

Log P-88

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: October 31, 1977

Forwarded to:

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SAFETY RECOMMENDATION(S)
P-77-27 through P-77-33

At 11 a.m., c.s.t., on December 7, 1976, a natural gas compressor operating at 1,000 psig pressure failed and then exploded and burned at an Exxon Gas System, Inc., station near Robstown, Texas. An emergency shutdown system was activated by a worker at the station, but the four automated fire gate valves on the two pipelines that supplied the station did not close. Another emergency control system also failed to automatically close the shutoff valves leading to two of the five compressors in the station. 1/

At 11:30 a.m., a second explosion occurred within the burning building in one of the compressors that had not shut down automatically. Pipeline valves upstream and downstream of the station had to be closed manually. Gas burned for 3 hours until the pipeline pressure decreased to 250 psig and the fire gate valves could be approached and closed manually. The fire killed one person, injured two persons, and destroyed three engine-driven compressors and the compressor building. Property damage and gas loss was estimated to be \$5 million.

Investigation after the accident revealed that many of the studs that secured the 10-inch suction valve covers to the compressor cylinders were tightened approximately three times the amount recommended by the manufacturer of the compressor. Metallurgy indicated that several studs had been overstressed and experienced fatigue-type failures.

1/ For more detailed information about this accident read: "Pipeline Accident Report, Exxon Gas System, Inc., Natural Gas Explosion and Fire, Robstown, Texas, December 7, 1976" (NTSB-PAR-77-3).

There had been no total systems review of the control components that operate the emergency shutdown valves. For example, an equipment-air line that failed as a result of the fire may have caused a loss of pressure in an instrument-air line that operated the shutoff valves. There had been no analysis of the effect of this type of failure and, consequently, no dual or emergency backup air system had been provided.

Although the remote-control equipment and the fire gate valves were inspected yearly in accordance with 49 CFR 192.731(c), the time interval between inspections and operations was too long to uncover potential equipment malfunctions. The linkage in a small 4-way pilot gas control valve had become stuck and prevented power gas from closing the two fire gate valves on the 36-inch pipeline. An insect and mud had clogged the 1/8-inch-diameter pressure relief vent line on a 3-way solenoid valve. The clogged vent made the two fire gate valves on the 30-inch pipeline inoperative.

The unit blowdown valves were designed to vent the gas trapped within the compressor building piping only, and were sequenced to open after all of the other shutdown valves had closed. Because some of the valves did not close, gas was vented only from a minor portion of the station's piping. There was no means of remotely blowing down all of the piping within the compressor station.

The operating personnel from other stations and from neighboring operating divisions of the company responded immediately to the emergency; however, if they had been trained on the equipment that they might be expected to operate in an emergency, and had there been signs that marked valves that were out of their normal positions, the fire probably could have been put out in less than 3 hours.

Therefore, the National Transportation Safety Board recommends that the Exxon Gas System, Inc.:

Take necessary steps to insure that studs on compressors components are tightened to the number of foot-pounds of torque recommended by the equipment manufacturer.
(Class II, Priority Followup)(P-77-27)

Inspect emergency shutdown valves and their components at compressor stations at more frequent intervals than 1 year (monthly or quarterly) until equipment of proven reliability has been installed, tested, and shown to be responsive for longer periods of inactivity. (Class II, Priority Followup)(P-77-28)

Make a total systems review of electric, air, and gas-operated emergency equipment, with particular emphasis on interconnected air systems and backup or dual-feed air systems in compressor stations. (Class II, Priority Followup)(P-77-29)

Include, in emergency shutdown systems, a separate control to remotely operate valves that can independently blow down the station piping. (Class II, Priority Followup)(P-77-30)

Investigate more dependable items of control equipment and replace existing solenoid and 4-way valves at fire gate valves with this equipment. (Class II, Priority Followup)(P-77-31)

Designate critical valves on control lines (gas, air, and hydraulic) as to whether they should be normally open or closed, and place signs on these valves whenever the lines are shut down for maintenance or when the valves are not in their normal positions. Such changes should be authorized, logged, and reported to all personnel responsible for the operation of the system. (Class II, Priority Followup)(P-77-32)

Train operating personnel from other stations and other nearby operating divisions of the company on the operation of emergency transmission line valves and emergency station fire control valves. Furnish each nearby company office that could be expected to help in an emergency with a contingency plan book and drawings of all of the facilities they might be expected to operate. (Class II, Priority Followup)(P-77-33)

BAILEY, Acting Chairman, McADAMS and HOGUE, Members, concurred in the above recommendations. HALEY, Member, did not participate.



By: Kay Bailey
Acting Chairman