

A solution to eliminate wasted time for dust collection in float glass works is presented here – the Dalamatic DLMV<sup>®</sup> from Donaldson Company. The article looks into how the dalamatic DLMV, without a housing of its own, can be integrated, either horizontally or vertically, within the existing process equipment. The application of the system, at Guardian Industries, is discussed by Adam Sick, Guardian Project Engineer.

From railcar/truck unloading, hopper and conveyor transfer points, cullet return systems, bucket elevators and silo venting, dust must be controlled for employee health, quality control, and general good housekeeping.

When you are in the business of making float glass, you want your staff to spend their time on making glass. You do not want them spending time on dust collection - unplugging ductwork, oiling bearings on screw conveyors, changing filters, or other maintenance tasks that most dust collection systems require. Now, Donaldson Torit introduces two products to the industry that will reduce maintenance time: longer life filter media and a dust collector that can be inserted into existing places.

Traditionally, two design approaches have been commonly used for dust collection in float glass plants:

1. **Centralized:** in which several hoods and duct runs are connected to a single dust collector.

The advantages are:

- a) a flexible installation process wherein collection hoods can be installed in very tight areas, and
- b) only one collector to maintain.

The disadvantages reveal themselves in the maintenance: there are continuous abrasion issues based on the nature of product conveyed and risk of complete system failure if the dust collection system is not regularly maintained. There can be lots of ductwork and if the main duct run gets plugged, production can be completely shut down. Also, the collected material is a mixture that can not be returned to the material stream and must be shipped to a landfill;



Because it doesn't have a housing, the Donaldson Dalamatic Insertable DLMV can fit into tight places where other dust collectors cannot.

2. **Decentralized:** in which point-of-use dust collectors allow discharge of dust material back into the system. While there is significantly less ductwork to maintain, there are more dust collectors and dust discharge systems to service.

Donaldson takes the best of both approaches to create a new solution: directly integrating the dust collector into an existing batch house or cullet tunnel. Dust collection is then decentralized with the advantage of less ductwork, while dust discharge is centralized for more efficient handling.

## A COLLECTOR WITHOUT A HOUSING

The first key to this approach is Donaldson's *Dalamatic DLMV* dust collector, which is a collector without a housing of its own. The components – the filter media, cleaning mechanism, and a fan – can be integrated, either horizontally or vertically, within the existing process equipment or hoods.

For initial installation, less ductwork means less cost. For ongoing maintenance, less ductwork means less chance of plugging, less replacement due to wear, and collector service without system shut-down.

Cullet dust in particular wears out ductwork regularly and pieces need to be replaced, sometimes as often as every six months. By positioning the dust collector in a transfer point, for instance, the abrasive dust can be captured directly, eliminating the need for ducting.

With the Donaldson *Dalamatic* decentralized approach, dust collectors can be shut down individually for service, without shutting down the whole system, so production is not interrupted.

Space is always an issue in float glass plants, and finding enough vertical space for a traditional (vertical) style bag collector can be challenging. The Donaldson *Dalamatic DLMV* is a bag style collector that can be used in any orientation – horizontal, vertical or at an angle – so it does not need as much space as a vertical style and can be fit into odd places.

## THE HEART OF THE COLLECTOR – THE FILTER MEDIA

The filter elements in the Donaldson *Dalamatic* are the other key factor in reducing maintenance. Instead of the traditional, very long filter bag (10 to 12 feet – 3 to 3.6 meters), the *Dalamatic* utilizes envelope-style filters of shorter lengths: 1.5, 3 and 5 feet – 0.5, 0.9 and 1.5 meters. Shorter filters are much easier to service and with Donaldson's new filter media, *Dura-Life*, the shorter filters have as much dust-holding capacity as long ones.

## CLEAN-SIDE SERVICING

On Donaldson *Dalamatic* collectors, dirty filters are removed from the clean air side. Operators pull the dirty elements out through a full-width access door, either horizontally or vertically depending on how the collector is oriented. This significantly reduces exposure to a messy job and eliminates OSHA "confined space" entry procedures and permits.



Left: Dura-Life filter bags

Right: Outside the building at the railcar/truck unloading station, this self-cleaning Donaldson Cased *Dalamatic* collects dust generated during raw material discharge.

## APPLICATIONS: GUARDIAN INDUSTRIES

When *Guardian Industries* decided to build its state-of-the-art float glass plant in DeWitt, Iowa, United States, that would operate 24/7/365, the company wanted dust collection systems that would be highly efficient and reliable, with low maintenance. *Guardian* opened its DeWitt plant in 1996, and, in 2004, added a major R&D facility to focus on glass coatings.

*Guardian* needed thorough and efficient dust collection throughout the plant, with the objectives of:

1. a clean plant;
2. protection of the process and measurement equipment; and
3. keeping installation and operating costs down at reasonable levels.

Adam Sick, *Guardian* Project Engineer, explained how Donaldson dust collectors are installed at several points throughout the plant, from the batch house to the cullet return system.

## UNLOADING RAW MATERIAL

As in most float glass operations, a great amount of dust is generated at Guardian's railcar unloading with the initial dump. To take care of this, Guardian uses a large hopper with an integrated hood located just below the grid and surrounding all four sides. This hood pulls air down and around the material during discharge so that none gets back up through the grid. At the hopper discharge to the crossover conveyor, a dust plume is created when the material transfers. A Donaldson Dalamatric reverse-pulsejet, envelope-style baghouse, mounted on the unload shed wall, collects the dust from these areas.

In the Dalamatric, a periodic reverse pulse of clean, dry compressed air releases material collected from the media. Guardian had the collector set to pulse-clean every 30 seconds, but recently installed a Dwyer Photohelic pressure switch that makes the system pulse only when air restriction reaches a specified point: in other words, now it pulses only when necessary and conserves energy usage.

Guardian utilizes a total of 13 Donaldson Dalamatric DLMV insertable filters supplied with individual integral fans throughout its batch house. One unit picks up dust created by the cross-over conveyor in the lower level as it feeds a bucket elevator that mechanically conveys material to the turn head distributor located on the fourth floor. Additional insertable filters are positioned just before the turn head and over each individual bin as a vent. A single DLMV filter vents two cullet silos located on the third floor, and two are located where the cullet is dropped onto the transfer lines that carry the batch to the furnace.

At the bottom of the silos, several Donaldson Unimaster dust collectors were installed for minor ingredients (intermittent operations). These stand-alone units, collecting the dust generated at the bag-emptying stations, are fitted with a mechanical shake cleaning mechanism that does not require compressed air to operate.

Above: Self-cleaning Donaldson Insertable Dalamatric DLMV's are mounted in existing hoods on top of mixer conveyer transfer points. The slanted tops are the service access doors.

Bottom: In this room at the top of the batch house, Donaldson Dalamatric insertable dust collectors (the tops are slanted) are venting each raw material silo. The clean-side access for service eliminates the need for OSHA "confined space" entry procedures and permits.

## CULLET RETURN

Guardian uses both centralized and decentralized dust collection systems for cullet return:

- a cased Donaldson Dalamatric does the main job with hoods at several points along the conveyor belt; and
- a Donaldson Torit cartridge collector is positioned near a crusher where dust is generated.

Cullet return lines present special challenges for dust collectors. There is dust, yes, but also pieces of sharp-edged glass that can abrade the filter bags prematurely. Consequently, the pick-up points for the DLMV collector are installed over a hooded portion of the belt just past where cullet falls onto the belt so that they see mainly 'fugitive' dust, and are positioned a little higher than is typical so that small pieces of glass are not collected. The Donaldson Torit collector is installed in a similar manner after the crusher.



## NIGHT AND DAY

Overall, Adam Sick says that Guardian is happy with the Donaldson systems. “I have seen places without Dalamatics, and there is a night and day difference!”

Sick has been working on perfecting the filter maintenance schedule and is seeing positive results. “The main issue I have come across is that many people simply do not understand how dust collection system filters work and they come up with their own ideas how to maintain them. One of my main focuses since I have been working with the dust collection systems is to change operators’ mindsets and get everybody on the same page when it comes to dust collector operation and maintenance procedures. During this process, Donaldson has been extremely helpful.”

As mentioned, on the unload shed collector, the system was set to pulse-clean every 30 seconds. Sick added a Dwyer Photohelic differential pressure gauge/switch that constantly reads the pressure across the filter bags and automatically initiates the pulse-clean cycle only when pressure reaches a certain point...in other words, only when cleaning is needed. The same gauge was also installed on the Donaldson Torit Collector in the cullet return. After a little more research is done, Sick says the same gauge may be added to the other Bin Vent Collectors in the batch house.

“The pulse occurs only once or twice a week now in the dust collector,” Sick explains, “and the cost of the new pressure switch will payback within a year. The filters will last longer, too.” Less pulsing means less energy usage by the compressor, which quickly translates to reduced cost. Less pulsing is also less wear on the filter bags and pulse mechanism promoting longer life.



Guardian Industries  
DeWitt, Iowa, United States

Why use a pressure gauge? Because it is the one true measure of when the filters are loading. Visual inspection does not do the trick – after all, if the filter is doing its job, it should look dirty! And the built-up dust, called the ‘dust cake,’ actually helps the dust collection process by providing more surface for further dust capture. When the dust cake has built up such that it begins to restrict airflow through the filter media, then the pulse-cleaning cycle is triggered by the gauge/switch. Dust is blown off until the pressure drops down to a set level.

In Guardian’s batch house dust collectors, Sick said that the crew was cleaning the dirty-looking filters ‘once a month.’ This led to much unneeded maintenance time spent. Adam explained, “Now, with written procedures in place, specific training by myself and Donaldson, and some testing to show how they should be maintained, the crew now knows to leave the filter bags in place and let the pulse-cleaning mechanism do the work. The once-a-month chore has been eliminated, along with its associated labour costs.”

## DURA-LIFE FILTER MEDIA

While Guardian is still testing the use of Donaldson’s new Dura-Life filter bags, Adam Sick is optimistic about using them. “Dura-Life bags were installed in our ‘sand 1’ silo collector and standard bags in our ‘sand 2’ collector. After five months run time the Dura-Life bags are 1/2 inch differential lower than the standard bags. This may not sound like much, but considering they are still on the very low end of the operating differential pressure, it is actually a sizeable difference,” Sick explained.

The Dura-Life filters are made of a media that provides better surface-loading – i.e. dust cake formation. This keeps the dust on the surface rather than embedded in the depth of the filter media, so that the dust is pulsed-off easier and faster during the cleaning cycle. The result is that most applications are seeing two to three times longer filter life compared to the polyester felt media so commonly used. This means fewer filter changes, labour savings, and reduced production downtime.

Proper hooding and airflow that allows the dust-generation points to be under slight negative pressure are critical in keeping dust under control. The combination of centralized and decentralized dust collection systems can reduce initial installation cost and reduce on-going maintenance efforts and cost.

## DONALDSON DURA-LIFE

### Manufacturing process

Standard 16-ounce polyester felt is manufactured using a needling process, where needles are used to entangle the fibers together. Because the needles are relatively large in comparison to filter fiber diameter, they create large pores (spaces between the fibers) that allow dust to penetrate deeply into the material.

In contrast, Donaldson Dura-Life felt is made through a hydroentangling process which uses micro-fine water jets to entangle fibers. Dura-Life fibers are 33 percent smaller than standard polyester fibers. The combination of smaller fibers and the hydroentanglement process results in a more uniform material with a maximum pore size that is 19 percent smaller than standard 16-ounce polyester felt.

### Particle release properties

The better uniformity and smaller pore size result in better surface loading and less depth loading of the dust. Better surface loading means that the pulse cleaning of the collector will be more effective in releasing the dust from the bag. A better-cleaning

bag means that the pressure drop will remain lower longer thus yielding longer bag life.

### Specification versus standard polyester bag material

Although the Dura-Life bag is a lighter weight bag, it still has the same thickness due to the hydroentanglement process. Dura-Life has a higher permeability than standard polyester so it has lower pressure drop at start-up. Because Dura-Life is made of polyester, it has the same temperature tolerance capabilities as standard 16-ounce polyester bags.

### Dust-capturing power

Lab tests, independent of Donaldson and verified by the Environmental Technology Verification (ETV) Program, show that the media used in Dura-Life bag filters captures significantly more of the 2.5 micron size dust than traditional polyester media. This is truly meaningful in glass production plants where silica and other harmful chemicals and compounds are used.

Donaldson Dura-Life was named "2002 Media of the Year" by Filtration & Separation magazine and given the Vaaler award from Chemical Processing magazine in 2003.



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