Aberdeen Group
A Harte-Hanks Company

Asset Performance Management

Aligning the Goals of CFO's and Maintenance Managers

November 2009

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Executive Summary

With the financial meltdown and the uncertainty surrounding economic recovery, Chief Financial Officers (CFOs) are compelled to make difficult decisions related to internal budgets. Aberdeen surveyed 139 executives in October 2009 to understand their asset management programs and the results revealed that in more than 70% of the responding companies, the capital and operational budgets have either remained the same or decreased by as much as 20% as compared to last year. This report will highlight how Best-in-Class companies are able to manage the reliability of their asset base in this environment by effectively executing an Asset Performance Management (APM) strategy, resulting in higher operational and financial performance.

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

Aberdeen used the following three key performance criteria to distinguish Best-in-Class companies:

- 88% Overall Equipment Effectiveness (OEE); 75% for Laggards
- 2% unscheduled asset downtime; 18% for Laggards
- 25% Return on Assets (RoA) versus plan; -10% for Laggards

Competitive Maturity Assessment

Survey results show that the firms enjoying Best-in-Class performance shared several common characteristics, including:

- Best-in-Class companies are more than 10-times as likely as Laggards to establish asset performance metrics that are lined to financial metrics
- Best-in-Class companies are more than two-times as likely as laggards to perform frequent risk based assessments
- Best-in-Class companies are nearly three-times as likely as laggards to provide historical and real-time asset performance data to employees for efficient decision making

"To be profitable for the long-term against lower cost off-shore competition, we need to ensure our equipment operates at peak levels at all times. We consider asset performance management one of the greatest opportunities to improve operational and financial results without incurring capital expenditures."

~ Jay Shellogg,
Superintendent of Reliability,
Domtar Ashdown

Required Actions

In addition to the specific recommendations in Chapter Three of this report, to achieve Best-in-Class performance, companies must:

- Establish a risk based strategy and provide a harmonized view of risks across plants to the executive team
- Align goals and metrics to foster collaboration between maintenance and production teams
- Invest in analytics and dashboards to provide role based visibility to the workforce for effective decision making

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Chapter One: Benchmarking the Best-in-Class

Business Context

Aberdeen's third annual Asset Performance Management (APM) research highlights four key areas for asset intensive companies to understand as they establish their goals for the next 12 months:

- How has the current economic downturn impacted organizations asset management plans?
- What are the top goals of the Chief Financial Officer (CFO) for the next year and how will those goals impact the maintenance and the operations group?
- As companies mature from scheduled maintenance practices to predictive asset management, what business capabilities and technologies are critical to enable that transformation?
- How do sustainability goals, specifically around energy and emissions management, impact asset intensive companies and what are the strategies needed to achieve those goals?

Companies operating in the asset intensive industries should use this research as a guideline to implement an APM program to maximize asset utilization and asset availability while improving Return on Assets (RoA), in this budget constraint environment.

Fast Facts

Best-in-Class enterprises significantly outperform their competition. These enterprises enjoy:

√ 85% Overall Equipment Effectiveness (OEE)

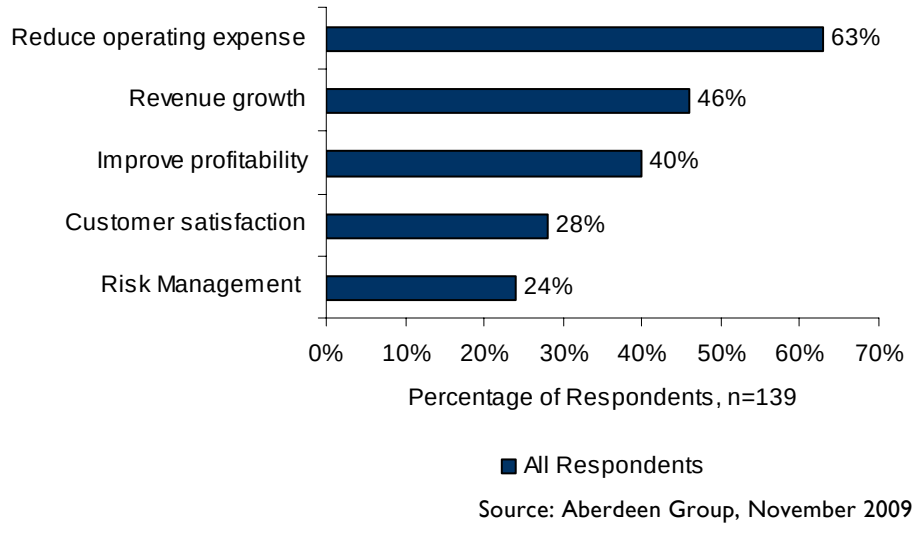
√ 2% unscheduled asset downtime

√ 25% outperformance of corporate RoA goals

From the office of the CFO

To start, let's understand the top goals of the CFO for the next year.

Figure 1: Goals for Chief Financial Officer



Source: Aberdeen Group, November 2009

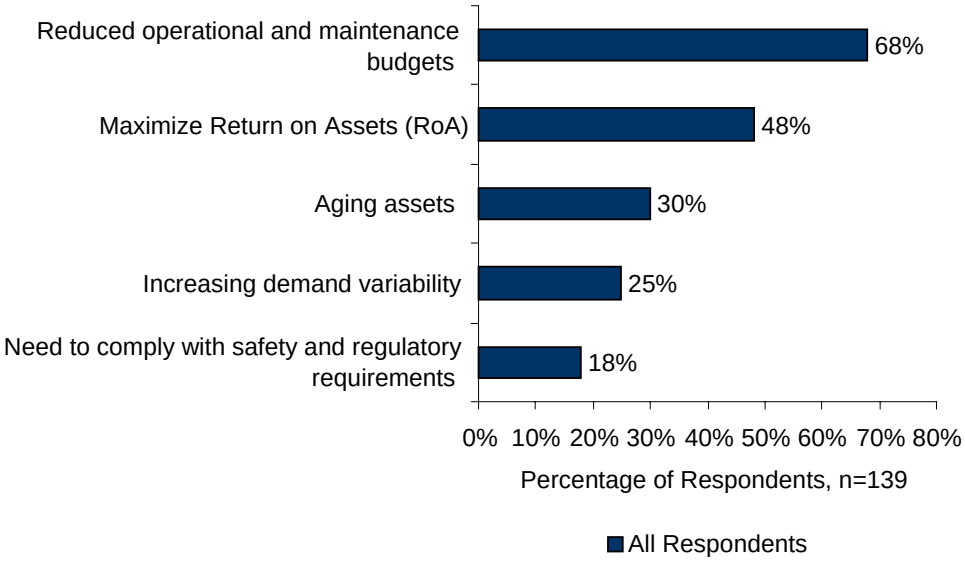
The survey respondents were asked to select the top three goals of their CFO. The top goal for cutting operating expense is not a surprise considering the current business landscape. A majority of companies across industries have seen a decline in their revenue and profitability growth over the last two years and this has directly impacted their decisions on internal budgets. CFO's are being pressured by internal executives as well as external stakeholders to put brakes on spending, which has resulted in reduced operational and capital budgets.

However when we look at the top three goals, it highlights the pressure on the CFO's to balance these goals. While 63% of CFO's will reduce operating expense in the near term, these executives are also forced to ensure that they are focused on improving profitability and revenue growth over the long term. This balancing challenge will be a key focus for CFO's as we see the economy slowly recovering in the next 12 months.

Feeling the Pressure from the CFO's Office

The focus on reducing expense has brought about an interesting change in the trend in the top pressure driving companies to focus on asset management.

Figure 2: Pressured Driving Asset Performance Management



Source: Aberdeen Group, November 2009

"The current economic downturn, did not impact our asset management plans as most of our products are basic necessities. As a matter of fact we even added number of maintenance personnel to augment our planning effectiveness and timely maintenance execution."

~ Manuelito Paner
Nestle

The results of the prior Aberdeen report on Asset Lifecycle Management and the 2008 *Asset Performance Management* report revealed that the primary pressure driving companies to focus on asset management is to maximize RoA and the secondary pressure is reduced budget. However, the looming uncertainty surrounding the economic recovery and the pressure from the CFO has reversed this trend. Sixty-eight percent (68%) of the responding survey population are driven by the pressure of reduced operational and maintenance budget. Further analysis on this finding showed

that in more than 70% of the responding companies, the capital as well as operational budgets have either remained the same or decreased by as much as 20% as compared to last year.

Another interesting trend, that is noticed this year, is the fact that 30% of total survey respondents selected aging assets as a pressure. It should be noted that the survey respondents were asked to select their top two pressures driving them to focus on asset performance. In prior studies, the pressure of aging assets has never been selected by more than 15% of total respondents. The reduction in the capital expenditure in the last 18 months has prevented many companies to make any significant investments in new assets and this has highlighted the pressure of the aging infrastructure, particularly in industrial facilities.

To summarize the above findings, the key pressure for operations and maintenance managers in the next year, similar to the CFO's, would be to establish a strategy to extract maximum value out of their asset base while operating at lower budgets.

The Maturity Class Framework

Aberdeen uses three key performance criteria to distinguish the Best-in-Class from Industry Average and Laggard organizations. These metrics measure the success of an organization's APM program not only from how it has improved plant operations, but also how successful these programs are in achieving financial goals.

- **Overall Equipment Effectiveness (OEE)** – measured as a percentage by multiplying availability times performance times quality
- **Asset downtime** – measured as the amount of time the asset is offline against total asset availability
- **Return on assets** - measured as the percentage of return on asset goal achieved

"Asset management is very important for us. As a global contract manufacturer we have to make sure the assets are readily available. We measure OEE from the walls down to the smallest of capital equipment. The results from our global OEE measures over the past year enabled the company to make decisions on investments, depending on future sales and the overall demand and the technology of the asset involved. The downturn has brought extra focus on the asset management."

~ Michael McCallion
CTS Corporation

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	▪ 88% overall equipment effectiveness ▪ 2% unscheduled asset downtime ▪ 25% return on assets vs. plan
Industry Average: Middle 50% of aggregate performance scorers	▪ 81% overall equipment effectiveness ▪ 11% unscheduled asset downtime ▪ 7% return on assets vs. plan

Definition of Maturity Class	Mean Class Performance
Laggard: Bottom 30% of aggregate performance scorers	▪ 75% overall equipment effectiveness ▪ 18% unscheduled asset downtime ▪ -10% return on assets vs. plan

Source: Aberdeen Group, November 2009

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 aggregated performance of Best-in-Class, Industry Average, and Laggard organizations.

Best-in-Class companies are able to effectively address the pressure of maximizing RoA in the current business environment. Best-in-Class companies are performing at the 13% higher OEE and 16% less unscheduled asset downtime as compared to Laggard organizations. This has directly resulted in Best-in-Class companies over achieving their RoA targets by 25% as compared to Laggard companies, which missed their RoA target by 10%. Achieving such results is helping executives in Best-in-Class companies to improve profitability in the current environment, one of the top goals of the CFO. The rest of the analysis of this report will be focused on revealing how the Best-in-Class companies are able to outperform its competition.

"The current economy has simply made us focus more on the efficiencies of the process and the value in reliable operation. The asset management system is much more visible to the top management."

~ Steven J. Cooke, CQA, CQE
Senior Quality Management Engineer
ADGAS

The Best-in-Class PACE Model

Maximizing RoA in an environment of reduced operational and budgets requires companies to implement a combination of strategic actions, organizational capabilities, and enabling technologies as shown in Table 2.

Table 2: The Best-in-Class PACE Framework

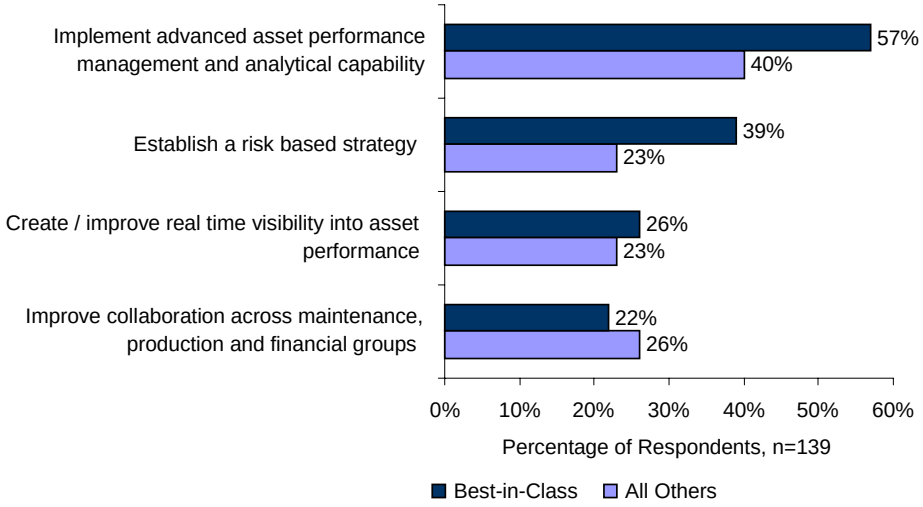
Pressures	Actions	Capabilities	Enablers
▪ Reduced operational and maintenance budgets ▪ Maximize Return on Assets (RoA)	▪ Implement advanced APM and analytical capability ▪ Create / Improve real time visibility into asset performance	▪ Frequent risk based assessments to understand the risk profile of the asset ▪ Executive focus on aligning asset performance and corporate performance ▪ Historical as well as real-time asset performance data is used as actionable intelligence for optimized decision making ▪ Asset performance metrics are linked with financial metrics	▪ Distributed Control Systems (DCS) ▪ Enterprise Asset Management ▪ Dashboards ▪ Analytics ▪ Risk Management ▪ Compliance Management ▪ Spare Parts Management ▪ Reliability Centered Maintenance ▪ Master Data Management

Source: Aberdeen Group, November 2009

Best-in-Class Strategies

The strategies highlighted in Figure 3 align directly to the four key steps that are critical to effectively execute an APM strategy.

Figure 3: Key Steps for Asset Performance Management



Source: Aberdeen Group, November 2009

"Some of the initiatives that are currently in place in our organization are operational excellence and maintenance and integrity execution. 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

The top strategy that differentiates Best-in-Class performers is to implement advanced APM and analytical capabilities. This is a key strategy to establish as companies move from reactive to predictive asset management. Predictive asset management processes goes a long way in helping companies avoid asset failure and fix problems related to assets before they actually happen, resulting in lower unscheduled asset downtime. The successful execution of this strategy requires companies to enable real time visibility into asset performance, a strategy that also differentiates Best-in-Class performance (Figure 3). Best-in-Class companies are empowering their employees with real-time visibility and are adopting analytical capabilities which enable predictive asset management programs. This allows Best-in-Class companies to understand the true value of the data collected and apply advanced asset management capabilities such as Reliability Centered Maintenance (RCM).

Best-in-Class companies are nearly70% as likely as their competitors to adopt a risk based strategy to enable efficient decision making. Aberdeen Group's research in *Risk Management in Asset Intensive Operations* revealed that Best-in-Class companies are 84% more likely than Laggards to establish a structured approach to pro-actively manage the risks inherent in their organization. In addition, Best-in-Class companies also have a response and a recovery plan in place to reduce or contain losses due to an adverse event.

Finally, the last strategy that is critical for a successful APM program is to enable collaboration among maintenance, production and financial groups. Best-in-Class companies have already addressed the cultural hurdle of

enabling collaboration and are now focused on enabling these cross functional groups with real time information to implement advanced asset management capabilities. Enabling cross functional collaboration is generally the most difficult strategy to execute considering the communications walls among these groups in a lot of asset intensive organizations. Companies that are able to establish and effectively execute this strategy will be the one that will have a greater chance towards realizing Best-in-Class performance.

In the next chapter we will highlight how to effectively execute all the four strategies, based on the capabilities implemented by Best-in-Class companies.

"The company has widespread assets and attempts to have a clear view of condition, problems, risks, and outlook as to downtime, five-year cycle costs, etc. The pressures driving asset management is the effect of downtime on revenue and excess cost of maintenance, which is not much different this year than last year."

~ Maintenance Supervisor, Utilities Company

Aberdeen Insights — Forward Thinking CFO

The data in Figure1 highlighted the top goals for CFO's in the next 12 months. On further analyzing the results of that question, Aberdeen found an interesting trend. The results indicated that CFO's of Best-in-Class companies are more than 60% as likely as others to have goals around risk management in the next year. This finding is further exemplified by *The 2009 Aberdeen report* that surveyed more than 4,500 companies. One of the important recommendations from the 2009 Aberdeen report for the CFO is to review the effectiveness of current risk management strategies and provide executive level visibility about the organizations risk profile. Establishing a risk based strategy will provide CFO's with a harmonized view of the risk that impacts different parts of their organization and will enable them to create a strategy to proactively address those risks, thus minimizing operational, financials and brand image loss.

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Chapter Two: Benchmarking Requirements for Success

The way in which companies implement the business processes designed to implement APM strategy is highly correlated to successfully responding to market pressures and the achievement of Best-in-Class performance.

Case Study — Chemical Company

A specialty industrial chemicals manufacturing company with over 7,700 employees, operating in 30 countries and supplying to over 30 different industry segments faced with external pressures had mandates to improve operational performance or risk losing market share. The company looked at the business challenges and addressed it with an enterprise wide APM initiative. The program linked APM metrics from their ERP, EAM, and Business Intelligence (BI) systems into a cohesive unified dashboard for different levels of management in all business areas (sales, planning / scheduling, manufacturing, logistics, and warehousing). Each department has their respective dashboards to manage the daily, monthly, and yearly metrics that drove business performance.

When starting on this initiative, the executive mandates were:

- Lower operating expenses
- Ensure financial benefits hit the bottom line
- Improve production equipment availability
- Increase plant uptime

To address these challenges, the company established a cross-functional Reliability Improvement Program (RIP). First, they allowed repeat failures to rest in peace. Then they established a cross functional team to put in place the basic operational components for an asset management system. They started with a pilot program which initially tracked high dollar equipment failures on a frequent and regular basis. The pilot program yielded interesting results. For the 100 pieces of equipment included in the pilot program, they were able to (in less than one year) reduce their annual maintenance costs by $500,000. Encouraged by this result, they expanded the program to include all equipment across the enterprise in order of priority.

The program helped reduce annual maintenance costs by over 60%, increasing equipment life span from six months to over five years on average. The company found that achievements were sustainable as they focused on operational errors and system design issues through a programmatic approach.

continued

Fast Facts

Best-in-Class companies technology adoption for supporting APM initiatives as compared to Laggards:

- √ **2-times** likely as to invest in automating analytics
- √ **2-times** as likely as to invest in role based dashboards
- √ **3-times** as likely as to invest in mobile solutions
- √ **2-times** as likely as to invest in Reliability Centered Maintenance (RCM)

Case Study — Chemical Company

Once the basic asset management and reliability programs were put in place, it yielded maintenance cost reduction successively for three years and started leveling off during the fourth year. At this time the program expanded in scope to capture additional operational metrics and link business metrics.

The project leader on this initiative noted, "We developed several performance metrics that were deployed across the enterprise. The results have been great, especially in some of the production facilities that were running at partial capacity, where we were able to bump them to full capacity. Others were expanded, consolidated and / or rationalized in the bigger scheme of things."

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 approaches they take to execute daily operations); (2) **organization** (corporate focus and collaboration among stakeholders); (3) **knowledge management** (contextualizing data and exposing it to key stakeholders); (4) **technology** (the selection of the appropriate tools and the effective deployment of those tools); and (5) **performance management** (the ability of the organization to measure its results to improve its business). 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.

Table 3: The Competitive Framework

	Best-in-Class	Average	Laggards
Process	Frequent risk based assessments to understand the risk profile of the asset		
	41%	36%	17%
	Standardized process is in place for the prioritization and management of maintenance work		
	65%	54%	43%
Organization	Management goals are aligned and coordinated with maintenance and production teams		
	57%	39%	30%
Knowledge	Historical as well as real-time asset performance data is used as actionable intelligence		
	59%	52%	21%
	Failure data is used to perform root cause analysis		
	59%	50%	45%

	Best-in-Class	Average	Laggards
Technology	Technology currently in use:		
	▪ 73% Enterprise Asset Management	▪ 62% Enterprise Asset Management	▪ 48% Enterprise Asset Management
Performance	Asset Performance can be compared across plants		
	61%	36%	17%

Source: Aberdeen Group, November 2009

Capabilities and Enablers

Companies operating in the asset intensive industry are facing two major competing pressures. On one hand these organizations are attempting to operate in a reduced operational and maintenance budget environment, while on the other hand there is a need to maximize RoA. To address these opposing market pressures, companies are establishing four key strategies centered on implementing advanced asset management capabilities, real-time visibility, risk management and collaboration.

At face value, each of these strategies may seem straight forward in implementation but for many organizations it is often a surprising struggle to drive actual business value from these strategies, which are core to APM. In this section, we will examine the specific business capabilities and technology enablers driving this business value for the Best-in-Class, a summary of these capabilities and enablers can be found in the Table 3.

Process

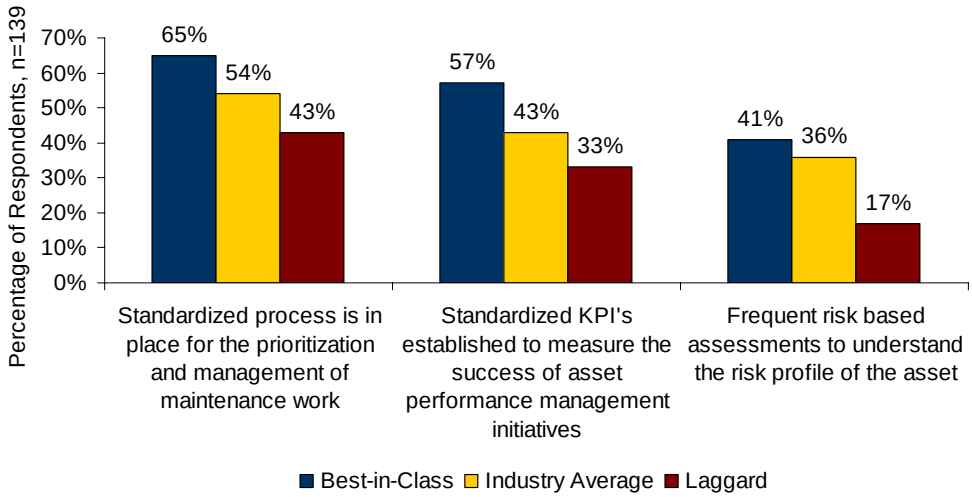
The results discussed in Chapter One showed that risk management strategy is a key differentiator for Best-in-Class performance. The data in Figure 4 highlights the key capabilities required to effectively implement a risk management strategy.

An effective risk management strategy requires organizations to establish standardized processes to identify, quantify, and prioritize risks that are inherent in the organization. The next step is to establish controls and contingency plans to reduce the impact of the possible risks. These risks may arise from different areas such as asset downtime, climate change, regulatory compliance and worker safety among others. The key is to have a risk management strategy in place to address these risks proactively to reduce or contain the possible losses to the organization.

The Best-in-Class are able to successfully implement the above process by being more than twice as likely as Laggards to have frequent Risk Based Inspections (RBI). RBI's enable these top performers to understand the criticality and the risk profile of their asset base. Best-in-Class are also more than 50% as likely as Laggards to establish a standardized process to prioritize risks with the information from the RBI. Finally, Best-in-Class

companies are establishing standardized Key Performance Indicators (KPIs) to measure the success of their APM initiatives.

Figure 4: Risk Management Principles



Source: Aberdeen Group, November 2009

One of the main goals for asset intensive companies is to minimize unscheduled downtime, and the only way to achieve that goal is by being predictive in managing assets. Adopting a risk management framework helps companies understand their assets and establish processes to enable the predictive nature of their business. This is one of the key strategies enabling Best-in-Class companies to perform at a 2% unscheduled downtime rate. Industry Average and Laggard organizations should look into adopting a risk management strategy by effectively implementing the above capabilities.

"We use RBI in our Inspections Department and various statistical methodologies for risk analysis and mitigation. The programs have helped us to reduce unnecessary work and focus resources on critical needs. The data value has increased with better collection, storage, retrieval and analysis capabilities. Quantitative analyses of action options are now done more frequently."

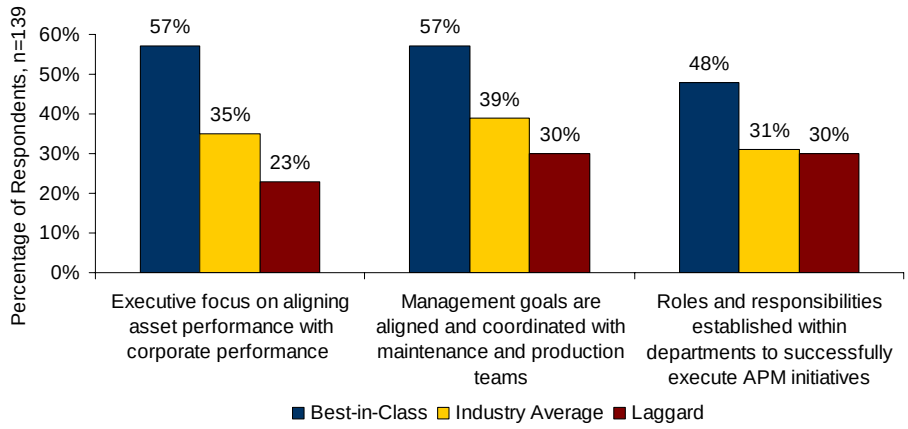
~ Steven J. Cooke, CQA, CQE
Senior Quality Management Engineer
ADGAS

Organization

A successful APM initiative requires organizations to operate beyond functional boundaries and balance asset availability and utilization by improving collaboration among functional teams. However, enabling this collaboration has been a key challenge in a majority of asset intensive organizations.

When analyzing the capabilities established by Best-in-Class companies, Aberdeen found certain key areas of focus that can enable companies to address this cultural challenge (Figure 5). The Best-in-Class are two times as likely as Laggards to establish ownership and sponsorship from the executive level regarding their APM strategies and programs. These executives' primary responsibilities are to implement processes to effectively align asset performance to corporate performance. This capability is a key to the risk management goals of the CFO discussed in Chapter One. Establishing this executive role will enable the CFO to get better visibility into risk that is related to asset management and understand how these risks impact corporate performance.

Figure 5: Collaboration across Organizations



Source: Aberdeen Group, November 2009

Traditionally, maintenance, operations and engineering groups have been compensated on different goals, which has often been a roadblock to enable collaboration across functional groups. Best-in-Class companies are addressing this challenge by establishing goals that are aligned to foster a culture of collaboration. A common example would be to establish goals around metrics such as Overall Equipment Effectives (OEE), which measures availability, quality and performance. Connecting these metrics together will ensure that functional groups are working collaboratively to achieve their goals. Best-in-Class companies are more likely to align goals and establish roles and responsible to enable collaboration, which is probably one of the key capabilities for the Best-in-Class to perform at 88% OEE as compared to 75% OEE for Laggard companies.

"As a company of four refineries, there is one asset manager at General Management. Reliability Superintendents report to Maintenance Managers at the refineries. These two positions are recently established. (2 yr) The economic downturn effected mostly the ROI calculations"

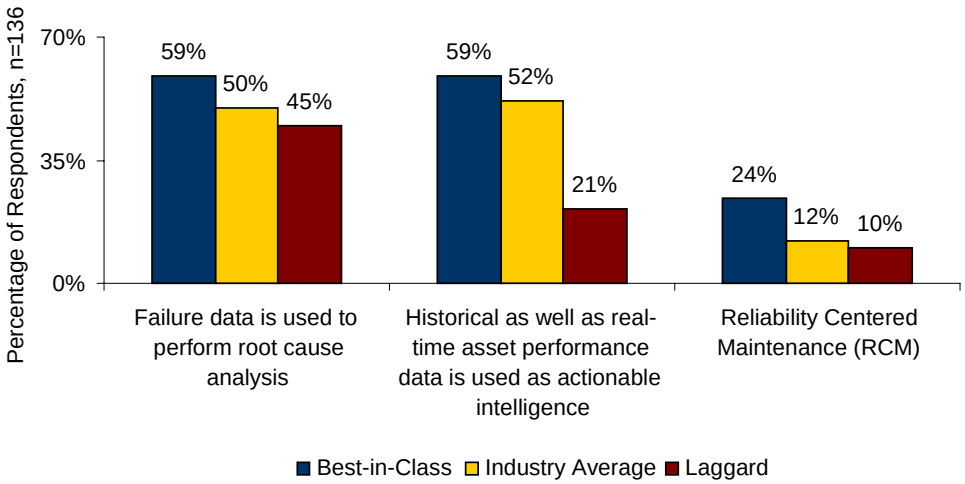
~ Large Refinery

Knowledge Management

Making effective asset decisions requires organizations to equip their employees with the right data at the right time in the right form. The Best-in-Class differentiate themselves from the Industry Average and Laggards by more effectively leveraging the data they collect and turning the data into actionable intelligence (Figure 6).

The Best-in-Class have created an environment where they are more likely to enable an understanding of what has happened in the past and apply this understanding to improve predictive decision-making in the future. Providing this information to employees in an on-demand fashion can be critical to reduce unscheduled downtime and improve asset performance. Only 21% of Laggard organizations have established processes to provide historical as well as real time data to their employees. With the advent of software technology and tools such as EAM solutions, wireless sensors, vibration analysis, lubrication analysis etc. it is no longer expensive to provide such visibility to employees; especially considering the opportunity cost of not providing real time and historical visibility in asset intensive environment, which ultimately results in increasing losses through higher asset downtime.

Figure 6: Data Driven Decision Making



Source: Aberdeen Group, November 2009

"We maintain a historic database for asset performance metrics and make the analysis available cross department. Every month the Continuous Improvement team meets to review the data and discuss opportunities to make improvements based on the analysis."

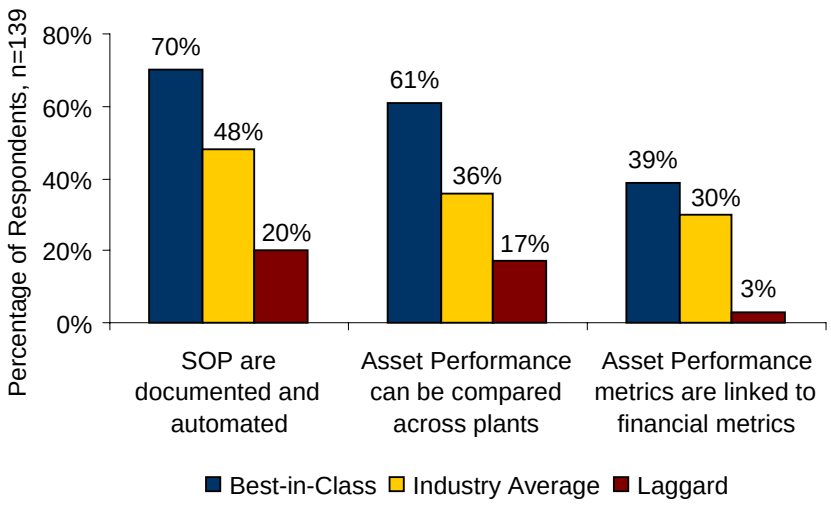
~ Atilio Gallitelli, Director, Instituto Tecnologico de Buenos Aires

To mitigate the risk of asset failure, companies should implement a predictive maintenance strategy to reduce the impact of a potential failure. A Reliability Centered Maintenance (RCM) strategy helps companies to understand the criticality of an asset and then decide on whether to apply a break-fix, preventative or a condition based maintenance approach. Best-in-Class companies are nearly 2.5 times more likely than Laggards to implement RCM as a primary maintenance strategy. The overall adoption of RCM as a primary maintenance strategy is still low. This is a great opportunity for non Best-in-Class companies to implement RCM and gain a competitive edge in the marketplace around asset management programs.

Performance Management

Effectively managing performance goes a long way to achieving Best-in-Class status. Best-in-Class companies are differentiating in two critical areas when it comes to performance management (Figure 7). First, the Best-in-Class are more than three times as likely as Laggards to establish capabilities to compare asset performance across plants. This capability enables companies to capture best practices in better performing plants and optimize asset performance across different plants. The Best-in-Class are further extending this capability by connecting asset performance metrics to financial metrics.

Figure 7: Process Compliance and Performance Management



Source: Aberdeen Group, November 2009

"A regular review of process hazards is undertaken to ensure that risks are appropriately mitigated. Avoidance of EHS incidents is critical to ensuring further growth is considered."

~ Director, Business Process Management, Mid-size Chemical Company

The second area of differentiation for the Best-in-Class lies in the area of process compliance. These capabilities ensure compliance to internal procedures as well as external regulatory requirement and are specifically important to reduce safety incidents and improve worker safety in the plants. Best-in-Class companies are documenting are automating Standard Operating Procedures (SOP) to ensure that employees have a clear understanding of the work process and are working in compliance to the SOP's established.

Case Study — Mining Company

A large mining operation with over 2,000 employees, has assets to maintain including drills, shovels, loaders, haul trucks, auxiliary equipment, roads, bridges, tunnels, trains, railroad cars, rail and ships. Reduction of time lost for shutdown or maintenance was the strategy to increase production. The idea was to become a world class maintenance organization and a top producer.

However, the path was not easy. The challenges included producing more with the same resources and equipment, managing assets with different criteria, determining the program for maintaining the assets (right frequency, proper task), adapting to a process and mobilizing the workforce and probably the most difficult, changing a 50 year old culture. Additional challenges included having a stable but aging workforce. Turnover was low, however the retirement rate was increasing and they required programs to attract and retain skilled employees.

continued

Case Study – Mining Company

The project started by first identifying best practices, benchmarking companies renowned for their maintenance practices. Then a reliability process team was created to establish a sustainable process for maintenance. Maintenance and operations employees were trained on asset performance and reliability practices. The company had a third party audit on maintenance practices and implemented asset performance management software to support the project.

KPIs, both leading and lagging, were established and closely monitored. Examples include:

- Percentage of alarms that have been acknowledged within 24 hours
- Number of work orders generated from equipment indicators that are in alarm
- Percentage of inspections and /or repairs can be made before complete failure

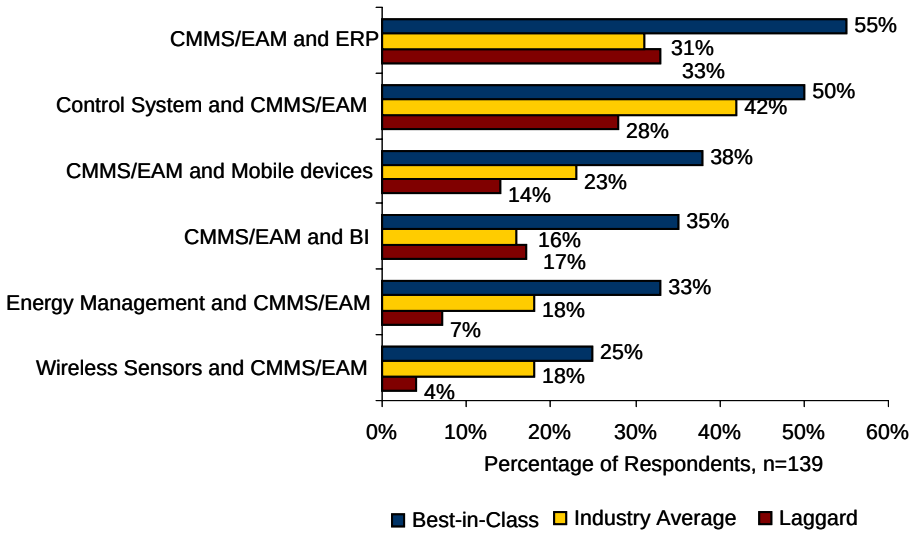
The results in the first year of implementing the proactive asset care process for mobile equipment, included mine production levels up by 28% – without increasing resources. In year four of the new proactive maintenance process, savings were in excess of $7 million to the bottom line through a combination of increased product throughput, deferred and reduced capital expenditures, and lower material carrying costs as a result of reductions in the spare parts inventory. Manpower efficiency was up by 5.1%, and spare parts inventory values were projected to be down by nearly $10 million by the end of year four.

Technology

Technology adoption is an important step for implementing an APM strategy. Best-in-Class performance is differentiated by the adoption of Enterprise Asset Management (EAM) solution. EAM provides a core set of functionality that closely aligns to how Best-in-Class companies approach technology adoption. EAM solutions help companies manage critical information related to work orders, materials, spare parts, employee data, procurement, and maintenance schedules and provide employees with a single platform to access this information on a timely basis to make intelligent decisions.

However, adoption of EAM is just the first step. To realize Best-in-Class performance, companies need to integrate EAM solution with their other technology investments. One of the roadblocks to this process is the fact that manufacturers have adopted technology applications that function independently. That's where technology integration plays a crucial role in APM.

Figure 8: Connecting the Enterprise



Source: Aberdeen Group, November 2009

The data in Figure 8 highlights the key integration path that differentiates top performance. Best-in-Class companies are connecting wireless sensors and control system to the EAM solutions, thus enabling real-time visibility into asset condition. In addition, Best-in-Class companies are further integrating EAM with mobile devices to enable field workers with asset data and also to improve accuracy if data is inputted during operator rounds. Best-in-Class companies are also connecting EAM with business solutions such as BI and ERP, thus providing the ability to connect asset performance to corporate performance.

"We are in the process of implementing an asset management program. We are looking into dashboards, and predictive maintenance measures. We have adopted a requirement for all new facilities to have predictive maintenance sensor incorporated into their design."

~ Greg Chol
City of Aurora, Colorado

Aberdeen Insights - APM Strategy

APM is a term that is not well defined in the industry. 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 requires visibility into all aspects of the asset lifecycle in addition to having real-time information about the asset condition. This will allow companies to maximize asset life and improve not only asset performance but also financial and operational performance.

Another critical aspect of APM is managing risk. Best-in-Class companies have established a risk management framework and are able to provide a harmonized view of risk to the executive team by enabling visibility into how asset performance impacts corporate metrics such as cost, profitability and RoA.

continued

Aberdeen Insights — APM Strategy

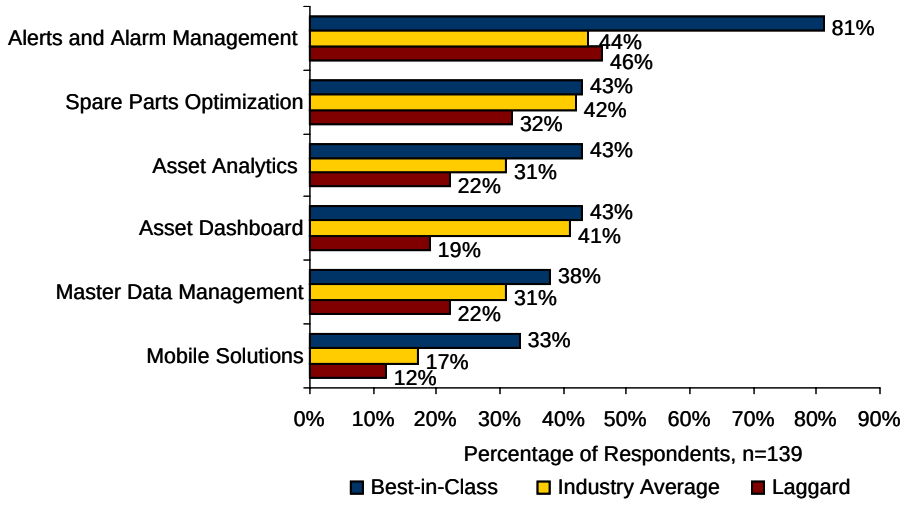
Finally, the Best-in-Class are investing in technology to automate the processes discussed above. There are companies in the marketplace that provide this as part of a single APM solution. Investing in technology highlighted in this section will enable companies to understand the value of both production and maintenance data to make timely and effective decisions.

In addition to the enterprise wide solutions, it is important to understand the core functionalities that need to be adopted to achieve Best-in-Class performance. These functionalities can be categorized in two major buckets. The first set of tools are required to improve visibility into asset performance and the second set of tools enable companies to make predictive decisions based on improved visibility. Asset dashboards, mobile solutions, master data management, and alerts management are all critical tools that enable visibility into the asset performance and provide that visibility to the right person at the right time in the right form to make intelligent asset decisions. Asset analytics and spare parts optimization are core functionalities that enable employees to make decisions out of the large volume of data collected across the asset base. Automating the spare parts optimization process can help companies effectively manage spare parts resulting in lower inventory costs and ensuring that the right spare parts are available during asset breakdown, thus minimizing the overall asset downtime.

"We are using a single EAM system to manage all of workflows through various groups such as real estate, street maintenance, facility maintenance, asset management and parking meters services group. This has helped us to monitor work more efficiently through a single system and increase transparency to the citizens of the city. We are currently planning to invest in a dashboard to provide executives visibility into critical operational and business metrics."

~ Daniel Choe
Senior Department Systems Specialist
City of Sacramento

Figure 9: Technology Functionalities



Source: Aberdeen Group, November 2009

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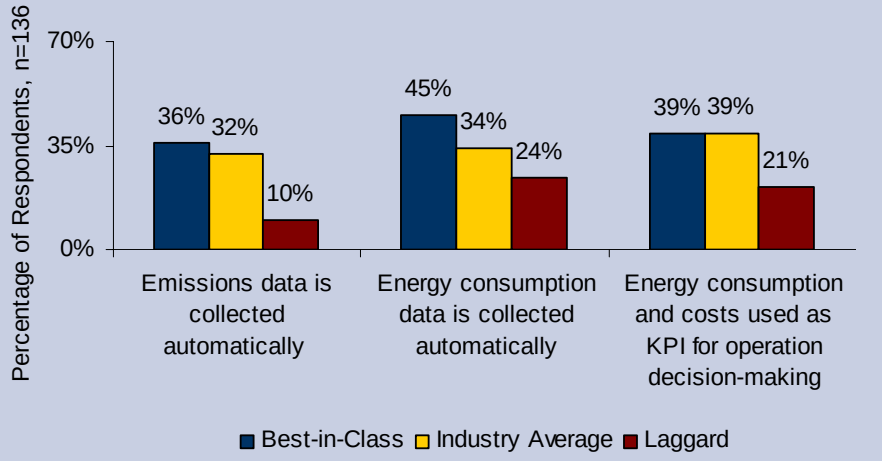
Aberdeen Insights — Social Responsibility with Profits

Reducing the energy consumption of asset intensive industries is an untapped resource in both the quest for profits and social responsibility. Best-in-Class companies are more likely to automate the collection of energy and emissions data and provide this information to the employees for making effective energy decisions.

While having energy information is critical, the next step is to utilize that information to optimize operational processes. Best-in-Class and Industry Average companies are 85% more likely than Laggard organizations to use energy consumption data for operational decision making. For example, if there is a motor, or a compressor that is utilizing more energy than expected, with the help of the available data, plant floor employees have the ability to schedule maintenance to understand the spike in energy consumption and establish corrective actions. This will help companies to not only reduce energy consumption but also provide an ability to improve OEE through reduced asset downtime.

Figure 10: Managing Energy and Emissions



Source: Aberdeen Group, November 2009

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Chapter Three: Required Actions

Whether a company is trying to move its performance in APM 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 executive focus for asset management.** Organizationally, focus has to start right at the top. Executives in the asset intensive industries should improve their focus on asset management and must view it as a core competency. Currently, only 23% of Laggards have executive sponsorship of initiatives focused on improving asset management.
- **Provide real-time and historical asset data to employees.** Optimized decision-making can only be achieved by providing critical asset data as actionable intelligence to key decision-makers, where actionable intelligence is defined as relevant and timely data presented in the proper context. Only 21% of the Laggard organization currently has the infrastructure to provide such visibility to their workforce. Laggards should invest in dashboards and master data management solutions to provide easy and timely access to required asset information.
- **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 nearly two times as likely to invest in analytics as compared to Laggard companies.

Industry Average Steps to Success

- **Establish a risk management strategy for predictive decision making.** Implement an enterprise risk framework to manage risk across the enterprise. This will help Industry Average manufacturers to have a structured process of identifying, quantifying and prioritizing risk and have procedures in place to mitigate the risks that has the most impact on the organizations success.
- **Align goals and metrics across maintenance and production teams**. When it comes to getting the maintenance and production teams working together, the Best-in-Class are 45% more likely than Industry Average companies to have goals, objectives, and metrics aligned across these two teams. Aligning goals and measuring performance based on common corporate

Fast Facts

Best in Class companies are:

- √ 70% more likely to establish a risk management strategy to enable predictive decision making
- √ 11 times as likely as Laggards to connect asset performance metrics to corporate performance
- √ 87% as likely as Laggards to automate the collection of energy data
- √ Five-times as likely as Laggards to integrate EAM solution with energy management systems

objectives is a lot easier if the technology supports it. Industry Average companies are at a stage where they can leverage their early investments in technology to enable collaboration.

- **Establish integration between EAM and the plant floor as well as business systems**. Integration allows manufacturers to connect maintenance applications with plant application and higher-level business systems more easily, which in turn results in increasing responsiveness and an ability to make quick and intelligent asset management decisions. The Best-in-Class are establishing real time interoperability between EAM system and control system and wireless sensors on the plant floor, BI and ERP systems at a business level and mobile devices to provide visibility to field workers.

Best-in-Class Steps to Success

- **Utilize energy consumption data for operational decision making.** In order to operate in a budget constrained environment, it is critical to squeeze cost out of each and every part of the operation. To reduce energy consumption, the Best-in-Class need to first automate energy data collection and use the data to enable operational decision making, specifically around production and maintenance. Only 39% of Best-in-Class companies currently have this capability.
- **Synchronize asset performance to corporate performance.** While the Best-in-Class are more likely to synchronize asset performance to corporate performance, only 39% of companies currently have this process in place. This capability allows organizations to understand how efficiency gains made through effective asset management strategies actually help to hit the bottom line.
- **Implement RCM as a primary maintenance approach**. Moving from a reactive maintenance approach to a predictive maintenance approach is a key to higher asset reliability. Best-in-Class companies need to establish processes to understand the criticality of the asset to effectively select a maintenance strategy. This requires companies to provide visibility into current and past asset data to effectively predict future failures and minimize the consequences of those failures.

"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

Aberdeen Insights — Summary

Unplanned downtime, inability to maintain planned production rates, safety and environmental incidents — all these business problems can be traced directly to recurring equipment failures and recurring operations mismatches in production rates and capacities which cause unplanned shutdowns. The potential impact of asset management programs on corporate goals has compelled the CFO of asset intensive companies to take an active role in critical asset management decisions.

Best-in-Class companies are addressing all the above challenges by effectively implementing an APM strategy. This includes fostering a culture of collaboration across functional groups, implementing a risk management framework, creating real-time visibility into the asset base and establishing advanced asset management capabilities. The results in this report serve as a guideline for companies looking to effectively execute on all the four strategies with the goal to achieve 85% OEE, 2% unscheduled downtime and overachieve corporate RoA targets.

Appendix A: Research Methodology

Between September and October of 2009, Aberdeen examined the use, the experiences, and the intentions of more than 130 enterprises using APM in a diverse set of enterprises.

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

Responding enterprises included the following:

- *Job title:* The research sample included respondents with the following job titles: Upper Management (CSO, CEO, COO, CFO, CTO, President, VP, Partner, Principle) (26%); Director (22%); Manager (22%); Staff (10%)
- *Industry:* The research sample included respondents from the following industries: Oil/Gas (21%); Industrial Equipment Manufacturing (11%); Consumer Packaged Goods (11%); Utilities (8%); Construction/Architecture/Engineering Services (7%)l; Chemicals (5%); Metal and Metal Products (4%); High Technology Manufacturing (4%); and Automotive (2%)
- *Geography:* The majority of respondents (55%) were from North America. Remaining respondents were from the Asia-Pacific region (17%), Europe (17%), and Middle East Africa (9%).
- *Company size:* Thirty-three percent (33%) of respondents were from large enterprises (annual revenues above US $1 billion); 38% were from midsize enterprises (annual revenues between $50 million and $1 billion); and 30% of respondents were from small businesses (annual revenues of $50 million or less).
- *Headcount:* Forty-nine percent (49%) of respondents were from large enterprises (headcount greater than 1,000 employees); 28% were from midsize enterprises (headcount between 100 and 999 employees); and 23% of respondents were from small businesses (headcount between 1 and 99 employees).

Study Focus

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

- √ The degree to which asset performance management solutions are deployed in their manufacturing operations and processes and the financial implications of the technology
- √ The structure and effectiveness of existing asset performance management implementations
- √ Current and planned use of asset performance management to aid operational and manufacturing abilities
- √ The benefits, if any, that have been derived from asset performance management initiatives

The study aimed to identify emerging best practices in asset performance management, and to provide a framework by which readers could assess their own management capabilities.

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Table 4: The PACE Framework Key

Overview
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: **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) **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) **Capabilities —** the business process competencies required to execute corporate strategy (e.g., skilled people, brand, market positioning, viable products / services, ecosystem partners, financing) **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)

Source: Aberdeen Group, November 2009

Table 5: The Competitive Framework Key

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

Source: Aberdeen Group, November 2009

Table 6: The Relationship Between PACE and the Competitive Framework

PACE and the Competitive Framework – How They Interact
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.

Source: Aberdeen Group, November 2009

Appendix B: Related Aberdeen Research

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

- *Managing Risks in Asset Intensive Operations;* March 2009
- *Asset Performance Management: Driving Excellence through a Reliability Strategy in Real-Time;* November 2008
- *Enterprise Asset Management: Maximizing Return on Assets and Emerging Trends*; June 2008
- *Risk Mitigation in Manufacturing Operations*; March 2008
- *Ground Up Strategies for Asset Performance Management*; September 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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