

Tech Talk is a regular feature of *Concrete Openings* magazine, focusing on equipment, maintenance and operational issues of interest to concrete cutting contractors. Readers wishing to have a particular subject addressed can call or email CSDA with their suggestions at 727-577-5004 or becky@csda.org.

Deciphering Power Ratings

by Todd Forbush

In 2007, Honda announced that they would change the way they rate the horsepower output of their engines, switching from a “gross” rating to a “net” rating. This announcement read in part: “The net horsepower standard is a change from the previous gross horsepower standard, which has historically been used in the general purpose engine industry. The SAE J1349 standard measures net horsepower with the production muffler and air cleaner in place and therefore more closely correlates with the power the operator will experience when using a Honda engine powered product.”

When we see a horsepower rating for an engine or piece of equipment, many of us assume there is one standard for measurement. We expect there to be a certain objectivity in the rating. However, power ratings are subject to a number of different factors relative to the conditions under which the rating is taken, the method by which the rating is measured and time period for which it is measured. The following are some questions and answers to ask when evaluating the power of a given engine, motor, or piece of equipment.

WHAT IS THE DEFINITION OF HORSEPOWER?

One horsepower is the amount of force it takes to lift 33,000 pounds one foot in one minute. This measure can also be stated as the equivalent of 550 foot-pounds per second, or 745.7 watts.

Why do different power sources with the same horsepower rating have different power outputs?

One reason is because the output of a power source can be measured in more than one way. In terms of “gross” versus “net” power, these ratings basically rate the maximum power a source can achieve under ideal conditions (gross power) or the expected power an engine will achieve under normal operation conditions (net power).

Another reason can be the way the power is transferred to the work area. For example, many industry applications use belts and sheaves to transfer power from the engine shaft to the blade shaft. The size and

number of belts and the ratio of the engine shaft sheave to the blade shaft sheave affect how much power is transferred. So, two pieces of equipment with the same make and model of engine can appear to have different power levels, based on the way power is transferred from the engine to the work point or a diamond tool.

The efficiency of power transferred from the engine to the work point can also be observed in hydraulic and electric tools. With hydraulics, the wrong size hoses to transfer fluid or an inadequate pump or tool motor will not allow a full transfer of the power from the original source through the hydraulic system. With electricity, using the wrong size electric cord for the amp rating of the tool and distance from the power source will restrict the ability for full power to transfer from power source to work point.

HOW DOES ONE DETERMINE THE ACTUAL POWER OUTPUT OF AN ENGINE OR POWER SOURCE?

Most of the information required for understanding this relationship should be in the operating manual for any given piece of equipment. For equipment with gas or diesel engines, there will often be a manual for the engine itself in addition to the manual for the equipment employing the engine. The information should include a description for various power ratings, for the engine and for the tool itself. Since the way these descriptions vary in different manufacturers’ manuals, contact the manufacturer of any piece of equipment in question, and speak with a tech support person to get specific answers.

With regard to electric power, most generators have two power ratings “no-load” and “load.” These ratings correspond generally to “gross” and “net” power ratings. A no-load rating on a generator gives the maximum wattage output with no tools drawing power from the generator. A load rating on a generator gives the maximum wattage output with tools drawing maximum power from a generator.

Why does a 40-hp electric motor seem to have more power than a 40-hp gas or diesel engine?

The main reason is that the electric motor operates under a “constant” power. As long as the power coming into the electric motor is from a solid, constant source and is being transferred through the appropriate size and quality cords, the power is almost perfectly constant. The electric motor is receiving power from an external source and transferring it into power for the machine.

In the case of the gas or diesel engine, power can be affected by the climate, altitude, and general maintenance of the engine. Whereas the electric motor is deriving its power from an external source, the gas or diesel engine IS the power source as well as the mechanism that transfers the power to the machine. The ability of the gas or diesel engine to transfer power most efficiently to the work point is to a great deal dependent on the maintenance of the engine. Keeping clean air, fuel, and oil filters, changing the oil as directed by the manufacturer and running clean fuel all play a major part in how efficiently an engine is running and, thus, the horsepower output of the engine.

HOW IS THE HORSEPOWER AT THE WORK POINT DETERMINED?

When measuring power at the point where a blade is attached to a shaft or a bit is attached to a spindle, the measurement is usually made in terms of torque instead of horsepower. Torque measures the force it takes to move an object around an axis. This force is measured using a device called a Dynamometer. Like horsepower, torque is typically measured in foot-pounds. If a Dynamometer is attached to a blade shaft or bit spindle, the maximum or “peak” torque is measured at the point just before a relief mechanism is engaged. For a typical electric core drill motor, the point of relief is the point where the clutches slip. For the typical electric motor, it is measured at the point when the drive belts slip or an electric breaker is tripped. For the typical gas or diesel engine the point of relief is when the drive belts slip or the engine stalls. For the typical hydraulic motor, the point of relief is when a fluid bypass is engaged or the power source stalls.

Understanding the value ratings of equipment is essential for the effective management of equipment fleets for the modern concrete cutting operation. As CSDA contractors strive to be more efficient and competitive in daily operations, understanding of each piece of equipment and its true capacities becomes more important to success. In the same way that the industry has put more emphasis on blade and bit performance in terms of speed and life, operators and owners also need to put a similar emphasis on equipment performance for efficiency and productivity.

For several years, the International Association of Concrete Drillers and Sawers (IACDS) has been working on a system for describing the power input and output of drilling and sawing equipment. In May 2007, the IACDS adopted a set of uniform descriptions in IACDS Standard 2007/1, with an expectation that manufacturers will implement these standard descriptions within one year. The value of this and other standards established by our national and international trade associations cannot be overstated. Such standards help us make educated decisions about the best systems for performing specific tasks and to make intelligent comparisons between different power options. Ultimately, these standards help us “to work smarter.” The IACDS Machine Parameters Standard is available on the CSDA website by clicking “Standards, Specs and Best Practices,” located on the right side of the home page.

The CSDA training programs offer more detailed discussions of horsepower and other topics related to cutting equipment. The courses not only discuss the basics of power definition but also the appropriate applications for different power sources using different tools for different applications. These courses are available year-round online, seasonally at St. Petersburg College in Clearwater, Florida, and regionally in the United States.

Todd Forbush is a Regional Sales Manager for DITEQ Corporation and can be reached at 816-820-3634 or tforbush@diteq.com.