Introduction to Control Room Management – What it Means and Requires

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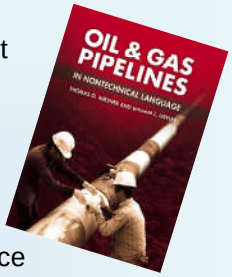
By
Tom Miesner
Pipeline Knowledge and Development

Tom Miesner



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  - Pipeline Education and Training
  - Strategy and Project Development
  - Expert Testimony and Arbitration
  - Appraisals and Independent Opinions
  - Management and Improvement Consulting
- Extensive pipeline background and experience
- President Conoco Pipe Line Company
- Numerous JV Boards and Committees
- Author *Oil and Gas Pipelines in NonTechnical Language, The Role of Pipelines and Research in the U. S., Pipeline Engineering for McGraw Hill, and* numerous other articles and reports
- Teaches a two day Oil and Gas Pipeline fundamentals class and other training modules.

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Outline

- Evolution of Pipeline Safety Regulations
- Control Room Management Background
- Requirements and Timing
- Areas Covered
- Industry Initiatives
- Agencies and Acronyms
- Details of Gas and Oil Regulations
- Summary
- Selected References
- Discussion

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U. S. Safety Regulations

- Enabling Legislation
  - The Natural Gas Pipeline Safety Act of 1968 as amended (NGPSA)
  - Hazardous Liquid Pipeline Safety Act of 1979 as amended (HLPSA)
- U. S. Regulation – CFR Title 49: Transportation
  - Part 192—Transportation Of Natural And Other Gas By Pipeline: Minimum Federal Safety Standards
  - Part 195—Transportation Of Hazardous Liquids By Pipeline
- Must be periodically reauthorized (2006)
- Inclusion of Homeland Security (TSA)

Security Regulations and Enforcement

- Department of Home Land Security
  - Transportation Safety Administration
    - Office of Transportation Sector Network Management (TSNM)
      - Pipeline Security Division
- Department of Transportation (PHMSA) (OPS)
- State officials
- Local officials

Pipeline Security Division

- Office of Transportation Sector Network Management
  - Develop security programs
  - Conduct analysis to maintain pipeline and domain awareness
  - Particular focus on critical systems and infrastructure;
  - Identifying industry best practices and lessons learned;
  - Maintain a dynamic modal network through effective communications with the pipeline industry and government stakeholders.
  - Distribute compact disc-based training titled "Pipeline Security Awareness for the Pipeline Industry Employee http://www.tsa.gov/what_we_do/tsnm/pipelines/training.shtm

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Pipeline Inspection, Protection, Enforcement and Safety Act of 2006

- Sec. 1. Short title.
- Sec. 2. Pipeline safety and damage prevention.
- Sec. 3. Public education and awareness.
- Sec. 4. Low-stress pipelines.
- Sec. 5. Technical assistance grants.
- Sec. 6. Enforcement transparency.
- Sec. 7. Direct line sales.
- Sec. 8. Petroleum transportation capacity and regulatory adequacy study.
- Sec. 9. Distribution integrity management program rulemaking deadline.
- Sec. 10. Emergency waivers.
- Sec. 11. Restoration of operations.
- Sec. 12. Pipeline control room management.

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Pipeline Inspection, Protection, Enforcement and Safety Act of 2006 (continued)

- Sec. 13. Safety orders.
- Sec. 14. Integrity program enforcement.
- Sec. 15. Incident reporting.
- Sec. 16. Senior executive signature of integrity program performance.
- Sec. 17. Cost recovery for design reviews.
- Sec. 18. Authorization of appropriations.
- Sec. 19. Standards to implement NTSB recommendations.
- Sec. 20. Accident reporting form.
- Sec. 21. Leak detection technology study.
- Sec. 22. Corrosion control regulations.
- Sec. 23. Inspector General report.
- Sec. 24. Technical assistance program.
- Sec. 25. Natural gas pipelines.
- Sec. 26. Corrosion technology.

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Section 12 of the PIPES Act (codified at 49 U.S.C. 60137) requires **PHMSA to issue regulations** requiring each **operator** of a gas or hazardous liquid pipeline to **develop, implement, and submit a human factors management plan** designed to reduce risks associated with human factors, including fatigue, in each control room for the pipeline. The plan must include, among other things, **a maximum limit on the hours of service** for controllers working in a control room. **PHMSA, or a state** authorized to exercise safety oversight, is **required to review and approve operators' human factors plans**, and **operators** are required to notify PHMSA (or the appropriate state) of any **deviations from the plan**.

Section 19 of the PIPES Act requires PHMSA to issue standards to **implement the three recommendations** of the NTSB SCADA safety study described above.

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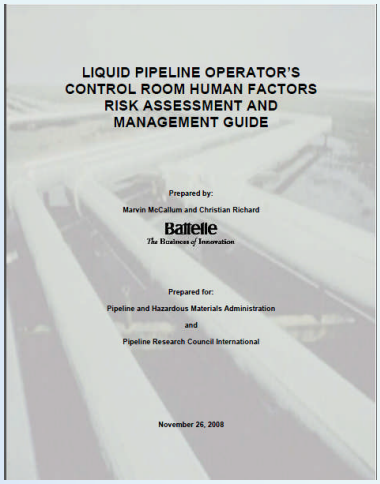
Selected Safety Studies

- Supervisory Control and Data Acquisition (SCADA) in Liquid Pipelines NTSB/SS-05/02
- Liquid Pipeline Operators Control Room Human Factors Risk Assessment and Management Guide, November 26, 2008



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Recommendations from the NTSB Study

- Require operators of hazardous liquids pipelines to follow API RP 1165 for graphics
- Require pipeline companies to have a policy for the review/audit of alarms
- Require controller training to include simulator or non-computerized simulations for controller recognition of abnormal operating conditions, in particular leak events
- Change the liquid accident reporting form to require data related to controller fatigue
- Require operators to install computer-based leak detection systems unless not needed.

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NTSB Study Extract

- Examined 13 accidents April 1992 to March 2004
- In 10 of these “some aspect” of SCADA systems contributed to the severity of the accident
- Principle issue was the delay between controller recognizing a leak and beginning response
- SCADA factors included; alarms, display formats, accuracy of screens, controller’s ability to evaluate SCADA data during abnormal operating conditions, appropriateness of controller’s actions, ability to make appropriate decisions, effectiveness of training in preparing controllers to interpret the SCADA system and react to abnormal operating conditions.

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Abnormal Operating Conditions

- **§ 192.803 Definitions and**
  § 195.503 Definitions
- *Abnormal operating condition* means a condition identified by the operator that may indicate a malfunction of a component or deviation from normal operations that may:
- (a) Indicate a condition exceeding design limits; or
- (b) Result in a hazard(s) to persons, property, or the environment.

The definitions for gas and oil are the same

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Whatcom Creek Arial View Post Fire

Source: National Transportation Safety Board

General Requirements

- "Each operator must have and follow written control room management procedures that implement the requirements of this section." In the CRM plan, operators must:
- Define a controller's roles, responsibilities and authorities during normal operations, abnormal operations and emergencies, even when the controller in not the first to detect the situation,
- Provide adequate information and training to the controllers to perform those duties,
- Establish a method to record shift changes,
- Establish shift lengths, schedule rotations and establish maximum hours-of-service to ensure controllers can achieve eight hours of sleep (emergency deviations are allowed in some circumstances) and
- Educate and train applicable staff on fatigue and fatigue mitigation.

Rule Timing and Applicability

- Effective February 1, 2010.
- Programs must be written by August 1, 2011
- Programs must be implemented by August 1, 2012.
- Grows out of the Pipeline Inspection, Protection, Enforcement, and Safety Act of 2006 (PIPES) Act which required PHMSA to set standards for a new human factors management plan.
- Applies to those persons who monitor SCADA data from a control room and have “operational authority and accountability for the remote operational functions of the pipeline facility as defined by the pipeline operator”.

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Control Room Cross Reference

NPRM	Basis of Inclusions			Affiliations and Regulations	
Enhancement Areas	PSIA CCERT Study Outcomes	Pipes Act	NTSB Recommendations	PHMSA Advisory Bulletins & Reg.Codes	Industry RP's and Standards
Roles & Responsibilities	X				API RP-1168** API RP-1162
Shift Change	X				API RP-1168**
Fatigue Awareness & Mitigation	X	Section 12	P-98-30^	ADB-05-06	API RP-1168**
SCADA Displays & Data Points	X	Section 19	P-05-01, P-98-22^ P-93-22^	ADB-99-03	API RP-1165
Alarm Management	X	Section 19	P-05-02 P-98-22^		API RP-1167* AGA White Paper*
Change Management	X			ADB-99-03 ADB-03-09	API RP-1168**
Qualifications	X			195.500, 192.800 193.2700	API RP-1118, 1161 ASME B31Q
Operating Experience & Training	X	Section 19	P-05-03 P-98-21^	195.500, 192.800 193.2700	
Executive Validation	X	Section 16		ADB-07-01	

(*)Under Development (**)New since NPRM (^)Closed Recommendation

http://www.api.org/meetings/proceedings/upload/Post_NPRM_101408e.pdf

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Selected Industry Initiatives

- API RP 1165 Recommended Practice for Pipeline Scada Displays
- API RP1167 Alarm Management
- API RP 1168 Pipeline Control Room Management
- AGA Alarm Management for Control Room Operations in the Natural Gas Industry
- API RP 1113: Developing a Pipeline Supervisory Control Center
- EEMUA Publication 191: “Alarm Systems - A Guide to Design, Management and Procurement
- GPTC Guide for Gas Transmission and Distribution Piping Systems

ISA Committee 18

- ANSI/ISA-18.1-1979 (R2004), “Annunciator Sequences and Specifications”
  - WG1 – Alarm Philosophy
  - WG2 – Alarm Identification and Rationalization
  - WG3 - Basic Alarm Design
  - WG4 – Enhanced and Advanced Alarm Methods
  - WG5 – Alarm Monitoring, Assessment and Audit
  - WG6 - Alarm Design for Batch and Discrete Processes.

Agencies and Acronyms

- DOT – Department of Transportation
- PHMSA – Pipeline and Hazardous Materials Safety Administration
- NTSB – National Transportation Safety Board
- AGA – American Gas Association
- API – American Petroleum Institute
- INGAA – Interstate Natural Gas Association of America
- AOPL – Association of Oil Pipelines
- CCERT – Controller Certification
- PSIA – Pipeline Safety Improvement Act of 2002
- PIPES – Pipeline Inspection, Protection, Enforcement, and Safety Act of 2006

192.631 & 195.446 Control Room Management

- a) General
- b) Roles and Responsibilities
- c) Provide Adequate Information
- d) Fatigue Mitigation
- e) Alarm Management
- f) Change Management
- g) Operating Experience
- h) Training
- i) Compliance Validation
- j) Compliance and Deviations

a – General Gas and Oil

- Applies to each operator of a pipeline facility with a controller working in a control room who monitors and controls all or part of a pipeline facility through a SCADA system. Each operator must have and follow written control room management procedures that implement the requirements of this section.
- An operator must develop the procedures no later than August 1, 2011 and implement the procedures no later than February 1, 2013 (August 1, 2012)

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a – General Gas Only

- except that for each control room where an operator's activities are limited to either or both of:
  - (i) Distribution with less than 250,000 services, or
  - (ii) Transmission without a compressor station,
- the operator must have and follow written procedures that implement only paragraphs
  - (d) (regarding fatigue),
  - (i) (regarding compliance validation), and
  - (j) (regarding compliance and deviations) of this section.

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a – General Gas Vs Oil

- Gas – The procedures required by this section must be integrated, as appropriate, with operating and emergency procedures required by Sec. Sec. 192.605 and 192.615.
- Oil – The procedures required by this section must be integrated, as appropriate, with the operator's written procedures required by Sec. 195.402.

b - Roles and Responsibilities Gas and Oil

- Each operator must define the roles and responsibilities of a controller during normal, abnormal, and emergency operating conditions. To provide for a controller's prompt and appropriate response to operating conditions, an operator must define each of the following:
  - (1) A controller's authority and responsibility to make decisions and take actions during normal operations;
  - (2) A controller's role when an abnormal operating condition is detected, even if the controller is not the first to detect the condition, including the controller's responsibility to take specific actions and to communicate with others;

b - Roles and Responsibilities Gas and Oil (continued)

- (3) A controller's role during an emergency, even if the controller is not the first to detect the emergency, including the controller's responsibility to take specific actions and to communicate with others; and
- (4) A method of recording controller shift-changes and any hand-over of responsibility between controllers.

c - Provide Adequate Information Gas and Oil

- Each operator must provide its controllers with the information, tools, processes and procedures necessary for the controllers to carry out the roles and responsibilities the operator has defined by performing each of the following:
  - (2) Conduct a point-to-point verification between SCADA displays and related field equipment when field equipment is added or moved and when other changes that affect pipeline safety are made to field equipment or SCADA displays;

c - Provide Adequate Information Gas and Oil (continued)

- (3) Test and verify an internal communication plan to provide adequate means for manual operation of the pipeline safely, at least once each calendar year, but at intervals not to exceed 15 months;
- (4) Test any backup SCADA systems at least once each calendar year, but at intervals not to exceed 15 months; and

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c - Provide Adequate Information Gas vs Oil (continued

- Oil – (1) Implement API RP 1165 (incorporated by reference, *see* §195.3) whenever a SCADA system is added, expanded or replaced, unless the operator demonstrates that certain provisions of API RP 1165 are not practical for the SCADA system used;
- Gas – (1) Implement sections 1, 4, 8, 9, 11.1, and 11.3 of API RP 1165 (incorporated by reference, see Sec. 192.7) whenever a SCADA system is added, expanded or replaced, unless the operator demonstrates that certain provisions of sections 1, 4, 8, 9, 11.1, and 11.3 of API RP 1165 are not practical for the SCADA system used;

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c - Provide Adequate Information Gas vs Oil (Continued)

- Oil – (5) Implement section 5 of API RP 1168 (incorporated by reference, see Sec. 195.3) to establish procedures for when a different controller assumes responsibility, including the content of information to be exchanged.
- Gas – (5) Establish and implement procedures for when a different controller assumes responsibility, including the content of information to be exchanged.

d - Fatigue Mitigation Gas and Oil

- Each operator must implement the following methods to reduce the risk associated with controller fatigue that could inhibit a controller's ability to carry out the roles and responsibilities the operator has defined:
  - (1) Establish shift lengths and schedule rotations that provide controllers off-duty time sufficient to achieve eight hours of continuous sleep;
  - (2) Educate controllers and supervisors in fatigue mitigation strategies and how off-duty activities contribute to fatigue;

d - Fatigue Mitigation Gas and Oil (continued)

- (3) Train controllers and supervisors to recognize the effects of fatigue; and
- (4) Establish a maximum limit on controller hours-of-service, which may provide for an emergency deviation from the maximum limit if necessary for the safe operation of a pipeline facility.

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e - Alarm Management Gas and Oil

- Each operator using a SCADA system must have a written alarm management plan to provide for effective controller response to alarms. An operator's plan must include provisions to:
  - (1) Review SCADA safety-related alarm operations using a process that ensures alarms are accurate and support safe pipeline operations;
  - (2) Identify at least once each calendar month points affecting safety that have been taken off scan in the SCADA host, have had alarms inhibited, generated false alarms, or that have had forced or manual values for periods of time exceeding that required for associated maintenance or operating activities;

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e - Alarm Management Gas and Oil (Continued)

- (4) Review the alarm management plan required by this paragraph at least once each calendar year, but at intervals not exceeding 15 months, to determine the effectiveness of the plan;
- (5) Monitor the content and volume of general activity being directed to and required of each controller at least once each calendar year, but at intervals not to exceed 15 months, that will assure controllers have sufficient time to analyze and react to incoming alarms; and
- (6) Address deficiencies identified through the implementation of paragraphs (e)(1) through (e)(5) of this section.

e - Alarm Management Gas Vs Oil

- Oil – (3) Verify the correct safety-related alarm set-point values and alarm descriptions when associated field instruments are calibrated or changed and at least once each calendar year, but at intervals not to exceed 15 months;
- Gas – (3) Verify the correct safety-related alarm set-point values and alarm descriptions at least once each calendar year, but at intervals not to exceed 15 months;

f - Change Management Gas and Oil

- Each operator must assure that changes that could affect control room operations are coordinated with the control room personnel by performing each of the following:
  - (2) Require its field personnel to contact the control room when emergency conditions exist and when making field changes that affect control room operations.

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f - Change Management Gas Vs Oil

- Oil – (1) Implement section 7 of API RP 1168 (incorporated by reference, see Sec. 195.3) for control room management change and require coordination between control room representatives, operator's management, and associated field personnel when planning and implementing physical changes to pipeline equipment or configuration;
- Gas – (1) Establish communications between control room representatives, operator's management, and associated field personnel when planning and implementing physical changes to pipeline equipment or configuration;

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f - Change Management Gas

- (3) Seek control room or control room management participation in planning prior to implementation of significant pipeline hydraulic or configuration changes.

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g - Operating Experience Gas and Oil

- Each operator must assure that lessons learned from its operating experience are incorporated, as appropriate, into its control room management procedures by performing each of the following:
  - (1) Review accidents that must be reported to determine if control room actions contributed to the event and, if so, correct, where necessary, deficiencies related to:
    - (i) Controller fatigue;
    - (ii) Field equipment;
    - (iii) The operation of any relief device;
    - (iv) Procedures;

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g - Operating Experience Gas and Oil (continued)

- (v) SCADA system configuration; and
- (vi) SCADA system performance.

– (2) Include lessons learned from the operator's experience in the training program required by this section.

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h – Training Gas and Oil

- Each operator must establish a controller training program and review the training program content to identify potential improvements at least once each calendar year, but at intervals not to exceed 15 months. An operator's program must provide for training each controller to carry out the roles and responsibilities defined by the operator. In addition, the training program must include the following elements:
  – (1) Responding to abnormal operating conditions likely to occur simultaneously or in sequence;

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h – Training Gas and Oil (continued)

- (2) Use of a computerized simulator or non-computerized (tabletop) method for training controllers to recognize abnormal operating conditions;
- (3) Training controllers on their responsibilities for communication under the operator's emergency response procedures;
- (4) Training that will provide a controller a working knowledge of the pipeline system, especially during the development of abnormal operating conditions; and
- (5) For pipeline operating setups that are periodically, but infrequently used, providing an opportunity for controllers to review relevant procedures in advance of their application.

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i - Compliance Validation and j – Deviation Gas and Oil

- Upon request, operators must submit their procedures to PHMSA or, in the case of an intrastate pipeline facility regulated by a State, to the appropriate State agency.
- An operator must maintain for review during inspection:
  - (1) Records that demonstrate compliance with the requirements of this section; and
  - (2) Documentation to demonstrate that any deviation from the procedures required by this section was necessary for the safe operation of the pipeline facility.

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Summary

- Operators much develop their own plans
- Plans must be written
- Numerous references to industry standards
- Plans are subject to review by the regulator
- Applies to both normal and abnormal operations
- Can be either manual of computer based
- Captures much of what operators are doing already
- Adds structure and review requirements

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- Title 49 - http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?sid=ca3d88e943c9b3619f96ac3d22f1c200&c=ecfr&tpl=/ecfrbrowse/Title49/49cfrv3_02.tpl%20
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- Oil and gas comparison - http://www.pipelineknowledge.com/images/stories/presentations/comparison_of_gas_and_oil_control_room_requirements.pdf
- API conference presentation regarding roles and responsibilities - http://www.api.org/meetings/proceedings/upload/Roles_Responsibilities_Miller_1.pdf
- PHMSA Worship - https://primis.phmsa.dot.gov/meetings/Mtg67.mtg
- PHMSA FAQs - http://primis.phmsa.dot.gov/crm/faqs.htm

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- Magellan consent decree - http://www.epa.gov/compliance/resources/decrees/civil/cwa/magellan-cd.pdf
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- AGA glossary - http://www.aga.org/Kc/glossary/Pages/default.aspx
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Additional Discussion

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