

Log P-282 A



National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

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In reply refer to: P-86-12

Mr. G. H. Lawrence
President
American Gas Association
1515 Wilson Boulevard
Arlington, Virginia 22209

Mr. Jerome J. McGrath
President
Interstate Natural Gas Association
of America
1660 L Street, N.W.
Washington, D.C. 20036

Mr. Charles J. DiBona
President
American Petroleum Institute
2101 L Street, N.W.
Washington, D.C. 20037

About 10:30 a.m. on July 23, 1985, in a rural area about 8 miles south of Kaycee, Wyoming, a girth weld cracked during a pipeline recoating project on a 23-year-old, 8-inch-diameter pipeline owned by the Continental Pipe Line Company. The cracked girth weld allowed the release, atomization, and ignition of aircraft turbine fuel under 430 pounds pressure, killing one person, burning six persons, destroying construction equipment, and shutting down the pipeline. Damage was estimated at more than \$128,000. 1/

In 1984, the Continental Pipe Line Company (CPL) contracted with the Vic Albee Construction Company (contractor) to excavate, clean, inspect, and recoat sections of CPL's 8-inch-diameter, 333-mile-long refined products pipeline that operated between Billings, Montana, and Sinclair, Wyoming. CPL did not issue to the contractor any formal written specifications or instructions with detailed procedures for performing the work. CPL gave the contractor a copy of CPL's Safety Manual, which addressed general safety requirements but did not address line recoating projects.

The forces generated by the weight of the pipe and the kerosene it contained, the internal pressure, and the upward pull of the sideboom upon the pipe resulted in a girth weld failure, which allowed the kerosene to be released and exposed to an ignition source. A properly made girth weld should be stronger than the pipe it joins and its

1/ For more detailed information read Pipeline Accident Report—"Continental Pipe Line Company Pipeline Rupture and Fire, Kaycee, Wyoming, July 23, 1985" (NTSB/PAR-86/00).

failure, rather than the failure of the pipe, indicates that the girth weld was one of poor quality which should have been detected and rejected during construction of the pipeline in 1963. The postaccident metallurgical analysis of the pipe showed that the girth weld that failed and four other welds on the pipe were of poor quality.

The careful visual inspection by a qualified welding inspector of the cleaned, exposed girth welds should have been a top priority. Therefore, the CPL should have assigned a qualified person to perform the inspection of this pipeline recoating project. Nonetheless, it is the Safety Board's opinion that more effective inspections could have been performed by the CPL inspector who was assigned if he had been told specifically what to look for and what to do if he saw substandard welds. To overlook one rough-appearing, concave girth weld or to simply consider it marginal, as the CPL inspector did, might be understandable; however, finding several welds of the same poor appearance should have alerted the inspector assigned to this project, even with his limited level of experience as an inspector for this recoating project.

In addition to the visual inspection of the girth welds, the welds also could have received radiographic nondestructive testing. The film exposure time would have been longer and the sharpness of the exposed film would have been less because the pipeline was full of kerosene under pressure. Nevertheless, any major girth weld defects, such as slag inclusions, lack of penetration, and burn-through, could have been detected. At the very least, if the CPL inspector had recognized the potential for weld failure, he could have and should have immediately notified pipeline management of the condition so that they could determine what actions should be taken to prevent a failure of the pipeline and to protect the safety of workmen and any of the public whose safety also could be affected.

Even with good quality girth welds, disturbing an existing pipeline always requires caution and careful handling as the pipeline industry, both liquid petroleum and natural gas, is well aware. To construct and then operate a pipeline that contains a number of substandard girth welds and then later to recoat the pipeline is to expose the workers (and also the public if the work is done near roads or populated areas) to an unnecessarily high degree of risk. In addition, because disturbing a pipeline for any reason requires caution and careful handling to minimize the external forces exerted on the pipe joints (be they welded or mechanical), the pipeline should not be lifted at or near a girth weld or a mechanical joint, but should be lifted as close as practical to the middle of the pipe.

Paragraph 195.402 of the Federal regulations for liquid petroleum pipelines states that "each operator shall prepare and follow for each pipeline system a manual of written procedures for conducting normal operation and maintenance activities and handling abnormal operations and emergencies." Recoating an existing pipeline would be considered a maintenance activity and should have a written procedure specifically for that task. Without such instructions or guidelines, the safe and successful conduct of the recoating activity is left to the varying abilities of both the contractor and the company inspector, whose qualifications were never properly defined or evaluated. CPL should have provided its inspectors and its contractor specific procedures to guide their actions during this unique operation and should have provided specific training in those procedures. It is likely that if CPL had issued specific instructions about this procedure and the workers had followed these instructions, the girth weld in this case might not have cracked or might have sustained a smaller crack, resulting in the escape of less kerosene and a less dangerous fire.

In addition, CPL should have made sure that the contractor and the inspector had specific and independent roles and that each was aware of his role and responsibility within that role. In this case however, even though he was hired as an "independent contractor," in reality the contractor looked for guidance from the CPL inspector. In addition, the CPL inspector many times instructed the contractor's personnel on how to do a job, such as how far ahead to keep the backhoes digging and how to handle the pipe. Specific job/task assignments by management at the beginning of this job could have solved the problem.

System Safety is the optimum degree of hazard elimination and/or control within the constraints of operational effectiveness, time and cost, attained through the specific application of management, scientific, and engineering principles throughout all phases of a system life cycle.

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By using the systematic approach to safety, pipeline accidents can be predicted and analyzed before they occur. They can then be prevented by taking the action necessary to eliminate or control the hazards which lead to accidents. System analysis methods will identify possible hazards. Risks will not be assumed unknowingly. Those risks which are assumed will be those that have been identified, and in which a management decision had been made to accept them.

As a result of its study, the Safety Board issued Safety Recommendation P-72-1 on July 11, 1972, to the API:

Develop guidelines for the use of systems safety by liquid pipeline operators. These guidelines should serve a similar function for liquid pipeline systems as the Military Standard, Requirements for System Safety Program for Systems and Associated Subsystems and Equipment (MIL-STD882), does for military systems. These guidelines should cover the full life cycle of liquid pipeline systems, and be applicable to the design of new pipelines as well as to the operation and maintenance of existing pipelines. This work should be undertaken with the cooperation of the American National Standards Institute Section Committee for Liquid Petroleum Transportation Piping Systems (ANSI-B31.4).

In response to Safety Recommendation P-72-21, the API stated that it had modified its "Recommended Practice for Analysis, Design, Installation and Testing of Basic Surface Systems on Offshore Production Platforms " (API RP-14C 1974) and its "Recommended Practice for Design, Construction, Operation, and Maintenance of Offshore Hydrocarbon Pipelines" (1976). Moreover, the API advised that the American National Standards Code for Pressure Piping, "Liquid Petroleum Transportation Piping Systems" (ANSI B31.4-1974), had been reviewed to ensure that applicable systematic and proven safety analyses were embodied in that code. It characterized the code as simplifying the systematic consideration of pipeline-designed criteria by the pervasive use of the code throughout the petroleum pipeline industry and the fact that the code serves both as a guide and a checklist. For these reasons the API indicated that, for the most part, it was unnecessary to analyze each system separately.

The Safety Board has reviewed the B31.4 code and cannot identify either specific guidance for recoating projects or the precautions to be taken when lifting pipelines operating under pressure. Furthermore, this code does not specifically advocate the use of proven safety analysis techniques to support the planning of work not specifically addressed within the code. Consequently, the Safety Board has closed this recommendation as "Unacceptable Action".

CPL should have used a system safety approach when it planned to unearth and to lift the 22-year-old pipeline operating under pressure. If CPL had analyzed the planned work and identified the potential failure modes (including sources of human error), CPL could have developed procedures to minimize the hazard and would have known how to train its inspectors and its contractor specifically for the task requirements of this job. Such actions would have substantially reduced the likelihood of an accident.

Two radios, one in the CPL inspector's truck and the other in the contractor foreman's vehicle at the job site, were available for both normal and emergency communication. Just before the accident, both vehicles were positioned near the sideboom used to lift the pipe from its foundation. When the girth weld cracked, the ensuing fire engulfed both vehicles containing the radios. With the only means then available for obtaining emergency aid being to drive from the remote location to the nearest telephone, it was fortuitous that the Texaco field office employee was in the area in a radio-equipped truck and through its use, emergency aid for those injured and for control of the fire was obtained expeditiously.

In this instance, the loss of available onsite communications produced no adverse effects; however, pipeline companies need to consider actions for minimizing the potential of a single event for destroying all radio communications, especially on projects being conducted in remote locations.

Therefore, the National Transportation Safety Board recommends that the American Gas Association, the Interstate Natural Gas Association of America, and the American Petroleum Institute:

Notify member companies of the circumstances of the pipeline accident near Kaycee, Wyoming, on July 23, 1985, and urge them to establish or review, as appropriate, their procedures for recoating pipelines, with particular emphasis on the inspection of exposed girth welds before fully lifting the pipe, and to develop procedures to minimize the potential for a single event destroying all onsite communications equipment. (Class II, Priority Action) (P-86-12)

BURNETT, Chairman, GOLDMAN, Vice Chairman, and LAUBER, Member, concurred in this recommendation.


By: Jim Burnett
Chairman