# Control Room Management/Human Factors

PHMSA continues to seek ways to improve the safety and reliability of pipeline transportation network and to protect the environment from the effects of pipeline failures. Integrity management programs have successfully reduced the top two leading causes of pipeline failure – third party damage and corrosion. PHMSA believes safety improvements are possible with regulation focusing on prevention through people working in pipeline control rooms. These personnel, commonly called controllers, rarely cause pipeline failures. However, they are frequently the first line of defense in reacting to an abnormal or emergency situation.

When a controller failed to recognize a pipeline rupture and subsequently restarted pumps, the larger amount of product released resulted in fatalities. When controllers failed to provide complete information during change in shifts, the result was an overflowed tank, fire and explosion. When a controller failed to recognize the presence of contaminants in gas removed from storage, the resulting pipeline failure led to a loss of service to several towns. When controllers have failed to react to emergency calls, there have been delays in identifying and correcting critical pipeline safety problems.

PHMSA, the U.S. Congress, the NTSB, and many pipeline stakeholders have identified control room management and human factors as key areas requiring improvement and enhancement to promote public safety and protect the environment. PHMSA identified nine safety enhancements which were included in a report to Congress in Dec 2006. The National Transportation Safety Board (NTSB) studied 13 high consequence pipeline accidents that occurred from 1992 to 2004 and found that control room management and human factors played a role in 10 of the 13 accidents. The NTSB made five recommendations to improve control room and SCADA operations. The Pipeline Inspection, Protection, Enforcement and Safety Act of 2006 (PIPES Act) requires PHMSA to publish regulations requiring pipeline operators to develop and implement a human factors management plan to reduce risks associated with human factors, including fatigue.

PHMSA initiated a rulemaking for Control Room Management/Human Factors for gas transmission and distribution pipelines, hazardous liquid pipelines, and LNG facilities. PHMSA plans to issue an NPRM by July 2008 to address all the above. This “prevention through people” program would form a part of the holistic integrity management program efforts.

**Background**

PHMSA began work on evaluating pipeline controller certification in 2002. Early on, PHMSA created an enterprise approach to encourage ongoing stakeholder involvement. This included a stakeholder focus group - the general public, industry trade associations, pipeline operators, SCADA system vendors, academia; and, State and Federal pipeline safety agencies. The enterprise also included two public workshops, a review of numerous entries in *www.safepipelines.com*, and support for the development of pipeline personnel qualification standards.

PHMSA gathered information on control room operations and controller qualifications by visiting over 20 large and small pipeline operators transporting numerous commodities in

pipeline systems of various sizes, components, and lengths. The control rooms ranged from simple monitoring operations to complex control operations. PHMSA also gathered data and lessons-learned regarding human factors and certification programs from other regulatory agencies such as the FAA, EPA, FRA, OSHA and the Chemical Safety Board (CSB).

PHMSA concluded that uniform examination and licensing of controllers is inappropriate but identified nine areas for safety enhancement. The nine enhancements relate to controller qualifications, control room procedures, control room operating environments, SCADA systems design, and management practices.

Concurrently, the NTSB conducted a study on hazardous liquid pipeline SCADA systems. The impetus for the study was a number of hazardous liquid accidents in which leaks went undetected by controllers after the initial indications of a leak were apparently evident on the SCADA system screens. The NTSB study was designed to examine how pipeline companies use SCADA systems to monitor and record operating data, and to evaluate the role of SCADA systems in leak detection. The NTSB examined 13 significant liquid accidents that occurred between 1992 and 2004 and found that control room management and human factors played a role in 10 of the 13 accidents. The NTSB study also identified five areas for potential improvement: alarm management, data collection, controller training, controller fatigue, and leak detection systems.

The PIPES Act requires that PHMSA publish regulations addressing human factors for pipeline control rooms. The regulations must require each operator to have a human factors management plan to

> reduce risks associated with human factors, including fatigue, in each control center for the pipeline. Each plan must include, among the measures to reduce such risks, a maximum limit on the hours of service established by the operator for individuals employed as controllers in a control center for the pipeline.

PHMSA or the relevant State must review the plans and may not approve a plan that does not include a maximum limit on hours of service. In addition, PHMSA must issue standards implementing the NTSB recommendations on the use of API RP 1165 for graphics and displays, the review of audits and alarms, and the use of simulator or non-computerized simulations for controller recognition of abnormal operating conditions.

**Proposed Rule**

The proposed Control Room Management/Human Factors rule would apply to gas transmission and distribution pipelines, hazardous liquid pipelines, and LNG facilities. Each operator would integrate control room management/human factors procedures into their existing written manuals and procedures for operations & maintenance, operator qualifications emergency. The control room management/human factors procedures would have to address each of the nine enhancements the PHMSA study identified, the three NTSB recommendations, and the PIPES Act statutory requirements.

**The Way Ahead**

PHMSA expects to have a proposal published by July 2008.