

OXYGEN TRAILER FIRE

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Shortly before 9 A.M. August 28, 1961, a 400,000 cu. ft. liquid oxygen tank trailer owned by National Cylinder Gas was involved in a fire at the company's Sterling, Illinois location.

This plant serves a local steel mill and as a warehouse and distribution point for the company's cylinder oxygen, hydrogen, acetylene, etc. In addition to the high pressure gaseous oxygen production plant, there is a 500,000 cu. ft. liquid oxygen converter to gasify liquid oxygen and feed it into the steel mill pipe line and a 600,000 cu. ft. liquid oxygen storage tank. The pipe line also is supplied from a number of high pressure gaseous oxygen storage tubes.

The producing plant is housed in a concrete block building having a concrete loading platform on which gaseous cylinders are stored. The high pressure tubes are racked up at one side of the building. In front of these tubes and to one side of the platform the converters and storage tank are located.

At the time of the accident, a 400,000 cu. ft. liquid oxygen trailer was backed up to the converter to which it was connected by a flexible hose. The contents of the trailer were being discharged into the converter with a centrifugal pump which is permanently mounted on the trailer.

About 15 minutes after the pump had been primed and the transfer of liquid started, the truck driver, who was standing behind the truck, thought he felt a liquid leak and immediately thereafter a fire broke out in the vicinity of the rear wheels. This fire rapidly spread, involving all eight tires, axles, etc. making it impossible to shut off any valves. The transport could not be driven away as this would have ruptured the filling hose, thus allowing the entire contents of the transport to run out.

The local fire department was called and arrived within a few minutes after the fire broke out. However, because of the danger of an explosion this hose was directed on the fire from a distance of approximately 150

ft. and did not have much effect on the fire. About 20 to 30 minutes after the fire started, the pressure in the transport tank exceeded the tensile strength of the material and the tank ruptured. This occurred even though all safeties were blowing and additional oxygen was escaping through burned off piping. Apparently the rate of heat input was extremely high since all eight trailer tires were burning as well as the bituminous pavement on which the tractor and front two thirds of the trailer rested. The trailer's rear wheels and the liquid oxygen storage equipment were on concrete.

The transport failure blew burning debris onto the building and loading platform. This caused fires to break out among the full high pressure cylinders.

Water which was sprayed on the high pressure storage tubes kept them from becoming involved. The storage tank and converter were damaged only superficially except for their exterior piping. The production equipment was not affected except for water damage to motors, etc. There were no personnel injuries.

We have now taken the following steps to reduce the possibility of such an accident happening again. First, if at all possible, discontinue transferring liquid oxygen if a leak occurs. If this is not possible, catch the leaking oxygen in a clean container.

Second, verify by feel that all tires and brake drums at the rear of any transport equipment are cool before starting to transfer.

Third, we are developing a method of remotely closing the liquid discharge lines so that a transport may be moved without having to approach the rear of the equipment to close valves, disconnect lines, etc.

Fourth, wherever possible, do not transfer liquid oxygen where the surface under foot is not clean concrete or other non-combustible materials.

The rear axles of all liquid transport vehicles are to be inspected periodically and cleaned often enough to prevent the accumulation of grease, oil etc.

DISCUSSION

SCHWAB—Factory Insurance Association: Was there a safety relief valve on the top of the tank?

PINNEY—National Cylinder Gas: The tank is protected with a safety relief valve connected to the vapor space as well as about a three-inch bursting disc. Both of these just relieve to the atmosphere.

SCHWAB: Do you think that this rupture disc and the relief valve system was adequately designed for fire conditions surrounding the tank or was this system designed to take normal heat input from sunlight or something like this?

PINNEY: The relieving system is designed to handle the heat input in any normal fire and the capacity of the relieving devices far exceeded the requirements of Part 2, Pamphlet S-1, "Safety Relief Device Standards," published by the Compressed Gas Association.

SCHWAB: You don't happen to know what the heat input design of the tank or relieving capacity of the rupture disc was, do you?

PINNEY: No. I am afraid that I don't have that information.

RAYFIEL—American Cyanamid: Did the rubber tires contribute to the fire?

PINNEY: I suppose it was possible but it must be remembered too that there are always quantities of grease around the rear axle of the trailer, and both rear axles on this trailer were pretty much burned into small pieces. When the tank ruptured, they were flung to one side so weren't involved any further. Whether they started it—or the tires started it—it is hard to say. There were about five or six witnesses but they all seemed to be looking somewhere else when it started.

SEFTON: I was wondering if this phenomenon may bear some resemblance to that in the refineries where there is generation of electrostatic energy? What is the velocity of unloading in the four-inch pipe?

PINNEY: The unloading line is 1-1/2" pipe size and the oxygen pump would handle about 50 GPM at the

pressures involved. However, the generation of electrostatic energy is not of great concern because we are handling a non-combustible fluid. I don't know whether or not the trailer was grounded by a dragging chain.

SEFTON: Although on the other hand, chains seem to be not completely adequate with refineries.

PINNEY: But then it must be remembered that the hose itself connecting this transport to the converter was metal.

PARRISS—Canadian Underwriters Association: Do you have any estimate as to the liquid level in the trailer at the time of the rupture?

PINNEY: It was about fifteen minutes after we started filling. It was probably about one-half full. You see, with weight limits the way they are in Illinois, the transport was only three-fourths full when we hauled it.