MAXIMISING ENERGY SAVINGS THROUGH THE SYSTEMS APPROACH

Europump's energy flagship ECOPUMP is built around three key pillars, Product Approach, Extended Product Approach and Systems Approach. The potential energy savings within a pumping system will surprise many and the System Approach should be a main focus during any company's energy reducing policy. Europump, which represents 17 national associations with 450 member companies, with a collective production value of more than €10 Billion, told **flow** why.

Various countries around the world have taken different approaches toward energy usage and possible energy reduction. The European Commission has concentrated on components within the Energy Related Products Directive (ErP).

The ErP focuses heavily on the efficiency of the products, and the Commission has already implemented legislation to ensure that products with low efficiency are gradually phased-out across Europe. This is a significant step in the right direction; however, new 'energy efficient' components may still be required to operate within an inefficient system, impacting hugely on any possible efficiency gains.

Evaluating the energy efficiency of a pumping system takes time, knowledge, and the will by both the pump system energy auditor and the pump's operator (customer) to make a determined change. But the rewards are worth the effort. The potential energy savings which could be secured throughout Europe are estimated at being between 40-50 TWh if the necessary changes to inefficient pumping systems are made.

THE SYSTEMS APPROACH

A pumping system is defined as one or more pumps and those interacting or interrelating elements that together accomplish the desired task of moving a liquid. A pumping system generally includes a pump(s), driver, drives, distribution piping, valves, controls, instrumentation, and end-use equipment such as heat exchangers. Using the 'systems approach' involves comparing the need or demand to the supply.

It is important to understand how the different components in a system interact and influence each other as a change to one component might improve or negatively impact other components.

An example of this is replacing an old inefficient motor that is employed to drive a pump with a modern high-efficiency motor. The newer high-efficiency motor will have less slip and will run faster than the old motor. When the pump is running more quickly, it will consume more energy, and this increase in energy usage can be larger than the savings produced by the more efficient motor.

To reap optimum savings from the change, the pump impeller might have to be trimmed.

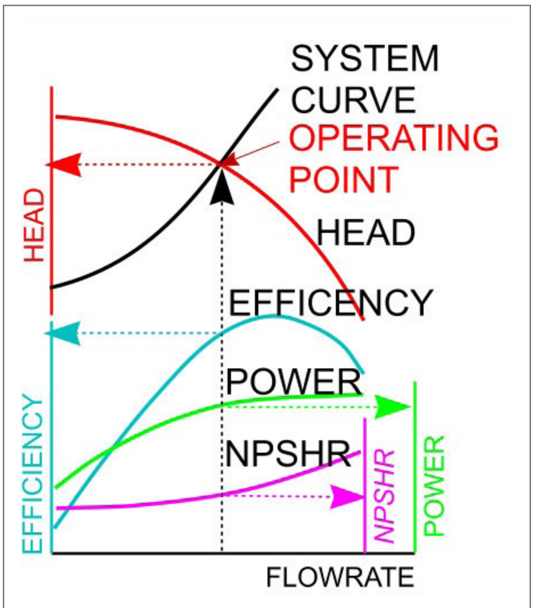

Fig. 1 Pump system interaction curve.

A system approach starts with defining the ultimate goal of the system. This includes determining the flow rates that the system must be able to deliver, whether there are flow variations and what kind of control is necessary. These requirements will influence the choice of piping size, control methods, pump size, motor size and so on.

Figure 1 uses the pump and system performance curves to determine pump operating conditions and to evaluate methods of flow control.

To determine the efficiency of a system, the minimum energy to fulfil the process demand is compared to the actual energy used. Figure 2 shows a simple system pumping a liquid from one tank to another and illustrates the difference between looking at components and looking at systems.

When looking at the component perspective, we compare the input power to the motor from the MCC to the liquid output from the motor and the pump (captured by the purple square). This analysis could, indeed yield an excellent result. If we broaden the view to the elements within the green outline, we can see a re-circulating line going back to the first tank. The flow rate coming out of the purple square in is essence greater than the green area. The power input is, however, the same.

Finally, we take a complete system view and include the losses in the recirculation line as well as the losses in the regulating valve on the line to the second tank (the red outline). What might have looked like a reasonably good system when measuring the components in the purple square can be viewed as an extremely low-efficiency system when looked at using the systems approach illustrated by the red outline.

To do this, we need to define the system demand, i.e. the minimum pressure, flow rate and subsequent energy for the pumping system to work. To understand the knowledge and tools required to assess the system, the industry has spent many years developing the international standard ISO 14414 – Pump System Energy Assessment.

CONCLUSION

There are many exciting programs designed to improve energy use being developed around the world, but in Europe, we have the Energy Efficiency Directive which mandates energy audits in systems. For the electrical energy savings identified in pumping systems to be fully achieved, there needs to be a far stronger emphasis on the 'systems approach' and a commitment to make this happen from both the pump industry and its final end-users – those that will ultimately benefit from lower energy bills.

Europump would like to thank Steve Schofield, CEO, British Pump Manufacturers' Association for his help in compiling this article.

www.europump.org

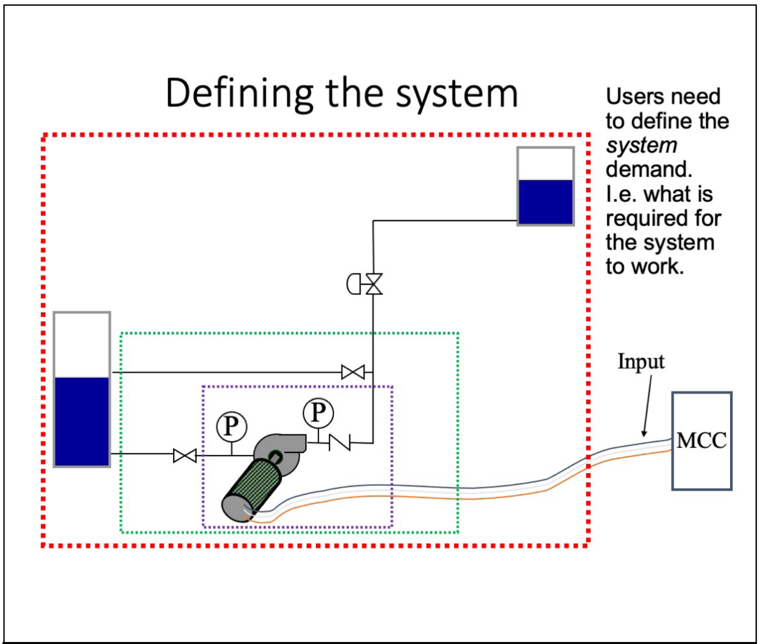

Fig. 2 Efficiency of a pump measured on a component basis (purple box) based on the ratio between the pump's input and output. The system view includes a re-circulation line as shown by the green box. Looking at the complete pumping system using a total system approach is illustrated by the red box.