# Wash and Dry

The Environmentally Friendly Way

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here are a few eco-conundrums associated with washing a car — from all the water it takes, to the array of chemicals used, not to mention the energy used in the process. After factoring in noise disruptions, it becomes apparent that wise choices by car wash operators and consumers alike can significantly reduce the eco-footprint created by car washing. To this end, we'll examine the following three areas a little more closely:

- Water
- Energy
- Noise

#### WATER

Water is chief in the hierarchy of human needs. It sustains life and forms a vital part of social infrastructures. Even though it appears that copious amounts of water are used in a car wash, professional operations use high-pressure pumps and nozzles to minimize water usage. Tunnel devices measure the length of each vehicle while computer controlled systems adjust the run time of each piece of equipment, which ensures that just the required amount of water is used for cleaning each car. Water usage for commercial car washes is generally less than 40 gallons per car.

In comparison, washing a vehicle at home typically uses 80 to 140 gallons of water and can top 200 gallons after the dog and kids are rinsed off. Dirty car wash water contains pollutants ranging from gasoline to oil and residues from exhaust fumes. The detergents being used to wash the car itself are a universal contaminant of groundwater and public water supplies. Home car washing is one of the more environmentally *unfriendly* chores we can do around the house.

We all live in a watershed. A watershed is an area of land that drains to the lowest point. Water from rain, storm drains, and ditches flows directly to rivers, streams, creeks, wetlands, and bays. Storm drains and ditches *are* different than sewers. They *are not* connected to the treatment plant and, without additional cleaning, runoff water can wreak havoc with the ecosystem. It is estimated that nearly 60 percent of our country's water pollution comes from runoff.

High-performance drying systems ensure that water, which isn't lost to evaporation or carried out with the car, is filtered by a reclaim system and recycled for reuse in the car wash. Laws require commercial car wash facilities to drain any remaining wastewater into a sewer system and thus the treatment plant, thereby filtering it once more before releasing it into the great outdoors.

#### ENERGY

There are many reasons to increase efficiency in car wash equipment operation. Reducing energy use as a commitment to responsible consumption of the Earth's limited resources has become a top priority.

#### Variable Frequency Drives

In short, the use of variable frequency drives (VFD) — also known as variable speed drives (VSD) — as motor control devices is one of the best ways for more effective use of energy to power motors in the car wash operation.

"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 horsepower 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."

The above quote is taken directly from the www.greencampus. harvard.edu website that contains details of the steps taken by Harvard University to reduce energy costs and further advance their green agenda.

#### 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 eliminat-

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ed, as much as 40 percent of the total electricity used by the motor during starting and running can be saved. Figure 1, below, illustrates this concept.

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

drive affords.

Conveyors

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

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.



## **FIGURE 1**

# 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 electricdrive 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 pickup truck beds and convertible tops. Some dryer manufacturers' 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

#### NOISE

Noise is defined as "sound that lacks agreeable musical quality or is noticeably loud, harsh, and discordant" or "results from irregular vibrations and produces an unpleasant sound."

#### Noise Pollution and Occupational Concerns

Although there is no exact and universally accepted point at which sound is perceived as noise, potential hearing damage due to noise is an accepted and recognized occupational hazard in industry. The extent of damage depends on the length of time exposed, the intensity, and the exact nature of the noise. Generally, the drying system is considered the major culprit in producing unacceptable sound levels. Some noise is created at the exit of the nozzle (where pressurized air meets still air) and some noise is created at the intake (where air is being forcibly pulled in and compacted). Cavitations, created at the fan as it compacts or pressurizes the air, create additional noise. Turbulence from the air being twisted, turned, and re-directed from the blades creates yet another noise source. All of these factors will produce noise with every dryer; however, the level of noise created with each one and the ability to reduce the noise will depend on the type of fan. Incorrect abatement methods can result in loss of airflow, overheating of motors, or fan failure by increasing backpressure on the fan itself.

Eventual hearing impairment is the most obvious damage caused by high industrial noise levels. There are many others. Occupational noise is linked to increased nervousness, irritability, and anxiety. New research indicates a possible additional relationship to heart disease, cardiovascular dysfunction, and certain gastrointestinal, endocrine, and metabolic disorders. Job-related noise also makes work more difficult by impeding communications. Noise causes productivity to decrease and on-the-job safety to suffer.

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The Occupational Safety and Health Administration (OSHA) sets the standards for occupational noise exposure. These standards govern the maximum levels of industrial noise an employee may be exposed to and they explain what action must be taken if these levels are excessive.

#### How to Interpret Noise Levels

Noise levels are measured and reported in decibels. However, the decibel system can be confusing because it is based on a logarithmic scale. For example, a 110 dB noise level is not 10 percent greater than a 100 dB noise level; it actually represents 10 times the acoustical energy.

For this reason, a small increase or decrease in the sound pressure level (measured in decibels)

has a very significant effect on the noise intensity. A drop of just three decibels means the sound pressure level has been cut in half.

The chart (above) is a helpful guide that lists typical sound pressure levels for daily activities.

#### Reducing Noise — Creating a Comfortable Neighborhood

Noise concerns have become a major issue for the industry. A successful car wash must be located in close proximity to both retail establishments and residential areas. Noise generated by car wash traffic and equipment can pose a problem for all concerned. Local ordinances may impose restrictions or dictate hours of operation, depending on the noise produced by the car wash perceived to be intrusive to neighboring properties.

Because car washes have large entrance and exit doors, sound cannot be completely contained within the building. Consideration should be given to sound reduction during the design phase through the orientation of the bays; however, it is

**Typical Sound Pressure Levels** Sound Pressure Sub jective Level (dB) Source Reaction 0 Threshold of excellent youthful hearing Threshold of hearing 10 Threshold of good hearing 20 Buzzing insect at 3 feet Faint 30 Whispered conversation at 6 feet 40 Quiet residential area 50 Window air conditioner Mode rate 60 Conversational speech at 3 feet 70 Freight train at 100 feet 80 Computer printout room Loud 90 Unmuffled large diesel engine at 130 feet Very Loud 110 Loud rock band Threshold of discomfort 120 Passenger ramp at jet airliner (peak) Threshold of pain 130 Artillery fire at 10 feet Extreme danger 140 Military jet takeoff at 100 feet Extreme danger

> more effective to contain and reduce the power of sound waves emitted at the equipment source.

> Noise radiates from a source. The most desirable approach to noise control is to reduce noise at its source by using absorbent materials to dissipate the sonic energy into small amounts of heat. All equipment emits sound within a wide range of frequency levels (Hz), and abatement materials must be designed to treat those specific ranges; however, most effective sound absorption materials used in construction are porous and are not suitable for wet, harsh car wash environments.

#### **CONCLUSION**

There are many reasons to be environmentally friendly in car wash operations:

• Water conservation and contamination reduction is an obvious benefit to our planet.

• Variable speed drives can offer significant electrical savings, in addition to reduced wear and stress, to many applications in the car wash equipment package.

• Reducing noise can improve the quality of life for employees and neighbors, while having a smaller impact on the local environment.

These are just a few examples of how car wash operators can enjoy smaller utility bills while doing their part to provide an environmentally cleaner, greener operation.

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Darryl and Cheryl Dobie own Aerodry Systems, LLC located in Denver, CO. They have successfully owned and operated car washes, and manufactured drying systems, since the mid-1980s. For additional information, please visit www.aerodrysystems.com on the web.