Energy impact on farming dynamics

Part 1

This is the first in a series of articles which will attempt to assist farmers in the reduction of their power costs. Each article will focus on a specific topic which we feel is crucial to the successful implementation of an energy optimisation plan. Our ultimate goal is raising awareness and assisting farmers in the reduction of their energy bills, while becoming more proactive towards energy efficiency.

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Escalating energy costs in conjunction with poor supply are forcing South Africans to reassess their habits when it comes to power consumption. There are limits to changes which the average home owner can make in reducing their power foot print; however as a farmer the opportunities for power reduction are far more extensive. Electricity is an unavoidable direct cost on all farming activities throughout the world. While there is ample supply it is not focused upon, however, as we all have found out in the recent past, when it is not available then it can be detrimental to the successful operation of farming activities. This, in conjunction with escalating energy costs, will continue to put pressure on farmers and force a change in mindset to one of more energy efficient farming.

The first step to any optimisation plan is to focus on areas of wastage. Once these have been eliminated, we can then move on to making changes to improve energy usage. The great thing about waste is that it is usually relatively easy and inexpensive to remedy, which creates a great starting point and drives the rest of the energy program forward.

Irrigation and water usage are generally some of the highest power consumers, along with being notoriously inefficient. Our first step is to attempt to manage water use by understanding pumping dynamics.

In order to effectively manage water usage it is crucial to first grasp how a pump curve operates. At first glance a pump curve is quite intimidating, but once one understands how to interpret the information contained therein it is relatively simple. Let's break the curve down into five parts and address each one individually.

PRESSURE

Pressure (or head) is a crucial topic on every pump curve, as this has a direct relationship with the flow rate which a pump is capable of. The higher the required pressure at which a pump is to operate, the lower the flow rate which it will be capable of pumping (centrifugal pumps). Long runs of piping, pumping up steep gradients, valve and bend installations – all affect the pressure of the system and hence reduce the flow which is achievable. Ideally these pressure losses want to be as minimal as possible.

FLOW

The larger the flow rate to be pumped, the lower the pressure at which it will be delivered, not to mention the higher the power consumption. This is critical, as it shows that if there are areas on a farm which are being irrigated unnecessarily or when there are many leaks, then this flow rate climbs and in doing so the power needed to pump this extra volume increases.

IMPELLER SIZE

Each one of the many pump curves corresponds to a specific impeller size; the larger the impeller, then the higher it will be located on the graph, as an impeller is trimmed then so it's corresponding curve moves down the graph. This allows versatility to adapt each installation to its own unique set of physical requirements. This in turn allows for a more efficient installation.

POWER USE

By correlating the point of operation with the power graph, it is easy to determine what power requirements are needed to allow the system to run correctly.

EFFICIENCY

The impeller size is chosen to balance the head and flow requirements with the efficiency of the pump, in this way the best power consumption for the application will be achieved and hence provide the least amount of unnecessary wastage.

As can be seen in Fig. 1, for a flow rate of 8 cubic meters per hour (Q m^3/h), on a full size impeller (ø140 mm x 7), a head of 25,5 meters can be achieved. Then, by looking at the efficiency of the pump, we have achieved a 48% efficiency (η %), before finally resulting in a power consumption of 1,2 kW (P). It's important to remember that this is per impeller, thus the same approach can be used for a multi-stage pump, and everything (except the efficiency) will just need to be multiplied by the number of stages.

Now that we know what the pump curve shows us, we will be able to determine our pump performance characteristics. Throttling either the suction or delivery valves will severely hamper this performance, as will any leaks on the

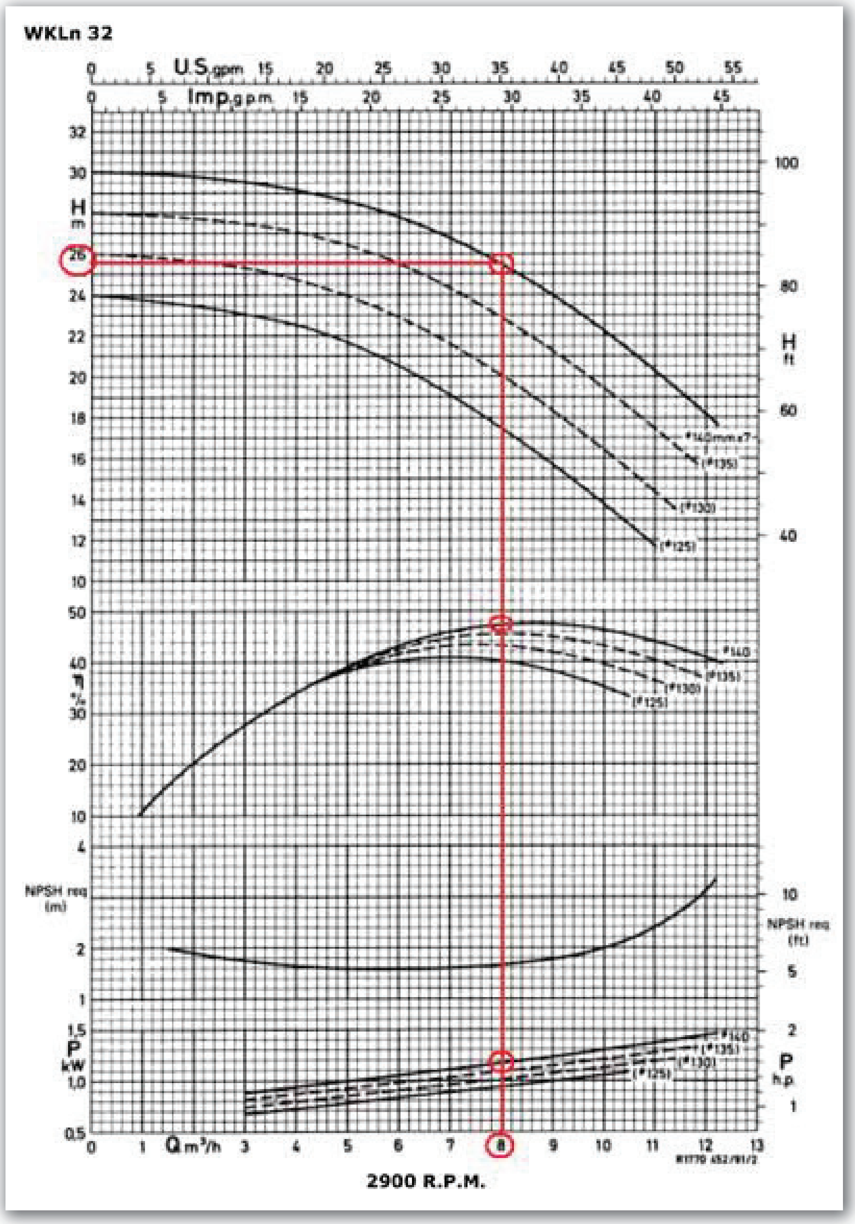

Figure 1. A pump curve for a KSB WKLn 32, 2 900 rpm pump. (http://www.ksbpumps.co.za)

suction or delivery side of the pump. Blocked impellers and cavitation will also hamper performance. All of this can be picked up from reading the curve and tying up your own installation's performance.

In short, once a good understanding of the pump curve is achieved, it is possible to monitor the irrigation network and be able to pick up whether the pump is operating correctly and at its most efficient point. In essence, check the following points:

1. Print a copy of the pump's performance curve off the internet or from the pump supplier.
2. Run the pump and ensure that the pressure and flow rates correspond on the performance curve.
3. Ensure that all suction and delivery valves are fully open.
4. Repair any leaks on the suction side of the pump, as well as all leaks on the delivery side of the pump. (This includes all leaks in the lands.)
5. Perform routine maintenance on the pump.
7. Size the motor correctly for the pump application.
8. Use premium efficiency motors.
9. Use the correct pump for the application.

With these simple checks in place, one can make great gains in the manner in which power is used and drastically reduce costs by increasing efficiency. ST

A sad resignation – invaluable contribution

Wouter Retief has decided to resign from Subtrop, after more than a decade's dedication to the South African subtropical industry. Wouter started working for the South African Avocado Growers' Association (SAAGA) as a technical advisor in 2001 and later for Subtrop, when the four growers' associations merged to form Subtrop in 2006.

He became a well-known expert, especially in the avocado industry, and contributed significantly in many areas to expand the knowledge and literature the industry today often takes for granted. As Gerhard Nortjé says: "Everything I know about avocados, I have learned from Wouter".

Wouter will be joining a family farming business in Kiepersol, where he has been staying for the past nine years. He will thus remain in the subtropical industry and will still be in contact with the Subtrop staff and the avocado and macadamia industries. Besides working on the family farm, Wouter will also do private consulting in the area. The technical section of Subtrop will co-operate with him on technical avocado issues as Wouter will still be a member of SAAGA.

Wouter's inputs in many areas will be sorely missed, but we wish him all the best in his future career. ST

Wouter Retief