INSULATION FIRE ON A STORAGE SPHERE

Before tank was completed a polyurethane foam insulation caught fire and was completely destroyed

H. L. Darling
Sherritt Gordon Mines, Ltd.
Fort Saskatchewan, Alberta
Canada

This report involves the installation of insulation on a newly constructed 2,000-ton ammonia sphere. This was a Hortonsphere. The vessel was not yet in service when this happened.

The insulation was 1-¾ in. sprayed urethane foam over which a seal coat of Flintcote C-29 was applied. This insulation application was done by an outside contractor.

During the installation period, the outside temperatures were below 0 F., therefore it was necessary to build a polythene envelope completely around the sphere. The working area within the envelope was heated with kerosene space heaters. The sphere itself was internally heated with steam and the condensate was allowed to drain out of the bottom manhole.

The day after completion of the installation, a mechanic was assigned to prepare the vessel for service, connecting up pipe, etc. He found that the liquid outlet connection which was connected to the bottom manhole cover was completely frozen up. This was from the condensate draining from the sphere. He decided that the quickest way to thaw this out was to use a propane torch.

Propane torch caused the fire

Now due to the fact that space heaters had been used during the installation period, it was felt by the operating people that no hazard really existed. A gas check was made. A safety permit was issued and the mechanic was allowed to proceed with the propane torch.

After a few moments, the bottom of the sphere caught fire. Before the mechanic could reach for the fire extinguisher it had spread beyond his control. He was alone at this point but managed to escape from the area taking the propane tank and torch with him.

Within minutes the whole sphere was burning fiercely and it burned itself out very quickly. The insulation was completely destroyed. The vessel after some time was sand-blasted, inspected and later reinsulated with the same material. This time it was warmer weather and we didn't have to use the polythene cover.

The after-fire investigation revealed that the C-29 is based on a coating of asphalt and gilsonite. These are blended with a 100-flash petroleum solvent, asbestos fibers and mica fillers.

Solvent oozes out

The solvent actually oozes out of the insulation until it is cured. This curing period, I am told, can take up to 30 days. This we didn't know.

The problem here, I think, could be summed up as a lack of communication between the operator and the outside contractor.

Figures 1 through 6 give a graphic view of conditions at the plant during and after the fire.

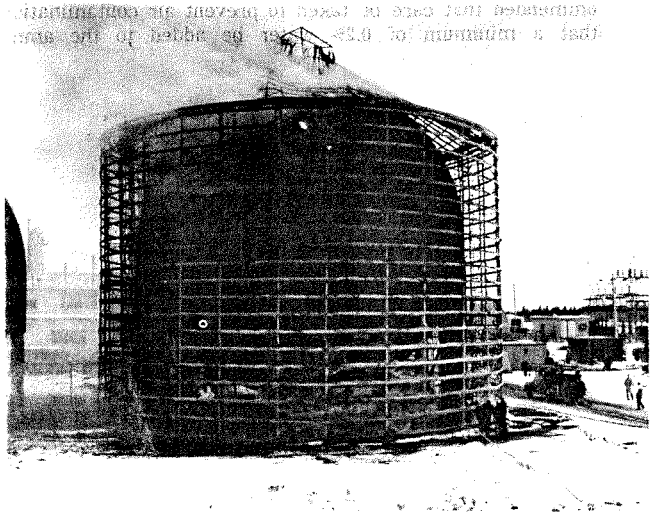

Figure 1. This was taken not more than 10 minutes after the fire started. The framework was all badly charred and had to be torn down.

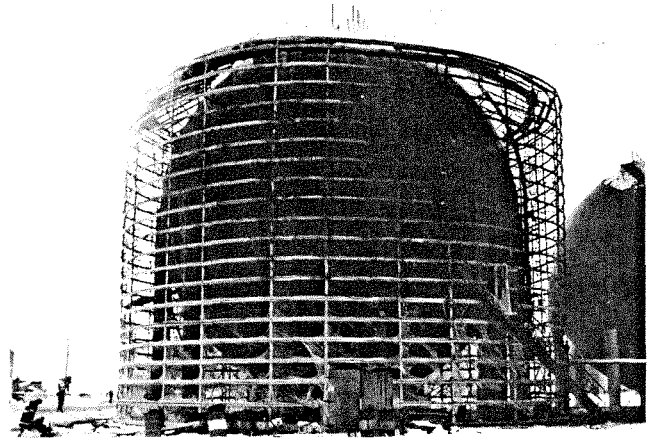

Figure 2. This is a closeup of damage done to the hoarding cover. Escape doors can be seen. Scraps of the polyethylene shelter were all that remained.

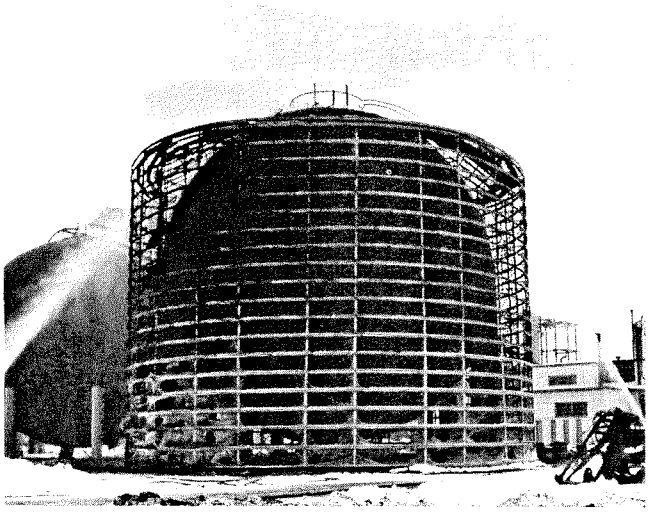

Figure 3. This is an additional view of the tank; nearby 1,000 ton spheres may be seen in background. Fire hoses are still playing upon the sphere.

Figure 4. The fire started here underneath the sphere where a workman attempted to thaw out a frozen nozzle with a propane torch.

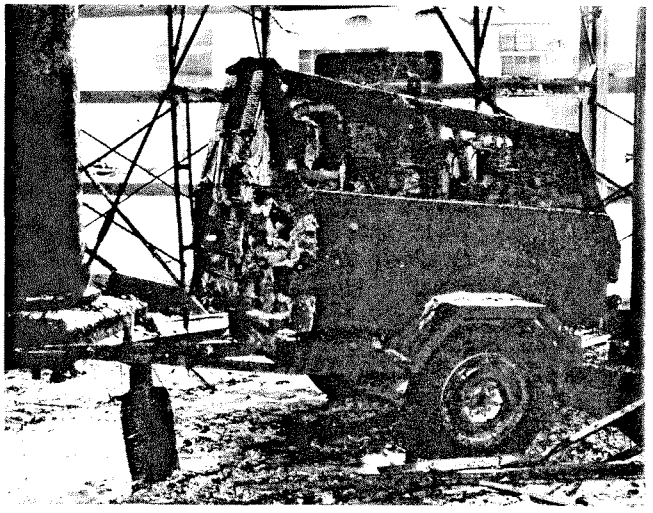

Figure 5. Extent of damage can be seen by this photo of the remains of the contractor's air compressor which was within the framework.

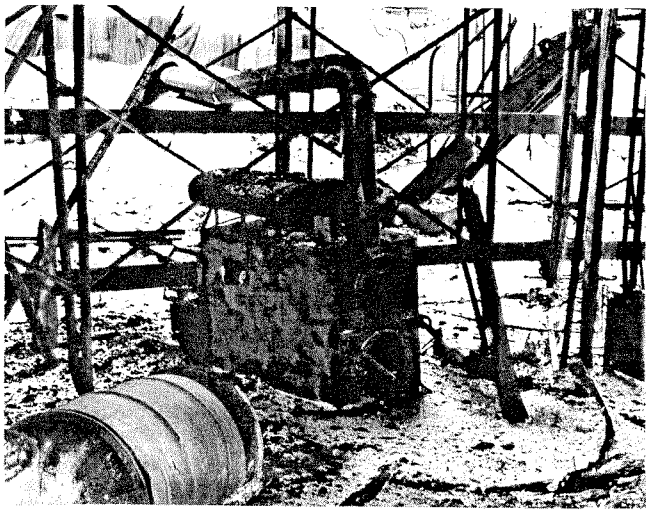

Figure 6. This kerosine space heater was also consumed in the blaze. The heater was used to warm the space within the polyethylene shield.

Discussion

Q. N. H. Walton (SunOlin Chemical Co.): Did you specify that the foam had to pass an inflammability test when you let the contract for it?

Darling: I don't believe so. We did a little experimenting with it afterwards and we found that the foam itself would not sustain fire. The culprit in this case was the C-29, but I do not believe that was specified.

Walton: In one of our installations, that was one of our specifications that the foam had to pass the ASTM flammability test. While the foam was being sprayed on, each day we took a sample and checked it, and a couple of times we found that it was not passing the test and brought this to the attention of the contractor and made him stop until he made changes in his formulation so that it would pass.

Darling: That seems like the right approach all right.

Walton: One other thing I might mention about the spraying on of foam systems is the importance not only of getting your nozzles properly coated but also where you have angles that are welded to the tank which go out to supports, stairs or platforms, etc.; the importance of spraying these angles out some quarter or so in order to get a good seal to prevent the infiltration of moisture.

Q. What temperature do you think the steel got to and what checks did you make to see if the structure of the steel had been altered at all?

Darling: I have no idea of the temperature the steel got to. Of course, they were spraying it with water. The engineering department made a thorough inspection of the steel after it was sandblasted and there was no damage.

Q. You mentioned that after curing, you felt that this fire risk would be diminished a good deal.

Darling: That is what they said.

Q. This would mean that the risk of a conflagration with the tank active would be minimal then.

Darling: That is right.

Q. Had the conflagration occurred with the tank full of ammonia, did anyone calculate the possible increase in vapor pressure in the ammonia storage tank, just as a matter of interest to find out what might have happened?

Darling: No, I don't believe so. I hadn't heard of any such study.