



# National Transportation Safety Board

Washington, D.C. 20594

## Safety Recommendation

Log P-290

Date: May 10, 1988

In reply refer to: P-88-1 through -3

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Administrator  
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About 10:30 a.m. on August 11, 1987, a flashing red light alerting device at the KG gas processing plant near Winters, Texas, indicated that an excessive amount of hydrogen sulfide (H<sub>2</sub>S) <sup>1/</sup> was flowing into the gas stream being delivered to the Lone Star Gas Company (Lone Star). At 11 a.m., the KG plant superintendent closed the valve on the pipeline which directed gas into Lone Star's gas receiving facilities located about 2,600 feet from the plant. The KG superintendent stated that he attempted to notify Lone Star by telephone but that he was unable to reach anyone. The superintendent took no further actions because he believed that only a small amount of H<sub>2</sub>S-contaminated gas had entered the Lone Star system.

At 9:50 a.m. on August 12, 1987, Lone Star received a gas leak complaint from a customer served by its Winters gas distribution system. At 10:10 a.m., a second leak complaint from the same system was received. Lone Star dispatched an employee to check the level of odorant at the gas receiving station at the KG plant. At 10:50 a.m., the gas company employee found that gas at the receiving station contained 1,600 parts per million (ppm) of H<sub>2</sub>S. Lone Star then requested other personnel to check the metering station and points within the Winters distribution system. Gas company personnel responded that these locations also contained H<sub>2</sub>S at concentrations of 1,600 ppm and greater. About 11:40 a.m., Lone Star informed the local police and advised that all residents be evacuated and that all buildings be well ventilated. Meanwhile, Lone Star began closing the pipeline system and purging all gas from it. The system was cleared of H<sub>2</sub>S by 9 p.m., and residents were allowed to return to their homes shortly afterward. Gas service was restored by 6:30 a.m. on August 13, 1987.

<sup>1/</sup> H<sub>2</sub>S is a toxic, colorless, flammable gas which is poisonous if inhaled. It is considered to be immediately dangerous to life and health at concentrations of 300 parts per million (ppm), and at concentrations of 1,000 ppm, it causes immediate unconsciousness and death.

In addition to the flashing alerting device which activated when the gas analyzer detected 4 ppm H<sub>2</sub>S, the KG plant contained other equipment capable of detecting H<sub>2</sub>S. An automatic shutoff valve was set to close the pipeline when the analyzer detected H<sub>2</sub>S concentrations of 6 ppm or more. On the day of the accident, however, the valve failed to operate. While Lone Star also had H<sub>2</sub>S monitoring equipment for the pipeline, it had been removed for repairs in April 1987 and had not been reinstalled at the time of the accident.

Information provided by Lone Star indicated that since 1977, Lone Star has experienced 11 additional incidents in which H<sub>2</sub>S-contaminated gas has been delivered to its pipeline systems. Seven of the incidents occurred in 1982. Lone Star did not report any of the H<sub>2</sub>S-contaminated gas incidents to the Office of Pipeline Safety (OPS) of the U.S. Department of Transportation (DOT) because the incidents did not comply with the requirements for notification contained in Federal pipeline regulations.

During its investigation of the August 12 incident, the Safety Board learned that other pipeline operators had experienced similar incidents. On December 28, 1983, the Pacific Offshore Pipeline Company's Las Flores Canyon Gas Treatment Plant, a newly constructed and tested plant located about 25 miles northwest of Santa Barbara, California, was placed in service. Impurities, including H<sub>2</sub>S, were to be removed from gas that was being transported by pipeline from producing wells in the Santa Ynez Unit (an offshore oil and gas field in the Santa Barbara Channel). The gas then would be delivered by pipeline to the Southern California Gas Company (SCG) pipeline system for distribution to its natural gas customers.

At 5:15 a.m., gas began entering the SCG pipeline system. About 9 a.m., an SCG employee who was testing a sample of the gas noted that an excessive concentration of H<sub>2</sub>S (in excess of 60 ppm) was entering the pipeline system. A second sample of gas taken at 10:15 a.m. showed that the gas contained 200 ppm of H<sub>2</sub>S. At 10:28 a.m., the treatment plant manager realized that the automatic gas analyzer was providing faulty readings and closed a valve at the plant to stop the flow of gas into the SCG system. (SCG did not have a valve under its control between the treatment plant and the gas delivery point located about 1 mile from the plant.) The automatic gas analyzer indicated 0.02 ppm of H<sub>2</sub>S in the gas.

The problem with the gas analyzer was corrected and at 10:45 a.m., gas delivery was resumed. Samples of the gas were tested at 15-minute intervals; the tests indicated that no H<sub>2</sub>S was being delivered in the gas stream. About 1 p.m., the gas was tested and 16 ppm H<sub>2</sub>S was found. The flow of gas into the SCG pipeline was again stopped. For at least 5 hours, H<sub>2</sub>S-contaminated gas (approximately 3 million cubic feet) was delivered into the SCG system.

SCG began sampling and testing gas from two pipelines (1010 and 1032) which received gas from the treatment plant delivery point. At 1:30 p.m., gas samples were taken from pipeline 1010 at locations about 30 and 40 miles north of the delivery point; the samples indicated no H<sub>2</sub>S. A valve in the section that was determined to be free from H<sub>2</sub>S contamination was closed, and all gas between the valve and the delivery point was purged from the pipeline. H<sub>2</sub>S concentrations of 33 and 80 ppm were detected in pipeline 1032 and the entire line was found to be contaminated. Valves were closed on the pipeline, and all gas was vented to the atmosphere. The gas distribution systems for Buellton, Goleta, Vandenberg Air Force Base, Lampoc, Alisal Ranch, and Solvang, California, were shut down, purged of gas, and then repressurized with gas. About 5 p.m., SCG instructed the public of the problem and requested that those in the affected area turn off their gas appliance pilot lights. Customers were advised to turn off all gas appliances and to open windows in their houses. Some residents were advised to evacuate their houses. SCG completed purging all systems, with the last system being returned to normal service about 4 p.m. on December 29, 1983.

In its January 3, 1984, report, the California Public Utilities Commission (CPUC) noted that the December 28 incident was not typical of reportable incidents because there had been an intentional release of gas and there had been no fire or explosion. The report also pointed out that the SCG did not regard the incident as being reportable to the DOT since it did not meet the criteria for reporting accidents. The CPUC report recommended that SCG install an automatic H<sub>2</sub>S analyzer, a shutoff valve, and an alarm for the gas supply line from the gas treatment plant and that the analyzer be designed to activate the alarm and close the valve when 4 ppm of H<sub>2</sub>S was detected.

A second, but less severe, incident involving H<sub>2</sub>S entering the SCG pipeline system occurred on May 12, 1984, at the Wilmington, California, gas delivery point. As a result of the incident, the CPUC requested SCG to list all of its locations where H<sub>2</sub>S-contaminated gas could be received. SCG provided a list of 28 locations and advised the CPUC that each delivery point would be equipped with automatic H<sub>2</sub>S analyzers and shutoff equipment by the end of 1984. The completion date was August 7, 1984.

After the gas contamination incidents in California, the CPUC amended its General Order No. 58-A, Rule 16, which established limits on the amount of H<sub>2</sub>S allowable in natural gas intended for domestic or commercial use. General Order No. 58-A, Rule 16, requires pipeline operators to conduct daily tests of gas intended for domestic or commercial use. The rule also requires that automated monitoring equipment capable of determining the total sulfur and ammonia contained in the gas be installed at gas supply points.

Federal pipeline safety regulations, 49 CFR Part 192, do not address public safety hazards associated with pipeline systems supplied from sources which, as a result of a failure, could deliver hazardous quantities of H<sub>2</sub>S to a pipeline. To learn the extent of previous similar H<sub>2</sub>S problems, the Safety Board reviewed the OPS accident and incident reports; no reports of H<sub>2</sub>S contamination were found. A review of the OPS accident/incident reporting criteria (49 CFR 191.3) indicated that such events are not required to be reported to the OPS.

The public has been fortunate that no deaths or serious injuries have resulted from incidents involving H<sub>2</sub>S-contaminated gas. However, it is obvious that many of these incidents posed serious threats to the health and lives of those exposed. Consequently, the Safety Board concludes that the OPS must act to prevent hazardous concentrations of H<sub>2</sub>S from being introduced into pipeline systems that transport gas intended for domestic or commercial purposes.

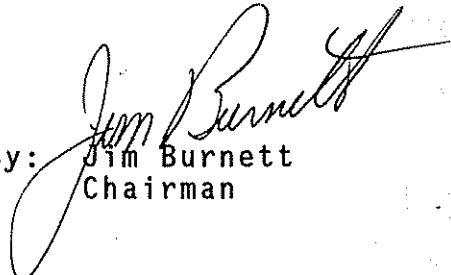
Therefore, the National Transportation Safety Board recommends that the Research and Special Programs Administration:

Establish, based on known toxicological data, a maximum allowable concentration of hydrogen sulfide in natural gas pipeline systems, and amend 49 CFR Part 192 to reflect this determination. (Class II, Priority Action) (P-88-1)

Revise 49 CFR Part 191 to require that pipeline operators report all incidents in which concentrations of hydrogen sulfide in excess of the maximum allowable concentration are introduced into pipeline systems that transport natural gas intended for domestic or commercial purposes. (Class III, Longer-Term Action) (P-88-2)

Require gas pipeline operators to install on their systems equipment capable of automatically detecting and shutting off the flow of gas when the maximum allowable concentrations of hydrogen sulfide-contaminated gas are exceeded. (Class III, Longer-Term Action) (P-88-3)

BURNETT, Chairman, KOLSTAD, Vice Chairman, and LAUBER and NALL, Members, concurred in these recommendations.

By:   
Jim Burnett  
Chairman