Development of a Rotational Connection for Severe Operating Conditions

Overview
In the Omega SD fire monitor, operating torques are excessively high, causing fatigue after prolonged operation. In addition, the monitor is not optimized for cost.

Objectives
- Maintain Baseline Performance
- Reduce Operating Torque by 25%
- Reduce Cost of Connection by 15%

Approach
- The team visited Akron Brass to discuss and quantify the problem with an engineer and test the monitor
- The team brainstormed to generate many concepts. These were narrowed down based off of how well each idea matched the sponsor’s needs
- Patents were researched in order to inspire, refine and focus new ideas and research
- Loading was determined both by conservation of linear momentum hand calculations and finite element analysis.
- CAD models and drawings were developed on Solidworks
- New Teflon bearings were machine using a water jet, while a torque testing apparatus was machined on an end mill.
- Friction and torque tests were conducted with a force gauge. Bearing distance testing will happen in Akron after sleeve inserts are machined.
- Spacing out the bearings farther will theoretically lower torque around 35%. Switching to Teflon bearings was experimentally verified to lower torque around 30%.
- A unique hydrostatic bearing was designed as a secondary solution.

Outcomes
- Simplifying the braking system and eliminating the drain plug will reduce the cost of the point by an estimated 17%
- Spacing the bearings out will reduce torque by 35%
- Changing the bearing materials will reduce torque by 30%
- The hydrostatic bearing is a novel solution that can be developed further.