Pellet Manufacturing Hazards and Controls

This Technical Service bulletin has been developed to apply directly to all phases of manufacturing, processing, blending, molding, conveying and packaging of combustible particulate solids or mixtures (pellets) where the materials present a fire or explosion hazard. The purpose of this bulletin is to prescribe technical requirements to minimize resulting damage from fire and explosions that occur in the manufacturing of combustible pellets. The goal of this technical bulletin is to provide reasonable guidelines to prevent and limit losses as a result of fires and dust explosions in operations that are involved with the manufacturing of combustible particulate pellets.

Two resource documents were heavily referenced in the development of this Technical Services Bulletin. NFPA 654: Standard for the Prevention of Fire and Dust Explosions and 664: Standard for the Prevention of Fires and Explosions in Wood Processing Facilities. It is strongly recommended that these two documents be reviewed on an ongoing basis in the evaluation and mitigation of Fires and Dust Explosions in the manufacturing operations involving combustible pellets.

The basic operations involved in the manufacturing of combustible pellets is the conversion of a source material, softwood or hardwood sawdust, softwood or hardwood wood chips, grass or field hay, or other potentially combustible products into finished pellets that can be used to fire both commercial and residential boilers or heat producing equipment. On average, finished pellet products will produce approximately 8,000 BTU's per ton. A significant difference in the makeup of the pellet produced will yield differing amounts of ash waste product within the combustion chamber of the heat producing vessel. Hardwood pellets produce approximately 1% ash where field hay can produce approximately 4% waste ash.

Regardless of the product produced, there exist similar hazards in the manufacturing operations that will be addressed within this Technical Bulletin. Basic operations involve receiving and storing source material; reducing material to uniform size; conditioning materials to desired moisture content; forming materials into pellet form; packaging finalized pellet products. Within the various stages of pellet manufacturing, product is transported, converted, stored, heated, cooled, and packaged. All manufacturing operation whether large or small, present very similar hazards that can be specifically identified and addressed to mitigate the potential for fires and dust explosions. A systematic approach to evaluating equipment and operations will be presented within this Technical Bulletin.

PELLET MANUFACTURING ITEMS TO EVALUATE

Raw material: grass, hardwood, softwood, dried, green / high moisture content
NOTE: some material so dry that moisture is added to make pliable
Raw material storage: on dirt or paved surface, inside, outside
Front end loaders rated for Class II Div 1 environment
Conveyance: belt conveyers (anti-static, enclosed), screw augers provided with isolation devices, elevators/bucket conveyer (anti-static enclosed)

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Wet hammer mills: Accumulation of dust and dirt, Class II Division 1 listed motor, mill enclosed
Bins/hoppers/silos: magnets in place to collect foreign metal items
Dryer: temperature controls (exit high temperature cut-off switch)
Conveyance from dryer to cyclone and bag house: enclosed, magnet, SDFS, bonding & grounding, blowout doors
Dust storage silo: deflagration venting to the outside, substantial construction, nozzles for fire protection

Dry hammer mills: Class II, Div. 1 electrics
Conveyance: pneumatic, magnet, SDFS, bonding & grounding
Cooling tower: dust control
Pellet mill: pressure 60,000 to 80,000 psi, temperature of pellets (180 degree F to 210 degree F)
Pellet shaker / sorter: class 2, Div. 1 electrics
Pellet storage silo
Bagging line
Program for review and maintenance of Certificates of Insurance coverage
Copies of system designers and installers certificates of GL coverage with limits on file
Ask risk for copies of certificates of insurance coverage

PELLET MANUFACTUING POSSIBLE RECOMMENDATIONS

MAGNETS: Foreign metallic objects in the process flow can cause sparks resulting in a fire. Magnets should be installed to remove any stray tramp iron or steel in the process flow. Magnets should be located:

In duct just after the dryer
Just prior to the hammer mill
Just prior to the pellet mill
Inside the feed ductwork to all storage silos

ELECTRIC: All production systems and equipment should be grounded and bonded. Electric wiring around dusty operations should be UL listed for use in a Class II, Division 1 location, such as:

Dry/wet hammer mills
Screen shaker / sorter
Pellet molding machine

CONVEYERS: Conveyer belts for dried dust particles should be anti-static. Conveyors should be enclosed with substantial covers and deflagration venting in place venting to the outside.

MATERIAL SEPERATORS: Material separators (cyclones) should be located outside of buildings. Deflagration vents should be in place for all material separators.

ABORT GATES: Dust collection return air abort gates, interlocked with the SDFS systems, should be installed preventing the reintroduction of smoke, combustion product gasses, and flame from re-entering the occupied spaces of the building.

PELLET TEMPERATURE: At the output from the pellet mill, the temperature of the pellets should be automatically monitored with a high temperature warning. The high temperature warning should be interlocked to shut down the production machinery in the event of a high temperature indication exceeding 240 degrees F.

SPARK SUPPRESSION: A spark that reaches the dust collector will almost certainly result in a fire or explosion. Spark detection and flame suppression (SDFS) systems with components and installation listed by a nationally recognized testing laboratory should be installed in the dust handling system at the following locations:

Downstream from the dryer and before the cyclone dust collector

Downstream from the dry hammer mill and before the cyclone

Downstream of the pellet molder prior to the cooling tower

SELF INSPECTION: A self inspection program should be established to verify weekly that all surfaces of electric boxes and motors are free of dust accumulation. The inspection program should verify that the insides of electrical boxes with hinged covers are cleaned at least monthly.

FUGITIVE DUST CONTROL and HOUSEKEEPING: Continuous suction dust collection systems, to minimize the escape of fugitive dust, should be located throughout the production facility. Horizontal and vertical surfaces should be cleaned of the accumulation of dust build-up on a scheduled basis. Surfaces should be cleaned in a manner (steam, vacuum or low pressure air limited to less than 15psi) that minimizes the potential generation of a dust cloud.

POWER INDUSTRIAL TRUCKS: Any power industrial trucks, such as fork-lifts, loaders, skid steers, etc., used in any location where combustible dust is present in qualities sufficient to produce an ignitable mixture or explosion should have an approved EX designation.

HOT WORK PERMIT PROGRAM: To help reduce the risk of a serious fire caused by a hot work operation, the PLM "HOT WORK PERMIT" program should be instituted. Hot Work Permit forms should be filled out and authorized for each individual hot work job performed. Copies of the completed forms should be maintained in a "Hot Work Permit" log book that is available for review by company management and PLM field personnel.

CERTIFICATE OF INSURANCE: Current certificates of insurance detailing coverage in force for general liability insurance coverage should be maintained for all contractors including electricians, riggers, equipment installers, and system engineering firms. Coverage should be confirmed prior to awarding of work or job contracts and should be

reconfirmed by contract for the period of installation and upon final completion of the contracted work performed. Coverage confirmation should be maintained on a permanent basis. Liability limits should be equal to or in an amount greater than the underlying company coverage limits.

FIRE SAFETY INSPECTION

Department / Location: _____

1. Dust control equipment and systems in place?
2. Satisfactory housekeeping?
    a. Horizontal surfaces
    b. Vertical surfaces
    c. Fugitive dust
3. Potential ignition sources identified and monitored on a scheduled basis?
4. Electrical equipment rated for Class II Div 1 hazardous locations?
5. Any noted change in process operations?
6. All bearings exposed and lubricated on a scheduled basis?
7. Are magnets in place to capture foreign metallic objects?
8. Are all system components grounded and bonded?
9. Are electrical boxes inspected and cleaned on a minimum of a monthly basis?
10. Is there a Spark Detection Flame Suppression system in place?

Inspection completed by: _____ Date: _____