



ENERGY MANAGEMENT INFORMATION SYSTEMS

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In the hydrocarbon sector, saving energy is the most reliable way to reduce operating costs and improve margins in a volatile market. Energy projects have a lower risk profile as they are less dependent upon relative prices of different products. Saving energy will always save money; today, tomorrow and next year. Energy projects will:



- Throughout the plant life cycle from new designs through revamps and into best operating practices reduce business risks by maximising returns on investment and continually drive down operating costs.
- Minimise the risk associated with stricter governmental and environmental legislations by reducing emissions and at the same time, improving public image.

Drivers to Reduce Energy Consumption

Energy is the largest controllable operating cost at most operating sites as shown in Figure 1. Energy savings, which in each typical asset can be of the order of \$30m per annum, can improve margins and remain on the bottom line indefinitely.

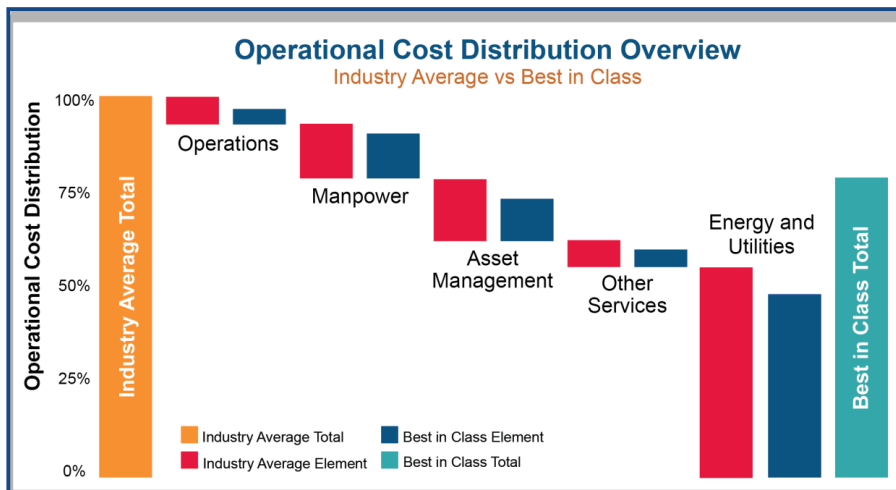


Figure 1: Operational Cost Distribution Overview

Figure 2 shows a site where both technical and organisational improvements were combined to deliver a programme of energy efficiency improvements over a 4 year time frame.

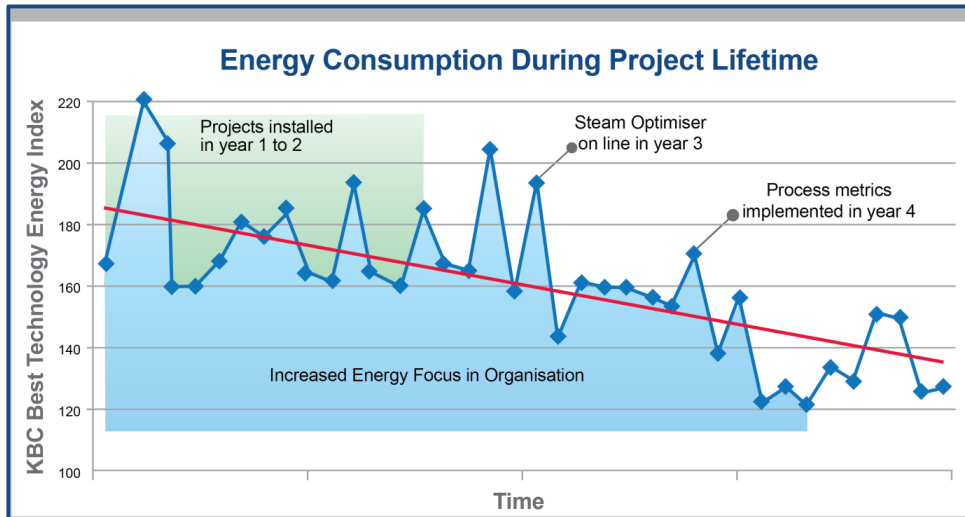


Figure 2: Energy Consumption During Project Lifetime

This operator benefitted from a 20% reduction in energy index over 4 years, resulting in them becoming a top quartile performer.

Challenges and Opportunities

While most operating companies have some elements of an energy management system, very few have all economically justifiable elements working and contributing to maximum energy efficiency and hence profitability. A best practice energy management system must at the very least comply with the ISO50001 standard for best energy management practices. It should also provide the technical add-ons that ensures ISO50001 delivers results in the hydrocarbon industry. One such programme is KBC's ENgage™ programme which is proven to close the gaps by integrating technical, organisational and behavioural change methodologies in order to identify, evaluate and deliver improvement opportunities. Figure 3 below shows how the technical add-ons are integrated into the various stages of the ISO50001 certification.

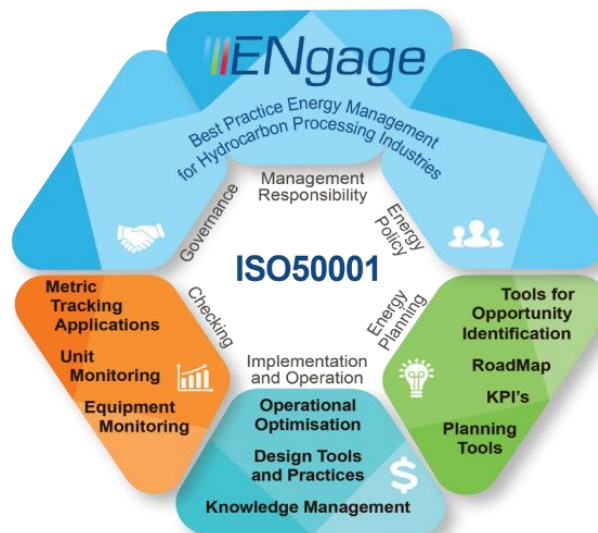


Figure 3: Integrating the Technical Add-Ons into ISO50001



Any programme set up to deliver superior energy performance via an Energy Management System, EMS, must consist of all tools, procedures and practices required to be a leading and sustainable energy performer. A best practice EMS must therefore include the following elements:

- The development of an appropriate organisational structure that is aligned with site's long term energy efficiency improvement goals
- The development and implementation of Best Practices
- Best Technology benchmarking methodologies to understand the gaps and deliver the business case
- An integrated suite of tools incorporating process simulation, utilities system modelling and pinch technology to identify all gap closing opportunities
- Optimised RoadMaps for non-investment operational improvements and optimised capital expenditure
- Organisational competency and effectiveness improvement to sustain the benefits
- The latest state-of-art technology enabled energy management information systems embedded in the day-to-day operation consisting of:
 - An appropriate set of Energy Metrics
 - An effective Monitoring and Reporting system

All this should be preceded by a comprehensive energy audit which identifies both the technical and organisational gaps and improvements.

Benefits of an Energy Management Information System (EMIS)

Whereas the EMS encompasses all aspects of an energy management programme an Energy Management Information System (EMIS) is focussed on the monitoring and reporting of energy metrics. The benefits from a metric tracking system include:

- An increased focus on energy performance throughout the organisation from operators, process engineers, unit managers through to the energy manager and ultimately the site leadership team
- Providing a methodology to sustain improvements in energy performance across the whole organisation
- Capturing benefits immediately rather than waiting for a weekly or monthly review when the opportunity to capture the benefit may well have been lost
- Improving consistency of operation from shift to shift as well as a common understanding of how and what needs to be achieved

The financial benefits of monitoring and reporting systems have been proven time and time again and that with very little outlay in capital it is possible to achieve savings between 2% and 4% of the sites energy consumption. This is typical and as such rapid payback on time and technology invested is achievable e.g. a European refinery recently reported savings of \$1.5 million per year related to improved stripping steam use alone.

Metrics Development

Energy metrics are defined at each level of the organisation in a hierarchy that allows "drill down" from an overall site level through the process units and down to the equipment or individual system level. This hierarchy is shown in Figure 4 and can be categorised into two types of metric defined in terms of:

- Top-level and mid-level Key Performance Indicators (KPI) which can be subdivided into:
 - Energy Coordinator level that are strategic and allows management to drive continuous improvement across the whole site e.g. site specific energy consumption and site best technology energy index

- Engineering level that are analytical and promote further investigation e.g. heat exchanger fouling and compressor efficiency
- Operations-level Energy Influencing Variables (EIV) for all production units and the utility system that are easily measurable and can be controlled from the operators panel e.g. stripping steam rates and furnace O2.

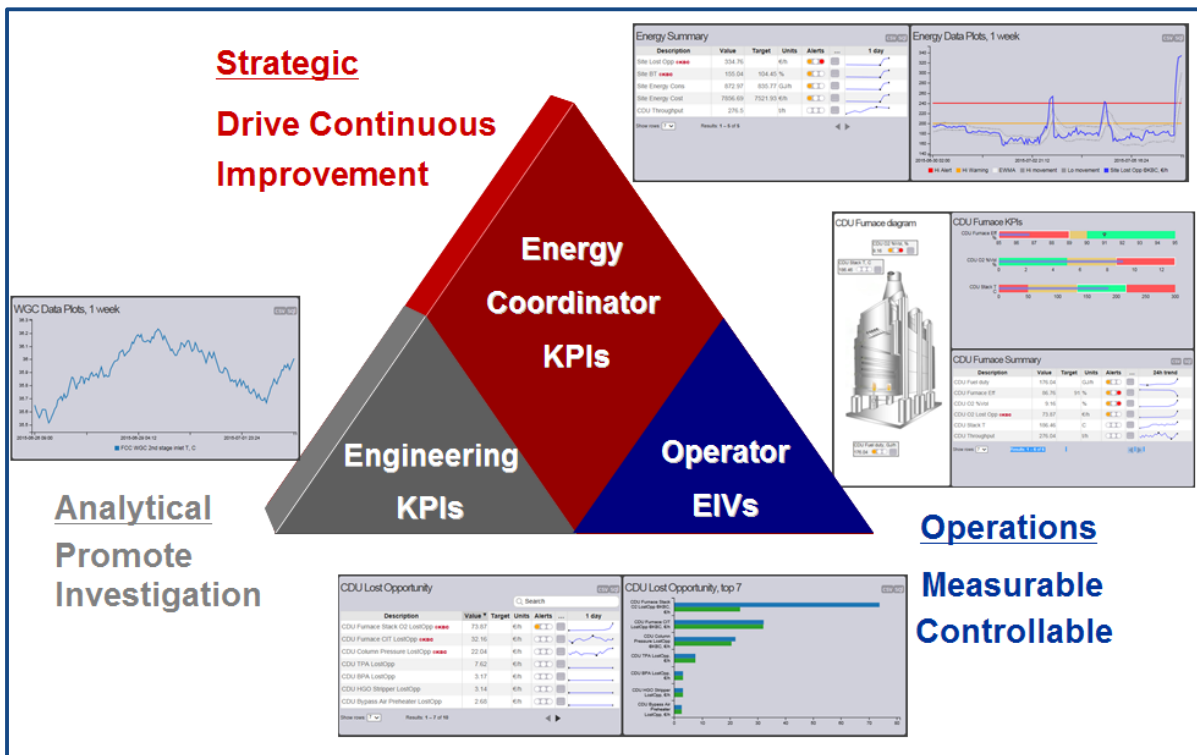


Figure 4: Typical Metrics Structure

After the energy metrics development has taken place, the next step is to incorporate them into a site energy monitoring system. Many systems are available on the market, but most tend to focus on reporting costs on a weekly or monthly basis rather than reporting on live data where immediate corrective actions can be taken.

KBC’s best practice energy monitoring and reporting systems are based on SUMMIT (Smart Unified Monitoring & Management Information Toolkit) which is a performance management system that links top level strategy to front line action, and vice versa. SUMMIT is the green “performance management” arrow in the one KBC model shown in Figure 5 that links from strategy, down through asset optimisation and back up again, on a foundation of people, organisation and applied technology.



Figure 5: KBC SUMMIT for Energy Performance Management

Conclusions

The key to capturing these benefits associated with optimising energy usage is to begin a process of systematic and methodical energy monitoring and optimisation. Once the no/low cost and quick win opportunities have been identified and implemented within the utility system and process units the next step is to develop an energy management information system. Use of SUMMIT for monitoring and reporting Energy Metrics sustains the benefits and ensures continuous improvement through:

- Accurate heat and mass balance reconciliation using fundamental Petro-SIM™ and Energy-SIM™ models
- Use of Best Technology data base and experienced Subject Matter Experts to identify appropriate metrics and set reporting hierarchy
 - Use of models and experience supports predictive analytics of “big data” sets
- Accurate monitoring of equipment and systems
- Dynamic target setting and lost opportunity reporting
- Corrective operator actions and associated work processes
- Reporting at all levels through web based dashboards

SUMMIT delivers energy improvement through the accurate definition of targets and calculated lost opportunity costs.



WHITE PAPER

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The EMIS Value Proposition is:

- Savings from a SUMMIT based EMIS is 2 to 4% of Site energy bill which is worth more than \$5 million per year
- Typically costs for implementing an EMIS result in paybacks less than 6 months
- KBC's provide the technology and the support of a SUMMIT based EMIS installation

About KBC

KBC Advanced Technologies is a leading consultancy and software provider to the global hydrocarbon processing industry. With over 30 years of experience, KBC combines industry leading technology with experienced engineers and operations personnel using robust methodologies to create personalised, sustainable solutions for its clients.

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