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Energy Intelligence: Creating Data Driven Efficiency

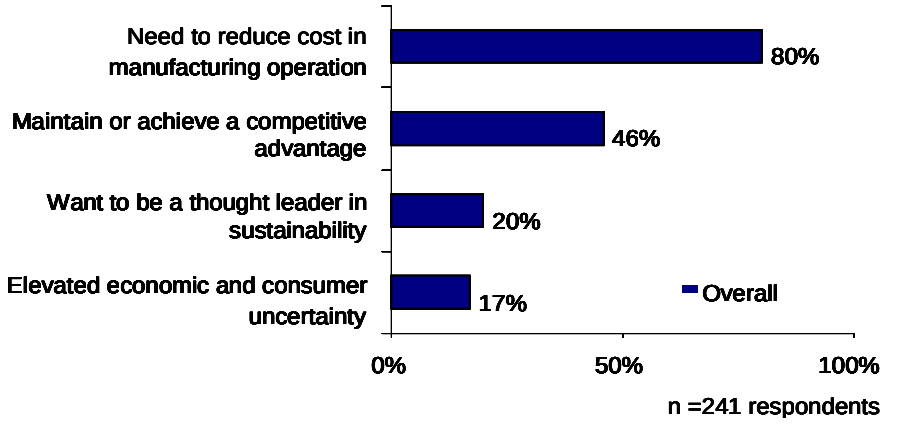
This Analyst Insight will focus on establishing the business case and functional requirements for Energy Intelligence; an emerging approach to managing energy in industrial operations. In this piece, we will analyze the current economic landscape and business trends driving the adoption of energy efficiency technology. The analysis will continue with a benchmarking of current energy use and corporate performance, highlighting the metrics being measured. The analysis will then end with a formal definition of Energy Intelligence, coupled with a clear roadmap for deploying this approach.

Cost Drives Decisions in Manufacturing

In the US today, the industrial sector accounts for about one third of total energy consumption, which is more than any other sector, including: residential, commercial, and transportation[1]. Globally, the story is even more compelling; with the industrial base now accounting for nearly half of all energy consumed[2]. Furthermore, in the top 10 most energy intensive industries, the cost of energy can range anywhere from 3.3% to 56% of total production costs[3].

The time is now for the leaders of industry to take action; not for altruistic reasons, but because it makes good business sense. Energy use is a large cost for many manufacturers, and finding ways to reduce cost is a critical directive for industry leaders today. In fact, eighty percent of respondents from a recent Aberdeen survey on Energy Management in Manufacturing indicated that reducing costs was one of the top two pressures impacting their operations.

Figure 1: Top Market Pressures



Source: Aberdeen Group, January 2010

Analyst Insight

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

[1] "Annual Energy Outlook 2009", Department of Energy, Energy Information Administration, March 2009

[2] "International Energy Outlook", Department of Energy, Energy Information Administration, May 2009

[3] "Energy Trends in Selected Manufacturing Sectors", Environmental Protection Agency, May 2007

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Real Reductions in Energy Use

To gain an understanding of how organizations respond to these cost pressures, it is necessary to first identify those manufacturers that have made substantive reductions in energy use. In Aberdeen's most recent survey on energy management, participants were asked to reveal performance in the following Key Performance Indicators (KPIs):

- **Real Change in Energy Use:** Measured as the year-over-year change in energy consumption; controlled for year-over-year changes in production output and normalized by energy intensity of the production process
- **Operating Margin vs. Corporate Plan:** Measured as operating margin realized relative to the corporate goals established

These two KPIs are critical for measuring the success of any energy management initiative. It not only takes into consideration how effectively a plant is reducing energy use but also considers how well this reduction translates to corporate performance gains. In Table 1, the performance of the top 20%, middle 50%, and bottom 30% of organizations is presented.

"Our energy management initiatives are around optimizing processes that generate steam to reduce natural gas consumption."

~ Mid-Size European Chemical Company

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	▪ 15% Real **Reduction** in Energy Use ▪ +14% Operating Margin vs. Corporate Plan
Industry Average: Middle 50% of aggregate performance scorers	▪ 7% Real **Reduction** in Energy Use ▪ +2% Operating Margin vs. Corporate Plan
Laggard: Bottom 30% of aggregate performance scorers	▪ 6% Real **Increase** in Energy Use ▪ -9% Operating Margin vs. Corporate Plan

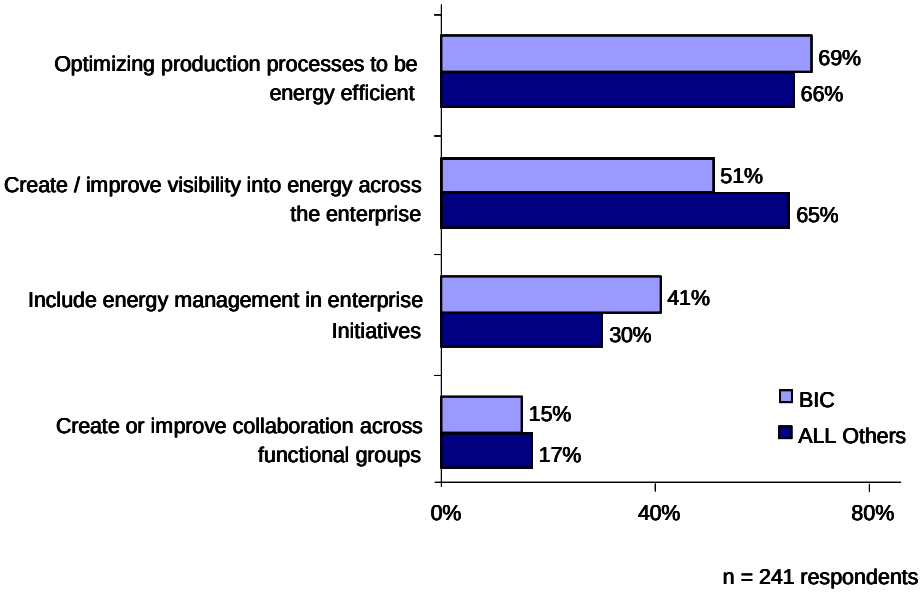
Source: Aberdeen Group, January 2010

There is a significant difference between the performance of top manufacturers and those still struggling with energy management. The Best-in-Class are able to effectively manage operations and reduce energy consumption by 15%, while outperforming corporate targets for operating margins by 14%. Compared to Laggards, with a net 6% increase in energy use and profitability miss by 9%, the difference is staggering. It should also be noted that there is a strong correlation with reducing energy consumption and the ability to outperform on corporate profitability targets. In the next section we will examine what is specifically driving these performance gains.

Strategic Actions Driving Reductions in Energy Use

Currently, there are two different but related strategic actions that are being deployed by a majority share of the market. The top strategy, which is more likely to be deployed by the Best-in-Class than underperforming organizations, is to optimize production processes to be more energy efficient (Figure 2). More specifically, this means Best-in-Class companies are using actual energy consumption, at the unit level, to make real-time decisions for optimizing production, maintenance, and energy delivery processes, among others. Best-in-Class manufacturers understand that strategies regarding energy management should not focus on tracking energy consumption at the utility bill level alone, but that they need to have a demonstrable impact on performance, which requires intelligent operational decision making.

Figure 2: Top Strategic Actions



n = 241 respondents

Source: Aberdeen Group, January 2010

The second major strategy, which is more likely to be deployed by Industry Average and Laggard organizations, is creating or improving visibility into energy use across the enterprise. Visibility is often a good first step for organizations just starting down an energy efficiency initiative. It won't get a manufacturing organization all the way to the point of being able to optimize operations but it can highlight trouble areas and jumpstart the process for making efficiency gains. Then, as the organization matures around energy management, the transition to focusing on optimization will be a natural progression. Taking this tiered, maturity based approach, to strategy deployment should go a long way to eliminating the false starts and failed implementations that are often associated with any new corporate led initiative.

Defining Energy Intelligence

It is a good start for many organizations to have an established corporate strategy for reducing operational costs by providing visibility into energy use and optimizing operations based on energy costs. However, it is something else entirely to achieve actual performance gains, and this is where Best-in-Class manufacturers excel. In Table 2, the technology enablers that are key to Best-in-Class success are listed. All of these are core functionalities to an Energy Intelligence deployment, and are discussed in more detail below.

Table 2: Energy Intelligence Capabilities

	Best-in-Class	Average	Laggards
Functional Requirements of Energy Intelligence	Energy data is collected automatically and stored in a central location		
	67%	50%	19%
	Maintenance operations are optimized with energy performance accounted for as a constraint		
	62%	34%	16%
	Production operations are optimized with energy performance accounted for as a constraint		
	55%	41%	23%
	Alerts and Event Management		
	46%	37%	24%
	Energy Dashboard		
	44%	21%	9%
	Energy Analytics		
	34%	20%	18%

Source: Aberdeen Group, October 2009

When viewed holistically, the six functional requirements in Table 2 are all closely tied to the top two most common strategic Energy Intelligence actions being deployed today, namely energy visibility and optimization. The most common component of Energy Intelligence being deployed by the Best-in-Class is the automated collection of energy data. This functionality is over three times more likely to be adopted by the Best-in-Class than the Laggard organizations. Furthermore, automated data collection forms the basis of any Energy Intelligence deployment, and is the foundation of real-time decision making; enabling many of the additional functionalities listed. However, for automated data collection to truly form this foundation, it is important for the data to be collected at a sufficiently granular level.

The next two most frequently adopted components of Energy Intelligence are specific to the optimization of operations. It is important to note that optimizing maintenance and production operations for energy use is highly correlated to improved energy efficiency and corporate profitability, with each component being two times more likely to be adopted by the Best-in-

Top Energy Intelligence Vendors

- √ ABB
- √ Danfoss
- √ Emerson
- √ EPS Corp
- √ GE Intelligent Platforms
- √ Iconics
- √ Invensys Operations Management
- √ Rockwell Automation
- √ Schneider Electric
- √ Siemens

Class manufacturers than Laggards. The other important issue is that optimizing production and maintenance requires more than just the deployment of Energy Intelligence. The optimal solution architecture is to integrate Energy Intelligence with the systems managing maintenance and operations, like: Manufacturing Operations Management (MOM), Advanced Process Control (APC), and Enterprise Asset Management (EAM). By taking this approach, the disruption to current operations is minimized and the value of legacy systems is maximized. For more detail on this integration, please see Aberdeen's recent benchmark report: *Energy Management: Driving Value in Industrial Environments*.

The final three components of Energy Intelligence are common to many types of technology, such as Business Intelligence (BI), but used in the context of Energy Intelligence, deliver specific value to companies around reducing the use of energy. When organizations jointly adopt Alerts and Event Management, Energy Dashboards, and Energy Analytics, it allows these organizations to effectively leverage collected energy data to contextualize real-time events and make optimal decisions based on historical trends. This is the true benefit of Energy Intelligence and can significantly reduce energy use while improving corporate performance.

Food and Beverage Case Study

In 2008, a leading US dairy producer was facing intense market pressure to measure and reduce their carbon emissions in order to maintain shelf-space and market share at one of their leading retail customers. As a result, they needed a way to lower their energy usage in their production processes throughout their facilities, and to reliably measure and verify their energy consumption and carbon emissions to meet their customers' new standards. The company set an aggressive goal to reduce their carbon emissions by 20% over the next five years and began searching for methods to operate more efficiently in every aspect of their organization.

To help achieve this goal, the dairy producer realized that measuring, controlling, and providing visibility into energy use would be critical for creating and sustaining energy efficiency gains. Furthermore, it quickly became apparent that monthly utility bills would not give plant operators the needed visibility or feedback on operations to achieve the target energy savings. To create this visibility, a 4 plant pilot program was rolled out, deploying EPS xChange Point ™. At each of these sites, EPS xChange Point™ collected near real-time electric, water, fuel and weather data. Additionally, EPS xChange Point™ provided visibility into the performance of the most energy intensive sub systems, including: refrigeration, compressed air, steam boilers and waste water.

In the first 90 days of deploying EPS xChange Point™, a number of discoveries were made that more then covered the installation of the system. First, one plant discovered that there was more waste water being discharged from the plant than there was clean water coming into the plant. On further investigation, it was determined that the waste water meter was

out of calibration and that the utility fresh water meter was overstating consumption compared to the EPS xChange Point ™ meters. The meters were properly recalibrated, resulting in significant monthly cost reductions. Another quick gain was found by correlating natural gas use with boiler feed water use, which allowed plant management to discover the over-utilization of boilers on the weekend, which in turn translated into an approximate 20% natural gas savings. Finally, EPS xChange Point identified that another plant could lower their electrical demands by as much as 200 to 300kw by monitoring and shutting down non-critical loads, translating to cost savings of up to $3,000 per month.

To corporate leadership, it quickly became apparent that an enterprise-wide deployment of the system would more than pay for itself in an adequate time frame and that these issues could not be effectively addressed by only using traditional energy audits. It is now the belief of the management that sustaining, over time, the benefits of these changes can only be achieved with a continuous monitoring system, which is exactly what the leadership is betting on over the coming years. Based on the success of the pilot program, EPS xChange Point™ was rolled out across the enterprise to the company's largest 50 plants in 2009.

Recommended Actions

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

- **Establish a formal corporate strategy. This strategy should be focused on** reducing overall operational costs through improving visibility of energy use and costs and optimizing operations based on energy costs and efficiency.
- **Invest in Automated Energy Data Collection.** This automation will serve as the basis for real-time visibility into energy data and provide a better understanding of plants' energy usage.
- **Include energy as part of the optimization process for maintenance and production operations.** Less than 20% of Laggard companies use energy data as a factor when optimizing maintenance and production operations. Integrating Energy Intelligence with Manufacturing and Maintenance systems will greatly improve the overall energy efficiency of operations.
- **Capitalize on investments in data collection and optimization. Energy Intelligence is all about providing the right data, to the righ**t decision maker, at the right time, and in the right context; which takes more than just automated data collection. As part of an overall Energy Intelligence deployment, manufacturers should also invest in Alert and Event Management, Dashboards, and Analytics.

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

Related Research	
Energy Management: Driving Value in Industrial Environments; April 2009	*Sustainable Production: Good for the Plant, Good for the Planet*; September 2009

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