

The Innovative Financing of a Pumping Cost Reduction Program in the Water Industry

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The Cost of Pumping

Most people in the water industry are aware that the efficiency and performance of pumping systems have a significant impact on operating costs. Energy accounts for 90% of the whole life cost of a pump. Even a relatively small 100 kW pump consumes about Euro 70,000 worth of electricity a year and something like 70% of a water company's electricity bill will be spent on pumping.

Independent studies have shown that up to a 30% reduction in energy costs can be achieved by improving the operation and performance of pumping plant. However the water industry is characterised by significant over capacity, a fluctuating demand and variable electricity tariff rates. This often means that pump selection and the optimisation of pumping regimes are not straightforward.

The skills and technology required to improve pumping system performance and reduce energy consumption are well understood. It has been shown on many occasions that significant and sustainable reductions in energy consumption can be achieved. Savings can be generated by: replacing or refurbishing inefficient equipment, the use of improved monitoring and control systems; and the implementation of more cost effective operating regimes.

Often the investment required to deliver the required reductions in energy consumption can be recovered from the savings generated. Payback periods are typically in the region of one to two years producing very attractive rates of return.

Traditional Barriers to Progress

Experience has shown that in many cases energy cost reduction projects have not progressed despite a sound technical case being developed. There are many reasons for this but most of them are related to the required finance package. The most common reasons for not progressing with a particular project are:

Risk

There are two elements of risk to be considered. There is the risk that the costs of any preliminary work required to identify a portfolio of savings related projects might not be recovered. Then, there is the risk that individual projects may not be successful and deliver the anticipated savings.

Budget Constraints

If capital investment is required in order to deliver the savings then it could be that there is no budget for activities of this type which arise part way through the

planning process. Even if there is a budget available it may be difficult to release funds at relatively short notice. In some cases, the investment required and the savings accrued can be allocated to different budgets, leading to internal conflicts.

An Innovative Finance Package

Advanced Energy Monitoring Systems (AEMS) and Hyder Energy Services (HES) have combined to offer a unique technical and financial package to the water industry. The package is designed to overcome the traditional barriers to progress in energy management.

The basic concept of the Energy Saving Partnership scheme is fairly simple.

- AEMS and HES work closely with the Client to identify sites and installations where it is believed energy consumption can be significantly reduced.
- AEMS carry out any testing or analysis work necessary to confirm current costs, quantify the potential for future savings and specify the work required.
- The work package and the key performance indicators are agreed with HES and the Client.
- HES finance the agreed work package and take a return on their investment from the savings generated.
- AEMS project manages the work and subsequently carries out any tests required to confirm the magnitude of the savings.

The contractual arrangements are based on a 'risk-reward' relationship. HES provide the finance and the Client agrees to share the savings generated by the work with HES. This is based on a fixed, agreed percentage split of the savings over a fixed contract term. AEMS are paid in accordance with their ability to deliver the savings based on post implementation monitoring and measurement.

Current experience is limited to work with Dwr Cymru/Welsh Water, who are also part of the Hyder Group, although as the project has been so successful the intention is to expand this service to other interested water companies.

Advanced Energy Monitoring Systems

AEMS was established as an independent company in 1981. Its core expertise is in the design and application of pump performance monitoring systems based on the thermodynamic (Yatesmeter) technique. It now offers a range of products and services associated with optimising the performance of pumping plant.

Hyder Energy Services

HES are part of the Hyder Group. Hyder is a multi utility whose main businesses are the distribution of electricity and the provision of safe, reliable water supplies. Electricity is supplied to nearly a million customers in South Wales operating a 32,000 km network of power lines and cables. Hyder's water business, Dwr Cymru/Welsh Water supplies treated water and waste water treatment services

throughout the whole of Wales and adjacent parts of England 24 hours a day, every day of the year.

The Benefits to Water Companies

The major benefits to Water Companies of the Shared Energy Saving scheme being offered are that it overcomes the traditional barriers to energy management, specifically it:

- is self-financing, with any expenditure required being funded from the savings generated;
- delivers significant, on-going savings in operating expenditure;
- provides a mechanism for improving the performance and reliability of plant and equipment without the need for significant up-front capital expenditure;
- is a low risk option.

Welsh Water's Court Farm Water Treatment Works - A Typical Energy Partnership scheme Project

Welsh Water's Court Farm Water Treatment Works delivers around 54 Ml of treated water each day depending on demand and consumes on average of 6,722,000 kWh of electricity a year at a cost of Euro 400,000.

AEMS tested the five main pumps at Court Farm and demonstrated that their in-service efficiencies had deteriorated to such an extent that it was economically viable to refurbish all five pumps. Base-line operating costs were defined in terms of specific energy consumption (kWh/MI) and potential savings targets agreed.

The required refurbishment work was specified, put out to competitive tender, and project managed to completion by AEMS. The pumps were again tested after being installed back on-site following refurbishment to confirm the level of savings generated. The results are shown in the table below.

Pump	Efficiency Before (%)	Efficiency After (%)	% Improvement
1	69	86	19
2	74	84	12
3	77	84	9
4	74	87	15
5	73	86	15

HES provided the funds required to carry out the testing, data analysis and pump refurbishment at the works. This investment resulted in a saving of 51 kWh/MI, which on present volumes equates to an energy saving of 15% of the pump energy costs for this installation.

The savings generated are being shared between HES and Dwr Cymru/Welsh Water to repay the investment over a 4-year contract term.

This project has proved so successful that Dwr Cymru/Welsh Water is looking to develop it across the business.

Photographs showing
Court Farm Treatment Works
Pumps before and after refurbishment

Diagrams showing
Pump curves before and after refurbishment matched to photographs
Pie chart showing a breakdown of costs

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