Summary of AGA White Paper

Leading Practices to Reduce the Possibility of a Natural Gas Over-Pressure Event

August 21 2019

Collaborative Industry Effort

- 8 AGA committees, 255 companies, 962 subject matter experts
- Multi-step process produced document
  - ✓Operator Roundtable – October 24th, 2018
  - ✓Face-to-face Draft Review – November 14th, 2018
  - ✓AGA publication review process
  - ✓Published and available on AGA website - November 26th, 2018
- Document contains 67 individual recommended practices, under 4 sections, specific to reducing possibility of over-pressure events
  - Design of Distribution Systems and Regulator Stations
  - Operating Procedures and Practices
  - Human Factors
  - Managing the Risk of an Over-pressurization Event

Contributing AGA Committees:

- ***Construction Operations***
- ***Customer Field Services & Measurement***
- ***Distribution Integrity Management***
- ***Engineering***
- ***Field Operations***
- ***Gas Control***
- ***Operational Safety Regulatory Action Committee***
- ***Operations Managing Committee***

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Definitions

Abnormal Operating Condition (AOC) - A condition identified by the operator that may indicate a malfunction of a component or deviation from normal operations that may indicate a condition exceeding design limits

Management of Change (MOC) - Formal procedure used in order to identify and consider the impact of changes to pipeline systems and their integrity. These procedures should be flexible enough to accommodate both major and minor changes, and must be understood by the personnel that use them. Management of change shall address technical, physical, procedural, and organizational changes to the system, whether permanent or temporary. The process should incorporate planning for each of these situations and consider the unique circumstances of each.

Distribution System and Stations Design

Overview of Recommendations

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Distribution Systems and Stations Design

Summary

System and station design aspects can vary depending on location, existing system, environmental, and other factors unique to operator. However, certain practices should be considered when designing and modifying regulator stations, or selecting over-pressure protection.

Areas of focus include:

- Considerations during station design that allow for optimal control of gas
- Station design practices that reduce likelihood/consequence of station failure
- Design considerations for utilization pressure (low pressure) systems

Distribution Systems and Stations Design

Design for Optimal Control of Gas - Highlights

- Design to include pressure monitoring and alarm capability. Examples are:
  - Alarm relief
  - Full relief valves
  - Pressure recording devices
  - Remote pressure sensors
- Design systems to minimize response time. Consider enabling remote control
- Consider current and future loads when designing stations and over-pressure protection devices

Distribution Systems and Stations Design

Reduce Likelihood/Consequence of Failures - Highlights

- Design to mitigate possibility of failures, including common mode failures
  - Protect sensing lines
  - Install slam shut valves
  - Separate and/or protect regulation assets
  - Design to minimize possible vent line and relief valve obstructions
  - Design to mitigate possible gas contamination
- Review and standardize design templates, with approval from subject matter experts (ex. Professional Engineer)
- Design for station security

Distribution Systems and Stations Design

Utilization/Low Pressure Systems - Highlights

- Design for additional over-pressure protection on utilization pressure systems, where feasible. Consider:
  - Additional monitoring regulation
  - Slam shut valves
  - Relief valves
  - Customer service regulation
- Design regulator stations with pressure monitoring as utilization pressure systems have lower tolerances for variations in gas pressure

Operating Procedures and Practices

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Operating Procedures and Practices

Summary

Day-to-day operations offer multiple opportunities to perform work in a way that continues to ensure safe, reliable and efficient delivery of natural gas. Areas of focus are:

- Complete **records** and drawings should be retained and documented on any work related to gas regulation or overpressure equipment.
- **Remote monitoring** and control of natural gas systems offers many benefits, but is not the solution for all over-pressurization events. Operators should evaluate hydraulic and mechanical equipment that can react in real time to pressure changes. In particular, utilization pressure systems have lower tolerance to variations in pressure.
- Work with local and state programs, and monitor excavation activities in immediate vicinity of control lines, to **prevent damage** to over-pressure protection assets.
- Additional precautions and considerations when planning and performing **tie-in and uprates.**

Operating Procedures and Practices

Standard Operations and Maintenance - Highlights

Written procedures are one of the most effective tools to prevent over-pressurization of a gas system. Ensure common procedures are standardized, and complex procedures are reviewed by qualified or licensed people that know the system characteristics.

- Review procedures with all stakeholders before issuing.
- Call out expected outcomes at critical steps, and what to do if those outcomes differ from expectations.
- Procedures should be available on the job site, and a person in charge should be known.
- All changes to the procedure should follow a known process.

- Monitor pressure during procedures on both sides of pressure controls
- Ensure valves used during procedures are in working order by moving (exercising) prior to beginning work
- Conduct a pre-job briefing
- Be aware of work upstream that could create debris that may affect your system
- Create a standard written procedure for notifying emergency first responders
- Implement a Lock-out – Tag-out (LOTO) program

Operating Procedures and Practices

Construction, Tie-ins, Tapping, Uprates, Abandonments - Highlights

All projects that involve utilization pressure, stopping or affecting the flow of gas, or working with systems of different pressures should:

- Be carefully planned
- Be reviewed by a qualified person with knowledge of the system(s) being worked on
- Require pressure monitoring to avoid creating abnormal operating conditions (AOCs)

- Verify correct location of control lines, services and mains involved in a project (by excavating if necessary), and mark the worksite
- Keep projects to a manageable size
- Communicate work in progress and work being planned in one system of record to avoid conflicting projects

Operating Procedures and Practices

Damage Prevention - Highlights

A serious threat to the integrity of a natural gas facility is the possible damage resulting from excavation, external forces, or intentional malicious activity around natural gas piping and regulator stations.

- Establish a buffer zone around regulator stations for one-call tickets to prioritize those locates
- Station qualified personnel on-site to observe excavation near regulator stations with buried control lines
- Protect regulator stations and control lines from accidental and intentional damage and tampering with fencing, bollards and locks

Operating Procedures and Practices

Records Management - Highlights

Accurate, complete, and up-to-date records, including maps and drawings, are critical for operations, maintenance, risk identification, and analysis.

Have a documented process for creation, collection, identification, distribution, and storage of records. The process should identify authority and responsibility for managing records.

- Records management, or asset management systems are helpful for maintenance, identification and history
- Precise location information is important – consider GPS data
- Update maps and records in a timely fashion for both as-built markups and field changes
- Make maps and records available for engineering, construction and maintenance personnel
- Equipment used for controlling pressure between systems is more critical for utilization pressure systems

Human Factors

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Human Factors

Summary

Human Factors are woven throughout all sections of the Leading Practices. Most practices, if not all, have Human Factors associated with the practice. This section expands upon the other sections and concentrates on Human Factors involving an over-pressure event

Areas of focus includes:

- Management of Change (MOC)
- Training for Prevention and Recognition of Abnormal Operating Conditions
- Operator Qualifications
- Field Oversight

Operators should consider developing a MOC program for all plans that have a potential for over-pressurization that communicates the level of authority required to make changes to the design and/ or written project plan.

Human Factors

Management of Change - Highlights

- MOC process should govern all proposed job changes during construction phase, including appropriate approvals, signoff and communications on projects that have a potential for an over-pressure event
- Clear delineation of authority during system work
- Stop Work Authority must be granted to all personnel
- Operators should endeavor to collect and report near-miss information and encourage the sharing of safety-related events.

Human Factors

Training for AOCs / Operator Qualification - Highlights

- Train gas operations personnel on what occurs in the structure during an over-pressure event, including the potential consequences of the event
- Provide specialized training for field personnel to highlight the unique characteristics of working on utilization pressure systems.
- Provide formalized internal or external training for design personnel.
- Enhance the current AOC OQ covered tasks to include over-pressurization.

- *Training operator & contractor personnel is essential on utilization pressure systems*
- *Recognize AOCs involving over-pressurization*
- *Design requires expertise- Professional Engineer or other natural gas industry standard*
- *During planning process identify all Covered Tasks*
- *During construction – be fully aware of all individuals' Operator Qualifications*

Human Factors

Field Oversight - Highlights

- Identify ongoing or in-process work for identifying system issues/constraints. Which step of the procedure you are on (as next step is about to occur).
- Permission to proceed needs to be clearly established, and a defined person in charge must be known by all on the job.
- Written procedures must be followed as directed in the appropriate sequence.
- Require employees with system pressure expertise to attend each design/construction prep meeting, including Gas Control personnel, when appropriate.
- Be prepared to rotate qualified staffing during lengthy procedures.

- *Prior to construction personnel should meet to review construction drawings, specifications, design criteria, schedule critical task list, OQ qualifications*
- *Field oversight includes Inspection, Quality Control and Assurance*
- *Provide documented procedures – detailed step by step guide*
- *Follow documented work sequence*
- *Include emergency contact information*

Managing the Risk of Over-pressurization Events

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Managing Risk of Over-pressurization Events

Summary

Management of over-pressurization treats require the operator to be able to identify and compare the risk of over-pressurization with other treats on the system and to be able to execute on mitigation measure with the support of all stakeholders.

Over-pressurization is considered a low frequency event and is difficult to model. When considering over-pressure threats, operators should consider:

- Analysis of industry data
- Data-based calculations
- Subject matter expert input
- Consider breaking evaluation into sub-treats

Mitigating over-pressurization threats require the support of stakeholders, communities, and customers:

- Stakeholder collaboration to remove resistance to infrastructure upgrade projects (ex. Moving inside meters)
- Community engagement in planning projects that impact roads and other infrastructure
- Support from local public utility commissions to secure rate recovery mechanisms

Managing Risk of Over-pressurization Events

General and Industry Specific Practices

- Operators should work with all stakeholders to proactively identify opportunities to upgrade utilization pressure systems
- Operators should track, trend, and determine root cause of significant over-pressure events
- Operator distribution integrity management program (DIMP) plans should include processes to track performance of types of pressure regulators
- Avoid using probability of zero in risk calculations
- Confirm appropriate consequence factors for low probability events in risk calculations

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