By Chris Obermair

Sweeping Parking Facilities

How to Control Fugitive Dust

Whether it's an open lot, a multilevel structure or an underground garage, parking facilities require frequent sweeping to keep them safe for users and employees, reduce long-term maintenance costs and make the facilities attractive and convenient to the people who use them. Industry studies have confirmed that parking facilities that are neat and clean attract more customers and elicit fewer complaints than facilities that are dusty, dirty and littered with trash. This is true whether the facility charges for parking or provides it free, as at a shopping center.

Fine dust is troublesome to remove and if not done properly, can be spread onto vehicles, other horizontal surfaces or back on the deck or roadway, exacerbating the dust problem and affecting the appearance of the parking facility. But it's more than just an appearance issue. Frequent sweeping of a parking facility has a number of other practical and economic benefits:

- Parking surfaces and decks will last longer. Sand, gravel and dust act as abrasives under vehicle wheels and can increase wear on driving surfaces. When asphalt surfaces become worn, they become more susceptible to water infiltration and begin to break down. Concrete wears too, and the resultant concrete dust necessitates even more cleaning.

- Debris on parking lots and decks contain traces of gasoline, oil, heavy metals and organic compounds that may contribute to water and air pollution if not regularly collected.

- Clean parking surfaces are safer for patrons. Accumulated sand and debris can increase the risk of slips and falls. By eliminating these materials and maintaining surfaces in good condition, injuries and possibly even legal action can be minimized if not eliminated.

Most parking facilities use power sweepers to collect the sand, gravel, debris, dust and trash that invariably accumulate on the parking surfaces - although the frequency of sweeping and the quality of the job vary considerably. A parking facility may purchase and operate its own sweeping equipment or it may contract with a cleaning service. In either case, the performance of the equipment used varies in terms of productivity, its ability to pick up a high percentage of the debris and the amount of fugitive dust produced during cleaning.

The Problem of Fugitive Dust

Power sweepers are usually designed with a rotating cylindrical main broom that loosens dirt and dust from the surface and throws it forward into the hopper, which can create dust clouds. This main broom is normally surrounded by a skirted plenum that creates a slight seal with the surface to reduce the dust clouding. A hydraulically powered fan creates a vacuum inside this plenum that draws the dirt, dust and debris into a hopper where most of the dust settles, and then ejects the air to the outside through a series of filters where the remaining fine dust is captured. Many power sweepers also have front rotating side brooms for cleaning edges by sweeping debris toward the main broom and vacuum. While these side brooms expand the width of the swept path, improving productivity, they are also the major source of fugitive dust.

Fugitive dust is the fine dust that is kicked into the air by the rotating side brooms on the front of most large power sweepers. Very fine dust can also be ejected from the air exhaust if the filters perform poorly. Unless properly controlled or suppressed, this fugitive dust will expose the sweeper operator to unhealthy air and will eventually settle back onto the deck or surface, overhead pipes, the tops of walls and railings, and vehicles.

Fine dust is very difficult to completely capture during the sweeping process, and is the type that is most likely to degrade a facility's general appearance and to irritate customers whose cars become coated with it. When fugitive dust settles on horizontal surfaces, customers are likely to get their hands dirty grabbing stair rails or get their clothes dirty brushing up against their vehicles. This dust will also be picked up by their shoes and end up on the vehicle's carpeting, or, packages temporarily placed on the deck will transport the dust to the upholstery. And when vehicles are coated with this fine dust and then exposed to rain, muddy water marks form that can be difficult to remove. In short, fugitive dust that ends up on vehicles and surfaces can be a customer relations nightmare!

Dust Comes From a Variety of Sources

The sources of dust are both natural and manmade. Natural sources include windborne dust of geologic origin such as clays, silts and soil particles. Other natural dust particles include pollen, mold spores, pulverized leaves and other organic matter that can accumulate at certain times of the year. The quantity and composition of this natural dust varies with geographical location as well as the season and weather. For example, geologic dust is common in the West, especially during dry and windy weather. Dust of organic origin is more common in the East during the spring and the fall.

These particular natural dust particles are very small—from about 2 to 10 microns in diameter. They are easily transported by winds and settle out on horizontal surfaces at both outdoor parking lots and open multilevel parking structures.

Manmade sources of dust found in parking facilities include pulverized sand and cement dust, ground-up rubber and carbon black from tires, vehicle exhaust soot, fibers, cigarette ash and dust from brake linings. These particles are larger (about 10 to 500 microns) than the dust particles transported by the wind, but they are still small enough to become airborne and travel short distances when disturbed.

Manmade sources of very fine dust aerosols (less than 1 micron) include combustion byproducts from power plants, industrial furnaces and exhaust from cars and trucks. While not a large volume, this very fine dust adds to the mix and is very difficult to eliminate.

DUST PARTICLE SIZE COMPARISON

Particle	Particle Size (in microns)
Sand	100 to 10,000
Pollens	10 to 1,000
Textile Fibers	10 to 1,000
Stone Dust	10 to 1,000
Cement Dust	3 to 100
Mold Spores	10 to 30
Fly Ash	1.0 to 1,000
Vehicle Emissions	1.0 to 150
Clay, Silt	0.1 to 50
Carbon Black (tires, soot)	0.2 to 40
Combustion Byproducts	0.1 to 2.5
Atmospheric Dust	0.001 to 40

(Note: one micron – one millionth of a meter)

CONTROLLING FUGITIVE DUSTWHILE SWEEPING

Most power sweepers do a good job of picking up sand, dirt and debris and of minimizing some of the dust at the main broom. However, their overall cleaning efficiency can be impacted by such factors as the porosity of the surface, the amount of wear on the skirting around the main broom (and, therefore, the air seal), the condition of the broom and dust filter, power of the vacuum fan and the speed of the vehicle.

Fugitive dust control depends on whether the side brooms incorporate a method of dust suppression and whether the sweeper's filter system is efficient enough to capture 98-plus percent of the dust in the exhaust air.

There are generally only two methods of controlling dust kicked up by the side brooms. One system involves surrounding the side brooms with a skirt and vacuum plenum to capture the dust in much the same way as the main broom and skirted plenum. While generally effective, the skirt must be changed frequently to compensate for wear, and the vacuum used to collect dust at the side brooms tends to degrade the performance of the vacuum around the main broom. In addition, the skirted side brooms are less effective at feeding larger debris toward the main broom.

A better solution involves the use of a water misting device that creates a "fog" around each side broom. When the fog is of the optimum density, it causes the finest dust particles to bond with the mist and fall back to the ground, where they can be swept in toward the main broom and then be swept up. Since the amount of water used is miniscule, the surface does not become wet, nor is the dust liquefied or turned to mud. An onboard water tank is sufficient for about three hours of dust-controlled sweeping.

To properly filter dust captured by the vacuum system, sweepers need a multi-stage, advanced filtering system using nano-fiber technology. Such near-H.E.P.A-quality filtering systems are capable of capturing greater than 98 percent of dust particles from 0.3 to 1.0 microns for great efficiencies down to the smallest dust particle typically encountered. Filters should have at least 94 square feet of filter area which will allow extended runs of dust-controlled sweeping between cleaning cycles. Top-performing sweepers enhance filtration by forcing the air stream to make abrupt changes in direction and velocity, causing the larger dust particles to fall out of the stream and into the hopper. By preventing these large particles from reaching the filter medium, filters perform better, longer.

CONVENTIONAL SWEEPING

SWEEPING WITH WATER MISTING

Dust filter efficiency is diminished unless it is kept clear enough to effectively restore airflow. The ideal method for restoring air flow is to aggressively shake the filter free of dust and send the dust to the hopper. For longer filter life and optimum dust control, the ideal power sweeper will have a dust filter shaker system that automatically executes a cleaning cycle each time the broom is raised.

CONCLUSION

It is important to control fine dust while power sweeping in parking facilities because of its tendency to resettle on horizontal surfaces or on customers' vehicles. By properly controlling or eliminating dust, the parking facility will be safer and more appealing to patrons. When selecting a power sweeper or contracting a cleaning service, look for equipment that controls dust across the entire sweep path (at the main broom and at the side brooms) for maximum productivity and fugitive dust control. Machines using a fogging device to suppress dust particles kicked up by the side brooms represent the most advanced form of dust-controlled power sweepers. Coupled with high-efficiency main filter systems, these state-of-the-art sweeping machines can ensure that parking facilities are clean, safe and inviting.■

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