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HAZARDS OF WOOD FUELS

Given a source of ignition, wood in all its forms will burn. As the tree is cut and processed into its eventual use, the hazard of fire increase from two directions: (1) reduction of moisture content from air drying, and (2) reduction of the wood particle size from the standing tree to finished lumber, to chips for fuel and chemical pulp, and to waste wood particles the size of finely divided dust and flour. As the drying and reduction process proceeds from the relatively large particles down to the dust/flour stage, the hazard changes from that of a Class A combustible material subject to typical burning characteristics to one of such rapid combustion that it is termed an explosion. In considering the storage of wood as a fuel, the hazards encountered will range from those for solid wood to those for wood dust/flour.

Solid Wood

The hazard for solid wood is Class A combustible material not readily ignited but capable of generating a large amount of heat if allowed to burn unimpeded. The rapidity with which fire will spread depends on pile configuration, moisture of the wood and surrounding atmosphere, physical characteristics of the wood (i.e., size of individual pieces), whether wood is peeled or with bark, and species of wood. Pile size and configuration will determine the amount of radiant heat released.

Chips

This form of wood is being used on an ever-increasing scale as fuel for heat and power generation because it can be mechanized on the scale needed. The hazard is again one of a Class A combustible and, because of its small size (5/8 to 11/4 in. [16 to 32 mm]), fires in piles tend to be surface type with no more than about 50 mm or more (few inches) of fire penetration into the pile itself. Internal fires do occur from spontaneous heating as a result of excessive internal heat buildup. These fires are usually from fines that cause too much compaction or humus material within the pile, which is subject to more rapid oxidation than clean wood chips.

The chip fines can present a flash fire or explosion hazard if handled inside and dispersed in a manner that allows the wood dust to collect on structural members or to be suspended in air at concentrations above the minimum explosive concentration (MEC).

Sawdust and Shavings

Sawdust and shavings, by-products of lumber mills and wood processing plants, are generally used as a fuel on site. If strategically located, the usable material, along with other waste wood, might be shipped to other locations for use in manufacturing pulp, particleboard, or pellet fuel. The hazards are Class A combustible material and possible explosion in storage and handling from wood dust buildup.

Other Wood Waste

Wood scrap and edgings are another waste by-product, particularly of lumber mills and furniture manufacturing plants. This material is generally put through a hog to reduce the size for conveying or blowing to storage bins and boiler rooms for fuel. If the larger pieces of scrap are recoverable for use as chips in pulp manufacturing, they are conveyed to a chipper and pneumatically blown to a loading station for transfer into rail cars or tractor trailers for shipment. The hazards are similar to those for chips and sawdust. The larger wood particles are readily ignited, whereas the fines generated by the sawing, planing, and chipping processes can contain particles small enough to be an explosion hazard.

Pellets

The process uses pulverized wood waste from the forest products industry, which is formed under high temperature and pressure into pellets approximately ¼ in. by ¾ in. (6 mm by 19 mm). The finished pellets are stored in bulk form inside to keep them dry; the raw stock of wood waste is stored outside. The finished pellet storage presents little dust hazard but will burn as a Class A combustible material.

Bark

Bark is generated at pulp mills, sawmills, and chip plants as a waste material and used to a limited extent as a soil conditioner and as fuel for limited-size boilers

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(when mixed with other wood scrap from the process), or it is simply disposed of by burning in teepee-type bark burners. Until recent years, bark was basically a disposal problem. Some pulp mills, however, generated too much bark over the years to be disposed of by the preceding means and it was simply piled at a detached site convenient to the plant. Over many years of operation, these piles have grown into miniature mountains. The sheer height and bulk of the piles have created a fire hazard from internal heating leading to spontaneous ignition and from external sparks from heavy equipment used to build the pile, particularly during dry periods.

A method has been outlined for eliminating fires in wood bark piles by controlling the flow of air (oxygen) horizontally into the pile. Oxygen control is achieved by sloping the pile at a 30 to 40 degree angle from the horizontal. In Figure 7.1.1 dimension A is the depth at which pressure and moisture allow the chemical reaction to generate enough heat and volatile material to provide two sides of the fire triangle (i.e., heat and fuel). Dimension B is the distance air (oxygen) must travel to complete the fire triangle and is approximately three times greater, with a 30 degree slope than with a 60 degree slope. The upward flow of heated gases within the pile prevents oxygen from reaching the point of combustion except from the nearly horizontal direction, which means the resistance to oxygen flow increases as dimension B increases. Where increasing the slope is not practical, sealing the slope to air penetration is an alternative.

What was formerly a waste disposal problem has become a valuable commodity as the price of fuel oil has gone up and the technology for burning bark on a large scale has improved. For those with such piles, they can be reclaimed as fuel for relatively large bark boilers. The reclaimed bark is mixed with the bark generated daily in the pulp manufacturing process.

Reference:

Dungan, Kenneth W.. Storage and Handling of Solid Fuels. Fire Protection Handbook 20th Edition. Massachusetts: NFPA. (2008)

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