Lessons from a Dust Collector Fire

Three recommendations for safe operating practice are developed from observations in the investigation of an ammonium nitrate prill plant fire.

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Lessons learned from a fire in a dry dust collector at an ammonium nitrate prill plant have led to three specific safety recommendations:

1. Do not use high-powered spot lights around flammable materials.
2. Use only low-voltage (24 v. or under) within a confined metal compartment or tank.
3. Establish an awareness of the hazard of unsafe use of portable electric equipment.

This discussion centers on what happened in a fire that developed on February 13, 1974, at the 350-ton/day, low-density, prill plant of Atlas Powder Co. in Joplin, Mo. The facility had been built in 1964 by C&I Corp.

The dust collector was installed to control dust from the product coating agent (kaolin clay) at the coating drum, at the discharge of the coated product elevator, and at the bagging scales. The fire was contained within the dust collector enclosure, and no damage occurred other than to the internals of the dust collector.

The collector is located on a platform adjacent to the clay feeder hopper above the coating drum in the solids handling building. The prill plant was in operation when the fire developed, but the dust collector was out of service. It had been shut down and was being cleaned in preparation for repair to the collector hopper which was to include some welding. The entire inside of the dust collector was to be washed down before any welding would be permitted, and the bags were being cleaned of accumulated dust so that the maintenance department could remove them.

An operator had spent the day removing material from between the bags; the loosened material would fall into the collection hopper below the bags and was being removed continuously from the hopper pneumatically. It is thought that not more than 200 lb. of material was in the collector (on the bags or in the hopper) when the fire occurred. During the fire, there was considerable smoke and it was thought that a sizeable proportion of the dust was ammonium nitrate. However, a later analysis showed only 2.2% ammonium nitrate in a sample of the dust.

The day shift operator left the area of the collector at about 2:50 p.m. to check on other items and to proceed to the locker room to shower and change clothes. Because there was still some clean-up to be done, he left the extension cord light on in the dust collector, assuming that the on-coming crew would continue and complete the job.

The evening shift crew arrived at about 3:20 p.m. and after exchange of information with the day shift crew in the lunch room, went to their assigned work areas. As they entered the solids handling building, at about 3:30 p.m., they noticed the smell of smoke and found the source as being in the dust collector.

Two men exhausted four fire extinguishers trying to control the fire while others sounded the fire alarm and stretched out a 3/4-in. service water hose and eventually a 1-1/2-in. fire hose to extinguish the fire. Dense smoke flowing from the open doors of the dust collector reduced visibility. No open flame was seen, but one operator thinks he saw some glow within the collector, through the smoke.

The fire was put out within 30 minutes of discovery. All damage was within the dust collector housing. All bags were burned, the operating mechanism was destroyed, and the paint was scorched. The prill plant was shut down as soon as the fire was discovered, but it was started up again at 11:00 p.m., after the fire was out and equipment cleaned up.

Details are still somewhat inconclusive, however the investigating committee is of the opinion that the fire was started by the extension cord light. The day shift operator had obtained a 120-v., 200-watt, spot light so that he could see between the bags while he was cleaning them. He hung this light, still turned on, on a protrusion within the dust collector when he left the area. The fire was discovered about 40 min. later.

This light was destroyed by the fire, but another light, presumed to be identical to it, was examined later. The examined light was turned on in the laboratory, and after a reasonable time, the surface temperature of the bulb was found to be 350°F, measured by a thermocouple.

A piece of tablet paper placed over the face of the bulb did not char. However, when the paper was moved away from the face of the bulb to the point of convergence of the light rays (about 6 in. in front of the bulb), it quickly charrred and ignited.

A piece of filter cloth retrieved from the fire was placed at this same location and it too charrred and ignited as temperature reached 550°F at the point of convergence of the light rays. It is presumed that when the operator hung the light in the dust collector it was so hung, or it later shifted, so that the cloth bag was ignited by the heat of the light beam. #