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Accumulator Safety Issue

While testing MUX pods after an extensive overhaul, the rig's subsea staff noticed erratic behavior from the subsea manifold regulator for the blue pod. Sometimes the pressure would increase several hundred psi with one push of the increase/decrease button, and sometimes the pressure would hardly change at all. The staff suspected a faulty pilot accumulator, so they removed it from the pod and mounted a new unit.

In the subsea shop, the gas charge port was opened to vent the nitrogen pre-charge to the atmosphere. With the accumulator separated from the pod, the fluid port was already at atmospheric pressure. With all pressure released, the subsea helper unscrewed the gas end cap.



Bladder, internal molding and gas end cap ejected from accumulator



Accumulator body in vise after ejecting contents

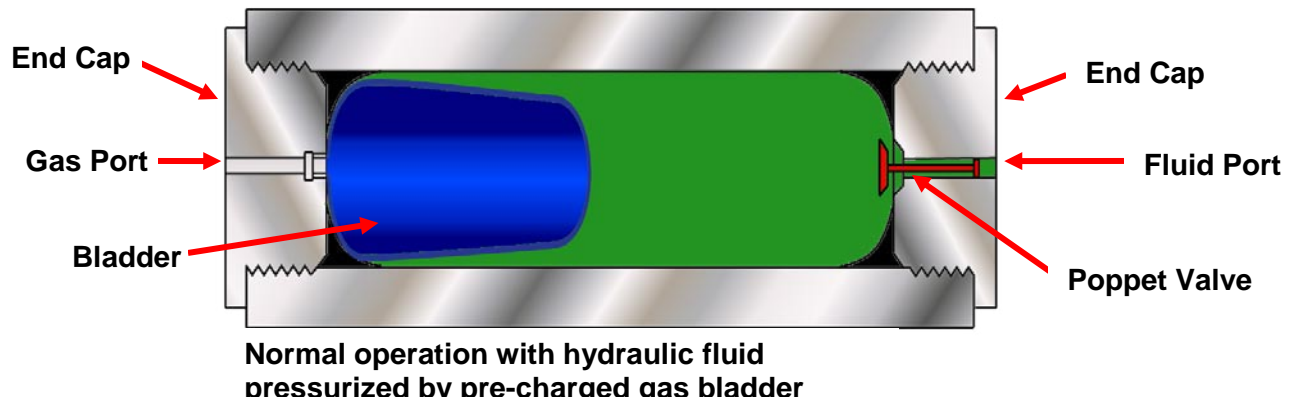
When the gas end cap (eight to ten pounds in weight) reached the end of its threads, it was ejected violently from the accumulator barrel — flying about eight feet across the workshop before hitting the bulkhead and dropping to the floor. Obviously, the potential for injury to anyone in the path of the flying cap was high.

Description of Issue

How could this happen?

Clearly, pressure was trapped in the accumulator even after opening both the fluid and gas ports. A rig investigation did not uncover a definite cause.

Regardless of the cause, this incident reinforces the rule that only trained personnel should be allowed to work with high-pressure equipment.



In this case, the accumulator design includes a large end cap exposed to any pressure in the accumulator body. Other designs, such as piston accumulators, have similar screw-in caps. With these designs, it is especially important to remove all pressure before disassembly.

Solution

There are a number of procedures for detecting and dealing with trapped pressure. Below are just some examples:

- If there is a poppet valve and the end is accessible, you can check to see if the valve is open by measuring the position of the poppet from the bottom of the accumulator. If the poppet is open, there can be no pressure trapped inside. Note that this measurement will differ depending on accumulator size and manufacturer.
- Removing valve stems will minimize the potential of a clogged valve.
- Removing valve bodies or other small access points may relieve pressure and/or allow inspection via measurement or fiber optic scope.
- The torque needed to unscrew some part of an unpressurized vessel will significantly decrease after the first 1-3 turns. You should be suspicious if the torque stays high, and should immediately stop work to investigate. While corrosion or seized threads can have the same effect, you should make absolutely sure that trapped pressure is not a cause.

Of course, proper training and tools, and proper oversight of new personnel are the first and best lines of defense.

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