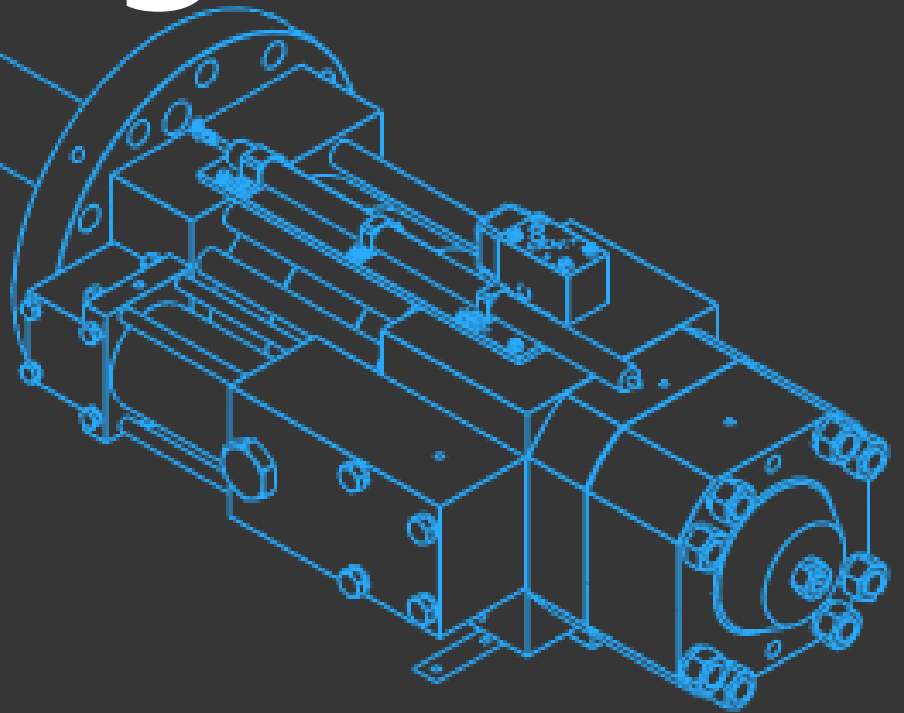


Power Plant Core Hydraulic System
Engineering Specialists

enesG Catalog



Global Energy Service

enesG worldwide

enesG Hydraulic Technology — Reliability and Safety for Power Plants



Turbine valve hydraulic actuators are critical systems that operate turbine valves and protect the plant's core equipment.

System failures can cause turbine damage and efficiency loss — making hydraulic system integrity a top priority.

enesG designs, manufactures, and maintains hydraulic systems for power plants, leveraging accumulated engineering expertise to improve operational reliability.

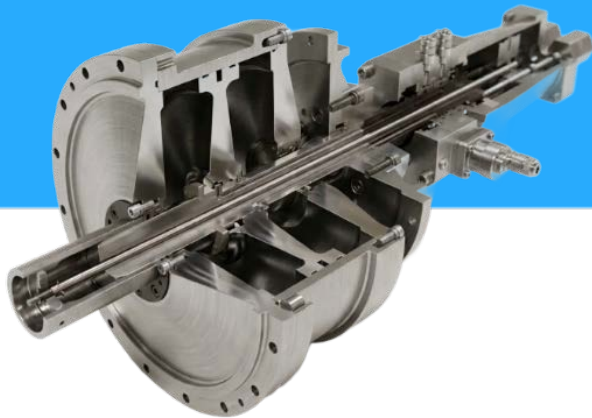
Key Clients



Engineering Excellence Defines Quality

Equipment reliability starts with maintenance.

enesG ensures stable plant operations through precision maintenance and proven technical expertise..



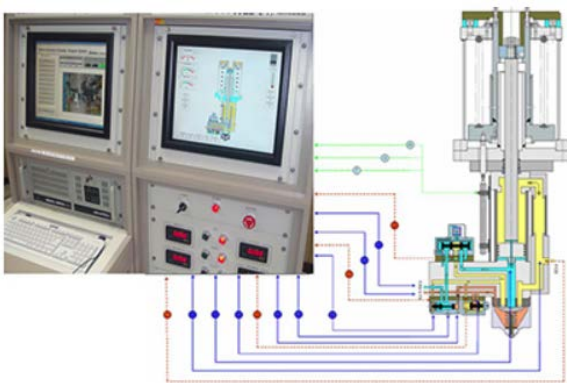
Maintenance & performance diagnosis of boiler control actuators

- ✓ axial fan hydraulic cylinders
- ✓ FGD booster fan hydraulic cylinders



Oil flushing Unit

- ✓ Turbine EHC system — remote-controlled oil flushing unit
- ✓ Turbine lube oil system — remote-controlled oil flushing unit



Actuator Maintenance & Universal Performance Testing

- ✓ On Thermal, nuclear & combined-cycle power plant actuator overhaul
- ✓ Air Vent System
- ✓ Actuator design, fabrication (spare parts supply)



Control System Hydraulic Valves

- ✓ Turbine emergency trip system (ETS) hydraulic valve maintenance & diagnosis
- ✓ Main TBN, BFP-T (MFWP-T), Main Steam, BFP-T Sol Valve Servo Valve maintenance & diagnosis

Contents

HPU Test Equipment 4p

Oil Purifier 5p

Flushing Unit ✓ TBN Oil Flushing 6p

✓ TBN Oil Flushing Block 7p

R&D Projects ✓ Rexroth 8p

✓ MHI 9p

✓ IH Convertor 10p

HPU Test Equipment

The HPU is a core system that delivers stable pressure and flow to hydraulic circuits. Precise pressure control and high-reliability components directly determine equipment performance and response.

enesG designs and manufactures custom HPUs for diverse operating conditions, as well as portable HPUs for field deployment.

[Hwacheon Hydro] Hydraulic System for Hydro/Pumped-Storage Governor Control

✓ Objectives

- Drive governor hydraulic system for hydro/pumped-storage Plants
- Monitor and log governor hydraulic system operation
- Control power supply and display interface
- Variable servo motor stroke profile setting
- Automated endurance testing with data logging

✓ Scope

- Pump & Solenoid Valve On-Off
- Servomotor Servo motor displacement and timing input
- Servomotor Ramp, Step Movement



Oil Purifier

The oil purifier maintains lubricant cleanliness by continuously removing moisture and particulate contaminants during operation — extending oil service life, minimizing internal deposits, and ensuring stable plant operation.

enesG designs and manufactures oil purifiers to support lubricant condition management and improve equipment reliability.

Oil Purifier

✓ Key Features

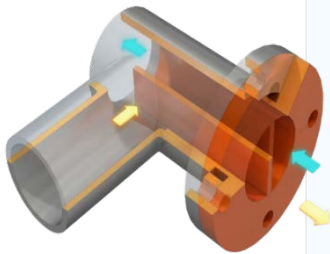
- Particulate removal (Beta ratio $\geq 4,000$ / electro-static purification filter)
- Moisture removal (effective on EHC oil)
- Degradation byproduct removal (sludge, varnish, dissolved contaminants, acids)
- Real-time oil condition monitoring (contamination level & moisture)



Flushing Unit

The turbine lube oil system supplies lubrication and cooling oil to rotor bearings, with oil flushing performed at every planned maintenance outage. enesG designs and manufactures flushing equipment with high-efficiency filtration and real-time monitoring, delivering field-optimized solutions.

TBN Oil Flushing



[KOSPO] Turbine Oil Flushing Unit Development

- ✓ Problems with Conventional Design
 - Flushing halted and filters replaced each time bearing differential pressure was triggered.
- ✓ Objectives
 - Continuous flushing without differential pressure interruption
 - Real-time flushing status monitoring
- ✓ Scope
 - Adapter-based oil bypass routing
 - Duplex filter for uninterrupted flushing
 - Isolation valve for block cleaning capability
 - Filter ΔP , oil temperature, and contamination monitoring



Category	conv	Unit applied
Manpower	16MD	10MD
Duration	3D	2D
Filter Replacements	6~10	None
Pump Stops	6~10	None
Real-time Contamination Analysis	Not Available	Available
Real-time Pr Analysis	Not Available	Available
Filter Replacement During Flushing	Not Available	Available
Patent	N/A	Pending

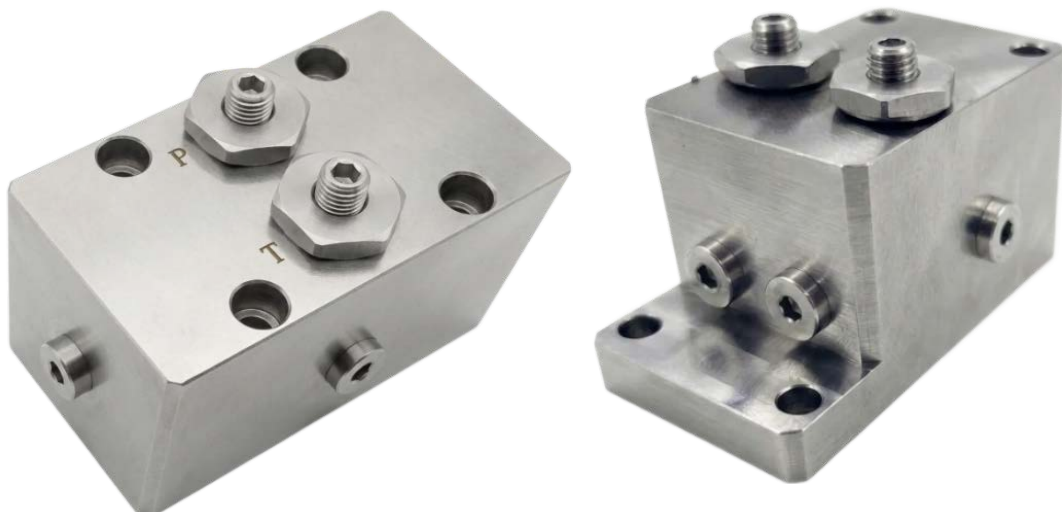
A flow path block used during flushing operations. Unlike conventional plates, integrated isolation valves enable flow control and zone-selective flushing — allowing line isolation and selective cleaning without system shutdown, reducing work time and improving operational convenience.

TBN Oil Flushing Block

- ✓ Problems with Conventional Design
 - Flow rate uncontrollable — all lines permanently open
 - Zone-selective flushing not possible
 - Full system shutdown required during work

- ✓ Scope
 - Integrated isolation valves within the flushing block
 - Flow path control and port switching
 - Interface compatible with existing line configurations
 - Quick-release structure for maintenance convenience
 - Reduced flushing time and operating costs

TBN Oil Flushing Block



R&D Projects

Current actuators rely entirely on imports, making timely spare parts procurement difficult in the event of unexpected failures.

enesG is building technological competitiveness through domestic development, reducing dependence on foreign OEMs.

Rexroth

[KOMIPO] Large Actuator Localization for USC Control Valves

✓ Problems with Conventional Design

- Chronic piston rod external leakage — OEM unable to identify cause or solution
- Non-maintainable structure — replacement only (\$400,000/unit, up to 10-month lead time)
- 100% import dependence on Rexroth — no domestic design or manufacturing base

✓ Objectives

- Domestically produced large actuator with structurally eliminated external leakage
- Maintainable design to reduce plant operating costs
- integration of design, manufacturing, and testing; domestic spare parts supply base
- Zero-failure target over 5-year warranty life

✓ Scope

- Failure cause analysis; foreign component material and equivalent/superior material selection
- Design validation via 2D/3D modeling and simulation
- Test block/Jig design, fabrication, and prototype build
- Certified testing → field validation (6 months)

✓ Key Features

- Optimized sealing structure — side load reduction design eliminates piston rod leakage
- Sleeve Type Cylinder — replaceable liner for damaged sections
- Insert-type Rod Bushing — independently replaceable on wear



[EWP] Hydraulic Actuator Localization for Turbine Valves Optimized for Frequent Start-Stop Operation

✓ Problems with Conventional Design

- Design unsuitable for WSS operation — repeated boundary lubrication of metal piston rings accelerates cylinder wear
- Internal/external leakage and response delay — degraded turbine load control; identical defects reported at other plants
- 100% import dependence on MHI (Japan) — parts procurement difficult on sudden failure; up to 21-day replacement lead time

✓ Objectives

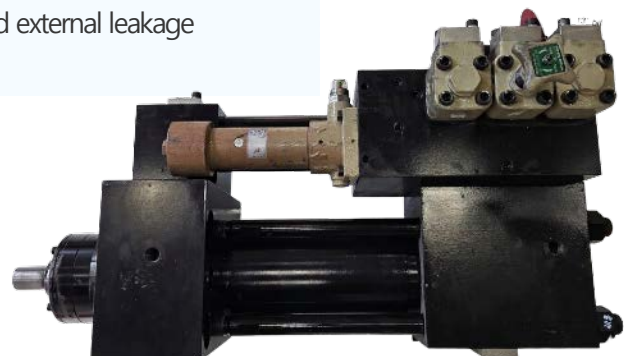
- Domestically produced actuator with enhanced durability for WSS/DSS environments
- Metal contact-free sealing to fundamentally eliminate boundary lubrication issues
- Universal 1:1 drop-in replacement design covering all four valve types: MSV, GV, IV, RSV
- Performance retention up to 2×10^5 cycles

✓ Scope

- Standardized failure mode and root cause analysis for MHI-type actuators
- Pressure-compensating sealing and air vent valve design — 3D validated
- Test Block / Jig design and fabrication
- Prototype → 5-item certified testing → field validation (6 months) → re-testing

✓ Key Features

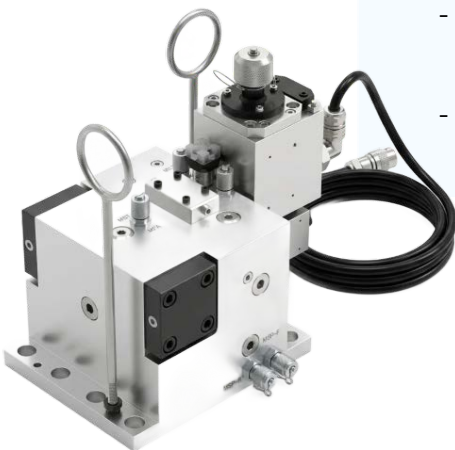
- Pressure-compensating piston seal — metal contact-free design suppresses boundary lubrication and prevents cylinder damage
- Air Vent Valve — active air purge from hydraulic circuit, preventing dieseling
- Rod Sealing Side Load reduction — minimizes bushing wear and external leakage



IH Converter

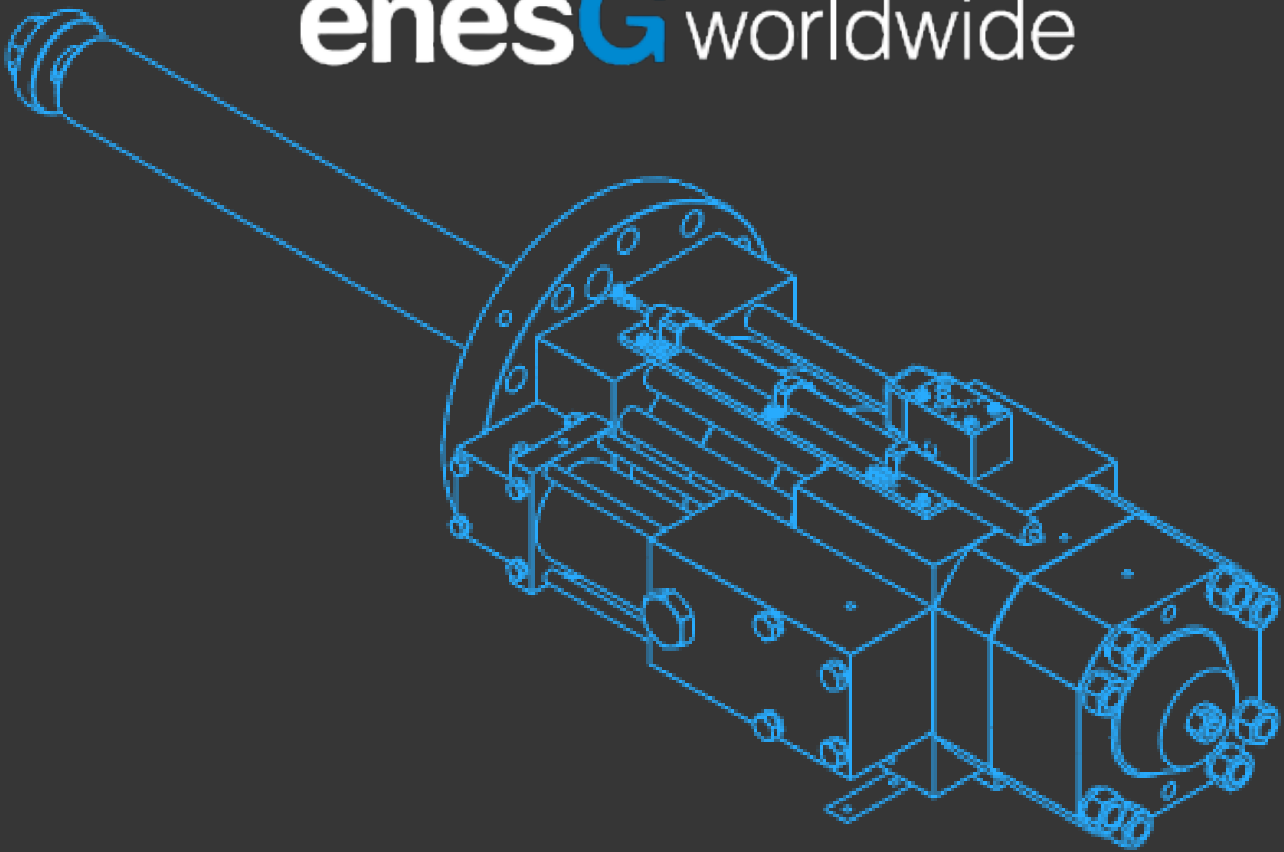
[KOWEPO] E/H Converter Localization for Gunsan Steam Turbine Control Valve

- ✓ Problems with Conventional Design
 - MHI discontinuation notice — sole supplier of 115 domestic units declared end-of-life; no replacement currently available
 - Mechanical control limitations — output tolerance $\pm 8\%$, calibration required every maintenance cycle, poor reproducibility
 - No fault diagnostics — steam valve malfunction causes plant trip, disrupting regional heat and power supply
- ✓ Objectives
 - First domestic electronic E/H converter to replace mechanical type
 - Control oil output tolerance improved from $\pm 8\%$ to within $\pm 3\%$
 - Full compatibility with existing installation position and servomotor — trip protection function retained
 - Performance retention up to 2×10^5 cycles
- ✓ Scope
 - Electronic design and servomotor interlocking design & fabrication
 - Performance test equipment design, fabrication, and interlocking operation testing
 - Certified performance & environmental testing → Gunsan combined-cycle field validation (12 months)
- ✓ Key Features
 - Electronic C.O.P precision control — proportional control oil pressure adjustment to input voltage; improved steam valve opening accuracy and reproducibility
 - Emergency trip protection — immediate control oil shutoff on trip signal; equivalent emergency stop protection maintained
 - Retrofit scalability — applicable to domestic combined-cycle/cogeneration plants and overseas MHI turbine retrofit projects



Global Energy Service

enesG worldwide



본사 및 공장

대전광역시 유성구 테크노 10로 8

팩스 (FAX)

042-718-5121

대표전화 (TEL)

042-718-5089

이메일 (E-mail)

insik.song@enesg.co.kr