



National Transportation Safety Board

Washington, D.C. 20594
Safety Recommendation

100#P-288B

Date: September 9, 1987

In reply refer to: P-87-21 through -27

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Director
Office of Pipeline Safety
Washington, D.C. 20590

About 4:20 a.m. on July 8, 1986, line 2N, an 8-inch products pipeline operated by Williams Pipe Line Company (WPL) at Mounds View, Minnesota, ruptured. Unleaded gasoline under 1,434 psig spewed from a 7 1/2-foot-long opening along the longitudinal seam of the pipe. Vaporized gasoline combined with air and liquid gasoline flowed along neighborhood streets. About 20 minutes later, the gasoline vapor was ignited when an automobile entered the area. Following an explosion-like noise, fire spread rapidly along the path of the liquid gasoline. Two persons were burned severely and later died, and one person suffered serious burns. There was substantial property damage and soil and water pollution. 1/

In its 1971 study on the rapid shutdown of pipelines, 2/ the Safety Board found that "By reducing the time required to shutdown a failed pipeline system to minimize the loss of materials, the hazardous effects to the public, to persons working near a pipeline, and to property can be minimized or eliminated." Since 1971, the Safety Board has made several recommendations to the Department of Transportation (DOT) regarding the need for regulations on rapid shutdown systems. In response to these recommendations, the DOT has stated that studies show that the installation of rapid shutdown systems or closely spaced valves along the entire pipeline length is not cost effective and thus it will not order them. The Safety Board believes, however, that installation of such equipment should be based on the population at risk, i.e., those persons who live or work near a pipeline. Failures of pipelines in residential or business areas expose large numbers of persons and thus present far greater risks to public safety than do similar failures in remote, sparsely populated areas. Therefore, an operator's ability to minimize the consequences of a failure in highly populated areas should be correspondingly greater. The Safety Board remains concerned about the rapid isolation of failed sections of pipelines and urges the DOT to require the installation of remote-operated valves on pipelines that pass through or near highly populated areas.

1/ For more detailed information, read Pipeline Accident Report—"Williams Pipe Line Company Liquid Pipeline Rupture and Fire, Mounds View, Minnesota, July 8, 1986" (NTSB/PAR-87/02).

2/ "Special Study of the Effects of Delay in Shutting Down Failed Pipeline Systems and Methods of Providing Rapid Shutdown" (NTSB-PSS-71-1).

Although the Office of Pipeline Safety (OPS) has devoted a considerable amount of its available time to working with WPL, it appears that much of its effort has been in the form of reaction to accidents and not proactive efforts to ensure that WPL operations uniformly comply with the established safety regulations. Accident related inspections have been so focused on operational aspects related to the accidents that inspectors have ignored all others. As the Safety Board's review of the OPS files on WPL showed, there were no common factors examined in all of the inspections. The Safety Board believes that this lack of common factors between inspections denied OPS the opportunity to compare the results of various inspections and prevented it from identifying company-wide problems within WPL.

If OPS had a more thorough inspection program, the Safety Board believes that it might have discovered the problems with WPL's cathodic protection of line 2N before this accident. OPS investigated at least two accidents involving WPL in which corrosion was the cause (one in Minnesota), and several other accidents in which past corrosion problems were discovered; yet, it never examined WPL's overall cathodic protection program for systematic problems.

Lack of thoroughness in its inspections is not the only problem. Disregarding past violations appeared to be a problem as well. While OPS has recognized that WPL's "history of compliance with the regulations has not been a shining example of 'strict compliance'" it appears to have had no effect on the level of successive enforcement cases. Although the OPS central region initiated enforcement actions as a result of 12 of the 17 initial inspections, there was no apparent increase in the severity of these actions. For example, warning letters, the lowest level of enforcement action, continued to be the primary enforcement action taken by OPS even after it levied the civil penalty in which WPL's compliance history was criticized. The Safety Board believes that this type of action did not give WPL any motivation to comply with the regulations in the future. In reviewing WPL's response to previous OPS enforcement actions, it is clear that WPL was not concerned about any actions OPS might take if it discovered violations of the Federal pipeline safety regulations. In the 1981 enforcement case involving nondestructive testing, WPL was told explicitly that the welds it made must be tested in a certain manner, yet WPL did not perform the required tests. In the 1984 enforcement case, it delayed for more than 2 years sending OPS a copy of the revised operating procedures.

The Safety Board does not believe that the problems identified in the OPS enforcement program are limited entirely to WPL or to the OPS central region. In the enforcement action related to this accident, OPS stated that, at present, WPL's compliance history is similar to that of other hazardous liquid pipeline operators. Regarding the OPS problems, the forms and policies used by the central region follow those given in OPS' enforcement procedures training course. In addition, the director of OPS stated that he agreed with the central region chief's policies, indicating that those policies are, indeed, OPS policies.

The Safety Board does not agree with the OPS policy of not disclosing any information on enforcement actions before closure of a case. OPS enforcement proceedings should be conducted in the public view. At a minimum, OPS should provide public notice of proposed charges and remedies before the case is resolved. OPS' accountability for its enforcement actions would be increased, and persons directly at risk from pipeline operations would be aware of OPS actions to protect public safety.

At present, OPS must depend on voluntary compliance with the Federal regulations to ensure the safety of the public from pipeline accidents. There simply are not enough pipeline investigators to effectively inspect every operator annually and to perform their

other duties. To perform inspections of each operator in the central region each year would require 272 inspection days, 47 days more than the approximately 225 inspection days the central region had available. (The number of available inspection days was determined based on two inspectors devoting 50 percent of their time.) If the "mere presence" of OPS is to have the effect of encouraging operators to comply with the pipeline safety regulations, then its efforts need to call more attention to its presence. Therefore, its efforts must motivate compliance by operators with the pipeline safety regulations.

The manner in which OPS has used its sanctions has been insufficient to motivate compliance with the pipeline safety regulations. For any regulatory program to be effective, it must have and use sanctions designed to motivate compliance. An understaffed program, such as that of OPS, cannot realistically expect to be effective without the use of sanctions to the extent that such sanctions motivate operators to implement aggressive internal compliance assurance programs. While the number of enforcement actions initiated has risen, the OPS has increased its use of enforcement actions, such as warning letters, while the average civil penalty assessed has fallen. Also, as demonstrated by OPS actions related to the order issued to WPL shortly after this accident, OPS negotiates with pipeline operators about its enforcement action.

Although OPS assessed a large civil penalty against WPL, it was only after its investigation of this accident involving loss of life. If pipeline operators were concerned that similarly severe actions might be taken against them for major violations discovered during routine inspections, the Safety Board believes there would be greater compliance with the pipeline safety regulations. The Safety Board believes that OPS should modify its enforcement policy to more effectively use its sanctions to motivate operator compliance and, without negotiation with the regulated operator before issuing any orders, to develop corrective actions which must be taken as part of the sanctions to protect the public's safety.

While a change in OPS' enforcement policy is necessary, that alone will not correct all the problems with the enforcement program. To adequately protect public safety, OPS staffing needs to be augmented. At the time of the accident at Mounds View, the OPS had only 16 inspectors nationwide. In the central region, which has complete responsibility for the WPL pipeline system, there were two inspectors available to inspect 113 interstate pipeline operators and to monitor the intrastate pipeline safety inspection and enforcement program for 10 States.

The Safety Board believes this number of inspectors is insufficient to allow thorough, periodic reviews of each operator. Additionally, just performing the initial review would allow no time for analyses of the various operators' performances to determine which ones require comprehensive monitoring, to actually perform any comprehensive monitoring, to participate in investigations of accidents and incidents, or to respond to public reports of potentially unsafe conditions.

Considering that only 11 States now serve as agents for the OPS in inspecting interstate natural gas pipelines, finding ways to obtain similar status for the other States would greatly expand the number of inspectors available to the OPS. Similarly, consideration should be given to providing inspection powers to the States for interstate liquid pipeline operations.

The Safety Board has long been concerned about the adequacy of the liquid pipeline safety regulations. Between 1970 and 1979, the Board made 19 recommendations concerning the transportation of highly volatile liquids (HVL). Some of the

recommendations were implemented and others were not. An accident investigation in 1983 brought to light many of the continuing problems with the regulations for the transportation of HVL by pipeline.

In 1983, the Safety Board investigated a liquefied petroleum gas pipeline rupture in West Odessa, Texas. 3/ As a result of the investigation, the Safety Board examined the development of 49 CFR 195. The Safety Board found that: 49 CFR Part 192 and 49 CFR Part 195 were primarily based on industry codes (ASA B31.8 for natural gas pipelines and ASA B31.4 for liquid pipelines). The gas code took into account population densities for the construction of pipelines while the liquid code did not. Furthermore, it found that 49 CFR Part 192 requires operators of natural gas pipelines that are located in areas where the population has increased significantly since the pipeline's installation to reevaluate and/or retest the pipeline to confirm that its margin of safety is adequate to reduce the maximum allowable operating pressure such that an adequate margin of safety is achieved. However, Part 195 does not require operators of liquid pipelines to take comparable action and, consequently, many liquid pipelines continue to operate without increasing the margin of safety even though the land adjacent to the pipeline may have become more densely populated. The margin of safety provided for liquid pipelines, especially for those that transport highly volatile liquids or liquids which possess toxic materials should be reevaluated periodically. Provisions for reevaluating safety factors, such as the provisions contained in 49 CFR 192.611 for natural gas pipeline, should be established for liquid pipelines which transport highly volatile or toxic liquids.

In 1976, the Safety Board investigated an accident involving the release of liquefied petroleum gas near Whitharral, Texas. 4/ The pipeline, constructed of electric resistance welded (ERW) pipe manufactured by Jones and Laughlin Steel Corporation, failed along a longitudinal weld seam. The pipe had been hydrostatically tested to a pressure of 1,660 psig, in 1960, and it failed at a pressure of 1,570. The pipeline company had experienced 14 longitudinal seam failures in the 8 years before the accident.

As a result of its investigation, on June 14, 1976, the Safety Board recommended that the DOT:

P-76-20

Review all pertinent data such as leak and failure reports submitted by liquid pipeline carriers to determine if longitudinal weld failures constitute a recurrent safety problem and take appropriate regulatory action if they do.

P-76-21

Request all pipeline companies which have installed ERW pipe manufactured by the Jones and Laughlin Steel Corporation to review their records on longitudinal seam failures and determine if the number of such failures is abnormally high. After DOT reviews these data, it should take necessary corrective actions.

3/ Pipeline Accident Report—"Mid America Pipeline System Liquefied Petroleum Gas Pipeline Rupture, West Odessa, Texas, March 15, 1983" (NTSB/PAR-84/1).

4/ Brief of Accident Report, DCA-76-FP-016, Mid American Pipe Line System Pipeline Rupture and Fire, Whitharral, Texas, February 25, 1976.

In its response to Safety Recommendation P-76-20, the Materials Transportation Bureau (MTB), an office formerly under the Research and Special Programs Administration, stated that a review of its records on longitudinal weld seam failures found that statistically longitudinal weld seam failures have caused a very small percentage of failures and continue to become even more insignificant. The MTB also stated that regulatory action as appropriate for the problems identified would be taken. The recommendation was classified as "Closed—Acceptable Action."

In response to Safety Recommendation P-76-21, the MTB stated that it would not conduct the requested review since sufficient data were not available to perform a meaningful review of the performance of ERW pipe. Instead, MTB advised that it would ask all operators to conduct a thorough evaluation of the physical condition of their pipelines through a rulemaking. OPS has yet to issue such a rulemaking.

Comments received on the 1980 MTB ANPRM, titled "Placing Longitudinal Welds Seams in Upper Half of Pipe," indicated that there were no problems with internal corrosion of ERW weld seams and that improved manufacturing techniques prevented the occurrence of insufficiently bonded weld seams. Safety Recommendation P-76-21 was closed at this time. The Board stated that, "Based on the information gathered . . . in your ANPRM, it has been determined that further action on P-76-21 would no longer be productive. Therefore, this recommendation has also been classified as "Closed-No Longer Applicable."

The Safety Board again became concerned about the safety of ERW pipe when on February 24, 1986, a 40-foot section of a natural gas transmission pipeline operating at 750 psig ruptured in Cale, Arkansas. ^{5/} The line, which consisted of low frequency ERW pipe manufactured by Youngstown Sheet and Tube Company, had been installed in 1950 and had been hydrostatically tested to 960 psig in May 1977. Segments of the ruptured pipe were metallurgically examined. According to the metallurgy report, the fracture initiated in an area of the weld seam with a lack of fusion. The report stated that "The basic defect is believed to have been present from the manufacture of the pipe but may have since been sharpened and become more severe due to pressure fluctuations caused by the normal operation of the pipeline." However, the examination showed no obvious fatigue marks. Investigation of the accident in Cale showed that the operator had experienced three seam failures on this same line since 1975. In addition, some of its other lines also had experienced operating failures.

The Safety Board believes that the accidents in Whitharral, Cale, and Mounds View illustrate a safety problem that must be addressed. While the change from the use of low frequency to high frequency in ERW welding may have eliminated many of the weld defects that were found, low frequency pipe remains in use and continues to be an issue of concern in pipeline safety. The Safety Board believes that the OPS, with its admission that its ERW pipe data is meager, had no valid basis for determining that longitudinal weld seam failures in ERW pipe constituted an insignificant safety problem. Therefore, the Safety Board believes that OPS should seek out information from pipeline operators sufficient for determining the relative safety of low frequency ERW pipe.

In 1978, the Safety Board, issued a special study on the safe service life of liquid petroleum pipelines. ^{6/} At that time, the Board concluded that there was no way to predict the safe service life of liquid pipelines using the data reported to the OPS. The Safety Board recommended that the Office of Pipeline Safety Operations (now OPS):

^{5/} Brief of Accident Report, DCA-86-FP-009. Arkla Energy Resources Pipeline Rupture and Fire Near Cale, Arkansas, February 24, 1986.

^{6/} Special Study—"Safe Service Life for Liquid Petroleum Pipelines" (NTSB-PSS-78-1).

P-78-58

Publish a plan that describes how the OPSO will use accident report data to formulate safety regulations and to develop a safe service life model for pipelines.

OPSO responded on February 1, 1979, that it was computerizing the pipeline accident data and that it believed this action would increase the utility of the data. The OPSO stated that it would publish a plan in its Pipeline Safety Advisory Bulletin. OPSO would not "speculate in a published plan as to how the accident report data might be used to develop a service life model for pipelines. . . . When we are convinced that model development efforts will have a satisfactory probability of success, we will, of course, document the efforts in a plan and publish it." OPS has yet to publish or develop any model. The recommendation has been classified as "Closed—Superseded," based on a safety recommendation issued as a result of this investigation.

The Board believes that the development of such a model is important especially since the potential for manufacturing defects to grow to critical failure size has been shown by actual operating failures. The Safety Board is pleased that someone has had the initiative to develop a service life model. Battelle's model has the benefit that it is not dependent on accident data. The Board believes that OPS must take advantage of this study and include in its regulations criteria for periodic hydrostatic retesting of all pipelines based on operating parameters. Such criteria also could be used to minimize the likelihood of ERW pipe failures during operations due to growth of manufacturing related defects.

Therefore, as a result of its investigation, the National Transportation Safety Board recommends that the Office of Pipeline Safety:

Increase the use of sanctions which reflect the gravity of the violation and the operator's compliance history as a means for motivating operator compliance with Federal pipeline safety standards. (Class II, Priority Action) (P-87-21)

Require the installation of remote-operated valves on pipelines that transport hazardous liquids, and base their spacing on the population at risk. (Class II, Priority Action) (P-87-22)

Revise 49 CFR Parts 192 and 195 to include operational based criteria for determining safe service intervals for pipelines between hydrostatic retests. (Class II, Priority Action) (P-87-23)

Revise 49 CFR Part 195 to include criteria, similar to those found in Part 192, against which liquid pipeline operators can evaluate their cathodic protection systems. (Class II, Priority Action) (P-87-24)

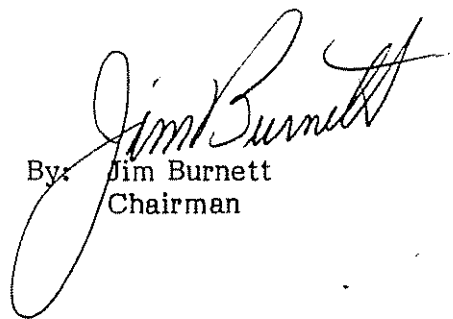
Before allowing Williams Pipe Line Company to increase the operating pressure on line 2N, require the company to provide scientifically based evidence through inspection and testing that corrosion, which could contribute to future failures, does not remain on the line. (Class II, Priority Action) (P-87-25)

Obtain sufficient data on low frequency, electric resistance welded pipe and determine if its continued use presents an unreasonable hazard to public safety and take appropriate regulatory action for identified deficiencies. (Class II, Priority Action) (P-87-26)

Revise its policy on the release of information concerning ongoing enforcement cases to keep the public aware of the Office of Pipeline Safety actions being taken during enforcement proceedings. (Class II, Priority Action) (P-87-27)

Also, the Safety Board issued Safety Recommendations P-87-13 through -19 to the Williams Pipe Line Company, P-87-20 to the American Petroleum Institute, P-87-28 to the Department of Transportation. The Board reiterated Safety Recommendation P-84-26 to the Research and Special Programs Administration.

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


By: Jim Burnett
Chairman

