Regulator Selection for High Efficiency Equipment
Regulator Functions

- Reduce inlet pressure to a constant lower outlet pressure
- Control the flow of gas to meet the downstream demand
- Provide safety against downstream over-pressurization in the event of regulator failure
Selection Criteria

FLOW

- Maximum capacity required (SCFH, BTU)
- Diversity of Load (One Appliance vs. Multiple)

INLET PRESSURE

- Maximum Inlet Pressure Rating (MAOP)
- High and Low Inlet Pressure ranges for the System
Selection Criteria

OUTLET PRESSURE

- Outlet pressure range
  - Gas Combination Valves
  - Line Regs
  - Ind. Gas Trains

- Overpressure protection requirement & method

- Accuracy of regulation over flow range (Fixed Factor Metering vs. Line Pressure/LP metering)
Regulator Performance (set point/droop/boost/lockup)

Typical Appliance Load Constraint Profile
Set with 2 PSIG Inlet Pressure, 7” w.c Outlet Pressure

High Pressure Trip
Lock-up with fast acting close at high fire rate

Normal Lock-up

Set Point

Boost

Low Pressure Trip

0 350 700 1050 1400
FLOW in SCFH, 0.6 sp gr Gas

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Selection Criteria

SPEED OF RESPONSE

Gas Meter

Regulator ——> Appliance
Meter Effects on Regulators
Fast ON /OFF Creates Rotary Meter Line Pack

(Constant Internal Relief events and failure of IRV)
HE Boilers: tighter pressure control requirements

Lock-up critical….no more pilots
Fully Modulating Boilers Cause Rotary Harmonic
(Leads to Pulsation and Regulator Failure)
Solutions to Rotary Line Pack

- Keep Distance from Rotary
- Replace Rotary with Ultrasonic
- Adjust Regulator response time (load ring)
- Oversize Orifice to reduce stroke (may impact safety)
Solutions to Rotary Line Pack and High Lock-up

- Select Regulators with optimized vent design
- Avoid Long Vent Lines
- Use regulator with extra heavy relief spring (note this impacts safety)
- Work with customers up front to increase pipe diameter & reduce pipe velocity
Solutions to Harmonic Issues

- Avoid Long Vent Lines, proximity to Rotary
- Install Ultrasonic meter or large diaphragm
- Extra Heavy Breather springs
- Lighter or Heavier springs to shift harmonic
- Deliver elevated pressure and have contractor install Line pressure regulators
- Insure Line Pressure regs sized and selected correctly
Line Regulator Construction

Vents & Vent Limiters

NFPA 54, 5.8.5.1: An independent vent to the exterior, sized per manuf. recommendations, shall be provided where the location of the regulator is such that a ruptured diaphragm will cause a hazard...

exception: a vent limiting means combination listed as complying with Z21.80 shall be permitted to used without a vent to the outdoors (limits NG to 2.5 Cuft, LP to 1 cuft as per section 2.11, table V of Z21.80)
Line Regulator Performance: Lock-up

- **Non Lock-up Regulators**: usually metal on metal seat. Outlet pressure = Inlet Pressure at no flow. Example Maxitrol RV Series
  - Flowing: 2 PSIG In, 7” w.c. out
  - No Flow: 2 PSIG In, 2 PSIG out

- **Lock-up “Type”**: Soft seat, but may “creep” up and ultimately outlet pressure will rise well above set point but will settle someplace below inlet pressure. Example
  - Flowing: 2 PSIG In, 7” w.c. out
  - No Flow: 2 PSIG In, 13” w.c. to 1.9 PSIG out

- **True-Lock Up**: Bubble Tight Lock-up. Lock-up close to set point.
  - Flowing: 2 PSIG In, 7” w.c. out
  - No Flow: 2 PSIG In, 8” w.c.-12” w.c out depending on speed of closure, and class.

Z21.18, section 2.9

Class 1: 150% of initial outlet pressure or initial outlet pressure +5 inches w.c., whichever is greater (e.g. 7” + 5” = 12” w.c.)
Class 2: 150% of initial outlet pressure (e.g. 7” + 3.5” w.c. = 10.5” w.c.)
Regulator Performance  (set point/droop/boost/lockup)
Example: Why Is Lock-up critical….new EPA compliant Generators

FUEL SYSTEM REQUIREMENTS

Utility High Pressure Fuel Supply
2.0 PSI Absolute Minimum.
15.0 PSI Maximum.
Note: Optimum pressure, 5 PSI.

Primary Fuel Pressure Regulator
Commercial/Industrial Rated.
Shall be rated for Engine/Mechanized application.
2.0in Connectors (Inlet & Outlet).

Minimum CFH Rating of 1.5x Greater Than the 100 percent Required Fuel Flow Rating of the Genset. Calculated using a Specific Gravity of 0.65 NG, 1.6 LPG-V.

6inH20 to 14inH20 Spring Rate.
Orifice Size dependent upon CFH Flow Rate requirement of Genset.

Output Pressure to be set at 13.0inH20.

Maximum Allowable Pressure Drop from a static condition to full load, shall not be equal to or greater than 2.0inH20.

Installed 6 to 10ft. from flex hose connection, on the same side as the flex hose connection.
The Diaphragm case shall be orientated in a Vertical Plane.
Future Challenges

- Increasingly fast valves
- High pressure limit switches on INLET!