



Pipeline SCADA Alarm Management API RP1167 Development Update

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Purpose



- API RP 1167 is intended to provide pipeline Operators with recommended industry practices in the development, implementation, maintenance, and validation of an alarm management program for SCADA systems. It will provide guidance on elements that include, but are not limited to, alarm definition, alarm philosophy, documentation, management of change, and auditing.

Scope



- API 1167 is dedicated to the management of software generated alarms from SCADA systems in pipeline control centers and control rooms.
- API 1167 does not focus on alarms generated external to the SCADA system.



Background

- 2001 – Alarm management as part of a broader SCADA system integrity presentation at API Pipeline Conference.
- 2002 – Alarm management presentation at Cybernetics Symposium.
- 2002 - Pipeline Safety Improvement Act, Section 10(b).
- 2002 to 2005 – Controller Certification study.
- 2002 to 2005 - NTSB SCADA Safety Study – PB2005-917005.
- 05/2006 – API/AOPL Environmental and Safety Initiative’s Performance Excellence Team starts Control Center Operations workshops.
- 2006 - PIPES Act, Section 12 .
- 2007 – API Research and Special Programs approves CRM team request to develop RP on Control Room Management.
- 04/2007 – API Research and Special Programs approves Cybernetics Committee request to develop RP on Pipeline SCADA Alarm Management. Steve Koenig with ConocoPhillips chairs and puts the team together. Work group members include liquid and natural gas pipeline operators, academia, PHMSA, API staff, consultants, and vendors.
- 09/2008 - PHMSA-2007-27954 NPRM on CRM (73 FR 53075).
- 09/2008 - API 1168 Pipeline Control Room Management published.

Current 1167 Work Group



- Chair – Gary Medley - BP
- API staff – Ed Baniak
- Academia – Dr. Craig Harvey -LSU
- PHMSA – Karen Butler

Current 1167 Work Group (cont.)



- **Liquids**

- Jarid Kling - Alyeska
- Mike Szymanski - BP
- Ken Dunkle - Buckeye
- Louis Sterne - Chevron
- Marty Dempsey - ConocoPhillips
- Les Reschny – Enbridge
- Brad Newman – EPCO
- Ken Bussel - EPCO
- Ron Threlfall – Kinder Morgan
- Tara Still - Marathon
- David Scruggs - Shell

- **Gas**

- Joe Kindernay – Ameren
- Dan Scarberry – Dominion
- Carol Wallace - PSE

Current 1167 Work Group (cont)



- **Consultants**

- Charles Alday – Alday Consulting
- Bridget Fitzpatrick – Mustang Engineering
- Don Gresh – PIPECS

- **Vendors**

- Doug Rothenberg – D-Roth
- Sumeet Shinde – Matrikon
- Bill Hollifield – PAS
- Kelly Doran – Telvent
- Bob Weibel – TiPS

Current 1167 Email Group



- Valencia Hiebert – Alyeska
- Michael Joynor – Alyeska
- John Martin – Alyeska
- Brianne Labry – Chevron
- Daryl Pyne – Chevron
- Steve Griffin - Colonial
- Steve Koenig – ConocoPhillips
- Mark McTavish – Enbridge
- Steven Hoffort – Enbridge
- Blaine Reinbolt - Enbridge
- Jeff Myers – EPCO
- Ron Threlfall – KinderMorgan
- Rex Miller – KinderMorgan
- Joseph Thrift – Portland Pipeline
- Inez Petersen – Sunoco
- David Strobhar – Beville Engineering
- Rob Lewis – CSICal
- Glen Uhack – LSU
- Beth Edmonds – Matrikon
- Kevin Brown - Matrikon
- Joe Ernst – Marathon
- Robert Molloy – NTSB
- Edward Unger – SJ Industries
- Jason Konoff – Telvent
- Larry Wewers – Wewers and Associates

Document development plan



- Ideally, the finished API 1167 document will balance the need to:
 - help the Controller keep the pipeline in a safe operating condition.
 - cover the fundamental elements of concern around alarm management from PHMSA and NTSB.
 - assist pipeline operators in complying with expected rule making on alarm management.
 - comply with the current direction from API for performance based versus prescriptive based recommended practices.
 - allow pipeline Operators to use existing risk-based methodologies to determine when, where, and how to apply 1167.
 - NOT force pipeline operators to use a particular vendor's product, process, or technique, to comply.
 - pass balloting from API member companies.



Document development plan (cont.)

- Document will include examples in the appendix.
- Document revisions managed through a series of comment rounds.
- Document will reference existing technical material and documents where reader may want more detail information.
- Workgroup webconferences conducted typically every two weeks.

Current Status and Timeline



- Document has been through two (2) comment rounds.
- Document is currently being reviewed by the API Cybernetics Committee members.
- Targeting EOY 2009 for review by other select stakeholders (not currently participating in workgroup).
- Targeting end of 1Q 2010 for balloting.

API 1167 Highlights



- Will include chapters on:
 - Definitions
 - Alarm definition and determination
 - Alarm philosophy
 - Alarm documentation and rationalization
 - SCADA Control System Alarm Functionality and Alarm Design
 - Roles and responsibilities
 - Alarm handling
 - Alarm audits and performance monitoring
 - Management of change
 - Appendix of examples

Alarm Definition and Determination



- General Considerations
- Alarm Definition
- Purpose and Use of Alarm Priority
- Diagnostic Alarm Priority
- Other Uses of the Alarm System

Alarm Philosophy



- Alarm Philosophy Purpose
- Alarm Philosophy Use and Contents

Alarm Documentation and Rationalization



- D&R Process
- D&R Methodology
- D&R Preparation
- Determination and Assignment of Alarm Priority
- Determination of Alarm Setpoint
- Recommended Storage of D&R Information

SCADA Control System Alarm Functionality and Alarm Design



- Point Types and Alarm Types
- Alarm Priority
- Alarm Settings and Alarm Occurrences
- Other Alarm-Related Electronic Records
- Alarm Journals
- Process Change Journals
- The Alarm Summary Display
- Alarm Deadband
- Alarm On-Delay and Off-Delay
- Alarm Suppression and Alarm Shelving
- Leak or Possible Leak Alarms
- Alarm System Reliability
- Predetermined Alarm Design Considerations

Roles and Responsibilities



- Overview and Introduction
- Management
- Technical
- Operations

Alarm Handling



- Nuisance Alarms
- Alarm Shelving
- Designed Alarm Suppression
- State-Based or State-Dependent Alarms
- Alarm Flood Suppression
- Alarm Audit and Enforcement
- Special-Purpose Priorities and Alarm Routing
- Controller-Adjustable Alarms
- Controller Alert Systems

Alarm Audits and Performance Monitoring



- Overview and Introduction
- Audits of Managerial and Work Practices
- Alarm System Performance Metrics
- Summary of Alarm System Key Performance Indicators (KPIs)
- Average Annunciated Alarm Rate per Controller Position
- Peak Annunciated Alarm Rates per Controller Position
- Alarm Floods
- Frequently Occurring Alarms
- Chattering and Fleeting Alarms
- Stale Alarms
- Annunciated Alarm Priority Distribution
- Configured Alarm Priority Distribution
- Unauthorized Alarm Suppression
- Alarm Attribute Monitoring
- Reporting of Alarm System Analyses

Management of Change



- Purpose and Use
- Testing
- Documentation
- Notification and Training
- Emergency MOCs
- Temporary MOCs



Alarm Definition 1

- Match these tags (A-F) with the correct situation (1-6):
- A – a low priority alarm
- B – a medium priority alarm
- C – a high priority alarm
- D – an alert/warning
- E – information
- F - event

- 1. a valve in transit
- 2. a pumping unit sequence failure
- 3. a loss of communications at a single site
- 4. a motion detector activation at a remote site
- 5. a SCADA database save error
- 6. the SCADA team disabling ESPN during the Super Bowl



Alarm Definition 2

- Match these tags (A-F) with the correct situation (1-6):
 - A – a low priority alarm
 - B – a medium priority alarm
 - C – a high priority alarm
 - D – an alert/warning
 - E – information
 - F - event
- 1. a rate of change (flow)
- 2. a gravity deviation from a remote (junction) PLC
- 3. a gravity deviation from a local (station) PLC
- 4. exceeding MADP on a pipeline
- 5. station power failure
- 6. 10% LEL from hazardous gas detector



Alarm Definition 3

- Match these tags (A-F) with the correct situation (1-6):

A – a low priority alarm

B – a medium priority alarm

C – a high priority alarm

D – an alert/warning

E – information

F - event

- 1. unit in local operation
- 2. hydraulic fault
- 3. low suction pressure
- 4. main breaker on
- 5. high pump vibration
- 6. unit low ac

Alarm Definition 4



- Here's what we are currently thinking...
- depends...
 - what response is needed
 - when is the response necessary
 - what are the consequences of the event
 - short term (now)
 - long term (in the future)



- How do I know I am doing a good job with Alarm Management?
 - # of alarms?
 - frequency of alarms?
 - appropriate notification (attributed correctly) to Controller?
 - appropriate responses to alarms in acceptable time frames?
 - are the Controllers in a “proactive” or “reactive” state?
 - proper follow up on “bad actors”?
 - assurance testing?
 - results of Controller workload studies?