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TECHNICAL INFORMATION
Bulletin

NUMBER THIRTY-SEVEN

REDUCING ENERGY COSTS IN YOUR OPERATING SYSTEM

Owners of commercial and residential buildings from all parts of the country claim that the present day cost of energy is the primary concern in the operation of their buildings. The cost of energy is the predominant component in their total operating budget; about 25% of the total spent in operating the building complex. To control the cost of energy and improve the potential profit, energy conservation measures are being successfully applied.

The building complex may not experience the total value of the money spent on energy. To determine areas for the greatest potential of energy conservation, and to develop a plan to control the use and cost of energy, an energy audit is beneficial. Peerless Pump is prepared to assist in formulating an audit to assist in lowering the operating cost of pumping equipment associated with heating, air conditioning, and domestic water systems.

Energy conservation in a centrifugal pump installation begins with the accurate information on system requirements and pump operating characteristics. It is a common engineering practice to apply “safety factors” when determining flow and system head.

Consequently, to assure adequate flow, and to overcome these “safety factors,” systems are designed for excess capacity. This leads to higher than necessary energy costs.

It is necessary to apply all available tools, operating, and engineering skills to improve the overall pump and system operating effectiveness.

Pumping and system operating costs can be controlled substantially by applying these factors:

1. Determining accurate system flow (gpm) requirements

2. Determining accurate system head requirements by using appropriate system pressure drop data

3. Eliminating excessive “safety factors”

4. Use of energy effective control valves

5. Determining most suitable pumping arrangement, such as zone pumping, primary-secondary pumping, series or parallel pumping, or variable speed pumping.

6. Defining equipment complementary to the application requirements for initial cost, reliability, maintenance skills and costs, and operator confidence.

In systems which experience substantial periodic demand changes, variable speed drives will reduce pumping energy costs. To maximize economy and reliability, matching a drive to a pump unit requires good judgment as well as engineering skills.

Reduction of energy and operating costs can be illusive and often not obtainable if pump and system performance estimates are not accurate. Also, if the equipment is not proper for the application, or not familiar to the operating personnel, cost savings can be offset.

The best application is one where the user is comfortable with the equipment, knows the product is reliable, and is adequately serviced by reliable sources.

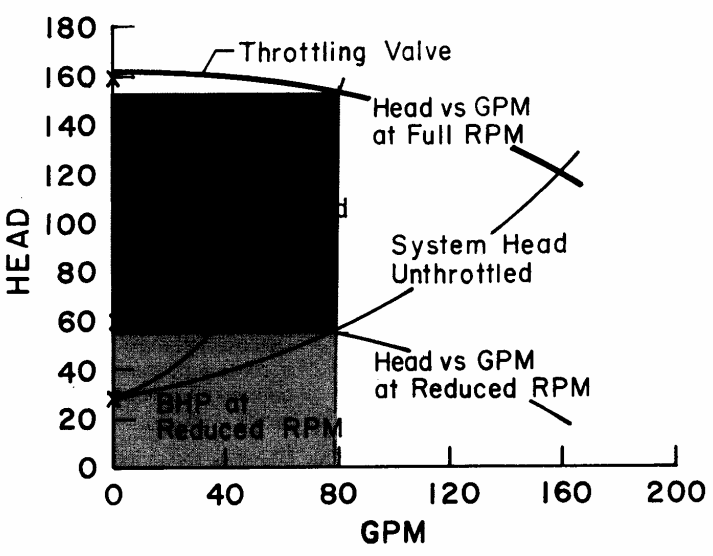
Today's technology has made available to the user numerous choices of variable speed drives; mechanical, electrical, and fluid types. The correct choice can be made only after proper consideration and evaluation of the equipment. For a cost effective installation, it is important that the pumps, (variable speed) drives, motors and controllers by coordinated to be compatible. By doing this, the owner has a far better chance to have a successful pumping system and to see a reduction in energy costs.

The potential savings achieved through these measures may be further enhanced by Federal and State investment and energy tax credits. In addition there may be incentives from local utility companies.

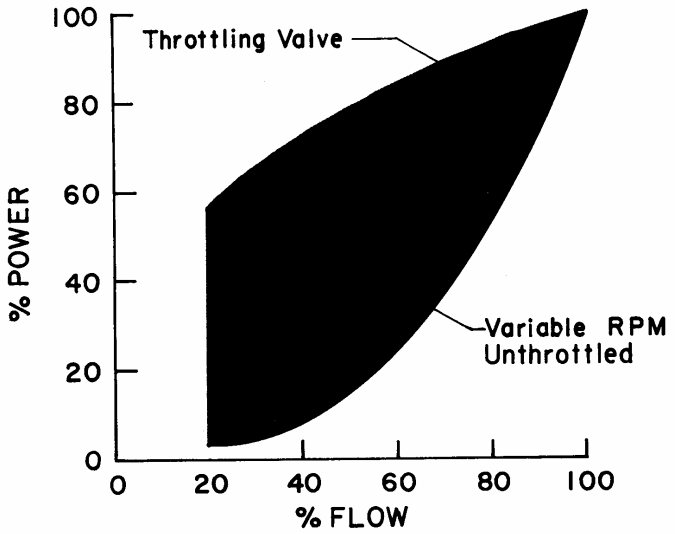
We stated earlier that systems which experience wide periodic demand changes can benefit from variable speed pumping and show reduced energy costs. This happens because the energy, i.e. power, consumed by the pump varies appreciably as the speed is reduced. The brake horsepower of a centrifugal pump handling water at 60° F is calculated as follows:

$$\frac{BHP = GPMxHEAD(FT)}{3960xEFF(PUMP)}$$

Therefore, any change in system GPM and/or head will generally affect the BHP and also the energy consumption. Figure 1 graphically illustrates a comparison between the power required for a constant speed pump, where a throttling valve is used to introduce artificial friction to allow the pump to operate at reduced demand, and the power required for a variable speed pump, where RPM is reduced to meet demand. Obviously, a throttling valve wastes energy, thus increasing operating costs.



The energy savings between a "throttled" system and an "un-throttled" system with variable RPM is graphically illustrated by figure 2.



Also, variable speed pumping will expand the energy savings by taking advantage of increases in suction pressure while a throttled unit will not. For example, in a variable speed pumping unit, an increase of 10 PSI in suction pressure can increase the energy savings by an additional 15% over figure 2. In a throttled pumping unit, the 10 PSI added suction pressure will be dissipated as friction loss through the valve while the energy requirements would remain the same. In this example, the variable speed pump would gain an additional advantage for energy savings of about 25% over a throttling valve pump system. Variable speed pumping is a recognized approach towards energy savings.

To achieve the full benefits of energy cost reduction, the auditor must have a working knowledge of the application and the related pumping equipment.

This information required includes:

- Accurate system flow (gpm) requirements
- Accurate system head requirements
- Accurate information on built in "safety" factors
- Complete list of system components
- Complete operating cycle of the system

With this information, and the information available through the Peerless system, an accurate audit can be performed with a minimum of inconvenience to the customer.