Control Room Management Issues

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Key CRM Issues

- Controller Workload

- Alarm Management

- Knowledge and Information

- Security

Controller Workload Issues

- Distractions
  - Responsibilities in addition to the activities necessary for the Control and Monitor of the pipeline
    - Phone switchboard
    - Office administrative duties / data entry / filing
    - Miscellaneous other duties
  - Interruptions
    - Other employees / co-workers stopping by to chat
    - Phone calls (personal or work related)

Controller Workload Issues (Cont.)

- Controller Fatigue
  - Have an FRMS Plan!
  - Follow your FRMS Plan!

Controller Workload Issues (Cont.)

- Alarm Rate
  - Alarm Floods
    - overwhelming number of alarms causing the controller to become unable to react appropriately
  - Alarm Frequency
    - Abnormal number of alarms over a particular period of time
  - Alarm Severity
    - Alarms which require significant work effort or time to resolve
  - Inappropriate Alarms
    - Defective field device or PLC I/O
    - Intermittent alarms / device (chattering, etc.)
    - Incorrectly configured set points / limits / bands

Controller Workload Issues (Cont.)

- Alarm Rate (Cont.)

Table D-1 Alarm KPI Summary (API RP 1167)

Alarm Performance Metrics per Controller Position		
Metric	**Target Value**	
Annunciated Alarms per Time:	**Target Value: Very Likely to be Acceptable**	**Target Value: Maximum Manageable**
Annunciated Alarms per Day per Controller Position	~150 alarms per day	~300 alarms per day
Annunciated Alarms per Hour per Controller Position	~6 (average)	~12 (average)
Annunciated Alarms per 10 minutes per Controller Position	~1 (average)	~2 (average)

Controller Workload Issues (Cont.)

Alarm Performance Metrics per Controller Position (Cont.)	
Metric	**Target Value**
Percentage of hours containing more than 30 alarms	~<1%
Percentage of 10-minute periods containing more than 5 alarms	~<1%
Maximum number of alarms in a 10 minute period	10 or less
Percentage of time the alarm system is in flood condition	~<1%
Percentage contribution of the top 10 most frequent alarms to the overall alarm load	~<1% to 5% maximum, with action plans to address deficiencies.
Quantity of chattering and fleeting alarms	Zero, action plans to correct any that occur.
Stale Alarms	Less than 5 present on any day, with action plans to address
Annunciated or Configured Priority Distribution	3 priorities: ~80% Priority 3, ~15% Priority 2, ~5% Priority 1 Other special-purpose priorities (e.g. "diagnostic" are excluded from the calculations
Unauthorized Alarm Suppression	Zero alarms suppressed outside of controlled or approved methodologies
Improper Alarm Attribute Change	Zero alarm attribute changes outside of approved methodologies or MOC

Alarm Management Issues

- Too Many Alarms
  - Alarm Management Plan should provide an alarm philosophy which provides the operator's definition of an alarm.
    - Consider the impact (severity of the alarm)
      - If everything is critical then nothing is critical
    - Consider the response (time to respond)
      - If a response isn't required then it shouldn't be an alarm

Alarm Management Issues (Cont.)

- Too Many Alarms (Cont.)
  - Alarm Management Plan should define breakdown of alarm priorities.
  - Alarm priorities should be kept to a manageable and easily distinguishable number
    - High (P1), Medium (P2), and Low (P3) is recommended

Alarm Management Issues (Cont.)

Table B-3 – EXAMPLE Severity of Consequences and Time to Respond Grid for Alarm Priority Determination (API RP 1167)

Maximum Time To Respond	Alarm Consequence Severity:		
	MINOR	**MAJOR**	**SEVERE**
> 30 minutes	Reconfigure alarm for Urgency	Reconfigure alarm for Urgency	Reconfigure alarm for Urgency
15 to 30 minutes	Priority 3	Priority 3	Priority 2
5 to 15 minutes	Priority 3	Priority 2	Priority 2
< 5 minutes	Priority 2	Priority 1	Priority 1

Alarm Management Issues (Cont.)

- Incorrect Classification of Alarms
  - 5% High (P1)
  - 15% Medium (P2)
  - 80% Low (P3)

Table C-1 – Recommended Priority Distribution for Alarm Configuration and Occurrence (API RP1167)

Critical Priority (Optional)	Rarely used, this priority should be constrained to less than 1% of the configured alarms and occurrences should be quite rare.
Priority 1 (P1)	~5% of the configured alarms
Priority 2 (P2)	~15% of the configured alarms
Priority 3 (P3)	~80% of the configured alarms
Priority 4 (P4) Diagnostic (Optional)	Excluded from percentage calculations

Alarm Management Issues (Cont.)

- HMI Design
  - Human Factors Engineering Really Matters
    - Be simple, consistent, and well organized
    - Limit the clutter (Signal-To-Noise Ratio)
    - Provide enough information (just enough)
  - Use of Summary Screens
    - Categorical
      - Grouped by priority / classification
    - Chronological
      - Listed as alarm occurs
  - Reference API RP 1165

Knowledge & Information Issues

- Lack of Adequate Training
  - Roles and Responsibilities
  - SCADA System
  - Pipeline Operations
  - Alarm Responses and Course of Action
  - Communications
  - Organizational

Knowledge & Information Issues (Cont.)

- Management of Change
  - Controller doesn't know about changes or operations in the field
  - Controller doesn't properly alert field of action required or changes to operations initiated from Control Room
  - Controller doesn't understand the communications plan

Knowledge & Information Issues (Cont.)

- Shift Change Procedure
  - Follow the script
  - Don't assume anything
  - Formalize it by using a sign-off

Security Issues

- Typical
  - Limit access to Control Room
    - Helps to reduce distractions to controllers
    - Good practice to understand worst case scenarios
      - What if…
    - Utilize a sign-in log book, security pass, etc.
  - Limit access to SCADA system
    - Must have password or other required credentials
    - Backup SCADA system verified and ready to go

Security Issues (Cont.)

- Non-Typical
  - Run through scenario exercises
    - Computer virus
    - Power outage
    - Communications outage
    - Bomb threat or other acts of terrorism
    - Vandalism

Conclusion

- Real world issues can be addressed by compliance with Control Room Management requirements in 192.631

- Follow a common sense approach to issues while working within the guidelines of the regulations