Save Energy

7. Pump Systems

Midland Quarry Products

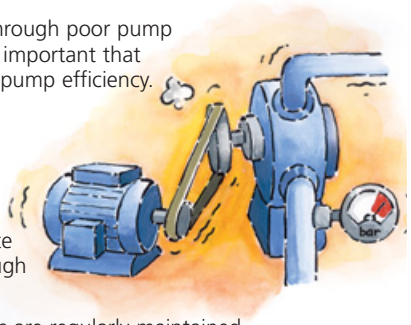
A well-designed, well-maintained and well run system can bring energy savings as well as cost savings through reduced wear and repair and less unplanned downtime.

fluid is delivered to the process and then re-circulated. Once the system has been balanced the pump output needs to be examined to ensure it is operating near its peak efficiency.

6 Optimise the pipe layout to minimise losses

- Design a pipe layout like you would a drain system.
- Use gravity wherever possible.
- Eliminate bends where possible or, if needed, use large radius bends and gentle angles.
- Use the maximum pipe diameter possible (this reduces flow rate and friction).
- Eliminate unnecessary valves – even open ones.
- Avoid turbulence in the pipes through rough surfaces and protrusions.
- Use gradual changes in pipe diameter, not step changes.
- Blockages and restrictions in the system (such as partially closed valves, pipe work that is too small or has sharp bends and Ts, and rough surfaces such as deposits or corrosion) cause the pump's output pressure to increase and could waste up to 30% of the pump's power.

7 Ensure pump systems are well maintained



- Significant amounts of energy are lost through poor pump system maintenance, 25% or more. It is important that all critical pumps are measured for their pump efficiency.
- Ensure that pump efficiency is routinely measured for all process critical pumps.
- Ensure that filter screens are regularly cleaned.
- Ensure that the pump impeller and volute are not worn, are clean and have no rough surfaces such as corrosion or pitting.
- Ensure that bearings, seals and couplings are regularly maintained.
- Ensure that pipework is clean and not filled with sediment.

QUESTION: **What next?**

ANSWER: **If, after reading through the Pump Systems bulletin, you have any further questions or would like to report any areas of potential energy inefficiency on your site, please contact the Energy Champions (David Gazzard / Mark Hamilton) via telephone, email or fax. You will then be contacted with relevant help and assistance to improve energy efficiency at your site.**

NOTE: Guards on certain images are not shown to aid clarity

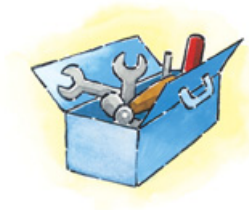
Did you know ?

- Up to 20-30% energy savings can be achieved through improving the average pumping system efficiency.
- Running energy costs can typically amount to 95% of a pump's full life cost.
- Regulation of flow by a valve is less efficient than regulation by variable speed control (like driving your car with your foot on the accelerator and regulating your speed with your brakes).
- Bypass systems can waste over 50% of the pump systems' energy consumption.

Please help us to SavE by:

- ✔ Reporting any leaks around the pump or in pipework or ducting
- ✔ Reporting noisy Vee belts, that are incorrectly tensioned, misaligned or worn out
- ✔ Reporting noisy or rumbling bearings, as they may be incorrectly lubricated or worn out
- ✔ Ensuring that you turn off pumps and hoses when they are not required.

If you are responsible for the operation and maintenance of pump systems at your site then read below:



TOOLBOX

How to reduce energy consumption and costs within pumping systems:

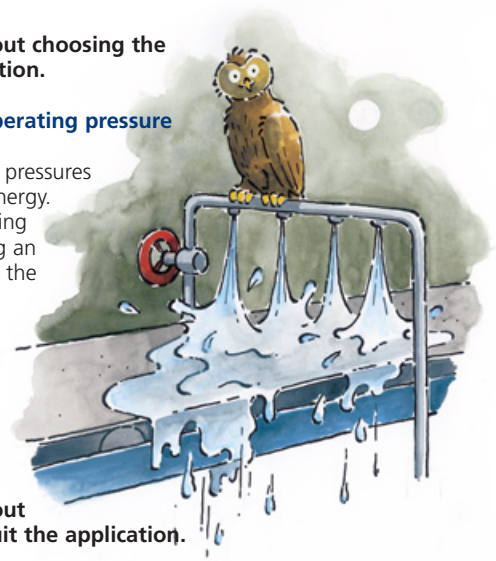
1. **Ensure the control system operates to maximise pump efficiency**
2. **Look for opportunities to reduce volume flow rate**
3. **Look for opportunities to reduce operating pressure**
4. **Correctly match the pump to suit the system characteristics**
5. **Balance systems to suit the demand**
6. **Optimise the pipe layout to minimise losses**
7. **Ensure pump systems are well maintained.**

1 Ensure the control system operates to maximise pump efficiency

- **Switch pumps off when they are not needed.**
- Where a pump has a variable duty, the most inefficient form of flow control is regulation by a valve. This includes flow-regulating (throttling) valves, which cause the pump to operate at excessive pressures, and bypass valves that simply re-circulate the fluid round the system.
- Adjusting the speed of the pump is the most efficient form of regulation as it maximises pump efficiency at the given duty. For centrifugal type pumps there is a cube law relationship between the speed at which the pump runs (and flow rate) and the power it draws. e.g. for a 20% reduction in pump speed an energy saving of nearly 50% can be achieved.

2 Look for opportunities to reduce flow rate

- Flow rate in a pipe is related to its size and the volume of fluid being delivered. Delivering more fluid than necessary wastes energy both in pumping the increased volume and by overcoming the additional friction in the pipework caused by pumping more volume. For example, doubling the velocity in a 100mm pipe from 2m/sec to 4m/sec will result in around a four-fold increase in the energy required.
- Ideally clean water should travel along a pipe at a velocity of 2m/sec, though with slurries it is important that the appropriate speed is selected to prevent settling.
- Changing the pulley ratio, fitting a slower motor, or regulating the motor speed with a variable speed drive will slow the pump down and reduce the flow rate.
- **Consult your pump supplier about choosing the best solution to suit the application.**



3 Look for opportunities to reduce operating pressure

- Asking the pump to deliver fluid at pressures in excess of requirements wastes energy. This could result from either throttling the pump output (valves), or having an excessive operating pressure within the whole system.
- Using the same techniques as those used for reducing flow rate may reduce pressure.
- If you need different pressures, use different pumps. Avoid using pressure reducing valves.
- **Consult your pump supplier about choosing the best solution to suit the application.**

4 Correctly match the pump to suit the system characteristics

- A pumps peak efficiency occurs within a relatively narrow operating band of flow rates and pressures.
- If the system into which the pump has been installed does not maintain the correct flow rate and operating pressure for which the pump was designed, the pumps efficiency will deteriorate and it is likely the system will also be inefficient. This usually occurs when settings have been changed or the system has been modified. Refer to the original system design (or commissioning) data and compare with current values to determine if the parameters have changed.
- Avoid parallel connected pumps.

5 Balance systems to suit the demand

- In a closed system, ensure the minimum amount of re-circulation. This is achieved by adjusting flow rates to ensure that only the correct amount of