TAYLOR SNUBBERS™

PROVIDE SUPERIOR SHOCK PROTECTION FOR MAJOR POWER PLANT SYSTEMS

Design based on extensive experience in heavy industry, aerospace, and power generation applications.

Optimized design with a minimum of component parts.

Operationally proven in nuclear and fossil generating stations in North America.

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Taylor Devices, incorporated in 1955, is known worldwide for its product line of shock absorbers and high pressure hydraulic systems for critical applications.

The Taylor Devices hydraulic Snubber design combines a hydraulically balanced piston rod with a positive internal pressure of 2000 to 4000 psi. This positive pressure automatically eliminates air voids and maintains sealing contact to preclude leakage over long periods of time. In addition, positive internal pressure minimizes the effect of radiation shrinkage on seals.

**TAYLOR SNUBBERS DESIGN FEATURES**

**BALANCED ROD CONSTRUCTION:**
The piston rod of a Taylor Snubber extends entirely through both ends of the fluid chamber. Thus, when the Snubber is stroked, there is no net oil compression or displacement by the piston rod. This eliminates the need for external valves, piping and accumulator, all potential sources for maintenance and malfunction. In addition, the balanced rod design supports the piston rod at both ends, greatly increasing its ability to withstand off-center or bending loads. A third advantage of the balanced rod is that both compression and extension snubbing valves are identical, with no biasing required to allow for piston rod displacement. The piston rod is fully machined from solid PH type stainless steel, is through hardened, then hand lapped to a mirror-like one micro-inch surface finish.

This exclusive technique reduces drag force, enhances seal life, and eliminates the pitting and peeling of chrome plated rods in corrosive environments.

**POSITIVE INTERNAL PRESSURE:**
A 2000 psi nominal pressure provides an inherent 5% compressed internal fluid reservoir while at the same time activating Taylor patented pressure seals and eliminating air voids. The ability of the 2000 psi positive pressure to exclude dirt, moisture, and air from the Snubber is far superior to the current industry approach of low pressure spring loaded accumulators.

**SNUBBING VALVE:**
An internal plate valve with redundant coil springs is equipped with an integral thermostat to provide less than ±15% variation in lockup set points from -20°F to +150°F. The snubbing valve seats around the piston rod, and its gap is maintained by coil springs set into the piston head. Depending on the Snubber size, between four and twelve springs are used, in a parallel combination for maximum reliability. A doughnut shaped temperature compensation ring sets the valve clearance and expands and contracts with the temperature of the silicone fluid, thus automatically adjusting the valve clearance to maintain the desired lockup rates. The low mass and large area of this exclusive valve design allow Taylor Snubbers to respond to shock frequencies in the range of ½ Hz to 40 Hz. This yields maximum protection for power industry use, particularly when seismic disturbances are involved.

**DYNAMIC SEALS:**
Taylor's unique seal design of DuPont Hytrel is suitable for service to 10⁶ rods in nuclear environments. The seal design incorporates the pressurized cold flow properties of Hytrel suitable for a 40 year seal life. As the seal wears on the piston rod, minute quantities of new seal material automatically cold flows in to replace it. Due to the cold flow of Hytrel under the positive pressure of a Taylor Snubber, this seal design is nearly totally free from radiation and thermal shrinkage.

Our seal materials have radiation test data indicating that they will perform as designed up to 10⁶ rods. This, along with our 30 year track record of pressurized units having similar design, leads us to believe our Snubber is truly "Life of the Plant," with little or no maintenance required.

**EXTERNAL GUIDE SLEEVE:**
Taylor Snubbers utilize a rugged sliding steel guide sleeve installed over the piston rod. This exclusive design feature offers protection of the piston rod from hostile environments, and a significant increase in structural rigidity under lateral loading.

In addition, the guide sleeve prevents external contaminants from reaching the rod, and reduces side load on the Snubber piston rod.

**IN LINE TESTING CAPABILITY:**
Taylor Snubbers can be furnished with fittings and internal stops for testing in place.

Standard Models, Small Bore Capabilities from 40,000 lbs. to 150,000 lbs.

Standard Models, Large Bore Capabilities from 300,000 lbs. to 1,000,000 lbs.

Retrofit and Custom Applications Capabilities from 350 lbs. to 3,000,000 lbs.

**QUALITY ASSURANCE PROGRAM:**
Our Quality Program is fully qualified to 10CFR50 Appendix B.
Standard Models
Large Bore Taylor Snubbers

- Lockup and bleed rates supplied as specified by customer.
- Maximum drag force is 2% of capacity.
- All dimensions in inches.

<table>
<thead>
<tr>
<th>CAPACITY</th>
<th>&quot;A&quot;</th>
<th>&quot;B&quot;</th>
<th>&quot;C&quot;</th>
<th>&quot;D&quot;</th>
<th>&quot;E&quot;</th>
<th>&quot;F&quot;</th>
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<td>3000 LBS</td>
<td>11.00</td>
<td>10.00</td>
<td>3.25</td>
<td>4.50</td>
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<td>31.50</td>
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<td>10000 LBS</td>
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<td>16.00</td>
<td>6.00</td>
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<td>15000 LBS</td>
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<td>8.60</td>
<td>10.25</td>
<td>6.25</td>
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Standard Models
Small Bore Taylor Snubbers

Notes:
1. Threaded rod may be ordered to fit existing requirements.
2. For various length requirements, threaded pipe with an adjustable (±1 inch) clevis is added.
3. For clevis to clevis (no threaded pipe adjustment) add the "H" dimension for OAL retracted pin to pin.
4. Lockup and bleed rates as specified by customer.
5. Maximum drag force is 2% of capacity.
6. All dimensions in inches.

<table>
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<tr>
<th>CAPACITY</th>
<th>STROKE</th>
<th>LENGTH RETRACTED</th>
<th>&quot;A&quot;</th>
<th>&quot;B&quot;</th>
<th>&quot;C&quot;</th>
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<td>1.87</td>
<td>1.34</td>
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Taylor Snubber Extender Pipe & Clevis
Dimensions

Notes:
J. Pipe diameter to be determined by faulted Snubber load and overall length pin to pin.
K. OAL of extender pipe and clevis dimension to be added to OAL of Snubber retracted dimension for total OAL of Snubber pin to pin.
L. Clevis dimensions match that on Snubber.
M. One inch ± adjustment if desired.

Information required by Taylor to determine proper Snubber selection:

- Snubber Capacity
- Required Bleed Rate at upset condition or faulted load
- Bleed Rates
- Lockup Rates
- Required Stroke
- Ambient temperature ranges
- Drag Force requirements, if less than 2% of load
- Hydraulic Fluid specifications, if required

Taylor specializes in retrofit and custom applications. Capacity of 350 lbs. to 3,000,000 lbs. can be accommodated.