Choosing The Right Power Supply For Portable Hydraulics

Jon Tan, Enerpac Sales and Marketing Manager, South East Asia

Increasingly, powerful and portable hydraulic tools are being relied upon for jobs that once involved backbreaking and often hazardous manual labour.

Many plant maintenance tasks, such as tightening or loosening bolts, cutting rusted nuts, spreading flanges, or positioning equipment, can be made easier by using these powerful and precise time-savers.

Because of the varying operating ranges and capabilities of these portable labour-savers, many factors have to be taken into consideration when deciding which type and style of hydraulic tool is most suitable for any particular application. How the tool is powered is an important place to start the decision process.

Power Options

Traditionally, users of hydraulic tools have been able to choose from three main pump power methods: hand, air, or electric. Each power source offers distinct advantages.

Electric and air-powered pumps offer plenty of power, but they must be connected to an available power supply by cords or hoses. Hand and battery-operated pumps offer flexibility and portability, but operator fatigue and battery life can restrict the size of job they can handle.

Other factors, such as purchase price, running costs, anticipated service life, worker training, employee safety, type and frequency of chores, and tool duty cycle, must also be taken into consideration.

Hand Pumps

Hydraulic hand pumps are probably the easiest and least costly type to use. They are usually the most inexpensive solution to portable hydraulic power source requirements, but they also have limitations regarding their use. In situations involving hazardous (classified) locations, a hand pump may be the only choice, because it does not rely on a power source that could produce a spark.

Hand-operated pumps come in a wide range of sizes from small, single-speed models weighing less than 5kg, to large, metal, two-speed units weighing close to 45kg. Units are available with valving for both single- and double-acting tools and with oil capacities up to eight liters. Large hand pumps can power 100-ton cylinders for short periods of time as long as speed of operation is not a critical factor.

Specifications for hand pumps should meet certain criteria: system oil capacity, type of valving, and fluid compatibility. Because they are typically used for short, non-repetitive applications, duty cycle is usually not a primary concern.

The main limitation with hand pumps is evident in the name. Because it relies on hand effort, operator fatigue may occur. Also, because one hand is needed to operate the pump, leaving only one hand free, efficiency and convenience can be reduced.

While hand pumps are very portable, they may not be suitable for use in confined areas, such as catwalks or on ladders, where users may not be physically able to generate the full amount of power needed. Another factor to consider is that these pumps must be placed on a relatively flat surface during operation.

Pump Selection Guidelines

Determine appropriate ratings for oil capacity, maximum operating pressure, cycle duration and frequency, flow rate, and valving.

Compare overall cost. Increased productivity and reduced manpower requirements should be considered.

Check safety and ease of use. Portability and weight determine how much strength and dexterity the operator must have. Sound levels should be low.

Check power requirements. Available power often dictates the type of pump used.

Match tool speed. As pump size increases, power requirements escalate. Pumps should be sized to the required speed and not beyond.

Air Pumps

Air-operated pumps, like hand pumps, are relatively simple to specify, and come in a wide range of sizes. They feature increased performance compared to hand pumps and, when far enough from a compressor, can be used in an environment where the spark from an electric current could otherwise pose a hazard. In addition, most are relatively lightweight and portable.

There are basically three types of air-operated pumps: reciprocating, rotary, and intensifier. Reciprocating pumps are the most popular because they are a cost-competitive alternative to hand pumps while offering better performance. Reciprocating air pumps are usually single-speed units. They feature high flows at low pressure, because the air motor runs faster under reduced loads.

When high flow is needed, a dual version of the reciprocating air pump can be used. It consists of two pumps linked together, one for high flow, the other for high pressure. This arrangement allows the high-flow unit to stall at high pressure and does not require an unloading valve.

When greater levels of performance are required, a rotary air pump can be specified. This pump consists of a rotary air motor driving a conventional hydraulic pump. This style of pump tends to be heavier, noisier, and requires more air than the reciprocating version.

The most important consideration when specifying either style of pump is to ensure that the available air supply is sufficient. All air pumps rely on a certain air flow rate, stated in liters a minute (or standard cubic feet per minute, scfm), to provide maximum performance. If the supplied airflow rate is unknown, a rule of thumb is that one horsepower at the compressor supplies 5 scfm.

Air operated pumps can be more expensive to run, because compressed air can be a less efficient way to power tools. However, if a facility already has an extensive air distribution system, this style of pump is worth considering.

Electric Pumps

The second most common type of high-pressure pump, after hand pumps, is electric models. They are versatile because users can choose from many options, such as motor type, valves and actuators, heat exchangers, and operating voltage. Because of the options available, they are the most difficult to specify correctly.

Besides the primary considerations for pump selection (such as size, valving, reservoir capacity, and voltage), the required duty cycle and electric motor have to be carefully reviewed.

Duty cycle is the amount of time the pump runs and at what percentage of full load. The majority of high-pressure (10,000 psi) hydraulic pumps are not designed for high duty cycles. Applications that require pressures above 5,000 psi for periods longer than one hour should use pumps with coolers to maintain oil temperatures at

65C (150F) or less.

There are two electric motor choices: induction and universal. The choice depends on the application. Induction motors are ideal for high duty cycle applications, because they are designed to run for long periods of time and at low noise levels. Noise is an important factor when working in confined spaces.

Pumps using induction motors tend to be heavy and less portable, but offer a long service life. A critical consideration when specifying induction motors is a very stable source of electrical power. If line voltage drops as little as 10 percent, the motor could be severely damaged. Situations where electrical power is supplied by a generator through an extension cord may not be the best for this type of pump.

When an application requires the speed and performance of an electric pump, but the power source and portability are factors, then a pump with a universal motor should be considered. This type of motor features light weight (about 25 percent less than an induction motor), high power-to-weight ratio, and the ability to run on less-than-ideal electrical power. Universal motors can produce full torque on as little as 50 percent of rated line voltage.