

Title: Fireball from Aluminum Grinding Dust

Identifier: 2001-RL-HNF-0036

Date: 2001-09-21

Lesson Learned Statement:

Aluminum grinding dust can create a serious explosive fire hazard when it is mixed with steel or iron grinding dust.

Discussion:

A safety coordinator at the Esso Oil Company plant in Longford, Australia, was using a belt grinder in his home workshop to smooth the edge of a hacksaw cut on a 2 inch length of 1.5 inch angle iron. He had been grinding for about 1.5 to 2 minutes when there was a loud "THUMP" accompanied by an approximately 2-foot diameter brilliant yellow orange fireball. The fireball lasted no more than 1 second and then completely extinguished itself. It completely enveloped the machine, his hands to half way up his forearms, and the front of his torso.

Injuries included deep second-degree burns to about 60% of the victim's left hand and 50% of his right hand and first degree burns to his neck, chin, cheeks, lips, and the end of his nose. The right cuff of his shirt was smoldering, his face felt a burning sensation, and he could hear the front of his hair sizzling. Nothing on the bench was burning. A few streaks of white powder were deposited on the bench top and on a few items lying on the bench. The workshop was filled with dense white smoke with very little odor. His fingers and the ends of his thumbs escaped relatively unscathed as they were protected from the heat flash. He was wearing glasses, which protected his eyes. He also lost half his moustache, one of his eyebrows, and about 1 inch off the front of his hair. His eyelashes were curled by the heat but not singed. The burns to his face were caused solely by radiant heat, as the fireball did not come that high.

Analysis:

A few days before the event, the man's son had ground the heads off about twelve aluminum pop rivets. Finely divided aluminum mixed with finely divided ferrous oxide (the black powder residue from grinding steel) produced a compound called thermite. Thermite is used to fill incendiary bombs and is used commercially to weld large steel items. It burns at approximately 3500C (6300F), hence the extensive burns from such a short exposure time.

Recommended Actions:

The victim recommended that the manufacturer of the grinding wheel should include a very strong warning about the dangers posed by grinding steel after having ground aluminum. That warning should include precautions to thoroughly clean the grinding

machine of all aluminum dust before grinding iron or steel.

Originator:

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Introduced into the DOE LL system by Fluor Hanford, Inc.

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Name Of Authorized Derivative Classifier:

Not required

Name Of Reviewing Official:

John Bickford

Priority Descriptor:

Yellow / Caution

Keywords:

grinder, thermite, aluminum dust

References:

Bechtel Australia Alert 01, Grinder work with Aluminium

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DOE Function / Work Categories:

Machining & Fabrication

ISM Category:

Analyze Hazards
Develop / Implement Controls

Hazard:

Fire / Smoke / NFPA

End of Lesson!