition to having visibility into current asset condition, Best-in-Class companies are also more likely to have a holistic view by enabling visibility across the complete lifecycle of the asset. Best-in-Class companies are six-times as likely as Laggards to ensure that on-demand asset lifecycle information is easily accessible by maintenance and production employees (Table 3).

"We utilize a database to document all production losses and track progress for asset utilization. With this, we drive improvement in parallel paths of loss elimination and ideal rate de-bottlenecking. We also have a corporate system to define, assess, and propagate best practices, which lends long term results in both asset utilization and costs. Finally, we utilize both vertical (line of organization) and horizontal (functional) work processes to optimize costs."

~ David Brown
Director, Manufacturing
Hercules Inc

Figure 3: Asset Lifecycle Information



Source: Aberdeen Group, November 2008

While having visibility into the complete asset lifecycle is important, at question here is the kind of data that is important for decision making. The details in Figure 3 show that Best-in-Class companies are more likely to have information right from the design and engineering stage, including details such as maintenance schedule, spare parts inventory, and asset utilization. The maximum differentiation was found around visibility into asset lifecycle expectation. Best-in-Class companies are four-times as likely to have futuristic information on asset life expectancy as compared to other companies. Data on asset value (original cost, depreciation, estimated replacement value) and asset lifecycle expectancy can be critical information while making decisions regarding removal or disposition of assets.

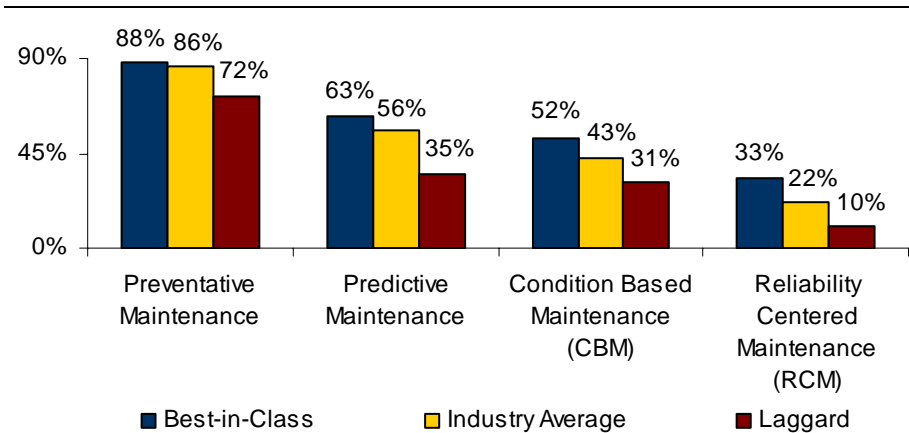
While Best-in-Class companies are more likely to collect data from different sources, they are also ensuring the storage of all information in a single location. Best-in-Class companies are nearly three-times as likely as Laggards to have a centralized knowledge warehouse to store data collected across different plants. This helps companies to reduce the complexity of disparate data sets and provides employees with access to all the information required from a single database.

Implementing an Balanced Maintenance Strategy

While some companies are still struggling to organize and execute preventive maintenance procedures, better performers have implemented

holistic asset management strategies that enable them to proactively ensure the health and fitness of plants, factories, and equipment across an increasingly dynamic global network. Best-in-Class manufacturers are guaranteeing asset availability by proactively focusing on the health and fitness of equipment and facilities before they fail to sustain optimal performance.

Figure 4: Maintenance Strategy



"Our goal for asset management is to maximize performance and minimize costs. We have implemented RCM and have a number of continuous improvement projects on the go."

~ Paul Soakell
Reliability Engineer
Watercare

Source: Aberdeen Group, November 2008

Best-in-Class companies are taking a break-fix and a preventive / scheduled maintenance approach for non-critical assets, but when it comes to critical assets, Best-in-Class companies are more likely to adopt a predictive, condition-based as well as reliability-centered maintenance approach. The Best-in-Class are enabling the success of such strategies by providing their employees with real-time visibility into asset condition and also analytical capabilities to minimize the risk of asset failure.

Performance Management: Closing the Loop

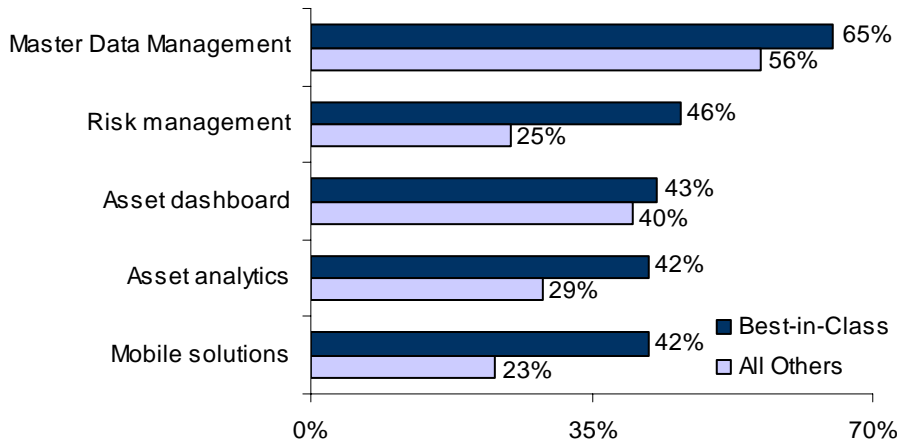
Depending on an organization’s resources, size, and even the industry in which it competes, the path to improved profitability and shareholder value is unique. To successfully achieve these goals, companies need to have the ability to monitor operational performance along with business metrics. Best-in-Class companies are more likely than other companies to align operational performance metrics to corporate metrics (Table 3). One simple example of aligning performance is to measure the cost of downtime as a metric instead of just downtime. This will provide executive complete visibility into how the total asset downtime impacts costs and profitability metrics.

Technology

Best-in-Class manufacturers are automating all the capabilities discussed by adopting technology at different levels of the organization. The technology column in Table 3 highlights the technology Best-in-Class manufacturers are

adopting to automate knowledge management and performance management capabilities.

Figure 5: Technology Enablers



"We are currently utilizing dashboards and Master Data Management. Dashboards help highlight areas where current emphasis are needed. Master Data Management has increased reliability of data by reducing potential for errors and has increased the confidence level of those using the systems and data.

~ Phil Lochbrunner
Manager, Manufacturing
Vulcan Materials Company

Source: Aberdeen Group, November 2008

Best-in-Class companies are more likely than other companies to adopt Asset Performance Management (APM), Enterprise Manufacturing Intelligence (EMI), and Business Intelligence (BI) solutions. APM is a term used by some vendors in a marketplace for a pre-packaged solution with some or all of the enablers mentioned in Figure 5. These vendors also provide performance monitoring tools to successfully implement RCM and CBM.

All these three solutions enable visibility into asset, operations, and business data. In addition, the analytical tools enable effective and timely decision making. Best-in-Class companies are able to successfully implement advanced asset management strategies such as RCM and CBM through the use of performance monitoring tools, automated workflows, analytics, dashboards, remote monitoring, and risk management tools. Best-in-Class companies are also more likely to implement Master Data Management (MDM) tools to collect data from engineering, maintenance, operations, and even suppliers and store these disparate data sets in a centralized location, providing employees with on-demand information of the complete asset lifecycle.

Case Study — P&H Equipments

P&H Mining Equipment is in the manufacturing and service of pace-setting large excavating and drilling machines used to mine copper, coal, iron ore, silver, gold, diamonds, oil-sands, phosphate, molybdenum, potash and other minerals and bedded materials.

continued

Case Study — P&H Equipments

P&H offers three major product lines - electric mining shovels, rotary blasthole drills, mobile mining crushers and walking draglines.

Due to the services business, P&H equipment had to make sure that their customer's equipment is running at peak performance to minimize asset downtime. Some of the challenges to achieve these goals for the mining customers industry are:

- New equipment is increasing in size, complexity and cost, so each failure results in greater impact to production and cost
- Remote location of the equipment makes it difficult to monitor health conditions
- It is difficult to identify and troubleshoot equipment problems while the equipment is operating
- Onboard information for each piece of equipment is not easily accessible to maintenance staff, causing delays and extra workforce requirements

The traditional maintenance approach was reactive. If a shovel stopped working or was not performing optimally, it caused equipment downtime which resulted in significant financial loss. The other issue was caused because of the remote location of the equipment. For example, say the technician who knows how to fix the shovel is far away from the shovel, thus getting the technician and the shovel to the same place takes time. So P&H equipment decided to implement a Remote Health Monitoring (RHM) solution to bring the equipment and the technician to the same place...virtually. The RHM solution provided P&H Equipments with the ability to automate data collection and storage from the shovel, data transmissions off the shovel, data collection and storage at the mine, data transmission from the mine to P&H, and data visualization and analysis.

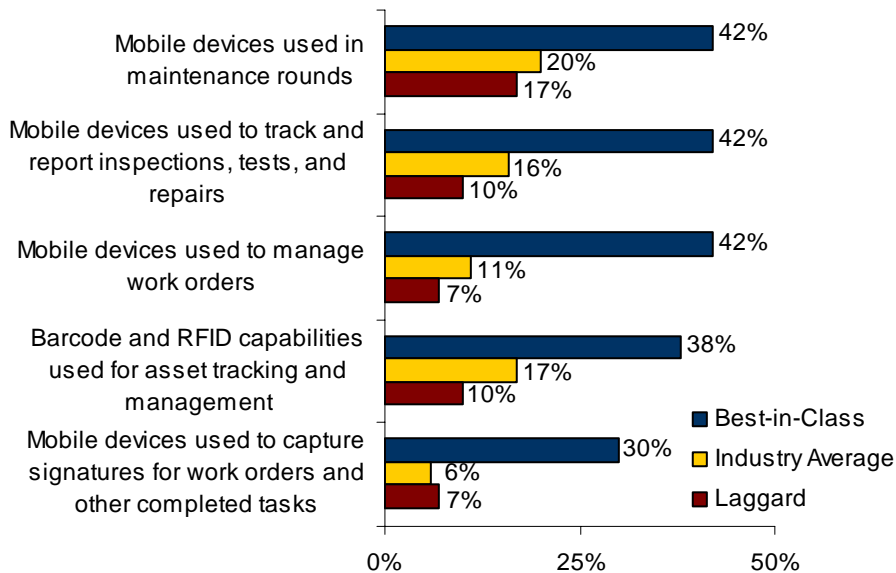
With the help of the solutions, employees are now able to make real-time informed decisions centrally, away from some of the extreme remote locations. According to Curt Hanson, Director of Engineering and New Product Development at P&H Equipments, "We were able to reduce asset downtime by 20%, which is directly attributable to the RHM implementation. RHM provided us with the ability to diagnose equipment faults, respond to changes in asset health, and predict failures before they occur as well as to improve parts and inventory forecasting / availability to shorten supply chains for replacement parts. Having real-time information about the equipment condition was critical to improving efficiencies and to providing feedback for continuous design and the maintenance practice improvement of mining equipment. Finally this visibility helped to expedite the implementation RCM and Life Cycle Management (LCM) programs and realize true value."

The Best-in-Class are nearly two-times as likely to adopt a mobile / remote monitoring solution as compared to other companies. Figure 6 shows how Best-in-Class are empowering operators with remote monitoring devices to enable real-time visibility even when employees are not in front of their workstations. This is an area that Industry Average and Laggard companies need to focus, considering the adoption level of mobile devices for both the groups.

"Our investments in handheld PDA – for operations and maintenance, for inspections and check sheets – have more than paid for themselves. Data is available at all times to everyone with alarms."

~ Jean Sewell
Reliability Engineer
Lion Oil Company

Figure 6: Remote Monitoring Capabilities

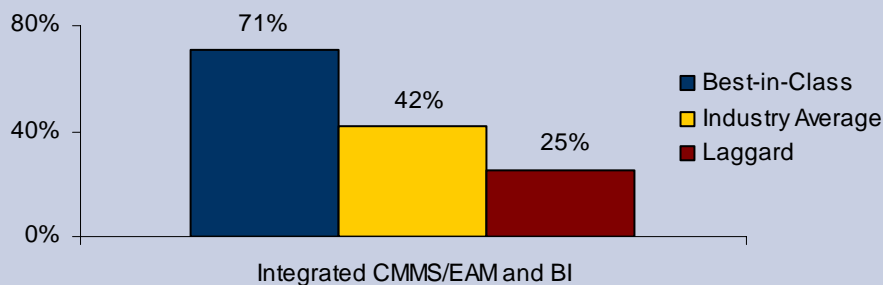


Source: Aberdeen Group, November 2008

Aberdeen Insights — Integration

In the performance management findings in Table 3, Best-in-Class companies are found to be more likely to align operational performance with corporate performance. The Best-in-Class are investing in real time integration between EAM and BI solutions to link operational metrics with business metrics. The integration is critical as it help companies to automate the process of gathering relevant information. Decision makers can, as a result, spend more time making decisions and less time gathering information.

Figure 7: Integrating EAM with Business Solutions



Source: Aberdeen Group, November 2008

Chapter Three: Required Actions

Whether a company is trying to move its performance in managing assets from Laggard to Industry Average, or Industry Average to Best-in-Class, the following actions will help spur the necessary performance improvements:

Laggard Steps to Success

- Establish support from the executive management for asset performance strategies across the enterprise. This is an important step to get additional resources for the success of an asset performance management initiative. Only 17% of Laggard companies currently have gained support from their executive team.
- Establish cross-functional teams responsible for balanced asset, production, and corporate goals. This will help companies to foster a culture of collaboration among maintenance and production teams and hence work together to balance asset availability and utilization. Best-in-Class are 65% more likely than Laggard companies to establish a cross functional team.
- Invest in analytics and dashboards to improve visibility into production and asset performance across the enterprise. The Best-in-Class are 92% more likely than Laggards to have real time visibility into asset performance information.
- Provide employees with on-demand access to information from various stages of the asset lifecycle by investing in MDM. This includes information such as asset design, maintenance schedules, spare parts inventory, asset utilization, and asset lifecycle expectation, among others. Best-in-Class companies are six-times as likely as Laggards to have visibility across the asset lifecycle.

Industry Average Steps to Success

- Invest in Reliability Centered Maintenance (RCM) and Condition Based Maintenance (CBM) to proactively monitor and manage asset performance. Adopting such capabilities is critical to transition from a reactive approach to a more predictive maintenance framework.
- Establish a risk-based approach to assess the health and performance of an asset. Best-in-Class companies are nearly two-times as likely to establish maintenance procedures based on risk-based approach, enabling them to minimize the risk of asset breakdown.
- Empower operators with mobile devices to enable remote monitoring of assets; recording of information during operator rounds; managing of work orders; and tracking and reporting of inspection, test, and repair data. This is especially important in asset intensive industries such as oil and gas, utilities, and mining, among

Fast Facts

Best-in-Class manufacturers are:

- √ Six-times as likely to provide on-demand access to the complete asset lifecycle to employees
- √ Three-times as likely to implement Reliability Centered Maintenance (RCM)
- √ Three-times as likely to dynamically update KPI and processes as best practices emerge
- √ 67% as likely to implement Condition Based Maintenance (CBM)

others, where operators have to be on the field most of the time. The Best-in-Class are 83% more likely than others to adopt mobile devices to provide real-time visibility into asset condition to their employees.

- Invest in analytics to truly understand the value of asset and production data and enable effective and timely decisions. Support decision-makers with analytic tools that help reduce the overwhelming load of real-time events and automate the monitoring and analysis of critical indicators impacting performance. Best-in-Class companies are 45% more likely to invest in analytics as compared to other companies.

Best-in-Class Steps to Success

- Dynamically update asset management procedures as best practices emerge across different departments or plant locations. While the majority of Best-in-Class companies are standardizing processes for monitoring asset performance across the enterprise, only a third have updated those processes with best practices. Only 29% of the Best-in-Class are currently update processes as best practices emerge. This is an important capability for Best-in-Class companies to retain their performance benefits.
- Invest in technologies to improve visibility into asset, operations, and business performance. This includes APM, EMI, and BI solutions. The adoption level for all these technologies is still below 50% for Best-in-Class companies.
- Align operations performance to financial and corporate performance by integrating EAM solutions with business solutions such as BI and Enterprise Resource Planning (ERP). Adopting an integrated technology can help companies to present comprehensive asset and financial information in real-time, directly to appropriate decision-makers.

Aberdeen Insights — Summary

Knowing when your assets need maintenance is not enough in today's competitive marketplace. Companies are faced with increasing shareholder pressure to reduce manufacturing costs and maximizing the returns on invested capital. Placing depreciating assets in productive tasks is the key objective of any asset intensive organization. Safety and compliance place added challenges in ensuring maintenance activities are initiated and completed in the most efficient manner possible. It is not enough that manufacturing enterprises have visibility to asset performance data and upcoming maintenance schedules. To minimize downtime and increase predictability and efficiency of maintenance operations, companies must first gain real-time visibility into both operations and maintenance.

continued

Aberdeen Insights — Summary

Best-in-Class companies are leveraging advanced asset management capabilities such as CBM, RCM, analytics, and asset performance monitoring, and are putting in place process, organizational, and knowledge management capabilities to stay ahead of the game – both in top-line revenue growth opportunity and bottom-line cost reductions related to asset maintenance.

Best-n-Class companies are also translating these savings and operational improvements to increased shareholder value by the ability to connect asset performance metrics to corporate metrics. Best-in-Class companies achieve 89% OEE, 97% complete and on-time shipments, and 2% unscheduled asset downtime. Industry Average and Laggard companies should follow the recommendations in Chapter Three to improve their performance in these metrics.

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Appendix A: Research Methodology

Between October and November 2008, Aberdeen examined the use, the experiences, and the intentions of more than 200 manufacturing executives across different industry verticals regarding their asset performance management capabilities.

Aberdeen supplemented this online survey effort with interviews with select survey respondents, gathering additional information on asset management strategies, experiences, and results.

Responding enterprises included the following:

- *Job title / function:* The research sample included respondents with the following job titles: CxO or President (4%); Vice-President (4%); Director (10%); Manager (43%), Staff (20%), Consultant (12%), and other (8%).
- *Industry:* The research sample included respondents from oil and gas (18%); metals and mining (14%); utilities (12%); chemicals (8%); energy (6%); waste water (5%); pharmaceutical manufacturing (5%); food and beverage (5%) and public sector (4%).
- *Geography:* The majority of respondents (58%) were from North America. Remaining respondents were from the Asia-Pacific region (15%), Europe (12%) and Middle East, Africa (10%).
- *Company size:* Forty-one percent (41%) of respondents were from large enterprises (annual revenues above US \$1 billion); 41% were from midsize enterprises (annual revenues between \$50 million and \$1 billion); and 18% of respondents were from small businesses (annual revenues of \$50 million or less).
- *Headcount:* Fifty-nine percent (59%) of respondents were from large enterprises (headcount greater than 1,000 employees); 27% were from midsize enterprises (headcount between 100 and 999 employees); and 14% of respondents were from small businesses (headcount between 1 and 99 employees).

Solution providers recognized as sponsors were solicited after the fact and had no substantive influence on the direction of this report. Their sponsorship has made it possible for Aberdeen Group to make these findings available to readers at no charge.

Study Focus

Responding manufacturing executives completed an online survey that included questions designed to determine the following:

- √ The pressures driving their focus on asset performance management
- √ The structure and effectiveness of existing technology implementations
- √ Top technology enablers adopted to facilitate asset performance management
- √ The benefits, if any, that have been derived from technology adoption and integration

The study is aimed to identify emerging best practices for asset performance management across the industry, and to provide a framework by which readers could assess their own capabilities

Table 4: The PACE Framework Key

| Overview |
|--|
| <p>Aberdeen applies a methodology to benchmark research that evaluates the business pressures, actions, capabilities, and enablers (PACE) that indicate corporate behavior in specific business processes. These terms are defined as follows:</p> <p>Pressures — external forces that impact an organization’s market position, competitiveness, or business operations (e.g., economic, political and regulatory, technology, changing customer preferences, competitive)</p> <p>Actions — the strategic approaches that an organization takes in response to industry pressures (e.g., align the corporate business model to leverage industry opportunities, such as product / service strategy, target markets, financial strategy, go-to-market, and sales strategy)</p> <p>Capabilities — the business process competencies required to execute corporate strategy (e.g., skilled people, brand, market positioning, viable products / services, ecosystem partners, financing)</p> <p>Enablers — the key functionality of technology solutions required to support the organization’s enabling business practices (e.g., development platform, applications, network connectivity, user interface, training and support, partner interfaces, data cleansing, and management)</p> |

Source: Aberdeen Group, November 2008

Table 5: The Competitive Framework Key

| Overview | |
|--|---|
| <p>The Aberdeen Competitive Framework defines enterprises as falling into one of the following three levels of practices and performance:</p> <p>Best-in-Class (20%) — Practices that are the best currently being employed and are significantly superior to the Industry Average, and result in the top industry performance.</p> <p>Industry Average (50%) — Practices that represent the average or norm, and result in average industry performance.</p> <p>Laggards (30%) — Practices that are significantly behind the average of the industry, and result in below average performance.</p> | <p>In the following categories:</p> <p>Process — What is the scope of process standardization? What is the efficiency and effectiveness of this process?</p> <p>Organization — How is your company currently organized to manage and optimize this particular process?</p> <p>Knowledge — What visibility do you have into key data and intelligence required to manage this process?</p> <p>Technology — What level of automation have you used to support this process? How is this automation integrated and aligned?</p> <p>Performance — What do you measure? How frequently? What’s your actual performance?</p> |

Source: Aberdeen Group, November 2008

Table 6: The Relationship Between PACE and the Competitive Framework

| PACE and the Competitive Framework – How They Interact |
|--|
| <p>Aberdeen research indicates that companies that identify the most influential pressures and take the most transformational and effective actions are most likely to achieve superior performance. The level of competitive performance that a company achieves is strongly determined by the PACE choices that they make and how well they execute those decisions.</p> |

Source: Aberdeen Group, November 2008

Appendix B: Related Aberdeen Research

Related Aberdeen research that forms a companion or reference to this report include:

- [Enterprise Asset Management: Maximizing Return on Assets and Emerging Trends](#); June 2008
- [Risk Mitigation in Manufacturing Operations](#); March 2008
- [Event Driven Manufacturing Intelligence: Creating Closed Loop Performance Management](#); May 2008
- [Manufacturing Operations Management: The Next Generation of Manufacturing Systems](#); January 2008
- [Ground Up Strategies for Asset Performance Management](#); September 2007
- [Manufacturing IQ: Taking Manufacturing Intelligence to the Enterprise](#); July 2007
- [Benchmarking Enterprise Asset Management](#); June 2007
- [Collaborative Asset Maintenance Strategies](#), December 2006
- [Driving Enterprise Performance with Asset Information](#), July 2006
- [The Asset Management Benchmark Report : Moving Toward Zero Downtime](#), April 2006

Information on these and any other Aberdeen publications can be found at www.Aberdeen.com.

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