Process Safety Incident of the Week
Hoeganaes Combustible Dust Flash Fires

https://www.aiche.org/sites/default/files/cep/20150323.pdf

In 2011, a series of iron dust flash fires and hydrogen explosions happened in the Hoeganaes facility in Gallatin, TN. This plant specialized in melting and converting scrap metal to various metal powders. There were three separate incidents. The first accident happened on January 31, 2011, the operators thought that the belt on the bucket elevator was off its track. They shut down the motor, and maintenance and an electrician inspected the equipment. They did not think the belt was off the track and told the operator to restart the motor. When the motor restarted, the powder from the equipment and floor dispersed causing a flash fire almost immediately and engulfed the two workers, killing both.

The second incident occurred on March 29, 2011 when a facility engineer and contractor were replacing the igniters on an annealing furnace. There was difficulty reconnecting a gas lines and the engineer used a hammer to force the connection. Large amounts of dust on nearby surfaces were dispersed by the force of the hammer and ignited almost immediately. The engineer suffered first and second degree burns, while the contractor was able to escape. The engineer was wearing flame-resistant clothing, which helped prevent worse burns.

The third incident occurred on May 27, 2011 when operators near an annealing furnace identified a gas leak coming from a trench that contained hydrogen, nitrogen, cooling water runoff pipes, and vent pipes for the furnaces. Mechanics were sent to find and fix the leak. One operator stood by as the mechanics searched for the leak. Although maintenance knew hydrogen piping was in the same trench, they assumed the leak was nonflammable nitrogen because of a recent nitrogen pipe leak elsewhere in the plant. Instead, the leak was coming from the hydrogen line. To lift the trench covers, a forklift was need. As the forklift pulled up the cover, friction created sparks causing an explosion. The hydrogen explosion dispersed large quantities of iron dust from rafters causing multiple dust flash fires. Three employees died from the burns suffered from the fire.

Key Lessons

Understanding hazards and risks is one of the pillars of PSM. After the incidents, combustibility tests indicated that the iron dust was a weak explosion hazard and relatively hard to ignite. These findings were similar to an audit performed in 2008. A lesson is that even a weak explosive and hard to ignite dust it is still combustible and should still be considered hazardous and capable of causing fatalities when ignited. The personnel at this facility did not fully comprehend the full risk of the dust. Another pillar of PSM is learning from experience. In 1992 the plant had a very similar incident to the third incident in 2011. Another employee was burned from a hydrogen explosion in the furnace. Hoeganaes did not learn from its own incident. Housekeeping is also extremely important in a facility that handles solids. All three of these incidents occurred due to large quantities of combustible dust present. At this facility, there was poor housekeeping and had no control of dust emissions. The ineffective dust control and housekeeping enabled dust layers with more than enough dust to fuel these three flash fires. The lack of housekeeping and dust control were all contributing factors to the incidents.