Sawmill Wood Dust Sampling and Measurement

FPInnovations is supporting an investigation into sawmill wood dust and its potential combustibility by conducting a systematic sampling of sawmill dust generation and accumulation across BC facilities. The objective of this work is to:

1. Collect data on dust particle size and its accumulation, supporting efforts to determine the potential risk of combustibility;
2. Collect data across a range of sawmill processing areas supporting efforts to identify and classify potential areas of risk;
3. Determine dust proportions and accumulation rates supporting efforts to design appropriate housekeeping and mitigation protocols and procedures.

Facility Sampling

Nineteen sawmill facilities representing each forest region in BC have been selected for wood dust sampling. These sawmills were selected from the 57 mills represented by the Manufacturing Advisory Group (MAG) and reviewed by FPInnovations. At least two sawmills were selected from each of the Cariboo, Thompson/Okanagan, North-East, Omineca, Skeena, Kootenay/Boundary, and South/West Coast forest regions. Seven of the mills are selected primarily dedicated to processing MPB. In addition, consideration was given to the technology and its age, employed in each sawmill.

In-Mill Sampling Procedure

The focus of the in-mill dust sampling will be to collect material from the generation source, for example the breakdown machines. This will allow efforts on reduction and control to be targeted at the dust source, which will focus the requirements for mitigation and housekeeping. This data will allow the broader impact and accumulation zone to be calculated and extrapolated, as required. No air-borne sampling is planned.

Dust samples will be collected in a receptacle as they are being generated rather than sampled from accumulated piles. This is expected to provide a more accurate particle distribution since piles tend to be stratified with smaller lighter particles at the surface and larger heavier particles at the base and the sampling method becomes a source of variation.

Collection receptacles will be strategically placed around machine centres throughout the sawmill from primary breakdown to edging and trimming. Additional samples will be taken from passive accumulation areas such as the mill basement and other surfaces where dust is observed to accumulate, which will provide an indication of impact and accumulation zone. The duration of the sampling will be recorded to allow the accumulation rate to be calculated.

Ten samples will be taken from each sawmill with more in some locations depending on the number of machine centres and the observed areas where dust is accumulating in significant quantities. A total of 200 to 300 samples are expected from the 19 sawmills.

Particle measurements require a substantial volume of raw material. The samples may be combined to make up samples of sufficient quantities targeting a minimum of 1 Litre and/or 500 grams. Explosion testing will require samples up to 2000 grams.

Observations

In addition to particle collection, FPInnovations technical staff will also be recording their observations in the sawmill with respect to wood dust collection and accumulation. This will include photographs, written observations and in some cases measurements.

Measurements

Measurements will consist of two components: Particle Screening and Explosive Testing.

Particle screening will be carried out according to the NFPA Fire Protection Handbook and WorkSafeBC Procedures to determine the size and proportion of particles in BC sawmills. A 40 mesh screen (420 μm) will provide the first threshold followed by 200 mesh screen (75 μm) as specified by ASTM E1515. Since it is relatively simple to add some additional screening, 212 μm and 1000 μm screens will also be used to segregate the material. In addition, sawmill equilibrium moisture content (EMC) and particle moisture content (MC) will be measured. The particle MC will be measured as it is being produced in the sawmill and again in the lab prior to screening.

Explosive testing is planned for a selection of samples below 25% MC (wet basis). This will be contracted to an external organization to determine the size, moisture content and proportion of saw dust below 420 μm that would pose an explosion risk. The first component of this is explosive screening, which are the initial steps of ASTM E1226, will be applied to segregate the samples. If the explosive screening is positive, the explosive severity, minimum explosive concentration test (MEC), minimum ignition energy (MIE) and the minimum ignition temperature test (MIT) may also be undertaken. The latter results will be monitored closely to determine if there is a pattern to the results. If this can be identified, it may be possible to reduce the required testing.

Reporting

The sawmill sampling and particle screening process require 6 to 8 weeks to complete not including any required explosive testing. Once the data collection and analysis are complete, a report will be written summarizing the results.

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