

About

Mechanical and Hydraulic Snubber Test Facility

Hydraulic Snubber used in sodium piping systems is designed for seismic loading to reduce the seismic induced forces on these piping systems. Nearly 500 numbers of Snubber are installed on various sodium piping with diameters ranging from 15 NB to 800 NB. Load capacity and stroke length of this Snubber vary from 15 KN to 200 KN and 100 mm to 300 mm respectively depending on the support locations and size of the piping system. Performance of this Snubber has been tested at factory as a part of quality assurance program during manufacturing. The Snubber is connected to the piping by means of yoke type clamps. In service inspection (ISI) of the installed Snubber needs to be conducted to ensure no degradation of their performance during the service life in the reactor. ISI of Snubber is done as per the guidelines of ASME BPVC Section XI Division 3:- "Rules for Inspection and Testing of Components of Liquid Metal Cooled Plants". Sample sets of specific number of Snubber are selected for the performance testing during inspection intervals specified as per the ISI program of the plant. A Snubber test facility needs to be installed for this purpose. This document gives the conceptual design and working principle of Snubber test facility for in service performance tests of the Snubber used in the plant.

Universal Snubber Test Facility is a modular and versatile system designed to evaluate and verify the performance characteristics of snubbers. It accommodates various snubber types (mechanical, hydraulic, and electrical) across a range of loads, speeds, and environmental conditions.

Physical Dimensions:

Frame Size: Adjustable to accommodate snubbers from 100 mm to 3 m in length.

Weight Capacity: Up to 5000 kg.

Machine Footprint: 3m x 4m (expandable with optional modular extensions). Mechanical System

Load Actuation:

Hydraulic cylinders: Up to 250 kN force.

Dynamic actuator: Up to ± 50 mm stroke at frequencies up to 5 Hz.

Support System: Adjustable clamping points for various snubber geometries.

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Specification

Snubber Designation: Hydraulic/Mechanical

Load frame Stiffness: 1500 MN/m

Test load: 25 Ton

Velocity generating capacity: 0.1 mm/sec to 15 mm/sec

Acceleration generating: 250 mm/sec²

Length adjustment of the moving beam: 1200 mm

Locking of Moveable Beam: positive hydraulic clamp which is locked without hydraulic pressure

Stroke Length: 50 mm to 300 mm

High precision Servo Actuator capacity: up to 50 Ton.

Hydraulic Power Pack capacity: up to 300 bar.

Software: Lab view

Hardware: NI/PLC

Instrumentation & Measurement

- Force Sensors:
 - ✓ Accuracy: $\pm 0.5\%$ of reading.
 - ✓ Range: 0.1 kN to 250 kN.
- Displacement Sensors:
 - ✓ Resolution: 0.01 mm.
 - ✓ Range: Up to 200 mm.
- Data Acquisition: 16-bit system with 1 kHz sampling rate.

Operating Conditions:

- Temperature Range: -40°C to 150°C (environmental chamber option).
- Humidity Control: Up to 95% RH (optional).

Control and Interface:

- Controller: PLC-based system with user-friendly HMI.
- Connectivity:
 - ✓ USB, Ethernet, and Wi-Fi for remote monitoring and control.
 - ✓ Supports SCADA integration.
- Software:
 - ✓ Pre-programmed test protocols with custom scripting options.
 - ✓ Real-time data visualization and automated reporting.

Power Requirements:

- Input Voltage: 380-480V AC, 50/60 Hz, 3-phase.
- Power Consumption: 10 kW (max).

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Description Of Test

- ❖ Free working test and measurement of stroke.
- ❖ Measurement of drag and break away force.
- ❖ Measurement of blocking Speed and Activation level.
- ❖ Measurement of Drift Speed and Test load.
- ❖ Measurement of spring rate.
- ❖ Measurement of Lost Motion.

Key Features

- ❖ Fully Automatic Powered by Lab view software.
- ❖ Can Test Both Hydraulic and Mechanical Snubber.
- ❖ Highly Robust and Rigid Test Bench.
- ❖ Integrated with Friction free, highly precise Servo actuator with high accuracy SSI Linear position sensor.
- ❖ All Size of Snubber can be tested.
- ❖ Highly compact and User Friendly.



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Applications

Hydraulic and Mechanical Snubbers are used extensively in sodium piping, nuclear plant, and critical power plant for seismic loading to reduce the seismic induced force on these piping, nuclear reactors etc.



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