PUMP SYSTEMS:

HIDDEN COSTS AND OPPORTUNITIES

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One of the greatest challenges and concerns in the 21st century is to ensure sustainable development. The needs of current and future generations cannot be met unless we change the way we use energy. There are plenty of good ways to reduce energy consumption every day, and some solutions are more effective than others, but there is an energy solution we could implement right now that would have huge impact.

Hidden underground and inside buildings, pumps are often unseen energy users, many of which needlessly waste energy. Estimates vary, but most sources have estimated that 10-20% of electrical energy is consumed by pumps globally, and in many industrial environments, pumping can consume anywhere from 25 to 50% of the plant's electrical energy. By replacing or upgrading pump systems with modern technology, huge reductions in CO_2 emissions and operational costs can be achieved.

Today, an increasing number of companies and organisations are concerned about the environmental impact of their businesses. For many, socially responsible behaviour has become an integral part of operational strategy. This has resulted in a number of initiatives, but the question must be asked: why don't we focus on the area where the single biggest savings can be obtained?

Putting pumps on the agenda can help you minimise your company's carbon footprint and offer significant economic savings.

Savings opportunity

In fact, pumps and other motor-driven applications offer an approximately five-times larger savings opportunity when compared to the potential of other more well-known energy users such as lighting. So optimising pumps makes sense - not just in terms of becoming greener, but also because of the financial benefits.

Technical staff and system engineers might maintain pumps, but as pumps are a part of your company's technical installations, it most likely also makes them a responsibility of your chief operating officer or chief accountant. Unfortunately, pumps have no novelty value. We have used them for decades and decades but they are taken for granted by most people. And for that reason they are today overlooked by most businesses in the debate about energy efficiency, carbon footprints and corporate social responsibility - all this despite the impressive evolution of technology, which means pumps should come under mandatory consideration by all businesses.

It has been estimated that two-thirds of all pumps installed today are inefficient and use up to 60% too much energy. Most of those currently installed are larger than necessary for the job at hand and, in addition, the majority of the motors that are chosen to drive them are inefficient and often run continuously at their maximum speed regardless of actual requirements. In reality, most pump motors only have to run at full speed 5% of the time. This leads to massive energy wastage all day, every day.

Over the years the pump industry has changed greatly, and the pumps we have today are far more efficient than ever before. This is partly due to intelligent, variable speed motor technology, which is used to make the pumps run, and also due to advancements in the technology of the pumps themselves. Replacing pump systems can make an immediate difference and in many cases return on

investment will be reached within just a few years, after which the new system results in pure savings.

It should also be remembered that pumps become even less efficient as they age and are subject to wear and tear, so in some cases, replacing old pumps with modern efficient ones, rather than repairing or upgrading - although initially more expensive - will usually lead to lower costs in the long run.

Knowing what you have

The first step in deciding what to do with your pump systems is to perform an energy check of your pumps and their energy use. Firstly, you should contact your maintenance or facility manager and ask:

- Who is in charge of our pump installations?
- What is our annual electricity consumption?

Next, the information for the energy check needs to be collected, such as:

- How many pumps are installed?
- How old are the pumps and what type are they?
- How do the pumps operate?
- What is the pump service history?

For most sites, the best way to go about this is to engage an external organisation to perform an energy check, in which their experts conduct an on-site assessment. With the information gathered it should be possible to get a prioritised list of the installed pumps, identifying energy usage and CO_2 emissions, running costs and potential ROI for upgrades or replacement.

As is almost always the case with energy-efficiency initiatives, the initial investment in time and effort is returned many times over by the energy and cost savings created.

Lifecycle costs

One important consideration is the pump's life-cycle cost (LCC).

Many organisations only consider the initial purchase and installation cost of a system. It is in the interest of the plant designer or manager to evaluate the LCC of different solutions before installing major new equipment or carrying out a major overhaul. This evaluation will identify the most financially attractive alternative.

There are two reasons why existing systems provide a greater opportunity for savings through the use of LCC methods than new systems:

1. For each pump system built each year, there are at least 20 times as many pump systems in the installed base.
2. Of these existing pump systems, many have pumps or controls that are not optimised due to pumping tasks changing over time.

Some studies have shown that 30 to 50% of the energy consumed by pump systems could be saved through equipment or control system changes.

Pumping systems often have a lifespan of 15 to 20 years. Some cost elements will be incurred at the outset and others may be incurred at different times throughout the lives of the different solutions being evaluated.

Life-cycle costs can be broken down into eight elements:

- Initial costs, purchase price
- Installation and commissioning cost
- Energy costs
- Operational costs
- Maintenance and repair costs
- Downtime costs
- Environmental costs
- Decommissioning/disposal costs

A detailed analysis of these cost elements is beyond the scope of this article, but energy consumption is often one of the larger cost elements and may dominate the LCC, especially if pumps run more than 2000 hours per year. Energy consumption is calculated by gathering data on the pattern of the system output. If output is steady, or essentially so, the calculation is simple. If the output varies over time, then a time-based usage pattern needs to be established. It is common to find that power consumption can be up to 85% of a pump's total LCC, while the initial purchase price may only be 5%, and maintenance only 10%.

Replacing pump systems with new systems with variable speed drives, suitably sized to support the actual pumping requirements, can make an immediate difference; and in many cases, return on investment will be reached within just a few years, after which the new system results in pure savings.