



SAVING ENERGY HARDLY SEEMS WORTH IT – OR DOES IT?

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With energy prices at their lowest level for over a decade and the prevailing view that they will be lower for longer, there seems to be little economic incentive to spend money on energy efficiency. Particularly in industry sectors where revenue is down, investment budgets are less likely to be made available for saving energy. Even so, depending on individual circumstances, energy reduction can be an important strategic objective, so it is important to understand the drivers both now and in the future as energy prices increase.



Sustainability is a watchword in many parts of the world but especially those where oil and gas exports form a significant proportion of national GDP. A full sustainability strategy will incorporate energy, emissions, water and material effectiveness, all of which contribute to a company's or country's ability to maximise exports of their valuable resources while minimising consumption themselves. While this white paper has its focus on energy, we will be publishing our perspectives on sustainability management in the coming months.

In some countries, resource management is achieved through legislation, which can take the form of an energy cap, a mandate to achieve a certain level of performance, or, more commonly, a charge on CO₂ emissions. A cap or mandated performance suddenly gives energy a high value, and efficiency improvements have an economic incentive. Adding a CO₂ tax, meanwhile, might only marginally increase the value of energy.

Outside regions where resource management has a high priority, in other words for most operating companies, the low energy price is still an apparent hurdle to investment. There is, however, a strong case for making investments now in preparation for prices rising again. With a falling number of engineering contracts, the cost of procuring engineering services is currently relatively low, making this a good time to invest.

In certain markets, there is a justification through an improved competitive position. For example, the low price of crude oil brings the cost of using naphtha as an ethylene feedstock closer to that of ethane. As a consequence, European ethylene crackers are more competitive against Middle East crackers and this renewed boost to profitability is an opportunity to close the gap still further. Asian ethylene producers have seen the value of continually investing in energy optimisation as a means of reducing costs and making their naphtha-based plants more competitive such that the most energy efficient ethylene plant in the world is now in Korea.



ENgage – The Whole Picture

Many years of experience have shown us that while improving energy efficiency always gives a return on investment, the benefits are not always fully captured and are often not sustained for a significant period. There are many reasons why this happens, such as lack of resources, insufficient training, ineffective energy management structure, and poor planning. These issues are effectively addressed by implementing an Energy Management System (EMS), which takes time and effort to do effectively, but does not rely on significant investment.

The deliverable of the KBC ENgage programme is an EMS that is best practice for the large process industries and ensures that improvements are identified, implemented and sustained. As such, it is compatible with ISO50001 which defines the structure of a generic EMS.

The full programme has three work streams that are developed across five phases. The Technology work stream delivers the tools that provide the insights and evaluation which are ultimately converted into energy savings. The Organisation work stream designs, develops and delivers the system elements of organisational structure, work processes and capabilities which ensure that the insights are captured, the evaluations carried out and the savings sustained. In the Strategy work stream, senior managers set the direction and goals of the EMS and provide the necessary governance in its execution.

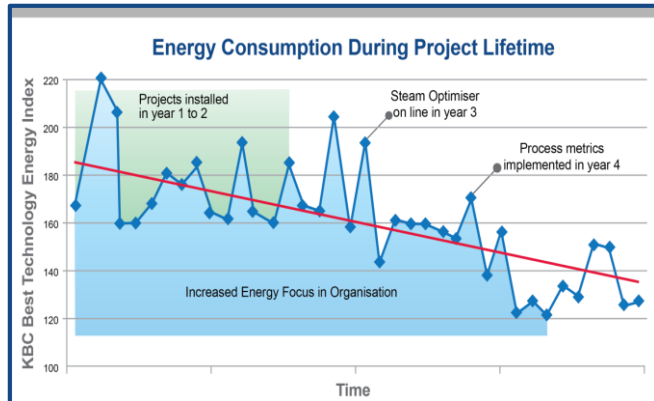


The five phases, meanwhile, allow senior managers to evaluate the benefits at each stage and target the areas showing the greatest benefits:

- Define – definition of the energy vision and strategy. Current performance and the ability to sustain benefits are the basis for an action plan that will address the performance gap
- Discover – benchmarking and gap analysis to determine the size of the prize, the value of achieving it and the opportunities that will lead there
- Develop – development of EMS capabilities, tools to support the EMS activities and projects to save energy
- Deliver – change management to implement the EMS and put the tools into practice



It is rare for any one site or company to need every element of a full ENgage programme since a foundation usually exists. The EMS benchmarking that we have carried out across the refining, petrochemicals and chemicals sectors has always found at least the building blocks of an EMS, even at a site that was struggling to maintain reliable operation and safety standards. It is this benchmarking that illuminates the elements offering the greatest benefits and thus focuses the programme where the greatest returns are expected. The example shows a 20% reduction in energy cost that was achieved through focusing on three key areas of technology.

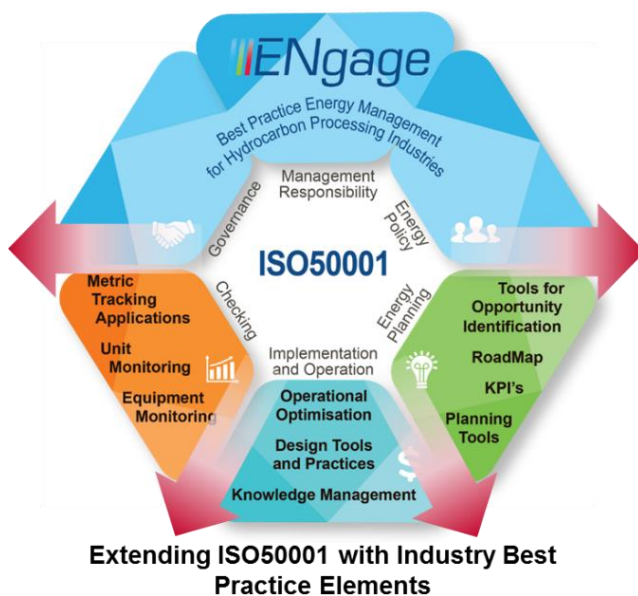


Energy Strategies When Prices Are Low

As might be expected, a significant proportion of the refining, petrochemical and chemicals industries is currently favouring no/low cost means of improving energy performance. It is therefore unsurprising that our clients are knowingly selecting a subset of the ENgage programme to deliver this specific goal.

Energy Management Systems

The profile of Energy Management Systems (EMS) has been raised in recent years by publication of ISO50001 which defines the standard for an EMS across all energy using industries. Can an EMS be considered a low cost solution? Unfortunately, there is not a clear cut yes or no answer.



Implementing an ISO50001-standard EMS where there is currently no EMS will result in improved energy performance (by definition). This can be a reasonably low cost undertaking. However, as previously mentioned, every company that has been benchmarked by KBC has had some building blocks of an EMS and a good number have reasonably mature systems. We have been asked by some of these clients what additional value they will get from being ISO50001 accredited when they already have an EMS specifically designed for their industry. The value being achieved by leading companies in these industries is, as you would expect, being achieved by pushing beyond the standard EMS towards industry best practice.

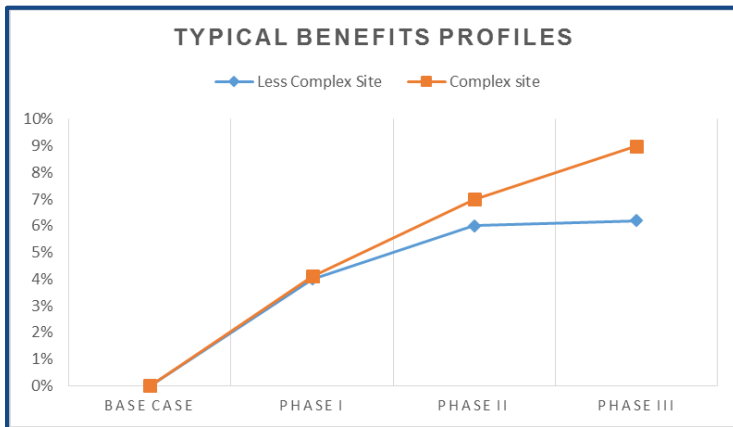
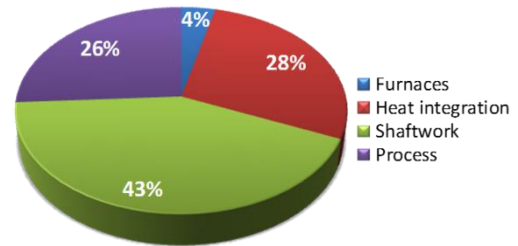
This white paper describes some of these elements and outlines the value that can be achieved. Taken together, an EMS is no longer a cheap solution – but it is an effective one.

Benchmarking

While benchmarking does not create value in and of itself, it is a crucial early step in determining the value of closing any performance gap together with the ability to close it and keep it closed. KBC combines benchmarks of energy performance, energy management maturity, skills and technology with a gap analysis to create a plan with defined opportunities, each with an estimated value. Our clients have used this first step for setting budgets, tailoring an overall strategy and even negotiating with third party utility providers.

Utility System Optimisation

There remains a strong perception in the industry that the largest savings are to be found in fired heaters where most energy is being consumed. Our analysis has shown that this has been a perception for so long now that it is no longer true. So much focus has been placed on fired heaters that only about 4% of the total energy performance gap is to be found here. The largest gap –43% - is in shaftwork efficiency where heat is converted to power.



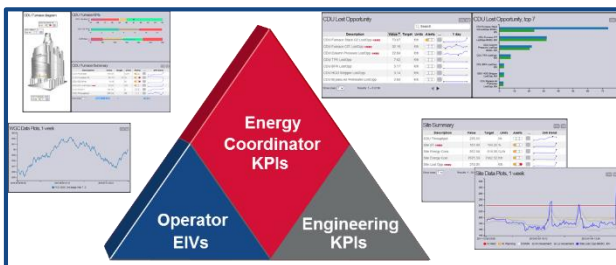
Our experience is that even simple models of the utility system in the hands of knowledgeable engineers can close a large proportion (80%) of that gap, corresponding to 2-4% of the energy bill, by increasing understanding of the levers that can be used to optimise the system; by allowing planning for a range of operational scenarios, both scheduled and unplanned; by allowing evaluation of investment opportunities; by evaluating the impact of wider site plans such as expansions. Putting the model online and using it for performance monitoring increases the

savings by a further 1-3%. Where systems are especially complex or have frequently changing operations, an online advisory optimiser can save a further 1-2%.

This is an area receiving considerable focus mainly because real and significant benefits appear to be realisable at low cost. It is important to bear in mind that the value is not achieved by software alone. It will only deliver if it is in the hands of trained, knowledgeable staff as part of a continuous, ongoing process to optimise the utility system. It therefore needs motivated people, the right work processes and, it goes without saying, the right tools for the job.

Tracking Energy Metrics

There is currently great interest from operating companies in systems for visualising energy metrics. Tracking performance against improvement targets for key equipment, process and site parameters focuses the attention of operators, engineers and managers where it is most profitable. The effects are many:



- Increased focus on energy across the organisation
- Improved consistency of operation
- Continuous comparison to targets ensures sustained performance
- Optimising the targets over time spurs continual improvement

As with utility system modelling, a software application is only part of a process of continual performance improvement that can reduce energy costs by 3-5%. For improvement to be continual, metrics and targets are not static – a subject for a future KBC white paper. In short, improving performance on an initial set of metrics allows evaluation of the benefits of automation. Once metrics are automated, new metrics are defined and the cycle continues.



Capability Development

Investing in skills development is good value as long as the skills are brought to bear. There is little value, for example, in having 40 qualified energy managers on site if there is no plan to utilise their skills. With the ENgage programme KBC recognised that different levels of expertise are required, from broad energy awareness (which is quite different in operations functions from management functions) through to subject matter expertise.

- Large companies with a corporate engineering function are building in-house energy management teams in order to maintain leadership in the field. Capabilities range from energy practitioner to energy leader and SME.
- Development of specific expertise within site engineering teams typically to the level of an energy practitioner
- Targeted functional knowledge for specific operating roles

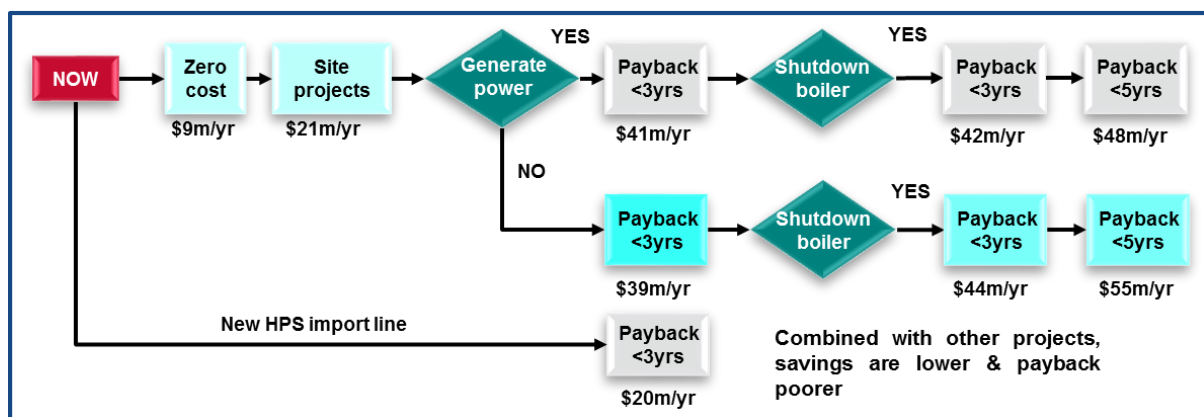
The most successful training is delivered on the job, i.e. where client engineers are embedded within a KBC team. The challenge for all companies is to ensure that capability development becomes self-sustaining whereby successive generations of specialists are trained by colleagues currently working in clearly defined roles.

Energy Strategies as Prices Increase

As the value of energy increases, the more investment becomes attractive. Building on a foundation of no/low cost initiatives, such as the above which result in a functioning EMS, the identification, evaluation and implementation of investment opportunities becomes significantly more effective.

Investment

Even when energy prices are low, our clients have been developing RoadMaps of energy projects. A typical RoadMap will combine no/low cost opportunities with investment items to determine the optimal combination to minimise operating costs and capital expenditure. A dynamic RoadMap therefore shows the economically attractive projects that can be justified now and those that become attractive as the price increases.



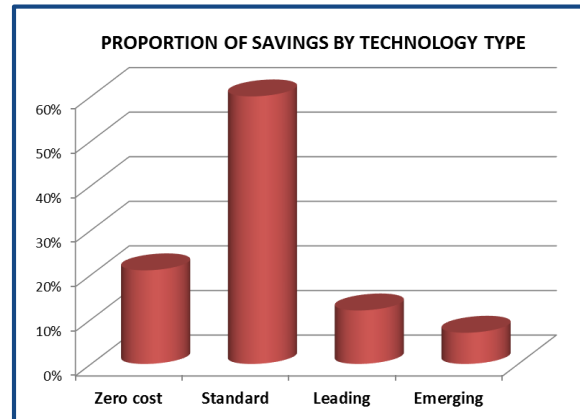
The benefits are calculated using a simulation of the utility system to capture the real value of combining the projects. This approach means that a range of alternative scenarios can be assessed.



New Technology

Many companies with mature energy management credentials find themselves gravitating towards new technologies because, after all, they have already done what they can with standard technologies. A review of even the most recent KBC studies shows that while there is real value to be obtained through leading and emerging technologies, by far the greatest potential still lies in what we would categorise as standard technologies. These include:

- Improved heat integration through application of pinch analysis
- Optimisation of distillation columns
- Furnace optimisation
- High efficiency pumps and turbines



Conclusion

Even while low energy prices mean that investment is less attractive, energy efficiency remains a high priority for many operating companies. An effective strategy for the current economic climate is to capture the significant value achievable through energy management systems, utility system modelling and energy metrics, and use these as a foundation for planning investments for when the energy price climbs, as it inevitably will.

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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