Bellows Contingency Plan

Risk Assessment

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Recap: Deformation from Pressure

- After filling to 4 psi. closed valve and disconnected parts (rated +/- 20 psi)
- Bellows status here
  - Plastic deformation
  - Spring constant probably changed
- Did some rough estimating with CAD
  - Roughly 3” +/- 0.5 extension on bellows
  - Our limit is 2.5”?

Caveat: this is after a little bit of work done towards fixing the bellows

Current State

Current Documentation

- Cycles:
  - +/- 0.78”, 1.5mil cycles to failure
  - +/- 2.5”, 2900 cycles to failure
  - +/- 4.7”, 239 cycles to failure
- These are strictly statistical, so the 4.7” deflection could be taken with a grain of salt….
- With my rough calculations for deflection, why did we see a large deformation….

Impact of damages

- Will this effect bellows events?
  - Particulates do “flake” off, but this will be removed in cleaning.
- How many cycles can we still achieve with a normal deflection of 0.75” (expected travel distance of compression/expansion)
  - Realistically, the deformation probably reduced this by 50%
- The PICO-40l bellows were damaged, but they still work fine.
  - How were these bellows damaged?
- We won’t know the true leak rate until we install the jars

What if they fail after construction

- Decommissioning of the detector will take roughly 1.5 years and loss of data
  - Deconstruction of PV and IV, cleaning of parts (jars, hardware, etc), personnel to do this
- Roughly $31,000 and 4 months for procurement, manufacturing, and shipping of the new bellows
  - Is this in our budget?

Moving forward

- Decide as to whether we purchase a new bellows
  - And will use these bellows in the construction
- In favor of using current bellows
- We can reshape the bellows, as done before at UofA
  - But will this cause more damage?
- Is there going to be a hydrostatic test on the bellows?

Discussion

Questions?