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VFD 101

Variable Speed Drives – Helping Build a Greener Car Wash

"Variable frequency drives, or variable speed drives (VSDs), can greatly increase motor efficiency in a variety of applications. VFDs are electrical devices which adjust the rotational speed of fan and pump motors in response to varying heating and cooling loads, and thus are much more energy-efficient than constant volume systems. VFDs offer direct control over the motor's electricity input rather than restricting the load itself by using valves and dampers… VFDs provide significant energy savings because horsepower in motors varies as the cube of the torque speed. For example, if fan speed is reduced by 20%, then motor horse-power is reduced by 50%. The best motor candidates for VFDs are large motors with long operating hours. VFD technology has been available for years and has a proven track record of energy savings and reliability."

This quote taken directly from the www.greencampus.harvard.edu web site detailing steps taken by Harvard University to reduce energy costs and further advance their green agenda. There are many reasons to increase efficiency in car wash equipment operation, and reducing energy use as a commitment to responsible consumption of Earth's limited resources has become top priority. In short, the use of variable speed drives as motor control devices, is one of the best ways for more effective use of energy to power motors in the car wash operation.

Start Up In-Rush Current

In-rush current or input surge current refers to the maximum, instantaneous input current drawn by an electrical device when first turned on. For example, incandescent light bulbs have high in-rush currents until their filaments warm up and their resistance increases. Alternating current electric motors may draw several times their normal full load current when first energized, for a few cycles of the input waveform. This represents the greatest area of potential savings. If the in-rush current can be reduced or even eliminated, as much as 40% of the total electricity used by the motor during starting and running can be saved.

Types Of Motor Loads

There are numerous types of electric motor applications in a car wash. The most common are pumps and blower fans, but electric motor driven cloth and brush assemblies and electric drive conveyors are becoming more popular.

Dryer Motors

Dryers and blowers offer the greatest potential for savings both economically and environmentally. The load generated by a blower fan is described as a variable torque load, meaning the load increases with the speed of the impeller. Often, variable speed drives controlling blowers will also reduce the speed of the blowers for special vehicle characteristics such as pick up truck beds and convertible tops. Some dryer manufacturer's

impeller design will allow the variable speed drive to “overdrive” the motor to 65 or 70hz and achieve the air flow output of a larger motor without the expense and current load of a larger motor. This is truly a “green” concept.

Vacuum Motors

Vacuum motor loads are really quite similar to blower or fan loads. Variable speed drives can match the vacuum motor’s speed to the actual demand load rather than full output, as with an across the line starter.

Hydraulic Pumps

Hydraulic power pumps can be described as a constant torque load. With the proper pump valving, variable speed drives can control the speed of the pump and the hydraulic device while maintaining maximum torque.

High Pressure Water Pumps

Pumps supplying open nozzle manifolds can easily benefit from a variable speed drive. Adding a pressure transducer in place of a mechanical pressure regulator and using the drive to control the water pressure can provide tremendous power savings, in addition to reduced wear on pumps, belts and hoses. The saving effect can be compared to driving a car with the accelerator pressed to the floor and using the brake to control speed. Booster pumps and Air Compressors are also equipment that can benefit from the control a variable speed drive affords.

Conveyors

Direct driven conveyors with electric motors are becoming more popular due to advances in motor technology and the control features a variable speed drive offers. Speed and torque can be matched to the exact conveyor load, making for an efficient and green application.

Conclusion

Variable speed drives can offer significant electrical savings, in addition to reduced wear and stress, to many applications in the car wash equipment package. The car wash operator can enjoy smaller electric bills while doing their part to provide an environmentally cleaner, greener operation.