

# Liquid Pipeline Operator's Human Factors Analysis of Pipeline Monitoring and Control Operations

(Battelle / Industry / PHMSA project)

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Project Update

for

Control Room Management Forum

October 14, 2008

# Battelle/Industry/PHMSA Human Factors Project

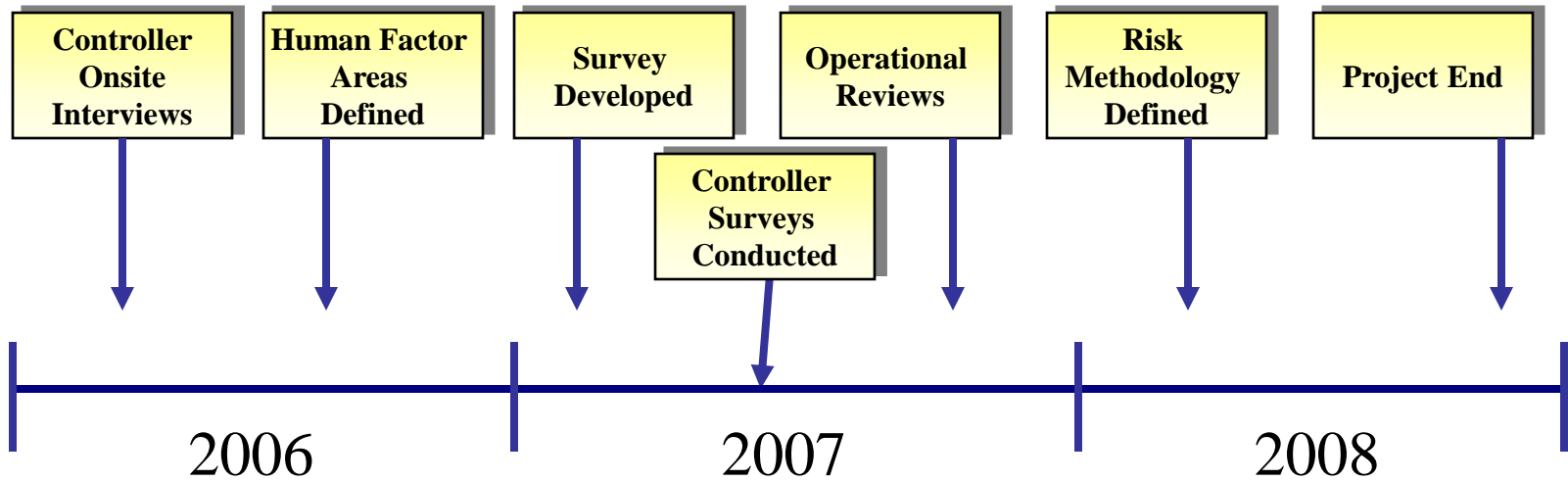
## Project Objectives

1. Characterize the nature of human factors issues that affect the safety and efficiency of pipeline monitoring and control operations.
2. Develop, validate, and refine standard procedures for conducting human factors reviews of pipeline monitoring and control operations.
3. Develop an improvement strategy guide for addressing identified human factors issues in pipeline monitoring and control operations

# Human Factors Project Overview

- Controller interviews and research conducted
- Human Factor Areas identified
- Controller Survey developed and piloted
- Operational Reviews conducted (pilot, industry feedback, 2<sup>nd</sup> generation guidance document)
- Human Factors Risk methodology defined
- Mitigation Fact Sheets drafted and refined
- Final project products to include technical report, Operational Review Procedures, Control Room Human Factors Improvement Guide (none computer-based)

# Project Timeline



# Human Factors Taxonomy: 11 Areas => 29 Topics => 138 Performance Factors

- **Task Complexity and Workload**
  - ⇒ Task Design (Topic 1.1)
    - ⇒ Execution of a control action requires too many steps (PF 1.1.1)
    - ⇒ Controllers make errors in performing manual calculations that are used directly as an input to operational activities (PF 1.1.3)
- **Displays and Controls**
- **Communications**
- **System Information Accuracy & Availability**
- **Job Procedures**
- **Alarm Presentation & Management**
- **Controller Training**
- **Coping with Stress**
- **Controller Alertness**
- **Automation**
- **Control Room Staffing & Design**



# Risk Methodology

- Risk level score reflects the relative risk associated with working conditions at the Topic-level, but can cross-check at the Performance Factor-level.

- Risk Level =

Median Prevalence Scaled Frequency Response

X

Median Risk Likelihood Rank-order Response

Where,

- Median Prevalence Scaled Frequency Response comes from the Controller survey data (never=0, Once a Year=1...Once a day=200...More than Once an Hour=2,000)
- Median Risk Likelihood Rank-order Response comes from the rating activity (not significant=0...medium=3... very high=5)

# Operational Reviews

- Select Operational Review Topics based on:
  - Topic-level risk rankings
  - High-risk Performance Factors
  - Other inputs eg. incidents, accidents, regulations
- Once scope of Operational Review defined, then:
  - Conduct reviews of previous near misses, incidents
  - Conduct Control Room personnel interviews
  - Conduct observations of activities
  - Conduct additional materials reviews, eg. operations manuals, policies, etc.
- Focus Areas and potential mitigations identified

# Risk Mitigation Strategy

- Identify and assess alternative, logical mitigation strategies by Topic to form a plan.
- Prioritize mitigations for development and implementation
- Implement mitigations and then repeat all or parts of the entire management process for continuous improvement.