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Optimizing Corporate Sustainability With Real-time Data

A GTM Research Whitepaper

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1 EXECUTIVE SUMMARY

From its "green team" origins, corporate sustainability has found its way into the executive suite and corporate boardroom. Many organizations now have a chief sustainability officer, and some of these same companies routinely issue reports on their progress toward sustainability. However, largely missing from the sustainability calculus is a way to move into the mainstream of day-to-day workplace decisions. For sustainability to reach the next level, operations staff who make resource decisions need feedback and visibility on the results of their actions, and senior executives need a way to gauge performance so they can reward improvements and troubleshoot lingering problems.

The maxim 'what gets measured, gets done' still applies to any organization that intends to drive its operations to a higher level of efficiency. However, building a sustainable business during times of great change and uncertainty will require an updated perspective, new tools and skillsets to make sustainable thinking part of the organizational culture, as well as to empower employees to take action. This whitepaper describes a metrics-based approach to sustainability that leverages real-time data to help organizations improve performance.

Part one of this whitepaper explains the benefits of corporate sustainability, while part two explains the value of a real-time data infrastructure for driving sustainability. Part three examines sustainability opportunities for a range of industry sectors (utilities, oil & gas, chemicals and petrochemicals, manufacturing, materials/mines/metals and metallurgy, pulp & paper, and critical facilities and data centers). Part four presents case study examples of different corporations that are employing a real-time data infrastructure to drive sustainability, and the last section of the report provides a framework for planning a sustainability roadmap.

2 THE BENEFITS OF CORPORATE SUSTAINABILITY

> "When we went after our CO2 goals, [...] we used technology to give the guy or girl on the shop floor better data and faster data so they could make real-time changes to the processes. This gave us lower energy costs, a lower carbon footprint and typically a higher output."
>
> – Kevin Anton, Vice President and Chief Sustainability Officer, Alcoa

Sustainability is a platform for managing business in an efficient and holistic manner. It provides resource and production decision-makers with tools and support to make better decisions. The benefits of a focus on sustainability are three-fold:

1. Resource and energy efficiency
2. Pollution abatement
3. Asset optimization

Each of these benefits is discussed in more detail in the following sections.

2.1 Resource and Energy Efficiency

The risk of rising raw material costs – and even of supply disruptions – is emerging as a key business sustainability challenge for the 21st century. Data-driven statistical process control can reduce scrap rates and improve yields from raw materials and energy. To begin quantifying opportunities to improve resource efficiency for your organization, think broadly about the natural resources your business uses.

- How much power does your business use?
- What does water consumption look like?
- Does your business use fossil fuels to generate thermal heat?
- What about other inputs like metals, wood or minerals?
- How much fuel is used for transportation?

Getting answers to these basic questions will help establish an efficiency baseline that shows current sustainability performance. Unlike revenues, every dollar of efficiency improvements flows through to the bottom line, and many organizations quantify energy and resource efficiency in terms of dollars saved.

Efficiency metrics that tie resource consumption to production or business provide a big-picture view of sustainability performance. These same metrics can be used to identify improvements.

2.2 Pollution Abatement

Pollution includes greenhouse gases like carbon dioxide (CO_2); toxins like nitrous oxide (NO_x) and sulfur dioxide (SO_x) (all from fossil fuel combustion); water effluents (for instance, chemical discharge from pulp and paper production); thermal heat released into the air or water; toxic metals from metal silicon wafer production; and so forth.

Pollution abatement and improved waste handling are key strategies for reducing the impact of byproducts. However, more efficient processes that improve yields can also reduce waste byproducts and environmental impacts.

2.3 Asset Optimization

Asset maintenance and optimization is another form of sustainability that has a direct impact on corporate performance.

Longer asset life translates to fewer purchases of new equipment and reduces the associated raw materials' impact on natural resources. It also reduces the indirect environmental impacts of manufacturing, transporting and installing new assets. Proper asset sizing cuts down on waste and frees trapped capital, as well.

Depending on the business, the positive environmental and corporate performance impacts of improved asset maintenance and care can be significant.

3 THE VALUE OF A REAL-TIME DATA INFRASTRUCTURE

Employees that make resource decisions impact sustainability performance. A real-time data infrastructure provides insight into sustainability performance and metrics to measure the impacts of:

- Changes in operational procedures
- New, more efficient equipment
- Adjustments to temperature controls
- Changes to operational settings
- Energy efficiency retrofits

The ability to create rules that trigger real-time alerts is another important capability. For instance, an alert identifying a sudden spike in water consumption may draw attention to a costly water leak; an alert that flags a sudden decline in manufacturing yields could draw attention to a faulty batch of raw materials. Real-time alerts enable immediate action, and data trending creates a feedback loop for continuous improvement.

To be most effective, a real-time data infrastructure should also provide easy organization-wide information access using intuitive interfaces at both enterprise-wide and local levels (in other words, think globally, act locally).

While there are point solutions for specific needs (one example is greenhouse gas accounting software), the advantage of a data infrastructure is that it can be adapted to a wide range of uses, and customized to support different contexts. For instance, a real-time data infrastructure can be tailored to measure pollution as well as energy consumption, asset utilization and more, all with a common set of tools and within a common data collection and management framework.

3.1 Using Analytics to Power Decision-Making

Raw data needs context to become actionable information. Examples of sustainability context include:

- Key performance indicators that track production processes
- Dashboards and reports that relate raw data like kilowatts used to dollar amounts and greenhouse gas (GHG) emissions
- Predictive models to identify problems before they occur so preventive action can be taken (for instance, detecting a deteriorating piece of power conditioning equipment that could damage industrial machinery)
- Visualizations that show trends and patterns over time, such as the amount of power consumed per unit of production
- Statistical tools for building correlations that relate power consumption or resource use to other factors like weather, a new, more efficient piece of equipment, etc.

The constituents for value-add analytics are two-fold: 1) senior managers and executives interested in monitoring and tracking sustainability progress and 2) line managers and individual contributors that need tools for planning changes, taking action and measuring results. In general, dashboards and reports are of the greatest interest to executives and senior managers, while statistical analysis, modeling, and predictive models are most useful to those tasked with day-to-day operations. The best arrangement, however, is for all employees to have access to the big picture, as well as the ability to drill down into details.

4 FOCUS ON INDUSTRY: SUSTAINABILITY OPPORTUNITIES BY SECTOR

Opportunities for sustainability improvements vary widely from one industry to the next. Each industry has its own unique value chain that establishes relationships to the environment. However, all industries can benefit from the ability to capture, store and analyze real-time operational data. This section of the report provides a brief investigation of sustainability opportunities for key industries and the role that a real-time data infrastructure can play.

4.1 Utilities

Key sustainability opportunities for utilities include more seamless integration of variable renewable power sources like wind and solar energy, opportunities to curtail demand to avoid costly spikes in demand, helping customers conserve power, and optimizing the delivery of power by tuning transmission and distribution. All of these and more have fallen under the general moniker of 'smart grid.'

Most descriptions of smart grid-enabling technology focus on two dimensions: digital device deployment and end-to-end data communications. The resulting 'data tsunami' is largely viewed as an inconvenient post-deployment challenge.

An alternative view is that smart grid actually represents the build-out of a flexible and robust data infrastructure that brings distributed data from sources like smart meters and renewable power controllers (i.e., inverters) and sensors into the enterprise for improved analysis and decision-making, improved asset management, grid optimization, and for incorporating renewable power into the grid as a dispatchable resource – something the California ISO is currently doing with its real-time data infrastructure. (The California ISO example is discussed in a subsequent section of this whitepaper.)

4.2 Oil & Gas

Increasing global demand and diminishing global supply mean that most of the 'cheap and easy' oil and gas reserves are exhausted, necessitating increasingly sophisticated techniques to sustain access to fossil fuels. Examples include maximizing recovery from conventional wells nearing depletion, as well as new, complex production techniques like deep sea drilling, slant drilling, tar sand mining and refining, and natural gas 'fracking.' Supply-chain complexity increases in tandem with production complexity. The good news is that sensor technology for process control is typically embedded all along the supply chain. Sensor data can be analyzed to identify supply chain efficiency improvements.

Real-time data can be used to identify opportunities for improvements all along the value chain that spans from wellhead to pump. Examples include better coordination of shipping oil from offshore rigs to shore-based refineries, as well as ensuring the safety of natural gas pipelines. An example of data-enabled gas pipeline safety is discussed later in this whitepaper.

4.3 Chemicals & Petrochemicals

According to an International Energy Agency sector report, the chemicals and petrochemicals industries account for more energy consumption than any other industry (30 percent). The same report estimates the energy savings potential for chemicals and petrochemicals to be in the range of five to 15 percent over the short to medium term, but goes on to state that “the results indicate that progress must be made primarily on data availability and data quality,” a clear call to action for the industry to implement a real-time data management infrastructure.

Key focal points for chemicals and petrochemicals sustainability are: lowering process energy content, replacing virgin feedstock with recycled content, and reducing air pollution, thermal pollution, etc. A real-time data infrastructure can help in multiple areas. For instance, it can help plant engineers monitor and control waste byproducts by establishing cause-effect relationships between process controls and yields and feedstock, catalysts, water, gases, etc. These are capabilities that extend well beyond passive GHG accounting software.

4.4 Manufacturing

Manufacturing efficiency, sustainability and profits are all interconnected. Higher manufacturing yields and lower defect rates reduce raw material use and improve environmental and financial performance. Statistical process control and six sigma methodologies – enabled by real-time data collection and analysis – can reduce defect rates, increase yields, help the environment and improve the bottom line.

In addition, energy and water consumption can be substantial for some industrial processes. For instance, according to GE, a large semiconductor fabrication facility can consume millions of gallons of ultrapure water per day, since a chip may come into contact with water more than 35 times during the manufacturing process. Small improvements in water utilization can translate into savings of millions of gallons and significant financial benefits. This is something IBM Burlington learned when it implemented a real-time data infrastructure using OSIsoft PI System at its wafer fabrication plant, saving $10M annually in energy and water.

4.5 Materials, Mines, Metals and Metallurgy

Mining, metal production and the production of construction materials are resource-intensive industries that require significant energy and produce extensive by-products. Small gains in yields and energy efficiency translate into major sustainability wins and financial windfalls.

According to a World Business Council for Sustainable Development report (Cement Technology Roadmap 2009), cement accounts for five percent of global CO2 emissions, making it the second-largest CO2-emitting industry behind power generation. The same report points out that “the efficiency at which manufacturing machinery is operated and maintained is key to ensuring that maximum operational efficiencies are achieved.”

Cement manufacturer CEMEX, a global building materials company with $14B in annual sales and operations in 50 countries, is implementing a real-time data infrastructure to improve sustainability performance. CEMEX is metering equipment at its production facilities and using the OSIsoft PI System real-time data infrastructure to gain visibility and control over power consumption. CEMEX is now able to calculate energy efficiency by type of equipment, and employees at each of its 69 plants monitored by the PI System can now measure performance against key performance indicators (KPIs). Standardized OSIsoft PI Process Book displays make it possible for corporate users to access and analyze data from anywhere in the company.

4.6 Pulp & Paper

Energy costs are a major component of overall paper mill expenses, running as high as 10 percent of revenues. Paper and pulp mills are also major users of water, with evaporative discharges from cooling, pressing, as well as the discharge of black liquor (the discharge from digesting pulpwood into paper pulp), for instance. Improvements in energy efficiency can help reduce GHG footprint and expenses – and help insulate paper mill economics from surging energy costs. Improvements in water use and thermal discharge also reduce the local environmental impact of paper mills.

Energy efficiency measures undertaken in the pulp and paper industry have a high enough payback to drive the business case for investments in energy metering and measurement devices, process controls and data infrastructure. Examples of quick wins include adjustments in operating temperatures, and participation in demand response markets (where available). A data infrastructure also helps to optimize power procurement to reduce costs, including evaluating return on investment from generating power from black liquor, and/or from steam exhaust. A pulp and paper energy efficiency case study appears in a subsequent section of this whitepaper.

4.7 Critical Facilities, Data Centers

According to the U.S. Environmental Protection Agency's ENERGY STAR® Program, health care is the fourth-largest producer of carbon emissions in the commercial building sector. A recent study (Managing Energy Costs in Hospitals) estimated annual energy use per square foot of 27.5 KWh and 110 cubic feet of natural gas. Clearly, the impact on operating budgets – and healthcare expenses – is sizable. The opportunity in this sector is to apply a real-time data infrastructure to identify energy efficiency opportunities that do not compromise quality of care.

Data centers are also a major power consumer. A recent study by Stanford professor Dr. Koomey ("Growth in Data Center Electricity Use, 2005 to 2010") estimates worldwide 2010 data center power use at 203.4 billion KWh, or 1.12% of total worldwide consumption, with around half the total devoted to cooling and power distribution. Real-time data can be used to target reductions in cooling expenses (for instance, using outside air instead of air conditioning when favorable) to better monitor and manage server load to increase power consumption efficiency, and to give remote technicians visibility and access to make adjustments. The eBay power efficiency initiative is shared later in this report.

5 SUSTAINABILITY IN ACTION

This section of the report profiles the use of real-time data to improve sustainability performance at five organizations:

- Halifax Water – leak detection
- eBay – reducing data center power consumption
- Bayer Material Science – reducing carbon emissions
- Alcoa – demand response
- Cascades – increasing energy efficiency
- NiSource – asset efficiency
- Cal ISO – integrating renewable energy on the grid

5.1 Water Management (Halifax Water Utility)

> "Sustainability on both sides of the meter."
>
> – Carl Yates, GM of Halifax Regional Water Commission

Sustainability Challenge: Detect and fix water leaks to preserve freshwater and capture lost revenue

Solution: Automatic leak detection using OSIsoft PI data infrastructure and OSIsoft Process Book visual display

Benefits: $650,000 annual savings by reducing water leakage.

Halifax Water is a municipal water, wastewater and storm water utility that serves 325,000 residents in Halifax, Nova Scotia. Its assets include 20 water pumping stations with 1,300 kilometers of pipe, plus 160 storm and wastewater pumping stations. The Halifax Water region is broken into smaller district metered areas. Intent on making process improvements, Halifax Water implemented automated leak detection by following leakage management best practices set forth by the International Water Association.

The solution consists of an OSIsoft PI System data infrastructure that connects two meters in each district metered area to the PI System database. OSIsoft PI ProcessBook displays, calculates and graphs minimum night flow between 3 a.m. and 4 a.m. to identify potential problem points. The system includes a PI DataLink application based on Microsoft Excel that uses Visual Basic to calculate real-time water loss for investigation and resolution. Halifax Water is also helping its largest customers conserve water by providing them with real-time water consumption dashboards. Plans include extending the PI System to wastewater management as well. Halifax Water reports annual savings of $650,000 from water leakage detection.

5.2 Energy Management (eBay)

"The foundation of our revenue is our data centers."

– Dean Nelson, eBay Director, Global DC Strategy

Sustainability Challenge: Reduce data center power consumption

Solution: OSIsoft PI System for data collection to support power management by remote engineers and to coordinate the use of outside air for cooling with the goal of using passive cooling instead of air conditioning for half the year.

Benefits: The goal is to make a new, state-of-the-art data center that is 30 percent more efficient than the most efficient data centers already in operation.

Internet commerce leader eBay supports an average of 88 million active users at any given point in time, and the company has a number of enormous, power-hungry data centers managing its online auctions on a 24x7, year-round basis. As part of a green data center build-out (LEED Gold), eBay set the objective of making it possible for skilled engineers to remotely manage the data center, including climate controls and processor utilization.

EBay decided to monitor the new site using the OSIsoft PI System. Soon, eBay engineers, managers and executives will be able to review data center operational summaries, including power usage effectiveness (PUE, which is the amount of power actually being used for computing versus cooling and other overhead), IT load, and total power consumed. They will also be able to schedule work items and remotely turn off lights. OSIsoft technology will perform data collection to allow control algorithms to adjust the cooling system for passive cooling opportunities and to manage IT load on a continuous basis.

5.3 Emissions Management (Bayer Material science)

Sustainability Challenge: Achieve 'Best in Class' ranking in Carbon Disclosure Index.

Solution: Emission monitoring and power consumption tracking at 100 production plants worldwide; using OSIsoft PI System.

Benefits: Target of 25 percent GHG reduction for Bayer Material Science, 15 percent reduction for Bayer Crop Science, and five percent reduction for Bayer Health Care.

With sales in excess of €10 billion, Bayer Material Science AG is one of the world's largest producers of polymers and high-performance plastics. Bayer has a corporate goal of achieving a 'Best in Class' ranking in the Carbon Disclosure Index, a challenging goal to achieve given that the company operates 100 production plants at 30 sites around the world. The goal is an extension of the company's track record of achieving a 37 percent absolute reduction in GHG emissions between 1990 and 2007.

Bayer Material Science is managing a €1 billion program for climate-related research, development and projects, and is using the OSIsoft PI System as a central element in its GHG reduction goals. The PI System is being used to monitor emissions and energy efficiency at Bayer's 100 production plants, providing visibility into 85 percent of all emissions. The PI System is being used to provide production groups with real-time information from utility providers, and to calculate and display key performance indicators, costs, and energy quality and peak consumption.

5.4 Electricity Demand Response (Alcoa)

> "Incremental changes: that's what we found the PI System is doing for us. These little things that we can add to what we are already doing to put the information out to the people making the decisions, and then we reap the benefit of those decisions. That's the power of the PI System."
>
> – Brian Helms, Energy Services Coordinator, Alcoa Energy

Sustainability Challenge: Help balance power supply and demand on the grid through demand response.

Solution: Alcoa implemented the OSIsoft PI System and an energy management system as the underlying data infrastructure for managing power generation and consumption according to grid needs.

Benefits: Participation in demand response markets yielded a four-month payback on an investment of $700,000.

Alcoa is the world leader in the production and management of primary aluminum, fabricated aluminum and alumina. The company's sales in 2008 totaled $26.9 billion. As a manufacturer of primary metals, Alcoa's power needs for areas like smelter operations are massive. In fact, Alcoa has its own internal power generation utility, called Alcoa Energy.

Alcoa has the PI System installed in 20 facilities in eight countries with 600 end-users. Most recently, the PI System was installed at Alcoa Aluminum's largest North American smelter located in Newburgh, Indiana. Adjacent to the smelter is Alcoa Power Generation's Warrick Power Plant with 732 megawatts of generating capacity, which feeds the smelter and rolling mill processes.

Seeing an opportunity to participate in the upcoming Midwest ISO Ancillary Services Market (ASM), Alcoa Power Generation purchased the PI System as its underlying data infrastructure. Now, the Midwest ISO sends signals that are received by Alcoa's Smelter Control System to either increase or decrease load. The smelter increases aluminum production when low-cost excess megawatts are available from Midwest ISO; it also diverts some of the Warrick Power Plant's electricity into the Midwest ISO system to help the grid satisfy peak demands when prices are high – a win-win for Alcoa, Midwest ISO, and the environment.

5.5 Energy Efficiency (Cascades)

> "Cascades' senior leadership has made energy efficiency improvement and sustainability very visible in the company in both short- and long-term goals. The ROI was less than a year at the corporate level, based on the deployment speed."
>
> – Francois Ruel, President, Hulix Genie Conseil

Sustainability Challenge: Reduce $350 million annual energy bill by 2 percent per year.

Solution: Monitor and report energy usage information company-wide by installing energy meters, and by using OSIsoft PI System to gather and deliver immediate real-time energy usage data to employees company-wide.

Benefits: Cascades is achieving continuous reduction in energy consumption and GHG emissions, including beneficial use of 63 percent of generated waste, decreased natural gas consumption, and optimization of energy sourcing using real-time pricing.

Cascades Inc. is a leader in the recovery of recyclable materials and the manufacturing of green packaging and tissue products, with (Canadian) $3.9 billion in annual revenues. The company is the leading recycler of paper in Canada and manufactures tissue papers, fine papers and commercial and industrial and food packaging. Its annual $350 million energy spend is a reflection of the power-intensive nature of creating new product from recycled paper.

OSIsoft PI System is central to Cascades' sustainability initiatives. Cascades is using the PI System to improve paper mill management by monitoring energy use in real time across all its mills. Employees use the PI System dashboards and reports to track performance against energy-related key performance indicators with targets based on models from historical data.

5.6 Asset Optimization (NiSource)

> "At the core, data must be transformed into knowledge and connected to tangible actions for risk mitigation."
>
> – John Cox, Team Leader Optimization and Gas Quality, NiSource

Sustainability Challenge: Identifying potential pipeline risks and reliability problems and taking action before problems occur.

Solution: PI System for gathering risk management data and for defect analysis using multiple reliability engineering tools.

Benefits: Provides front-line workers with on-line condition monitoring for strategic compression stations using key performance indicators.

NiSource is a major natural gas distributor with more than 3.3 million customers in seven U.S. states and 60,000 miles of gas pipelines. To sustain its operations, NiSource faces the challenge of integrating modern technology assets with aging infrastructure. Also, natural gas fracking is dramatically changing the gas distribution landscape. Pipeline system managers must be proactive in capacity planning, while ensuring system stability.

NiSource is managing pipeline reliability with continuous monitoring of real-time data from its most important compression stations. The company's PI System-enabled analytic approach assesses critical locations, critical assets, system capacity constraints and system capabilities. The result is more effective decision-making on critical assets while keeping safety and reliability foremost.

5.7 Integrating Renewables Onto the Grid (Cal ISO)

> "This is the first renewables dispatch desk in the U.S. [...] This control room will be instrumental in [managing] this wave of renewable energy hitting our grid."
>
> – Stephanie McCorkle, director of communications and public relations for Cal-ISO

Sustainability Challenge: Integrating variable renewable power as a generation resource that can be dispatched to meet grid power requirements.

Solution: Real-time visualizations of wind and solar power generation in the Cal-ISO control room.

Benefits: Improved visibility of solar energy and wind power output helps system operators manage and integrate renewable power generation.

With responsibilities for managing the flow of electricity across the high-voltage, long- distance power lines that make up 80 percent of California's power grid, the California Independent System Operator (ISO) faces the daunting task of continually balancing power generation and transmission to meet power demand. The growing penetration of wind and solar power is adding to the complexity of the challenge. Both sources vary significantly in power output, as cloud cover and wind speed shift during the day. To meet the challenge, California ISO turned to OSIsoft technology.

Cal ISO is using OSIsoft PI System to combine data on wind speed and cloud cover with geospatial data to create renewable power output displays. System operators can now view geospatial visualizations that overlay power generation for grid-scale solar and wind power installations, including visual representations of key transmission lines. The new tools are helping California turn variable renewable power into a more predictable generation resource. Over the long term, this should help reduce the need to back renewable power with fossil fuel power and enhance the ability to effectively manage California's rapidly growing renewable energy portfolio.

6 PLANNING YOUR SUSTAINABILITY ROADMAP

This section of the whitepaper provides recommendations and guidance pertaining to how to design and implement continuous improvement sustainability programs that empower workers with real-time data.

6.1 Determine Environmental and Energy Footprint

The starting point for building out a metrics-driven sustainability initiative is understanding your organization's energy and environmental footprint. Key metrics include kilowatt-hours of electricity used, fossil fuels used for heating, power used for (industrial process) cooling and air conditioning in commercial and industrial facilities, water and raw material use, and pollution discharges (including carbon, other air contaminants, thermal waste, and water discharge). In some cases, the answers may already be known, either from existing meters and sensors or electricity and water bills, for instance. Organizations without immediate access to their own energy and environmental footprint data can begin with industry benchmarks available from a growing body of industry-specific sustainability studies.

High-impact areas should be the targets for your sustainability roadmap. These are the areas that have the most energy and environmental importance and leverage.

At this point in the process, it is not necessary to build detailed plans for how to achieve sustainability improvements. The data-driven employee empowerment model enables workers making day-to-day decisions to come up with their own strategies for improving sustainability performance.

6.2 Establish Objectives and Performance Metrics

It is up to executive leadership to set SMART organization objectives and mandates for sustainability (SMART stands for Specific, Measurable, and Actionable in a Reasonable Timeframe). The objectives should be corporate-wide, but should also have relevance to people that can take action. They can be quantitative performance metrics or criteria set by third-party sustainability rankings. Examples include reducing power and/or water consumption by some percentage each year, or achieving a 'Best in Class' ranking for sustainability within your industry sector (as determined by a third-party evaluation). In order to achieve lasting improvements, it is a good idea to set "evergreen" objectives. These are objectives that continue well into the future to avoid sliding backwards or a rebound effect (where any gains in efficiency are absorbed by increasing power demands in other areas).

It's time to develop key performance indicators (KPIs) that can track how the organization is performing in key areas once high-level objectives are identified. Examples include the amount of water and/or power per unit of production, energy efficiency ratings for individual pieces of capital equipment, or the amount of GHG emitted by each production site. A best practice is to align KPIs with sustainability responsibilities for different job functions. This gives employees feedback on how they are doing and encourages them to be proactive.

6.3 Identify Personnel and Data Sources

Sustainability doesn't happen by itself: it requires champions, executive sponsors and accountability in order to move beyond the era of voluntary "Do what we can" green teams and into a strategic corporate initiative that delivers lasting improvements in environmental, financial and asset performance.

It's important to build an organization-wide context of the people, processes and technologies that have a direct impact on energy consumption and environmental impacts. Examples include plant engineers that design systems that consume power, control room personnel that operate industrial control systems, plant managers responsible for managing production facilities, facilities managers that control climate settings and line employees that use power every day to do their work. These are the end-users that need access to real- time sustainability data.

The starting point for identifying data sources is to understand the meters, sensors and control systems already in place and the data they collect. Existing data sources should be mapped and compared to KPIs in order to create a gap analysis between what is available and what is needed. The gap analysis should include consideration of the potential uses and business value of measurement data, as well as an estimate of the cost and complexity to adjust and gain visibility. Understanding value and complexity makes it possible to prioritize investments.

6.4 Plan Your Sustainability Data Infrastructure

At a functional level, a sustainability data delivery infrastructure should connect end-users that can make sustainability decisions with access to real-time key performance indicator (KPI) data for their areas of responsibility. It should also provide executives with dashboard oversight of overall sustainability performance. Both line employees and executives should have the ability to drill down into detailed views of individual devices and equipment that they control.

Key capabilities for a sustainability data infrastructure include: 1) data collection, 2) data management, 3) analytical support, 4) data delivery, and 5) support for intuitive visualizations. Each of these capabilities will now be discussed in more detail.

1. Data collection interfaces make it possible to gather data from sensors and industrial process control devices in real time. Sensors can include purpose-built meters that measure the consumption of different commodities (e.g., natural gas, water, electricity); sensors that monitor exhaust (such as heat waste, carbon monoxide, SOX or NOX); and industrial process control devices and systems that measure and control production processes. Support for a wide range of devices makes it possible to source data as needed to build sustainability metrics and dashboards and to support value-added analytics.
2. Data management capabilities are needed to gather and consolidate different data streams from devices so the data can be merged together to gain a common view. Data management should also include the ability to create relationships between devices, processes, and people. This stages the data for more intuitive access and use.

3. Analytical support should include the ability to aggregate real-time and historical data and events into intuitive formats, including key performance indicators for different sustainability objectives such as conserving resources, reducing pollution, maximizing yields and ensuring maximum asset performance and longevity.
4. Once data is consolidated and organized, it is ready for delivery (push) and shared access (pull) by the people and processes that can benefit from it. Data delivery capabilities should include support for real-time feedback to personnel managing processes and systems that have a direct impact on sustainability objectives, and for delivering summary- level data to senior managers and executives interested in a more consolidated, birds- eye overview.
5. Examples of intuitive visualizations include process control dashboards that show key values in a format that resembles the dials in the cockpit of an airplane, graphs and charts that show trends and anomalies, and standard reports that can be further customized to meet specific needs. The ability to download and manipulate data in comfortable and familiar desktop tools like Excel and more powerful statistical analysis tools like Minitab is also important for empowering end-users to conduct their own analyses.

A comprehensive data infrastructure provides these end-to-end capabilities in a seamless and easy-to-use fashion, but with depth of functionality and the ability to tune and configure each capability to meet specific needs.

6.5 Measure, Change, Optimize

With continuous access to sustainability KPIs and real-time performance data, it is possible for workers and executive management to incorporate sustainability as a key element in the work that they do. Baselines that provide data on historical performance are an excellent starting point. Ongoing performance can be compared to historical baselines, and the baselines can keep evolving to support continuous improvement.

Organizations that understand their sustainability footprint and set ambitious objectives – and then back those objectives up with key performance indicators and a robust real-time data infrastructure – will be well on their way to notching lasting gains in sustainability performance. The key is employee empowerment that enables bottom-up action and top- down visibility using real-time performance data.

Visit http://www.osisoft.com/software-support/what-is-pi/What_Is_PI.aspx to learn more about the OSIsoft real-time data infrastructure.
Visit http://www.osisoft.com/sustainability/ to learn more about how OSIsoft PI System can be used to power sustainability in your organization.

7 ABOUT OSISOFT, LLC

OSIsoft, a global leader in operational intelligence, delivers an open enterprise infrastructure to connect sensor-based data, operations, and people to enable real-time and actionable insights. As the maker of the PI System, OSIsoft empowers companies across a range of industries in activities such as exploration, extraction, production, generation, process and discrete manufacturing, distribution, and services to leverage streaming data to optimize and enrich their businesses. For over thirty years, OSIsoft customers have embraced the PI System to deliver process, quality, energy, regulatory compliance, safety, security, and asset health improvements across their operations. Founded in 1980, OSIsoft is a privately-held company, headquartered in San Leandro, California, U.S.A, with offices around the world. For more information visit www.osisoft.com.

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