Gas System Operations

Over-Pressurization Control Strategy-UNITIL

October 17, 2019

Over-Pressurization Control Strategy-UNITIL

- Utilization of Slam Shut Regulators for LP System Over-Pressure Protection
  - What are the challenges?
- Unitil's Comprehensive Approach to Over Pressure Protection
  - System Equipment, Configuration & Design

Slam-Shut Regulators-Are they the Answer?

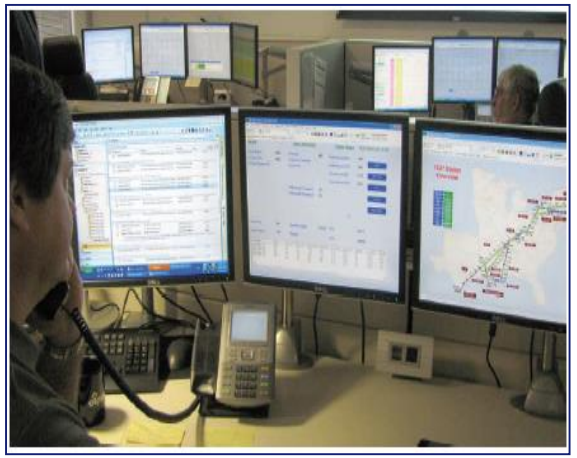
- Single system supply
  - Immediate stopping of the flow of gas
  - Protection for end-user
  - Customer impacts
    - Relights required for all end-users
    - Effect on business & critical care constituents
    - Maintaining System Continuity
- Multi-system supply
  - SCADA monitoring an absolute must
  - Inherent risk associated with pressure loss to parts of the system
    - Customer Appliance Pilots
    - Management of shut-offs/relights
    - Maintaining System Continuity

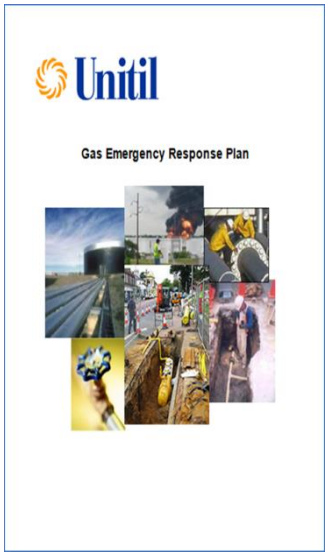
UNITIL'S COMPREHENSIVE OPP STRATEGY

UNITIL OVER PRESSURE PROTECTION STRATEGY

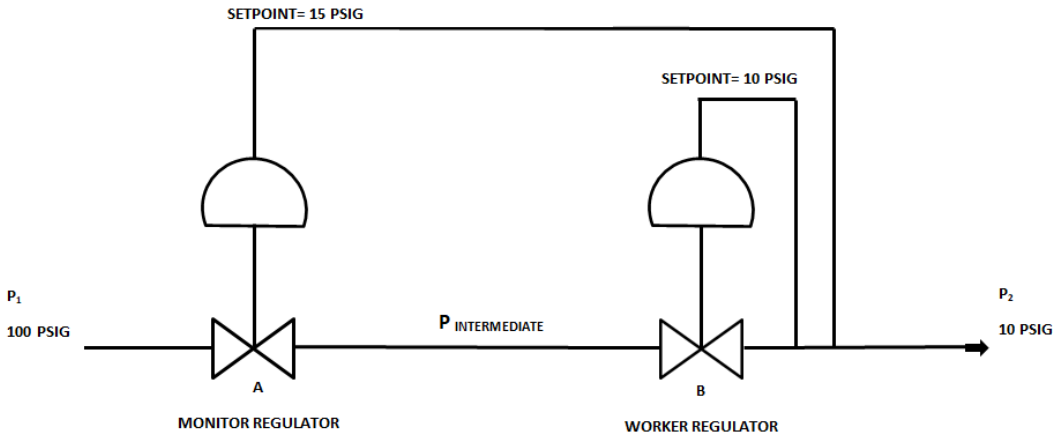
- Five Step Approach:

1. Prevention – Station Design & OPP Redundancy
2. Prevention – Monitor & Detection (Gas Control)
3. Prevention – New Technology & System Upgrades
4. Prevention – Physical Damage & Human Error
5. Emergency Response





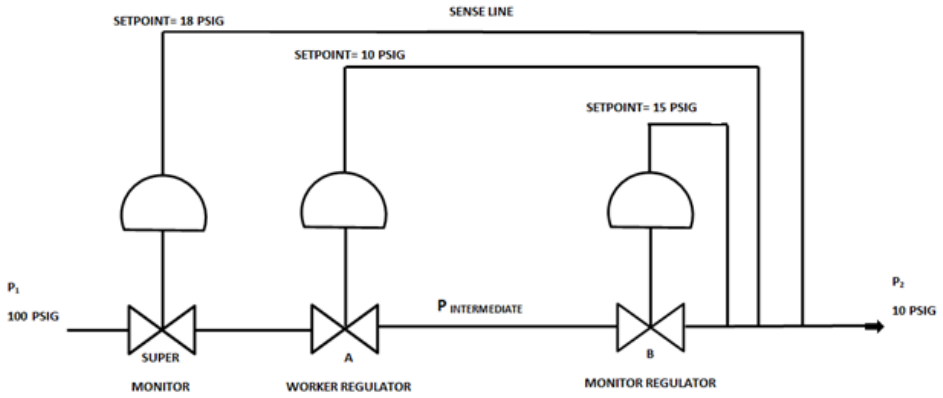
WORKER/ MONITOR CONFIGURATION



- A Worker & Monitor Regulator (Industry Standard)
- Code Minimum (49 CFR §192.195)
- Provides for over pressure protection if the primary regulator fails (failure +1 level of protection)

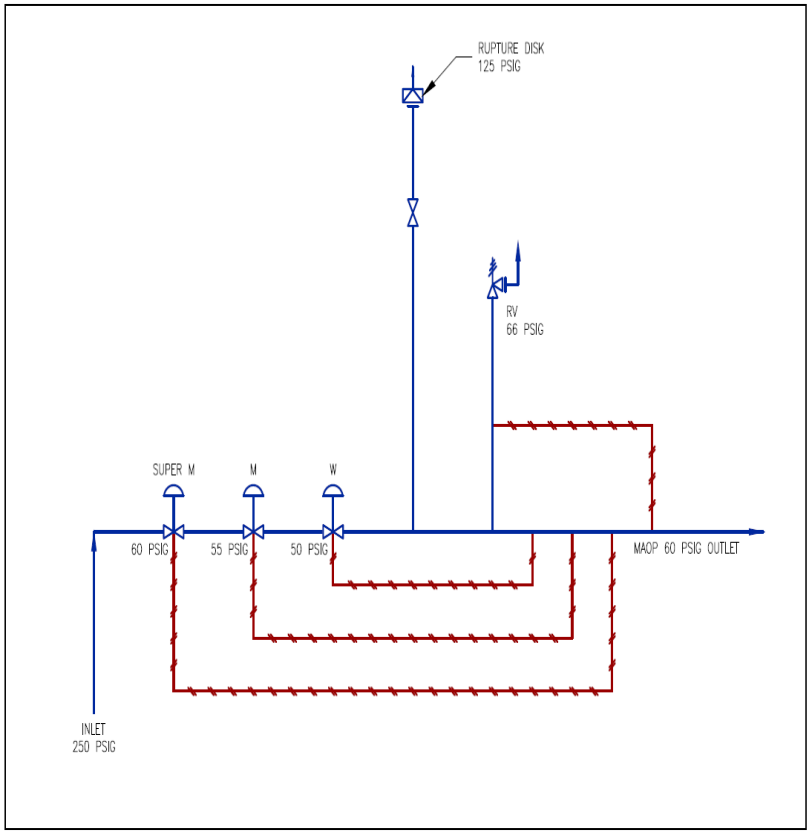
WORKER / MONITOR / SUPER MONITOR

(Station Design & OPP Redundancy)



- A Worker Regulator, Monitor Regulator & A 3rd Regulator (Super Monitor)
- Provides for over pressure protection if the primary regulator fails (failure + 2 levels of protection)
- Unitil Standard Design Since 2010

REGULATOR STATION DESIGN STANDARD
SUPER MONITOR WITH RELIEF VALVES
(STATION DESIGN & OPP REDUNDANCY)



Note: Not Suitable for all existing locations

- New Design Standard Since Merrimack Valley
- Provides for over pressure protection if the primary regulator fails
  (failure + 4 levels of protection)
- Industry Leading Design
- Four Stations in Design or Ready for Construction
  1. Forrest St, Plaistow NH
  2. Forrest St. @ Riverside St., ME
  3. Eastern Road, ME
  4. Mardell Ave, NH

GAS CONTROL CENTER & SYSTEM MONITORING
(Monitor & Detection)

- Unitil's Gas Control Center is located in Portsmouth, NH
- Staffed 24/7 & 365
- Monitors system operations for all gas service areas (MA; ME; NH)

- Responsibilities of Gas Control:
  1. Continuously monitor pressures and flows
  2. Initiates internal notifications for emergency's
  3. Dispatches emergency crews to the field
  4. Direct line of contact for Police/Fire

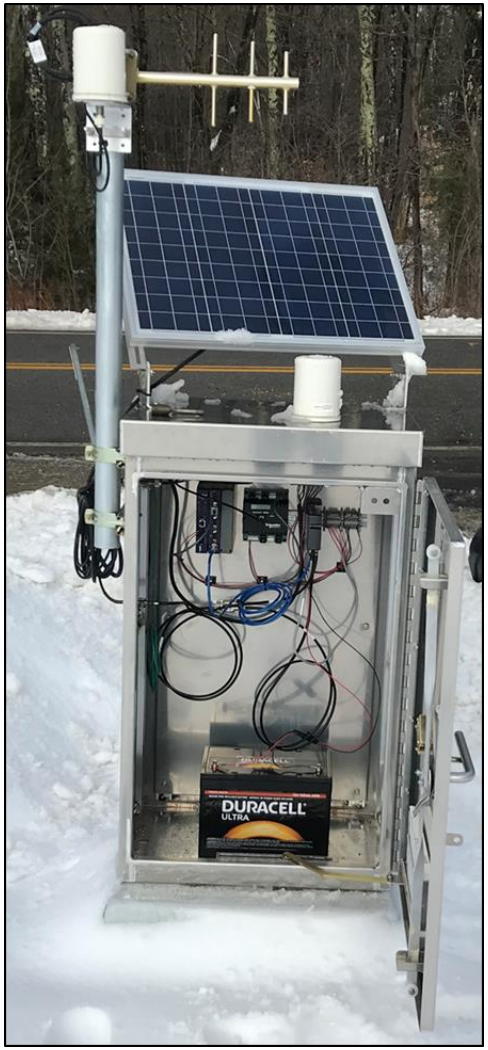
SCADA ALARMS & SETPOINTS

- Regulator Set points Points:
  - Worker – Below MAOP
  - Monitor – Below MAOP
  - Super Monitor – At MAOP
- SCADA Alarms :
  - High Alarm – Before Monitor Regulator Set point
  - High - High Alarm – At Monitor Regulator Set Point
  - Technicians Dispatched at High Alarm Notification

Example:

- System MAOP – 60 PSIG
- Worker Regulator – 55 psig
- Monitor Regulator – 58 psig
- Super Monitor – 60 PSIG

(Conservative & Industry Leading)



NEW TECHNOLOGY & SYSTEM UPGRADES

- Cast Iron/Bare Steel Replacement Programs
  - NH Complete, ME- 2024, MA – 2035
  - Elimination of the Majority of the Low Pressure Systems
  - Excess Flow Valves
  - Service regulators on IP systems
- Relocate meters from inside to outside
- Evaluating End User Piping Protection Devices (Over-Pressure Shut Offs (“OPSO”) on Risers)

REGULATOR RISK ASSESSMENT MODEL DEVELOPMENT & OUTPUT

(3) Primary Assessment Categories:

- Operational Hazards & Vulnerability
- Operational Security & Protection
- Operational Integrity

Multiple Sub-categories embedded in each Primary Category:

- Each risk in a specific sub-category is assigned a specific numeric value
- A higher numeric risk value is associated with an increased/higher overall circumstance or outcome
- Each specific sub-category total point output is weighted as part of the overall Primary Categories total numeric risk value

- The output algorithm incorporates the weighted numeric point value from all the sub-categories in each weighted primary category to develop an over-all risk assessment score for each regulator station.
- The data that is inputted into the model is derived by an individual analysis conducted at each station by the Operations Supervisor /technicians.
- The Risk Assessment Model has been developed to sort and prioritize the over-all risk at a station by quantifying a weighted numeric input/output.
- In addition, specific risk areas can be prioritized based on sorting the numeric value associated with a specific sub-category embedded within any of the three Primary Categories.
- The Regulator Station Risk Assessment Model is a data driven, flexible tool to identify multiple risks and to prioritize remediation of these risks.

STATION RISK ASSESSMENT
(OPERATIONAL HAZARDS AND VULNERABILITY)

STATION RISK ASSESSMENT						
Operational Hazards and Vulnerability						
25%	Sense Line Accessibility, Station Configuation and Material		Point Value	Point Rating Given	Total Points	Weighted Points
	15%	Above ground Sense Lines	1		0	0
		Within Vault configuration: sense lines parallel- marked out	5			
		Within Vault configuration: sense lines separated- marked out	3			
		Burried Sense Lines- Parallel	3			
		Burried Sense Lines- Separated	1			
		Sense lines: plastic	5			
		Sense lines: steel	1			
	Sense Line Location- Proximity to Station		Point Value	Point Rating Given	Total Points	Weighted Points
	20%	< 10 feet	1		0	0
		10 feet to 25 feet	2			
		25 feet to 50 feet	3			
		50 feet to 100 feet	4			
		>100 feet	5			
	Station Location- Environmental Concerns (All that apply)		Point Value	Point Rating Given	Total Points	Weighted Points
	15%	Wetlands- flooding potential	5		0	0
		Unstable soil conditions- landslide	5			
		Sloped access	3			
		Industrial accident potential	3			
		Suseptbility to vandalism	5			
		No Environmental Concerns	0			
	Tree Hazards- Canopy		Point Value	Point Rating Given	Total Points	Weighted Points
	15%	No trees	0		0	0
		Some canopy concerns- trimming to mitigate	2			
		Overgrown vegitation- trimming to mitigate	3			
		Large scale trimming to mitigate damage- Within 50'	5			
	Vehicular Traffic Hazards (All that apply)		Point Value	Point Rating Given	Total Points	Weighted Points
	15%	Light to moderate traffic	2		0	0
		Heavy traffic	5			
		Intersection	5			
		Near parking area	3			
		Highway/ embankment concern	5			
		No Vehicular Traffic Concerns	0			
	Corrosion- Visual Inspection		Point Value	Point Rating Given	Total Points	Weighted Points
	10%	Good	1		0	0
		Fair	2			
		Poor	3			
		Very poor	4			
		Material loss	5			
	Cathodic Protection: Corriosion Protection		Point Value	Point Rating Given	Total Points	Weighted Points
	10%	Yes	1		0	0
		No	5			

STATION RISK ASSESSMENT
(OPERATIONAL INTEGRITY)

Operational Integrity						
	Number of Customers		Point Value	Point Rating Given	Total Points	Weighted Points
	20%	< 50	1		0	0
		50-500	2			
		500-1000	3			
		> 1000	4			
	Single/Multi Feed System		Point Value	Point Rating Given	Total Points	Weighted Points
	10%	Single-feed	3		0	0
		Multi-feed	1			
	LP or IP System		Point Value	Point Rating Given	Total Points	Weighted Points
	10%	LP system	3		0	0
		IP system	1			
		HP System	1			
	Station Heat Capability		Point Value	Point Rating Given	Total Points	Weighted Points
	10%	Not required	0		0	0
		Pilot required (none)	3			
		Pilot required (active)	0			
		Pre-heat required (none)	5			
		Pre-heat required (active and sufficient)	0			
	OPP/Fire Valve (levels)		Point Value	Point Rating Given	Total Points	Weighted Points
0.45	20%	Fire valve present	1		0	0
		No fire valve	2			
		Worker/monitor only	4			
		Worker/monitor/supermonitor	3			
		Worker/monitor/supermonitor/releif valve	2			
		Worker/monitor/supermonitor/releif valve/burst disk	1			
	Single Run/Multi-Run System		Point Value	Point Rating Given	Total Points	Weighted Points
	10%	Single run	3		0	0
		Multi-run	1			
	Station Foot-Print (Upgrade and Growth Potential)		Point Value	Point Rating Given	Total Points	Weighted Points
	5%	No room for expansion	4		0	0
		Limited availability(+50%)	3			
		Availability(+100% - double)	2			
		Unlimited with no restrictions	1			
	Vault Venting and By-pass (all that apply)		Point Value	Point Rating Given	Total Points	Weighted Points
	10%	Vaults vented (no obstruction)	1		0	0
		Vauts not vented	5			
		No by-pass (Vault or aboveground)	5			
		Burried By-pass	5			
		Enclosed By-pass (Confined within Vault)	1			
		By-pass (Aboveground)	1			
	Above Ground, Vault, or Confined Space Vault		Point Value	Point Rating Given	Total Points	Weighted Points
	5%	Above Ground	1		0	0
		Vault	3			
		Confined Space Vault	5			
					Operational Integrity Total Weighted Points	0

STATION RISK ASSESSMENT (OPERATIONAL SECURITY AND PROTECTION)

Operational Security and Protection						
30%	Vehicular Traffic Protection (For Vehicles and Trains (where applicable)		Point Value	Point Rating Given	Total Points	Weighted points
	20%	None required	0		0	0
		None (but required)	5			
		Bollard	3			
		Guard rail	2			
		Jersey barrier	1			
	Station Monitoring		Point Value	Point Rating Given	Total Points	Weighted points
	30%	None required	0		0	0
		Required- none available, or tell tale only	7			
		Chart only	5			
		ERX with Modem	3			
		Tell-tale gagues- w/other	3			
		Pressure only	3			
		Heat and temperature with pressure	2			
		Controlled access and fully monitored	1			
		Cameras with controlled access and fully monitored	1			
	Physical Station Security		Point Value	Point Rating Given	Total Points	Weighted points
	20%	None required	0		0	0
		None	5			
		Locked vault/enclosure	2			
		Fence only with locked gate	3			
		Fence and barbed wire with locked gate	2			
		Controlled access facility- site or building	1			
	Telemetry Power		Point Value	Point Rating Given	Total Points	Weighted points
	15%	Direct AC	0		0	0
		Battery/solar array with solid exposure	2			
		Battery/solar array with limited exposure	4			
		System telemetry with power backup	1			
	Communications		Point Value	Point Rating Given	Total Points	Weighted points
	15%	Landline	1		0	0
		Cell modem	3			
		Cell modem with failover	2			
					Operational Security and Protection Total Weighted Points	0
					Total Station Risk Assessment	0