



National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: November 4, 2004

In reply refer to: P-04-07 and -08

Mr. Samuel G. Bonasso
Acting Administrator
Research and Special Programs Administration
400 Seventh Street, S.W.
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On April 7, 2003, about 8:55 p.m., central daylight time, an 80,000-barrel storage tank at the ConocoPhillips Company's (ConocoPhillips) Glenpool South tank farm in Glenpool, Oklahoma, exploded and burned as it was being filled with diesel. The tank, designated tank 11, had previously contained gasoline, which had been removed from the tank earlier in the day. The tank contained between 7,397 and 7,600 barrels of diesel at the time of the explosion. The resulting fire burned for about 21 hours and damaged two other storage tanks in the area. The cost of the accident, including emergency response, environmental remediation, evacuation, lost product, property damage, and claims, was \$2,357,483. There were no injuries or fatalities. Nearby residents were evacuated, and schools were closed for 2 days.

The National Transportation Safety Board determined that the probable cause of the explosion and fire was ignition of a flammable fuel-air mixture within the tank by a static electricity discharge due to the improper manner in which ConocoPhillips conducted tank operations. Contributing to the extent of the property damage and the magnitude of the impact on the local community was the failure of American Electric Power (AEP) employees to recognize the risk the tank fire posed to the nearby power lines and take effective emergency action.¹

AEP power poles were located east of the Glenpool South tank farm on top of the wall of the dike that surrounded the tank farm. The facilities included three conductors and two shield wires² supported off a single crossbar on dual wooden poles. AEP personnel became aware of the accident through broadcast news reports shortly after the explosion occurred, and although the AEP transmission system operator knew the AEP power lines were near the fire, no AEP personnel responded until several hours later when a ConocoPhillips employee contacted AEP and asked that the electric lines be inspected. An AEP representative visited the scene twice while the tank burned, and he inspected the power lines. But he did not notify the incident commander when he arrived on scene or inform him of his findings. About 6:00 a.m. on April 8, the shield wires and energized conductors on these poles fell to the ground. This started a fire in the unburned diesel that was released from the destroyed tank that was being impounded in the dike north of the destroyed tank 11.

¹ For additional information, see National Transportation Safety Board, *Storage Tank Explosion and Fire in Glenpool, Oklahoma, April 7, 2003*, Pipeline Accident Report NTSB/PAR-04/02 (Washington, D.C.: NTSB, 2004).

² A *shield wire* is a grounded conductor installed to shield a phase conductor from a direct lightning strike.

Because of the proximity of the AEP power lines and the Glenpool South tank farm, it is obvious that damage, a failure, or an emergency at one facility had the potential to jeopardize the safety of the other. However, neither AEP personnel nor ConocoPhillips personnel had contacted one another to familiarize themselves with the affected facilities at the Glenpool South tank farm or to plan for a coordinated response to pipeline and electrical emergencies there.

The fact that the AEP representative never made contact with the incident commander limited the incident command's ability to keep AEP informed as the fire situation changed and limited AEP's knowledge of the situation. As a result, AEP's second response to the accident site was too late, and its overall response was ineffective.

Had ConocoPhillips and AEP, as part of emergency planning, previously met to discuss and plan emergency response activities for an electric line, tank, or pipeline emergency at the Glenpool South tank farm, it is likely that AEP's emergency response would have been more effective and that, considering the potential hazard to life and property, actions would have been taken to more thoroughly assess the threat to the electric lines and the consequences of their failure. The Safety Board concluded that because ConocoPhillips and AEP did not preplan their response to emergencies near the Glenpool South tank farm, the emergency response was unsuccessful in managing the electrical hazard caused by the tank explosion and fire.

Regarding tank operations and procedures governing product flow rates, ConocoPhillips personnel indicated that the company's current design procedures are based on American Petroleum Institute (API) recommended practice (RP) 2003. These procedures require that flow velocities be restricted in certain operating situations to control the electric charge in a tank. For flow velocity limitation in the case of a tank with a floating roof, such as the tank in this accident, the ConocoPhillips procedures stated that delivery of low-vapor-pressure products into an empty tank should not exceed 3 feet per second until the roof is buoyant. Investigators sought to determine the height of product in the tank at the time of the explosion. The strapping table³ provided to investigators indicated that 7,180 barrels of product would be required to fully float the roof, and that product would first contact the pontoons at a volume of 6,390 barrels. Two alarms were set in the supervisory control and data acquisition system to alert the controllers when the volume in the tank was nearing the level at which the roof would no longer float. The set points for the alarms were based on the landed height of the floating roof assumed in the ConocoPhillips strapping table. Based on the measurement of the height of the floating roof documented on the construction inspection report and based on measurements investigators made of the tank 11 legs and the floating roof in tank 12, the strapping table was determined to be incorrect. Because the height at which the legs are set and the height of product in a tank determine whether a roof is floating or landed, a pipeline operator's strapping table for a tank must be accurate to help operators determine the effect of tank operations on movement of the roof.

As a result of its investigation of this accident, the National Transportation Safety Board makes the following safety recommendations to the Research and Special Programs Administration:

³ A *strapping table* shows for the height (level) of product in a tank the volume (quantity) of product in the tank.

Revise the emergency response planning requirements in the pipeline safety regulations to include coordination with electric and other utilities that may need to respond to a pipeline emergency. (P-04-07)

Issue an advisory bulletin to liquid pipeline operators to validate the accuracy of their tank strapping tables. (P-04-08)

The Safety Board also issued safety recommendations to ConocoPhillips Company, American Electric Power, the Institute of Electrical and Electronics Engineers, and the American Society of Mechanical Engineers. In your response to the recommendations in this letter, please refer to Safety Recommendations P-04-07 and -08 in your reply. If you need additional information, you may call (202) 314-6177.

Chairman ENGLEMAN CONNERS, Vice Chairman ROSENKER, and Members CARMODY, HEALING, and HERSMAN concurred in this recommendation.

By: Ellen Engleman Connors
Chairman