Power Tool Amps, Horsepower and Volts

What, what and what. Why are some tools rated in amps, some in horsepower and others in volts? Good question. Over the years I have received numerous emails on this topic, so I tried to put something together to explain each one and the ins and outs without getting to technical or complicated.

Amps

A tools amp rating indicates the electrical current load a motor can carry for an indefinite period of time without degrading the insulation and other electrical compounds of the motor. In a UL tested tool, the motor is tested to verify that it can run or operate below a specific temperature while current or electricity is flowing through it. So in essence how much can the motor absorb and dissipate heat. Motor speed is important. The faster a motor can spin the more air it can draw through the motor to help cool it down. So amps measures or indicates the maximum time a tool can continuously run without exceeding the temperature limits. Amps basically measure how effectively the motor cools itself, not how much power it has. With this in mind, more amps can be good because motors will run longer and won't heat up as fast. Remember heat is what kills a motor. Have you ever popped a circuit breaker on the panel? This can be annoying, but it protects your tools. Notice when you're popping the breaker your tool is probably bogging down causing more heat to build up and in return drawing more amps.

Another misconception is that because two tools have the same amp rating they must be the same. Not the case. Take two circular saws for example that both have a 15 amp rating. They must be the same, right? Wrong, even though they both have 15 amps, a worm drive can transfer the power to the blade more efficiently than the inline version giving the worm saw more torque.

Regarding cordless tools, the more amps the battery has, the longer the tool will run. Most 18 amp professional power tools have higher amps than the cheaper tools, even though the batteries have the same voltage and look like they are the same size.

Torque

Torque is a measure of rotational force. Again, toque numbers can be misleading. A lot of the toque comes from how well the gear system is designed. Have you ever wondered why a no name brand tool has the same amps and same toque, but can be a 1/3 of the cost of a professional power tool. Well the gearing is different, the quality of parts is different and some other very important things are different. So when you think you are actually getting a bargain, you are actually getting ripped off. Most torque ratings show the tool at no load speed (when the tool is running at full power and not actually making a cut). Toque represents the stalling point. If you get a motor to stall, its torque is maxed out. A stalled motor is the worst thing you can do as it creates more amps which create more heat.

Horsepower

Horsepower is a mathematical expression of the relationship between speed and torque. Again horse power is misleading because it is a mathematical equation and the manufacture can either use sustained or stalled toque; and thus you can get two different numbers. Most manufactures use peak power (stalling point) as the higher number. This is a bogus measure because it shows the highest output possible. If you did that to your tool you would burn the motor out very quickly because of the high current and high heat build up. So in reality it is not a realistic number measure.

Volts

Volts is the force and is most commonly used in cordless tool measurements. You can think of volts as horsepower for cordless tools. The higher the volt, the more power it can use for higher drain applications. A higher volt will also be able to handle bigger bits and blades. I am not going to get to involved in volts because it begins to get to technical, just as long as you know more volts usually means a heaver tool with cordless tools. But again with Lithium batteries this is not always the case. A higher volt is not always better. Yes, if you are doing heavy applications you need a higher volt, but sometimes a smaller volt is better. A smaller volt will get you inside cabinets easier because the tool is smaller and lighter.

Efficiency

Efficiency is very important, but never mentioned. Efficiency is how efficient the power gets disbursed to the output. Not all energy makes it to the the output. Some energy is lost through the transfer process of making it to the output, the blade or drill bit. Energy is lost through friction, such as ball bearings, iron losses, copper losses on the brushes and numerous other ways. The more efficient a motor is the more power you will get as the end result. What makes a motor more efficient? Simply the type, quality, design and grades of materials used to make an efficient tool. That is why the Professional Power Tools tend to cost more. Sure, some of the cost is because of the name, but the quality is what you really get. Take a 10 horsepower motor. An efficient motor might transfer 93% to the output while and cheaper model might only transfer 79% to the output. Well, who cares as long as they both screw a screw into the wall? Well, for one, the inefficient motor will without a doubt strip more screws and will cause more heat build up in the tool causing it to burn out extremely quick. Every time you screw a screw into wood you will have to put just a little more pressure on the tool, causing the torque and amps to build up, which causes more heat build up. In the long run, spending the extra money now will save you money, time, and aggravation later.

Conclusion

Sounds goofy, but in the reality of things comparing horsepower and amps from one manufacturers tool to another is pretty much useless. The one exception is corded power tools and amps. Corded power tool motors are required to be

tested by Underwriters Laboratories standards, so the amps are on a level playing field. However, they test amps only and do not test output power.