The Garfield Alloy Fire

4878 Chaincraft Road,
Garfield Hts., Ohio
December 29 - 31, 2003

Garfield Alloy Fire

- Garfield Alloy, Inc. is a magnesium recycler
- Process magnesium wastes into magnesium ingots for re-use
- 16 acre site with 4 buildings and many storage trailers
- 8 employees on site at time of fire
- 2 million pounds of magnesium stored in buildings and trailers


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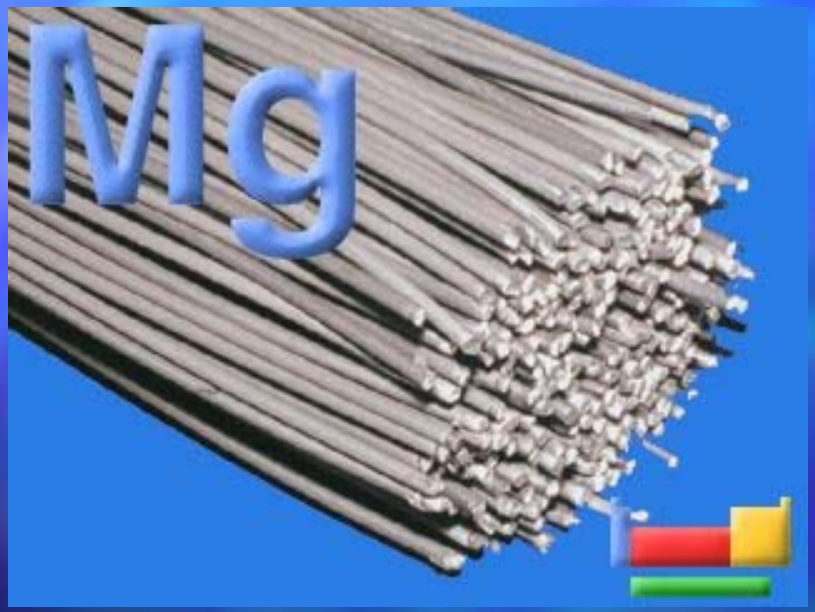
Garfield Alloy Fire

- 10 miles southeast of Cleveland
- Located adjacent to residents, Mill Creek, railroad tracks and other industrial businesses
- 2000 Census data estimates 21,434 people live within 1 mile of plant

Garfield Alloy Fire

- Fire started at 2:59 pm when one drum accidentally ignited three other drums.
- Usually, magnesium fires are extinguished with M-130 flux.
- Flux was unable to control this quickly spreading fire.
- Fire Departments from 7 cities responded.

Garfield Alloy Fire



$$Mg(s) + 2H_2O(g) \rightarrow Mg(OH)_2(aq) + H_2(g)$$

- Magnesium is a silvery white metal found in the earth's crust.
- Magnesium burns at 5,000°F.
- Magnesium is used to manufacturer aluminum cans, machinery parts, and cars.
- Magnesium reacts with steam and water to give magnesium oxide (MgO) and hydrogen gas (H_2).
- The released hydrogen gas can cause fire and explosion.

Garfield Alloy Fire

Garfield Alloy Fire

- Fire Fighters attempt to save adjacent buildings with water
- Water cannot be used on fire, due to explosions
- Attempted to use foam product without success
- A number of adjacent businesses were saved

Garfield Alloy Fire

- Following huge explosions and broken windows late on Dec 29, 60 families were evacuated.
- Later an additional 80 families were evacuated.
- The huge fire could be seen for over 20 miles and the huge explosions shook the ground for miles around.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Garfield Alloy Fire

- Stored on-site were:
  - 2 million pounds of magnesium (ingots, scrap and dross)*
  - 8 cylinders of nitrogen gas
  - 7 cylinders of sodium dioxide
  - 1 cylinder of argon
  - 3 cylinder of sulfur hexafloride
  - 5 tanks of propane for bobcats*
  - 5 cylinders and 5 tanks of propane
  - 9 cylinders of acetylene
  - 4 cylinders of oxygen
  - 2 55-gallon drums of hydraulic oil*
  - Miscellaneous cleaning and process chemicals*

* Materials destroyed in the fire.

Garfield Alloy Fire

8 Air Sample Locations:

- in residential areas,
- in the plume of smoke,
- on perimeter of the site

Ohio EPA and Sewer District collected water samples from sewers, the runoff and Mill Creek.

q = Sample Location

Garfield Alloy Fire

- Air Monitoring in smoke plume and at sample locations with:
  - PID and FID
  - CGI, O_2, H_2S meter
  - Drager tubes for ammonia, chlorine, and acid gas

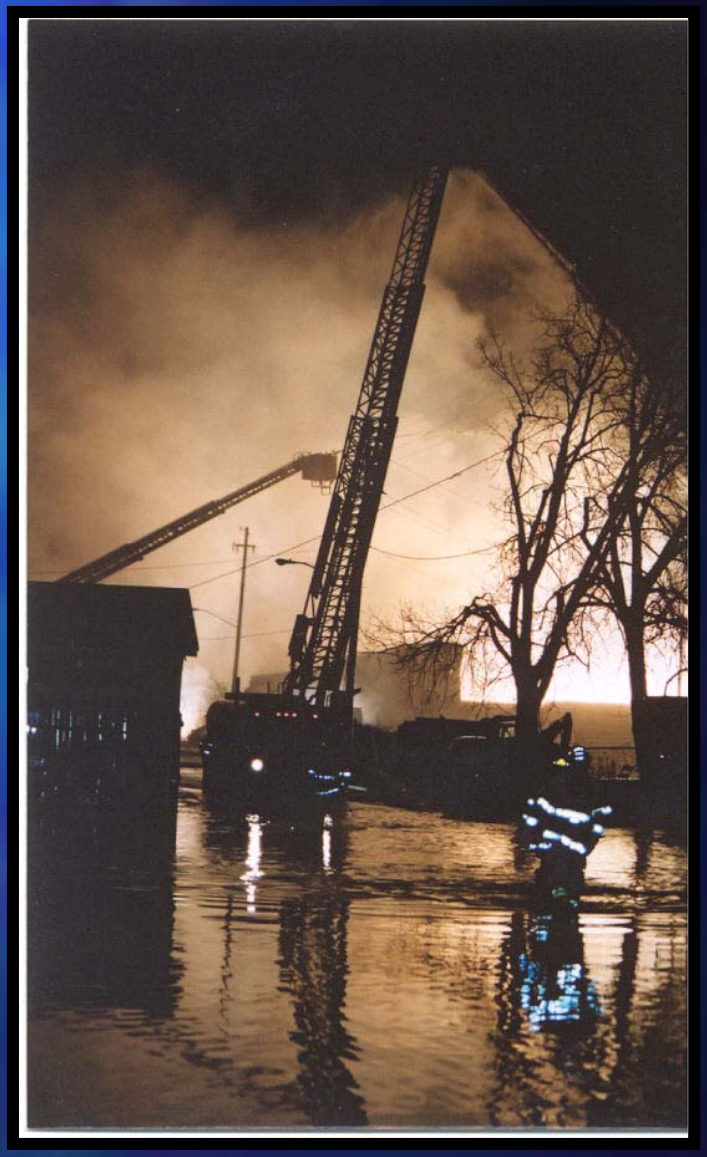
No readings or not above background on all instruments

Garfield Alloy Fire

- Air Sampling at Sample Locations:
  - Personal Data RAM
  - Summa Canisters – Method TO-14
  - Absorbent tubes and cassettes for metals and tubes for volatile organics
  - HAPsite – from Cleveland Fire Department – organics library scan

Garfield Alloy Fire

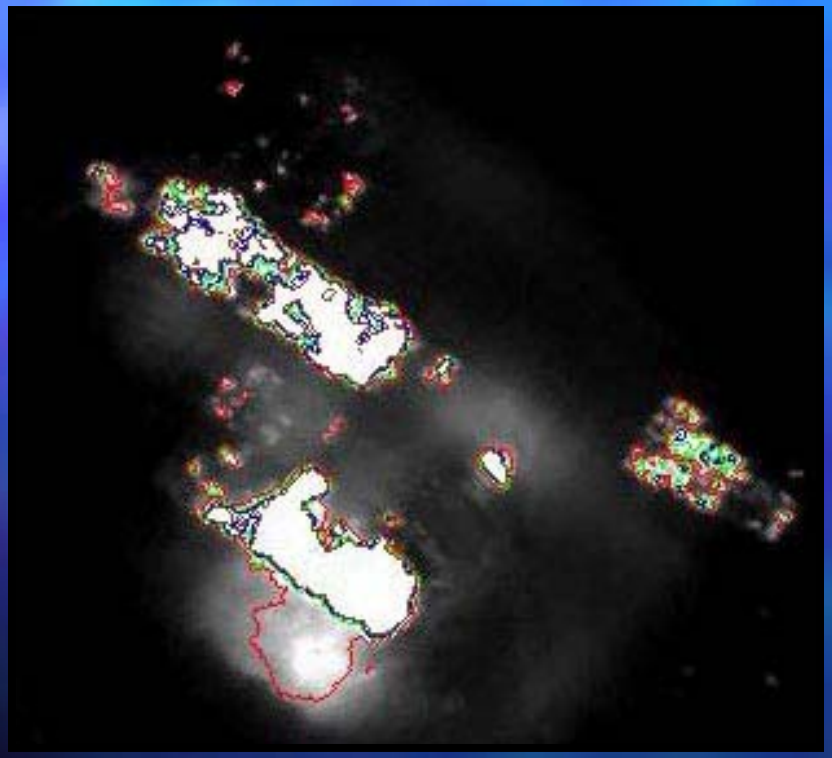
- Analytical Results from December 29 (first night):
  - Magnesium/Magnesium Oxide ranged from <0.12 to 0.84 mg/m^3
  - Volatile and Semi organic (Summa and tubes) was non-detect (< 4 ppb for Summa and <0.44 ppm for tubes)
  - HAPsite scan with organics library was background for air sample
  - Personal Data RAM 0.0 to 1.6 mg/m^3 in the smoke plume



Garfield Alloy Fire

- Analytical Results from December 30, 2003 (next morning):
  - Magnesium/Magnesium Oxide was non-detect (< 5.2 $\mu g/m^3$).
  - Data RAM 0.0 to 31,054.7 $\mu g/m^3$ from the fire area (direct draw pump).

Garfield Alloy Fire



- U.S. EPA's ASPECT team used their airborne IR system to image the fire on 12/30.
- Temperatures above 30°C are pure white.
- The IR system can also be used to identify chemical plumes.
- No plumes of MgO were detected leaving the heated area on 12/30.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Questions ?????