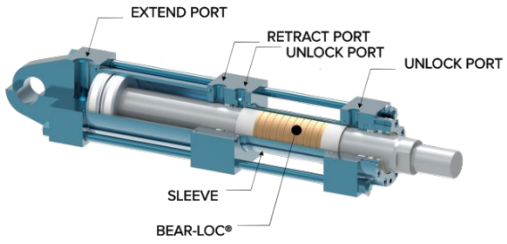
The Bear-Loc® Enables Failsafe Valve Control For Safe Castaic Power Plant Electric Supply.

Marcel van Niekerk, 04.02.2024

Aerial photograph of Castaic Lake and Castaic Dam. By Chevy111 - Own work, CC BY-SA 4.0, https://commons.wikimedia.org/w/index.php?curid=45535740

The Bear-Loc® hydraulic rod locking actuator is a proven and reliable customizable failsafe solution for hydro control systems. York Precision Machining & Hydraulics recently refurbished and updated a Bear-loc unit, equipped with our positive locking technology, that is in service at the Los Angeles Depart of Water Resources' Castaic Power Plant [1]. This is one of two units which have been in service since the early 1970's.

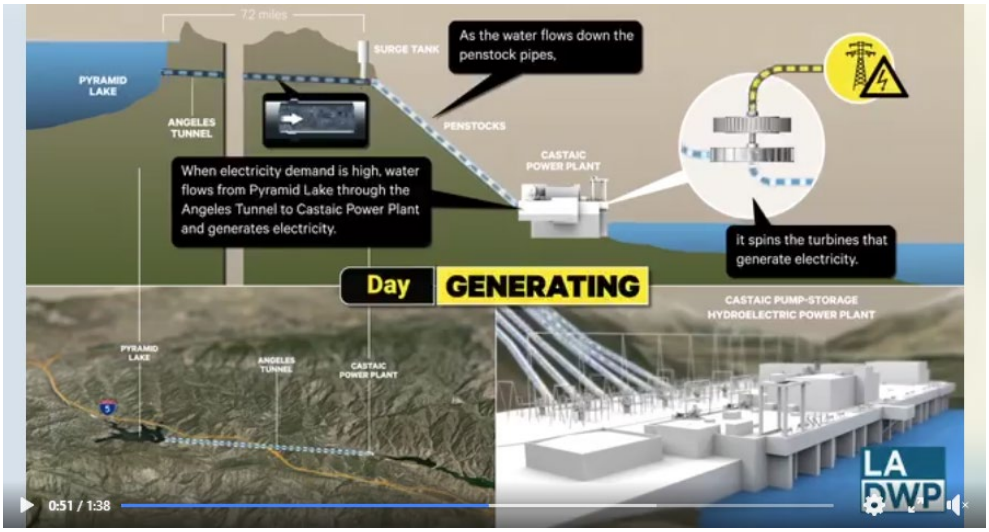
This Bear-Loc® boasts a 7" Rod with a 106,000 lbs of load holding capacity. Operating at 2000 psi which is now equipped with our latest liner locking technology, ensuring decades of zero-drift instantaneous locking capabilities. This not only contributes to system, equipment, and personnel safety, but also helps ensure safe maintenance working conditions at the Castaic Power Plant.



Bear-Loc® Operating Principle - How Does Bear-Loc® Work? By YPMH https://yorkpmh.com/products/bear-loc/

The Bear-Loc® is an industry leading failsafe load-holding solution that requires minimal maintenance and boasts efficient operation due to its innovative design that eliminates dependence on moving mechanisms that are susceptible to system wear. The Bear-Loc® is designed with a precision interference fit that allows locking capability along any phase of the stroke. When hydraulic pressure is applied, relieving the interference fit, the sleeve expands radially within its elastic limits, allowing the rod to move freely. Once pressure is removed intentionally or lost due to hydraulic failure, the Bear-Loc® locks instantly, ensuring the actuator is locked in place without any drift within its rated load holding capacity [2].

Per the LADWP, the Castaic Power Plant provides peak-load power during the day by water flowing downhill along the Angeles Tunnel between Pyramid Lake at an elevation of 2,572 feet to the Castaic Power Plant at 1,519 feet [3], where it is stored in the Elderberry Forebay, before it connects with the main water body of the Castaic Lake. The Angeles Tunnel is a seven-mile long, 30 feet in diameter underground conduit with bidirectional flow capabilities [4]. At night, during off-peak hours water is pumped back by the reversible units from the Elderberry Forebay to Pyramid Lake through the Angeles Tunnel which reduces the energy costs associated with moving water along the California Aqueduct [5].



The LADWP has a very informative animated video that explains how the Castaic Power Plant system operates during peak demand hours and off peak times of the day. This video can be watched on LADWP's Facebook page https://www.facebook.com/watch/?v=1802036736653442

The Castaic Pumped-Storage Plant not only assures the availability of 10,000-acre feet of water for on-demand power generation but also provides the means to channel the water supply through the Castaic Power Plant in a short time frame. This allows meeting short-term peak demands on the LADWP's electric system by means of the bidirectional energy generation by day and water conservation by night capabilities of this dual-purpose design.

Picture of the Castaic Power Plant taken by a power plant worker facing east from the Elderberry Forebay. By Sirbatch at English Wikipedia, CC BY-SA 3.0, https://commons.wikimedia.org/w/index.php?curid=86486796

The Castaic Power Plant's critical infrastructure relies on the Bear-Loc®'s load holding capability in the penstocks and piping in-stream release structure, where the Bear-Loc®'s infinite positioning ensures the valve can be positioned and locked at any point in the stroke without the limitation of preset locations. Penstocks commonly serve the purpose in hydroelectric systems of controlling water flow between reservoirs and hydro-turbines [5]. YPMH's Bear-Loc® rod locking device secures a critical 114" Butterfly Valve which controls waterflow in the penstock system where water pressure is closely monitored and regulated with precision. The Bear-Loc® is a preferred solution for this application as it lends itself to precision adjustment of flow rates and system control without the risk of drift as experienced with non-mechanical load holding solutions.

The Castaic Power Plant has a nominal installed capacity of over 1,500 Megawatts (MW), supplying power to over 1.4 million homes. The plant is equipped with six reversible 250,000 kilowatt (Kw) main units and one conventional 55,000 kW auxiliary unit which serves as a pump-starting unit for the six reversible units. Infrastructure of this magnitude depends on the precision machining, quality, and reliability that the Bear-Loc® offers with its track record of decades of failsafe service across multiple industries and demanding environments.

The Bear-Loc® hydraulic locking system is a customizable hydro-industry solution that not only helps optimize control system performance, but also effectively reduces maintenance costs and associated downtimes, while extending equipment service life and ensuring the safety of employees.

Works Cited

1. *Los Angeles Department of Water & Power*. Castaic Power Plant, 4 February 2022, facebook.com/LADWP/videos/the-castaicpowerplant-is-ladwps-unique-pumped-storage-power-plant-offering-1265-/1802036736653442/. Accessed on 02 April 2024.

2. York Precision Machining & Hydraulics. Bear-Loc Operating Principle – How Does the Bear-Loc Work?, 2024, https://yorkpmh.com/products/bear-loc/.

3. *Castaic Lake* (PDF). California Department of Water Resources. 2007. Archived from the original (PDF) on 2014-07-03. Accessed on 02 April 2024

4. "South SWP Hydropower - Project No. 2426". California Department of Water Resources. Archived from the original on November 3, 2013. Accessed on 02 April 2024.

5. *Pyramid Lake* (PDF). California Department of Water Resources. 2000. Archived from the original (PDF) on 2016-03-04. Accessed on 02 April 2024.