VALOR EPC

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Valor Surrebuttal, Pneumatics EF

Which is more suitable, 13.5 or 3.5 sch/hr?

- No studies (to our knowledge) in New Mexico so we don't truly know.
- Until that time, both values are arbitrary.
- One could argue that 3.5 scf/hr was more appropriate for Colorado due to more regulations and more frequent LDAR. "More awareness"
- So, if New Mexico gets similar stringent LDAR, wouldn't we see an NM industry wide improvement, possibly towards 3.5 scf/hr?
- Or could it be that **from 2014-2019**, separators in CO were being outfitted with smaller valve trims for CVS compliance? This makes one valve cycle per plunger run.

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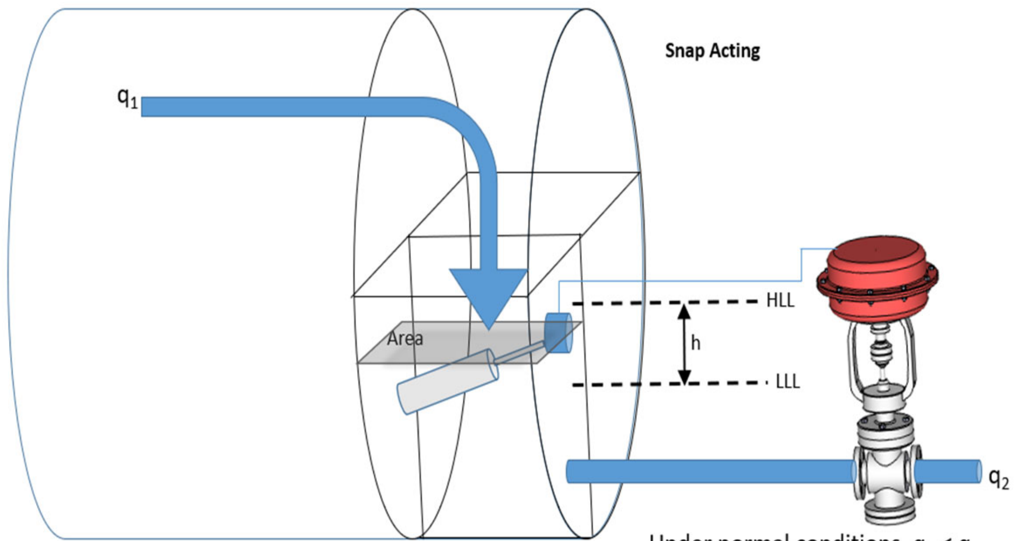

Under normal conditions, $q_1 < q_2$, and therefor valve will be cycling (open and closing)

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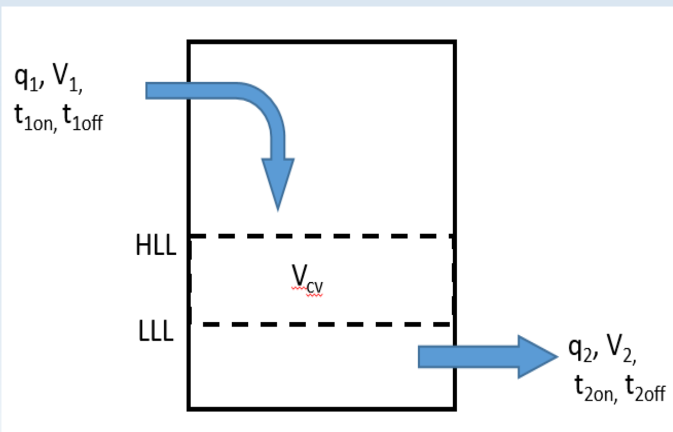

IF $q_1 \geq q_2$ (typical for throttle dump valves or snap dump valves where the well flowrate is equal to the separator flowrate)	**THEN,** $t_{2on} = \frac{60(V_1 + V_{CV})}{q_2}$ $t_{2off} = t_{1off}$ $n = 1$ (Dump valve cycles per upstream cycle)
IF $\frac{V_1}{q_1} < \frac{V_1}{q_2 - q_1}$ **(typical of snap acting valves)**	THEN, $t_{2on} = 60\left(\frac{V_{CV} + V_1 - \frac{q_2}{q_1}V_1}{q_2}\right) + \frac{60V_1}{q_1}$ $t_{2off} = \frac{60V_{CV}}{q_1}$ $n = \frac{V_1}{q_2 t_{2on}}$ (Rounded up to nearest whole integer)
IF $\frac{V_1}{q_1} > \frac{V_1}{q_2 - q_1}$ **(typical of snap acting valves)**	THEN, $t_{2on} = \frac{60V_{CV}}{q_2 - q_1}$ $t_{2off} = \frac{60V_{CV}}{q_1}$ $n = \frac{V_1}{q_2 t_{2on}}$ (Rounded up to nearest whole integer)

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<u>Free flowing well</u>

- Valve cycle time is typically ON for 3-5 seconds, OFF for 20-40 seconds
  - *This is part of our data collection process when evaluating tank closed loop vapor control systems*

<u>Plunger wells</u>

- Can vary, but because of the need to not overwhelm downstream equipment, trim sizes on valves are reduced.
  - *May have only one cycle per plunger arrival due to small valve trims that may be needed for CVS PPIVFR*

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<u>Intermittent ON/OFF Valve</u>

- Diaphragm volume (typical 2” globe valve): ~49-53 in^3
- Pressurized to 30 psig of fuel gas in that 49 in^3
  - ~ 0.10 scf when deenergized
- Deenergizing rate/Depressurization rate varies by valve, orifice in vent line, etc.
  - Globe valves typically happen in 1-3 seconds
  - Some ball valves 20-30 seconds to depressurize

If emission factor is an instantaneous rate: 0.10 scf/1 sec = 360 scf/hr
But if emission factor is *totalized* over hour: depends on frequency
NMED/ERG cost analysis was based on this totalized over an hour.

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- NMED/ERG used 13.5 scf/hr (totalized over hour) for a single intermittent valve over an hour.

  13.5 scf /hr = 0.10 scf / cycle * X cycle/hour → X = <u>135 cycles per hour</u>

  Not a likely scenario in an unfailed condition.

- NMED/ERG used 3.5 scf/hr (totalized over hour) for a single intermittent valve over an hour.

  3.5 scf /hr = 0.10 scf / cycle * X cycle/hour → X = <u>35 cycles per hour</u>

  Still unlikely scenario in an unfailed condition but better. Valve would need to open for 1 second, close for 1 second (that's more of a throttling valve behavior).

Valor Surrebuttal, Pneumatics Cost Analysis

- Valor replaced investigate those cells in the NMED/ERG cost analysis that were applicable to our scope: Emission Factor and Costs
- No intention of complete dissection of entire spreadsheet
- Valor echoed all of NMED/ERG assumptions
    - *Example: Used similar air compressor HP used by NMED/ERG*

Convert to Instrument Air - Compressed air may be substituted for natural gas in pneumatic systems without altering any of the parts of the pneumatic control.

Source: U.S. EPA. Lessons Learned: Convert Gas Pneumatic Controls to Instrument Air. OAR: Natural Gas Star. October 2006. https://www.epa.gov/sites/production/files/2016-06/documents/ll_instrument_air.pdf

Method for Reducing Natural Gas Losses	Volume of Natural Gas Savings (Mcf/ year)	Volume of Natural Gas Savings (scfh)	Air Volume (cfm)	Horsepower	Capital Cost (Installed) ($2006)	Capital Cost (Installed) ($2019)*
Replace Gas with Air in Pneumatic Systems (10 controllers per facility)	1,594	182	12.0	4.0	$5,918	$7,196
Replace Gas with Air in Pneumatic Systems (40 controllers per facility)	6,377	728	48.2	16.1	$23,672	$28,785
Replace Gas with Air in Pneumatic Systems (100 controllers per facility)	15,943	1,820	120.5	40.2	$59,181	$71,962
Replace Gas with Air in Pneumatic Systems (per medium-sized facility)	20,000	2,283	125	30	$60,000	$72,958

Result: Based on the sizing guidelines, 1 cfm of instrument air is needed for each pneumatic device. The air dryer consumes 1[illegible]% of that. Thus, a wellhead with 10 pneumatic devices needs ~12 cfm of instrument air.

* Updated from $2006 to $2019 using the CEPCI Index.

** Electric price for commercial accounts in NM for year 2020 are from U.S. EIA . https://www.eia.gov/state/data.php?sid=[illegible]

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- All engineers size instrument air packages different:
  - *Based on known actuation frequency*
  - *Based on a fuel gas flowmeter (then to convert to IA)*
  - *Based on a percent of baseload demand plus peak demand, with safety factor*
  - *All are valid, all are appropriate. But all look at the demand (i.e., inlet flow) to the valves and devices*
- Process knowledge is important
  - *Proper selection of valve – size, trim, stroke, materials, etc*
    - *Proper opening time, and closing time for the valve – use to size actuator, size the vent orifice, etc*

Example: A valve is required to open with applied pressure (NO valve) in 1-3 seconds as a safety flow divert. Engineer sizes upstream Fisher regulator with 90 psig upstream, solenoid, and valve actuator size assuming 35 psig to achieve that open time. But when the valve closes, it needs to do so slowly so as to not water hammer the upstream system. Engineer adds a vent orifice to achieve 20-30 seconds open time.

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Valor Surrebuttal, Pneumatics Sizing

- The point is that **demand rate is NOT the same as vented rate**.
- One cannot use the emission factor studies (which are exhausts) as a basis for instrument air sizing which is a study of baseload and peak demand of instrument air. That is just not correct.
- Therefore, process is to know your end valves/devices, know the peak and baseline demands, size the hydraulic horsepower required, and then add electric motor efficiency, and round to the nearest 5, 10, 15, 20 , 30, etc horsepower.

  - Note, NMED/ERG cost data used 4 HP, 16.1 HP, etc which are not standard sizes. Valor used cost estimate for closest/commercially available HP.

Valor Surrebuttal, Pneumatics Cost Analysis

- Regardless of how you size air compressors, there are standard packages being used/sold: 5, 15, 30, 60 HP packages. Costs reflect actual hard quotes from recent projects.
- Costs for other equipment were from recent projects
- Costs for installation vary, therefore Valor used NMED/ERG's assumption of 50% of the capital cost is installation.
- Installation includes field services time, construction manager, crane time, etc, etc. Even though packaged units come fully assembled, and they offer commissioning support, there is installation costs associated with the "balance of plant".
- Valor costs estimates were from one-off quotes, and not RFP for 1000's of units. With supply chain severely inhibited by COVID, potential costs are even more.