

1081# P307

NATIONAL TRANSPORTATION SAFETY BOARD

Washington, D.C. 20594



Safety Recommendation

Date: December 15, 1993

In Reply Refer To: P-93-9

Ms. Rose McMurray
Acting Administrator
Research and Special Programs Administration
400 Seventh Street, S.W.
Washington, D.C. 20590

On April 7, 1992, an uncontrolled release of highly volatile liquids (HVLs) from a salt dome storage cavern in the Seminole Pipeline System near Brenham, Texas, formed a large, heavier-than-air gas cloud that exploded. Three people died from injuries sustained either from the blast or in the fire. An additional 21 people were treated for injuries at area hospitals. Damage from the accident exceeded \$9 million.¹

During its investigation of this accident, the Safety Board found several systemic deficiencies in the design of Brenham station, the most important of which was the lack of a fail-safe cavern shutdown system.

The Seminole Pipeline Company is a stock corporation in which MAPCO Natural Gas Liquids, Inc. (MAPCO) has controlling interest. When MAPCO constructed Brenham station, no industry or government standards existed that described the type or design of equipment needed to provide a specified level of safety control. MAPCO engineers designed the station, including the configuration of the station's cavern safety system and selected equipment, after reviewing the practices of other companies that were operating caverns at the time. Between the time that the Brenham station was originally constructed and the time of the accident, MAPCO had never performed a comprehensive safety analysis of the Seminole system, including Brenham station, to identify potential points of failure and product release.

¹For more detailed information, read Pipeline Accident Report--*Highly Volatile Liquids Release From Underground Storage Cavern and Explosion, MAPCO Natural Gas Liquids, Inc., Brenham, Texas, April 7, 1992* (NTSB/PAR-93/01).

During its investigation, the Safety Board searched recommended practices and guidelines of several pipeline-related organizations to determine what guidance had been provided by industry associations on the design, construction, operation, and emergency preparedness of underground storage systems. Section 6 of the Gas Processors Suppliers Association's (GPSA's) *Engineering Data Book, 1987 Edition*, contains information on underground storage facilities, but not enough technical information to design or operate an underground storage facility.

At a public discovery hearing held July 29-30, 1992, in Austin, Texas, the Safety Board asked representatives of the Office of Petroleum Safety (OPS), the American Petroleum Institute (API), and the American Gas Association (AGA) what assistance they provided to their members on underground storage. The API representative advised that since 1981, it has recognized the need to develop standards for solution-mined underground storage facilities. The API's transportation committee appointed a task force that began developing standards for solution-mined storage facilities, but the task force halted work after several years, apparently because of an industry economic downturn. In December 1989, the task force resumed working on standards for design and construction, and in July 1990, resumed working on standards for operations and maintenance. According to a spokesperson, a draft of the design and construction standards includes recommended practices on designer qualifications, cavern design parameters and criteria, wellhead safety equipment, cavern drilling and completion, cavern integrity testing, cavern product inventory measurement, cavern operation, and cavern abandonment. The API expects that both sets of standards will be issued by the end of 1993.

The AGA witness stated that the present standards applicable to underground natural gas storage were developed for the exploration and production of oil and gas. The API, the American National Standards Institute, and the International Association of Drilling Contractors have recommended practices on wellhead equipment, casing equipment, and drilling operations. The GPSA also has some educational materials on underground storage.

The AGA representative identified agencies having some safety control over underground storage of natural gas, including the Federal Energy Regulatory Commission, which reviews both the environmental studies and facility construction and design proposals for interstate operations, and State utility regulatory commissions, which perform similar reviews for intrastate operations. In most cases, the States regulate the performance of wellhead and down hole equipment.

The spokesperson stated that although the AGA does not develop standards, the association has an underground storage committee that reviews and disseminates to its members technical information on the safe and efficient operation of both cavern and aquifer storage facilities. The committee works with standard-writing bodies by reviewing and recommending improvements; maintains technical papers; meets biannually to exchange technical information, to review research, and to review environmental regulatory requirements; and collects and publishes statistics on underground storage operations.

The Safety Board believes that System Safety Society and other professional organizations have greatly improved safety analysis techniques in use since the Board initially recommended their use. However, the pipeline industries have not adequately used the techniques even though

the Department of Transportation has advocated their use and the AGA has developed guidelines to make them easier to apply.

The Safety Board is aware that the OPS is now developing a risk-based analysis and prioritization process that it believes will provide an analytical basis for selecting from among potential pipeline safety improvement projects those that will lead to optimal use of its pipeline safety resources. The Safety Board is encouraged by the OPS's action in using safety analysis techniques to improve the administration of the pipeline safety regulatory program. However, the Board believes that the OPS should extend its new-found appreciation of the advantages of system safety analyses by incorporating incentives into its pipeline regulations that will encourage individual pipeline operators and pipeline standards-writing organizations to also incorporate these techniques into their pipeline safety programs. The Safety Board believes that the OPS should require pipeline operators to apply system safety analyses to new and modified system designs and to evaluate the adequacy of existing underground storage systems. The OPS could motivate standards-writing organizations to use analysis techniques in assessing new or modified standards and practices by not incorporating into Federal regulations any standards that have not been appraised using safety analyses.

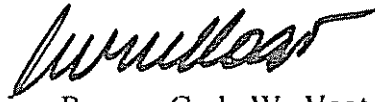
This accident and the lack of underground storage regulatory public safety oversight posed by the more than 1,400 liquid and more than 400 natural gas underground storage facilities in the country demonstrate that the Research and Special Programs Administration needs to develop safety requirements for storage of highly volatile liquids and natural gas in underground facilities.

Therefore, the National Transportation Safety Board makes the following safety recommendation to the Research and Special Programs Administration:

Develop safety requirements for storage of highly volatile liquids and natural gas in underground facilities, including a requirement that all pipeline operators perform safety analyses of new and existing underground geologic storage systems to identify potential failures, determine the likelihood that each failure will occur, and assess the feasibility of reducing the risk; require that operators incorporate all feasible improvements. (Class II, Priority Action)
(P-93-09)

Also, the Safety Board issued Safety Recommendations P-93-10 through -14 to the MAPCO Natural Gas Liquids, Inc.; P-93-15 and -16 to Washington County; P-93-17 to the Texas Department of Public Safety; P-93-18 through -20 to the American Petroleum Institute; and P-93-21; P-93-22 to the American Gas Association; and P-93-23 to the International Association of Fire Chiefs. The Safety Board is also reiterating Safety Recommendation I-88-1 to the Department of Transportation. If you need additional information, you may call (202) 382-0672.

Chairman, VOGT, Vice Chairman, COUGHLIN, Members, LAUBER and HAMMERSCHMIDT concurred in this recommendation. Member HART did not participate.



By: Carl W. Vogt
Chairman