Fireball from Aluminum Grinding Dust

Date: September 21, 2001

Identifier: 2001-RL-HNF-0036

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

Discussion of Activities:
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" length of 1.5" 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.

OSH occupational safety & health service

DEPARTMENT OF LABOUR TE TARI MAHI

ACCIDENT/INCIDENT ALERT

October 2004

Fatal Grinder Accident at Quarry

Incident

A welder was carrying out maintenance on a quarry excavator bucket. He was using an angle grinder to prepare surfaces for welding when the disk disintegrated.

Circumstances

The hand-held angle grinder was fitted with a 230 mm diameter cutting-off wheel and when it disintegrated, fragments penetrated the victim's chest and abdomen. He was rushed to hospital by rescue helicopter but died the same day.

Investigation

This is continuing but initial inspections show that the grinding machine and cutting disk were not compatible - and the grinder was not fitted with a guard.

Recommendation

Grinding machines and abrasive wheels should always be used in accordance with the manufacturer's instructions.

In particular:

- Always ensure the maximum speed (the no load rpm) marked on the abrasive wheel is greater than the rated speed of the grinder.
- Do not use grinding wheels that are larger than the maximum recommended size, or worn down wheels from other grinders.

Angle grinder and disintegrated disk

- Never use grinding wheel power tools without the wheel guard attached to the tool and positioned for maximum safety.
- Store and handle abrasive wheels with care and inspect them for chips or cracks before installing. Do not use any wheel that may be damaged.
- Refer to Australian Standard 1788 - *Abrasive Wheels* for more detail.

Friday, 3 January, 2003, 17:02 GMT

Firm fined for grinder accident

The court was told Mr Thompson was left in a coma

A tool manufacturing company has been fined £20,000 and ordered to pay £10,000 in costs after an accident which left a worker in a coma.

Doctors feared Craig Thompson would die after a grinding wheel shattered and pieces became embedded in his skull.

Mr Thompson had been working for Forst Broach, based in Dartford Road, Leicester, when the accident occurred in February 2001.

The firm acknowledged its failure to implement and enforce a strict code of conduct with regard to the use of guards on the grinder.

Hazard control

Mr Thompson, 28, was in a coma for several weeks but has suffered lasting brain damage.

Bernard Thorogood, prosecuting, told Leicester Crown Court that on the morning of the accident a mistake was made when inputting the size of the abrasive wheel into the computer, causing the machine to spin it too fast.

Mr Thorogood said the injuries could have been avoided if a guard had been placed over the wheel, as required by health and safety regulations.

But he said Mr Thompson had not fitted one, and a supervisor who had checked on him that morning did not point it out.

The firm, now trading as Forst Cardinal, a subsidiary of American firm LaPointe International, admitted breaching health and safety regulations by failing to take preventive measures to prevent or control hazards arising from the disintegration of equipment.

Judge John Burgess, ordered the company to pay a £20,000 fine and costs of £9,299.84 over the course of 18 months.