Getting mill dust more under control

A trial at a West Fraser mill in B.C. has demonstrated the feasibility and energy efficiency—and potentially increased safety—of using dust control equipment that has been very successfully used in the mining industry.

By Paul MacDonald

Following fires/explosions at two sawmills in B.C. in 2012, the Canadian forest industry has been pro-active in working on solutions to reduce dust in mills. While it has not been determined that dust was the single cause of these accidents, it’s now generally thought that it was a contributing cause. Both mills—Lakeland in Prince George and the Babine Forest Products mill in Burns Lake—processed beetle-killed timber that produces extra-fine dust.

For Sita Millar of Catamount Consulting Inc., who has had a long career working with the Canadian forest industry, the issue is personal. She knew and worked with one of the workers killed in the fires/explosions. Millar has been involved with B.C. sawmills for decades and while she has always been conscious about safety, the accidents have increased her efforts to make Canadian sawmills even safer. “There’s a personal connection to me with this issue,” she says.

That’s a big part of the reason why Millar decided to get involved with West Fraser Timber, BC Hydro’s Power Smart program and dust control equipment company Engart Inc. in a pilot proof of concept dust control program at West Fraser’s MDF plant in Quesnel, B.C. The program involved the installation of dust control equipment from West Virginia-based Engart that was adapted from particulate control technology that is widely used in the coal mining industry, and by power utilities in coal handling and boilers.

“One of our energy engineers came across the technology in the mining sector, and in the context of safe and energy efficient dust collection, we thought there might be an opportunity to apply it in the sawmill sector,” says Markus Zeller, who works in industrial technology innovation at BC Hydro.

BC Hydro talked with a number of forest companies about the equipment, including West Fraser. Brad Hunt of West Fraser thought the best fit for the dust suppression equipment try-out would be the company’s WestPine MDF plant, in Quesnel.

Before the pilot project went ahead at WestPine, however, equipment supplier Engart did some testing. The Engart system involves installing dust extractors that use energy generated by a fan to encapsulate dust particles into atomized water.

“We did some testing of WestPine dust at our facility in West Virginia, to get a feel for how the equipment reacted to it, and to see if there were any modifications we needed to make before it went into the mill,” said Tim Warden, general manager of Engart.

“The dust consisted of very fine particles—it was almost like flour, it was so fine.
“We were a little surprised to see that the dust particles were so small, but that was fine. It’s good to test with the extreme scenario, which in this case involved the finest particles you’re likely to run across in a mill.”

In Engart’s experience, an industry being able to safely handle the dangers of the finest dust particles is critical.

“What happens with any kind of dust collection—whether it is from coal, rock or wood—is that the smaller dust particles are the most difficult to capture. They are the most hazardous in terms of combustible dust because they will float and land on surfaces. And if there is an initial explosion, sometimes the secondary explosion will be the most dangerous because the fine dust particles will be released into the air.

“When you rate the efficiencies of equipment, you want to look at the efficiency it has with small dust particles.”

So, the thinking was that if the technology could work with the extremely fine dust particles in an MDF plant, it would also work effectively with the larger dust particles in a sawmill.

Engart has extensive experience installing dust control equipment in the mining industry, notably with coal mining, and coal handling facilities at utilities. Warden notes there are some similarities with the forest industry.

“It depends on the type of coal, but some western U.S. sub-bituminous coal dust is similar to the forest products dust we tested. It’s very powdery, but the specific gravity of the wood dust is lower.

“But when you talk about dust particles in the 10 micron range, they all react very similar in that they float. They are almost invisible to the eye unless there is a real high concentration. And this is the dust that can propagate explosions in ambient air.”

To give you an idea of how small 10 microns is, baby powder is about 10 microns in size. And the width of the average human hair is about 70 microns.

But there are also some significant differences, too.

“The nature of wood dust is that it’s probably easier to trap than coal dust in that the wood dust can soak up water,” says Joe Finn, senior process ventilation engineer for Engart. “And with our equipment, we’re trying to trap these very fine wood particles into water droplets. Wood dust is more cellulous, and it absorbs water easier—so we have a higher collection efficiency with wood dust than with coal.” In fact, the ratings for their equipment are often based on coal dust because it is one of the most difficult dusts to trap.

The equipment installation at the WestPine MDF operation of West Fraser was pretty straightforward, reports mill manager Jim Scott. They simply connected the Engart equipment with ducting to three existing exhaust locations in the sawdust shavings and recovery building. Engart designed and supplied new “clamp together” ductwork for the pilot installation, so it was pretty much plug and play at the mill.

The system was put on the mill floor, the Engart-designed ducting was installed—and the system was turned on. “Other than adjusting the effluent system a bit to manage the type of dust and water flows created, which the Engart field engineer
did, it didn’t impact mill operations whatsoever. It did as good a job, or better, of collecting the dust in the mill,” says Scott.

Tim Warden said that their equipment is what he termed “explosion proof” due to the way it handles dust. “We are using water to collect the dust and extract it and since it is a wet system, there is no chance of fire or explosion.” This compares with a traditional bag house system used in sawmills, which collects dust particles dry.

Warden notes that they have seen good acceptance of their system in U.S. coal handling facilities since it can eliminate baghouses, and reduces the chance of fires/explosions due to dust.

A big part of why it works well lies in the custom design of the system, he said.

“We have a solid team to design the system. For example, we will design in minimum air flow requirements for the transport of dust back to the extractor, to avoid any dust settling in the ducting itself. So we will have certain air volumes and air velocities that we target at capture points, to bring dust back to the extractor.”

At WestPine, three exhaust points were selected that matched the capacity of an Engart Type 18 20-hp dust extractor, which has air flow ranging from 4,000 CFM to 6,800 CFM. The ducting and pick-up points are designed by Engart for each application.

“Once we gather the dust, we then trap the wood dust into a water droplet at the front of the equipment. We have air water separation at the back of the machine, to separate the dirty water out of the airstream. So clear air comes out of the exhaust and the dirty water is taken out through a gravity-fed drain at the bottom of the machine. So there is no water or dust stored in the machine—it is a process that mixes the water with the dust and discharges it out.”

Since this was the first forest industry application of the Engart equipment, there was some tweaking.

“When we are working with coal mines and utilities, they have a place to put the water coming out of the system, and the sawmills don’t,” explained Warden. “So we have since developed a way to separate the dust and water and re-use that water back in the machine.” The discharged water-dust mix can be handled at the mill, in the hog pile.

“What we’re offering with our concept is not just our equipment—we’re trying to offer a solution to an issue,” says Warden. “Every situation, every project, every application is often very unique and requires application engineering and field evaluation to make sure it’s done properly.

“One of the big problems in industry, and the reason you see industrial explosions, is that expertise has not been well applied. We’ve seen plants where they have had explosions, and the knowledge has been there to prevent that, but it was not implemented. I’m not talking about just the wood products industry, but combustible dust industries.”

In addition to the safety aspect, the system also offers energy savings, which can help sawmills remain competitive.

“BC Hydro Power Smart is always interested in looking at new energy efficient technologies that will help us meet conservation targets,” said Markus Zeller. “We’ve looked at dust collection technology and how we can assist BC Hydro customers with improved bagouse designs, system optimization, and more efficient fans and motors.

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“When I saw this technology, with its potential of significant energy savings, we wanted to find a customer that could apply it, for proof of the concept.”

Project consultant Sita Millar noted they had meters set up during the trial, to measure the electric power consumed, and then calculate the energy performance in terms of kilowatt per CFM. “In this case, we were expecting 15 per cent energy savings, but we were able to get 25 per cent energy savings—we were actually able to get better results than we thought.”

With dust control representing about 15 per cent of overall sawmill power consumption, the savings could be significant.

Warden noted the Engart system offers a number of efficiencies.

“The pressure drop through the internal part of our equipment is typically less than a baghouse, so we can have power savings from that. The equipment is also much smaller and compact, so we can place it close to the dust source, and minimize the ducting.” Since bag houses are located outside a mill facility, they require a fair bit of ducting to transport air.

The electricity consumer in dust collection systems is all about moving air, added Markus Zeller. “About 99 per cent of the energy going into a system is about moving air, and maybe one percent is to bring the material from one point to another. So if you can locate the equipment close to your source, you can reduce the pressure drop in the ducting system, and save energy.”

WestPine mill manager Jim Scott says West Fraser was pleased with the trial and the system, especially now that how it handles material has been improved. “The way the wet dust was handled during the trial was a bit of a roadblock for us, but now that it’s been addressed, we’re quite interested in it.” He added that they’d like to see how the system works in cold temperatures, as some West Fraser mills can easily see temperatures of -30 Celsius. “The equipment could be in a heated situation at some of our operations, but at WestPine, it would be subject to freezing conditions.”

He added that there looked to be some real positive aspects to the equipment. “From what we saw, there were fewer moving and disposable parts relative to an equivalent-sized baghouse. I would think you would see lower overall maintenance costs in the long run. It seems simpler and has robust design, without a whole lot of things that could go wrong.”

During the field trial, which was held last spring, WestPine, BC Hydro and Engart hosted a field day, inviting people from other mill operations in the region—and had a good turnout.

In addition to talking with West Fraser about installing systems, Engart has made plant site visits and evaluations to several other companies in B.C. which have interest in using the Engart technology as part of their dust mitigation effort.

All of the participants in the pilot program emphasized that there is no one magic solution to best handling mill dust, and making operations safer. The issue has to be addressed at a variety of levels. Millar noted that in B.C., WorkSafeBC and the industry itself have done a lot of work on implementing Best Practices approaches, using current technology and systems. “This pilot program at West Fraser looked at another aspect of the issue, a new technology side of looking at it.”
Everyone involved with the project noted that it was about more than simply improving technology and energy efficiency, though.

As Engart’s Tim Warden put it: “We take lot of pride in the fact that we are actually providing a service that saves lives and prevents injuries.”

That was a part of the reason everyone was so invested in this project, says Millar. “Everyone went the extra mile on this project, helping make it a success.”

As much as possible, they want to prevent a repeat of the fires/explosions from 2012—and the resulting loss of life, and injuries.