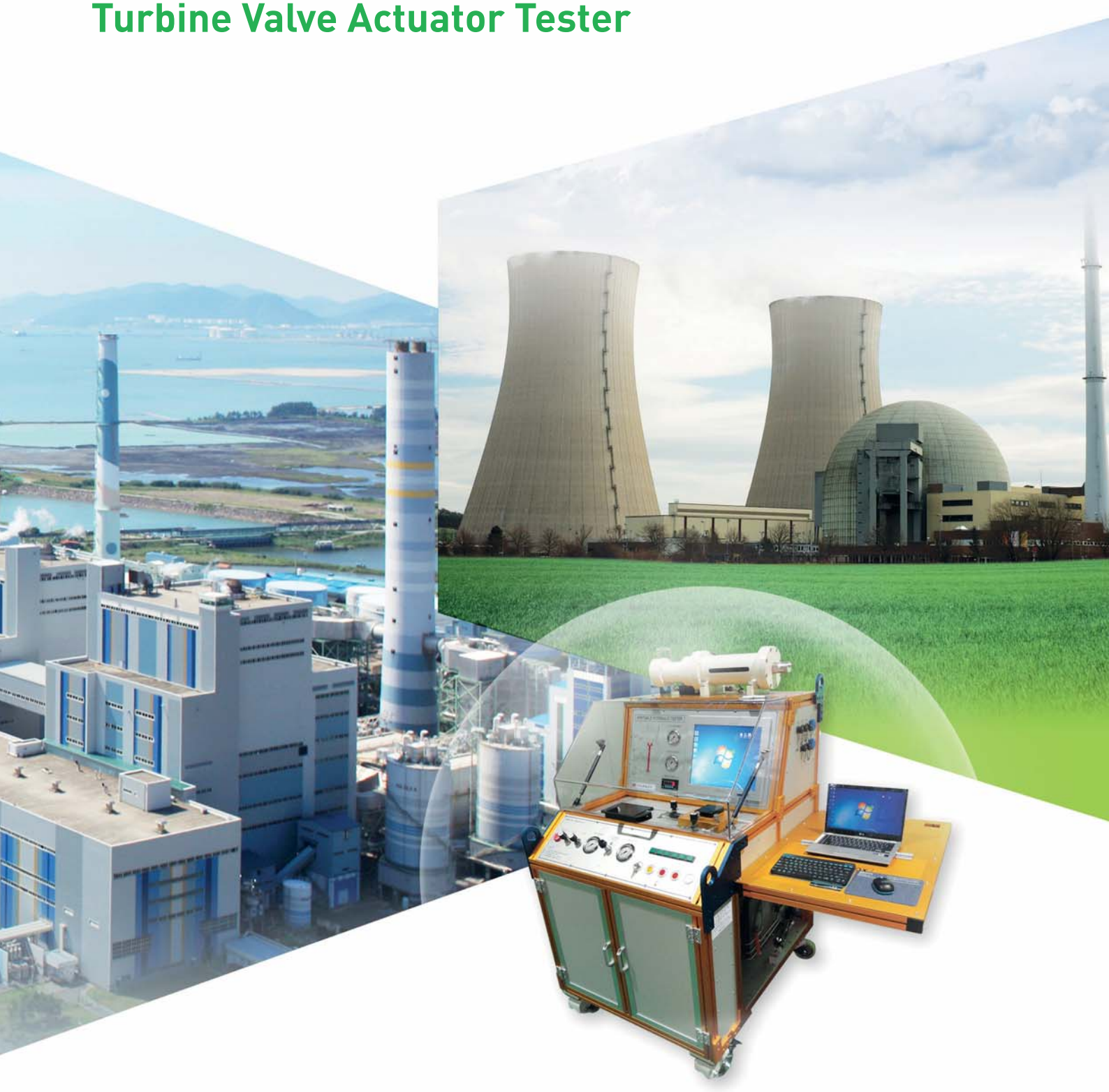
TVAT

Turbine Valve Actuator Tester



Made in Korea

FUTURE AUTOMATION CO.
MIRAE 미래자동화

Introduction of Company

Future Automation Co., Ltd. was founded in May 1998 as a company with the mission of "Challenging mind and customer satisfaction". Through the engineering, design, manufacture and installation of industrial sectors' pneumatic, hydraulic , and vacuum system, we are in charge of the efficiency, environmental management, productivity, and product quality of each industry.

Especially, it is important to check the performance of turbine valve hydraulic actuators, which is a core device installed to control the amount of steam supplied to the turbines of nuclear power plants and thermal power plants. "Performance Prediction Diagnostic Tester for Turbine Valve Hydraulic Actuators (TVAT)" evaluates performance through diagnosis of malfunctions in advance and increased reliability of the power plant's maintenance and diagnosis technology. It was distributed to power plants and favorably received to power generation companies for its successful performance on the power plant site demonstration test.

The "Performance Prediction Diagnostic Tester for Turbine Valve Hydraulic Actuators (TVAT)", the world's first developed tester in the area of futuristic automation, is a new product that has been verified of its performance and successfully applied on the field of power plants. We have gained the new product (NEP) certification, and we are concentrating on expanding distribution to domestic power generation companies . We are also mainly working on strengthening our marketing competence to secure overseas production and sales based in China, Europe, Russia and Southeast Asia, and promoting new market openings.

Thank you

President Engineer K.C YOUN

Corporation History

1998. 05 Establishment of Future Automation Co.
(Company Motto: Challenging Mind and Customer Satisfaction)

1998 ~ Pohang Research Institute of Industrial Science and Technology,
Samsung Heavy Industries, Samsung SDI, Samsung Electro-Mechanics,
Registered Renault, Samsung Motors and Daewoo Shipbuilding as supplier

2010. 08 **Certified as Venture business**

2011. 05 Submitted for "Busan International Machine Tool Exhibition"

2011. 12 Submitted for "2011 Korea invention patent exhibition"
Awarded by Minister of Knowledge Economy (Gold Prize)

2008 ~ Patent registration: 10 cases (PCT international application: 2 cases)

2012. 03 Submitted for "Busan International Nuclear Industry Exhibition"

2012. 05 **"Turbine valve actuator tester(TVAT)"** first supplied First time supplying the
power generation, Korea Southern Power (KOSPO)

2012. 08 Factory Registration

2012. 10 **Certified Quality Management System (ISO9001)**

2013. 04 Selected as a preferred product for public agency purchase

2013 ~ Submitted for "International electric power, power generation industry exhibition"
&"Busan International Environment & Energy Industry Exhibition"

2013. 10 **Certified as INNOBIZ company**

2015. 05 **Acquired New Product (NEP) Certification** (Ministry of Commerce, Industry and Energy)
"Turbine Steam Valve Actuator System Non-isolated Moving Tester"

2015. 10 Submitted for "BIXPO2015" and awarded silver prize for power company group

2015 ~ **Turbine valve actuator tester(TVAT)** scheduled to be supplied
(KOEN, KOSPO, EWP, KOMIPO, WP, KHNP)

2016. 04 Submitted for "Busan International Nuclear Industry Exhibition"

2016. 11 Submitted for "EP China 2016" - Beijing, China

2017. 09 **Designated as a venture business start-up innovative procured product**
(Public Procurement Service)

Certifications, Patents, Awards

Turbine Valve Actuator Tester(TVAT) for Power Plants

Performance Prediction Diagnostic Tester for Turbine Valve Actuators (TVAT)

- Power supply: 380 ~ 480VAC
- Tested pressure: 5 ~ 250 bar (max.)
- Dimensions (mm): 1200 x 1100 x 1750 (H)

※ Specifications are subject to change without notice.

- The "Performance Prediction Diagnostic Tester for Turbine Valve Hydraulic Actuators (TVAT)" has been certified by the Ministry of Industry and Commerce of the Ministry of Commerce, Industry and Energy (NEP). It is a new innovative product of the world's first developed power plant maintenance and diagnostic technology which has successfully received the power plant field test.

- "Turbine Valve Hydraulic Actuators" of thermal power plants and nuclear power plants are important core devices that are installed to control the amount of steam supplied to the turbine, which requires high durability and reliability. It has significantly improved the serious problem of current generation maintenance technology, which couldn't diagnose its performance without separating the hydraulic actuator from the system.

- "Performance Prediction Diagnostic Tester for Turbine Valve Hydraulic Actuators (TVAT)", which is moveable for easy access to the plant site. Without disconnecting the turbine valve hydraulic actuator from the system, it is possible to diagnose performance and this prevents the power plant from being turned off, save enormous maintenance cost, shorten the maintenance period, and determine the replacement period. Stable supply and demand can be expected due to increased reliability of maintenance and improved power plant operation efficiency.

01 Present Problems and Countermeasures for Performanc Prediction Diagnostic Tester for Turbine Valve Actuators

Turbine Valve Hydraulic Actuators are an important key device installed to control the amount of steam supplied to the turbines of nuclear power plants and thermal power plants.

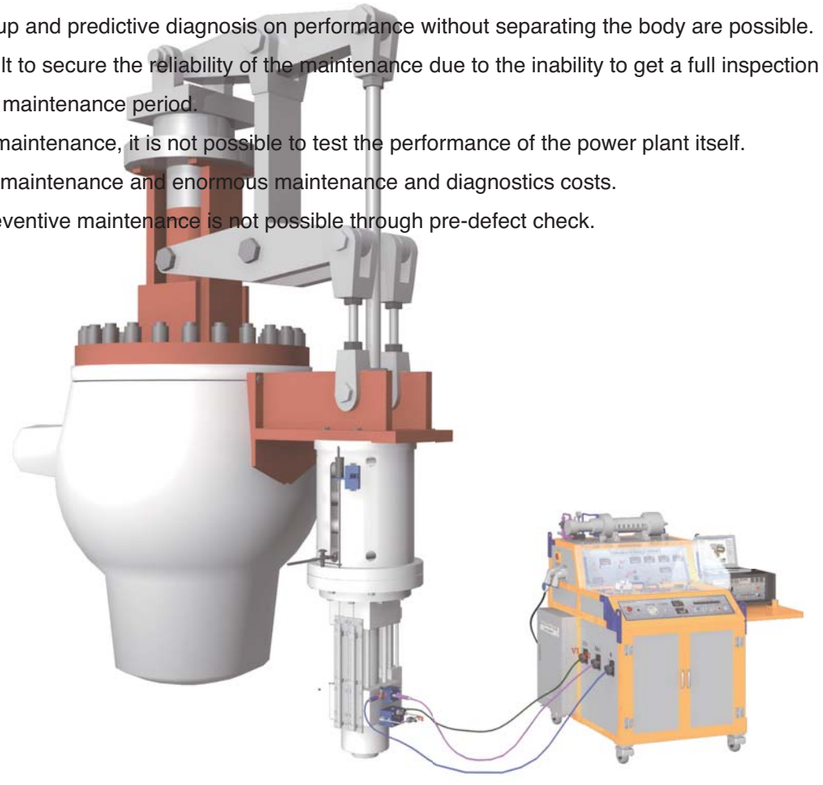

ICV


IV


RSV


CV

- No checkup and predictive diagnosis on performance without separating the body are possible.
- It is difficult to secure the reliability of the maintenance due to the inability to get a full inspection within the maintenance period.
- After the maintenance, it is not possible to test the performance of the power plant itself.
- Delays in maintenance and enormous maintenance and diagnostics costs.
- Actual preventive maintenance is not possible through pre-defect check.



Power plant turbine valve actuator installation site


IV


RSV


CV

MSV


(CV)-R Type


(CV)-R Type


(MSV)-R Type

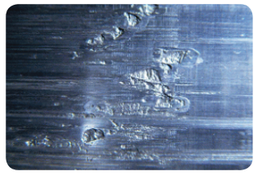

(RSV)-R Type

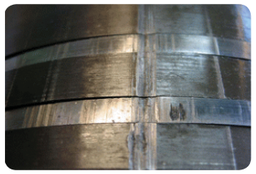
Turbine Valve Hydraulic Actuators are constantly used for one cycle (1.6 ~ 8 years) due to the characteristics of power generation facilities. Despite being the core equipment requiring high durability and reliability, the current maintenance and diagnosis technology cannot check defects in advance without removing the system. It has greatly improved this significant problem.

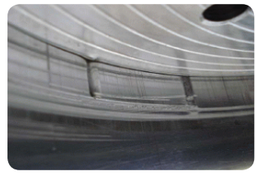
It is not necessary to separate the Turbine Valve Hydraulic Actuators from the system by using TVAT, and it is possible to perform default checks through preliminary full checkup without removing the system, so that actual preventive maintenance and reliability of the diagnosis technology can be increased.

02 Contamination of hydraulic oil due to internal damage of Actuators


Rod cover damage


Tube damage


Piston damage


Internal damage

Turbine Valve Hydraulic Actuators are caused by foreign substance (iron powder) due to internal damage circulating in the hydraulic system, causing the contamination of the hydraulic operating oil to accelerate the abrasion within the hydraulic actuators.

In particular, it has a negative impact on servo control valve (FAS, shut-off valve) and emergency stop valve (ETS, solenoid valve) which are vulnerable to the pollution of hydraulic operating oil. It is a major cause of the frequent breakdown and cutback (power generation reduction).

As shown in the picture above, to check the internal damage condition of the main turbine valve, which is the core equipment of the power plant, the turbine valve hydraulic actuator must be separated from the system and requested to be taken out for maintenance to an outsourcing company.

Disassembling the hydraulic actuator at the repair shop of the outsourcing company is necessary to verify the condition of internal damage visually so that the performance can be checked. The serious problem of the existing power maintenance technology which could not be check defaults beforehand was significantly improved.

Performance Prediction Diagnostic Tester for Turbine Valve Hydraulic Actuators (TVAT) can be used to check the performance of turbine valve hydraulic actuators without separating them from the steam valve system. It can contribute greatly to the actual preventive maintenance, improvement of the reliability of development maintenance (diagnosis) technology, and the improvement of the operation efficiency.

Improving power quality and increasing power generation efficiency can contribute to stable power generation.

03 Necessity of Performance Prediction Diagnostic Tester (TVAT) before malfunctioning

Turbine Valve Hydraulic Actuators are core devices of nuclear power plants and thermal power plants. Although high durability and reliability is required due to the characteristic of power generation facilities, the present inspection method can only carry out maintenance limited to specific hydraulic actuators that are checked to have trouble and it can not be diagnosed without separating the hydraulic actuator from the system.

It is a portable on-site performance prediction diagnostic tester that doesn't have to go through the inconvenience of separating the hydraulic actuator for unnecessary maintenance and reinstalling. It does not incur huge maintenance cost and allows the full inspection within a fixed maintenance period.

Actual preventive maintenance is possible through preliminary full inspection and performance evaluation without separating the Turbine Valve Hydraulic Actuators from the steam valve system.

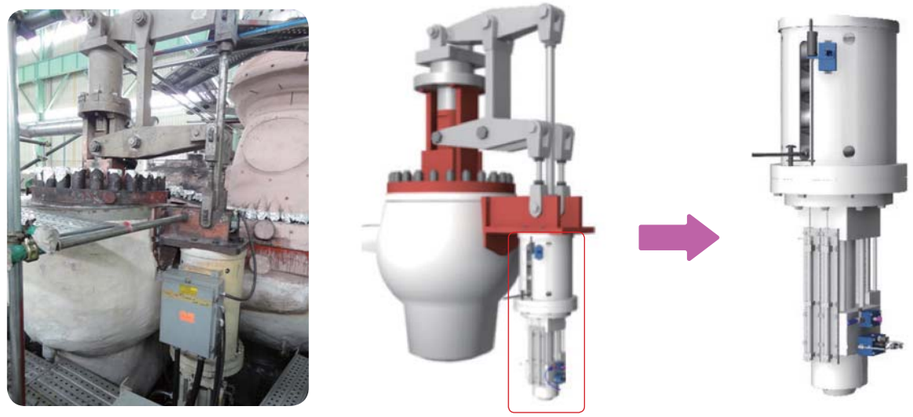
Maintenance cost dramatically saved thorough saving in whole inspection and repair.

Ensures reliability of power generation maintenance through power plant self-certification test before installing system.

04 Differences from existing similar product technologies

A picture showing that it is currently possible for inspection only if it is separated from the system.

<There are various types of turbine steam valve hydraulic actuators in power plants as shown below>



In order to diagnose the performance of the hydraulic actuator, it is necessary to separate it from the system, and it is troublesome to move the system to an external inspection service company for disassembly and confirmation, and a huge maintenance cost is required.

Since it isn't possible for whole inspection, some or all of the planned maintenance cycle is being replaced, which delays the maintenance period and costs immensely.

Turbine Valve Actuator Tester(TVAT) for Power Plants

05 A non-separating Performance Diagnosis using TVAT

TVAT doesn't separate the hydraulic actuator from the system. It determines whether to continue use and measures and analyzes the diagnosed results for whole inspection, so it can secure the reliability of the power generation maintenance. TVAT is the newest developed product that allows one to prevent malfunctioning factors of power plants by establishing a periodical maintenance diagnosis system of power plants.

06 Differences from existing similar product technologies

The current method is to test the hydraulic actuator by attaching the valves to the hydraulic actuator and supplying power to each of them, so that the ambiguity of the test results can be known with the data including the servo valve, the dump seat part and the cylinder leakage.

It is not possible to test the performance of the power plant itself before installing the system's warehousing goods and spare parts.

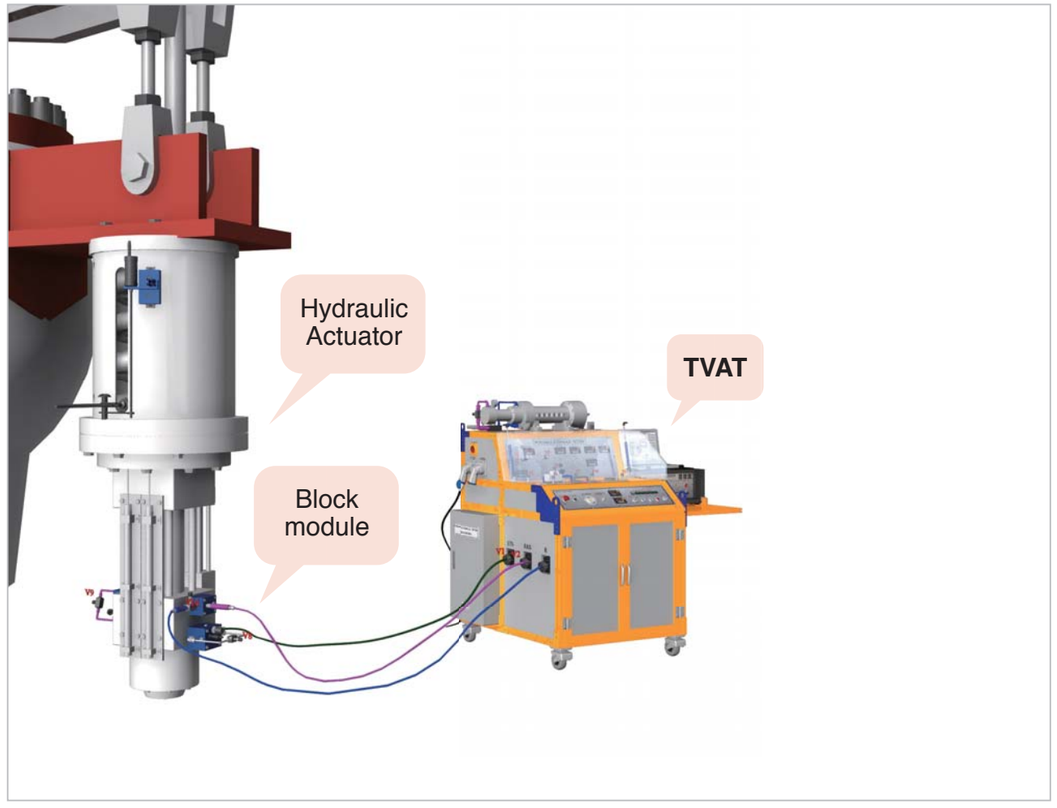
Category		TVAT	Similar Products
1	Performance diagnosis(Category)	Diagnosis of Actuator	Diagnosis of valves
2	On-site mobility	YES	NO
3	System non-separation test	YES	NO
4	Self-performance verification test	YES	NO
5	Occasional inspection	YES	NO
6	Hydraulic actuator leakage test	YES	NO
7	Dump seat part test	YES	-
8	Shut-off valve test	YES	-
9	Servo valve test	YES (Option)	-
10	Diagnosis time	3 M/H	120 M/H

Currently, the valve test device is a similar product, but it is a fixed type that is owned by an external company. It is necessary to separate the hydraulic actuator from the system and disassemble it from the external company for visual confirmation.

The diagnostic method used by the existing similar product doesn't allow performance diagnosis before the hydraulic actuator is separated from the system.

Turbine Valve Actuator Tester(TVAT) for Power Plants

07 Picture of an example of System Non-separation Performance Prediction Diagnostic Test



Measurement, analysis, predict diagnosis Determines replacement cycle and the condition of hydraulic actuators through algorithms Residual life diagnosis test.

Power plant site demonstration test video, catalog data of product introduction can be check out on the company's website at http://www.servokorea.co.kr

08 Diagnosis of performance by specialized performance diagnosis block module



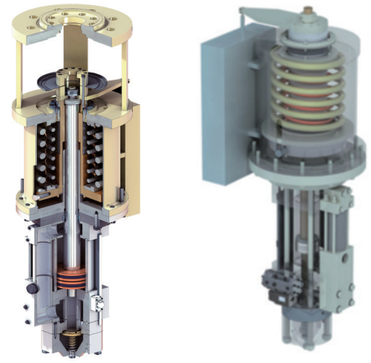
After installing the consumable parts FAS, Shut-off Valve, ETS, Sol 'Valve and Servo Control Valve attached to Turbine Valve Hydraulic Actuators, carries out performance prediction diagnosis using specialized block modules.

Turbine Valve Actuator Tester(TVAT) for Power Plants

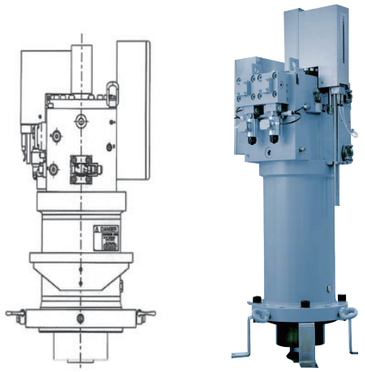
09 Performance Diagnosis Items

Turbine Valve Hydraulic Actuators are periodically maintained every 2 to 6 years, but they must be separated from the system to perform performance diagnosis and repair service. This has dramatically improved the problem of current diagnosis and maintenance technology that doesn't allow one to judge (inspect) performance because it is impossible to carry out whole performance diagnosis within the maintenance system. It is a performance predicting diagnosis test system for It is a field portable performance prediction diagnostic tester for ensuring reliability of power generation maintenance and establishment of a new maintenance (diagnosis) environment.

Actuator P-Type Dwg.



Actuator Rexroth-Type Dwg.



Performance Diagnosis Items

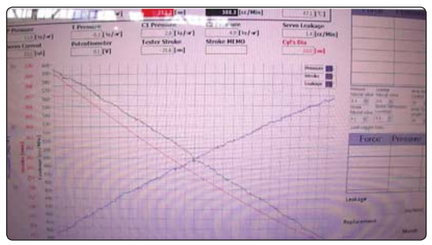
① Performance diagnostic test for turbine valve hydraulic actuator
② Dump seat system performance test
③ Spring tension and dump operation test (dumping speed test)
④ Shut-off valve test and flushing hydraulic oil in hydraulic actuator
⑤ Automatic determination of maintenance and replacement cycle of turbine valve hydraulic actuators, predicting diagnosis test for malfunction
⑥ Verification test of performance of power plant after maintenance of Hydraulic actuator, before installation of system
⑦ Self actuating trial run before configuration synchronization of new power generator

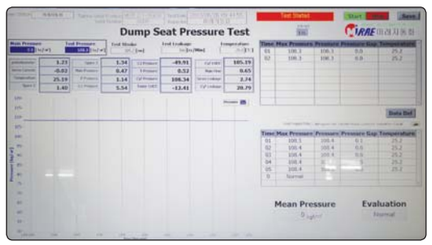
Automatically measures, stores, and reports the test results of thrust, test pressure, stroke (opening ratio), leakage, and oil temperature of turbine valve hydraulic actuators and prints out the report of results on the performance test. Compares and analyzes the next cycle of maintenance and allowed to use it as a big data. It is possible to prevent cutbacks in advance and efficiently manage the system by predicting the maintenance cycle through predicting malfunctions of the core equipment of the power plant.

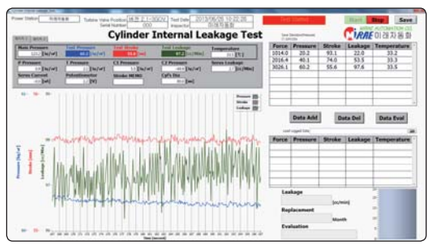
10 Scene of Power Plant Site Verification Test



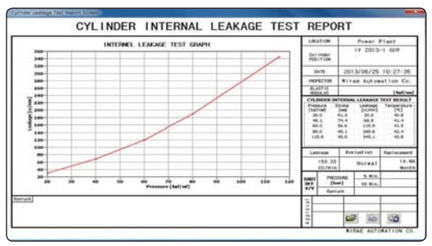

11 Repair, Replacement Cycle Determination Life Span Prediction Diagnosis Algorithm Configuration







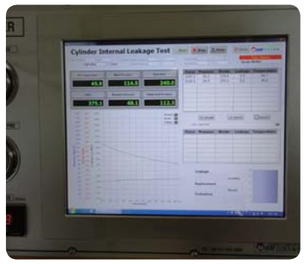
Performance prediction diagnostic test screen



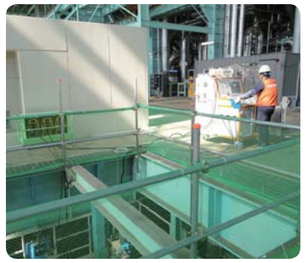
Report of diagnostic test result

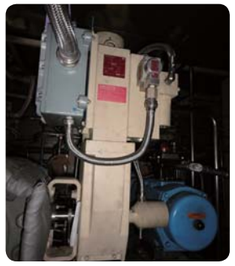
12 Scene of Power Plant Site Verification Test







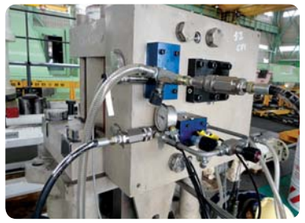
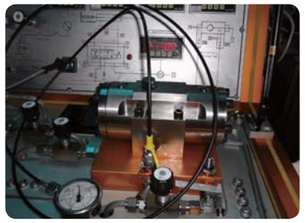




13 Scene of installing power plant





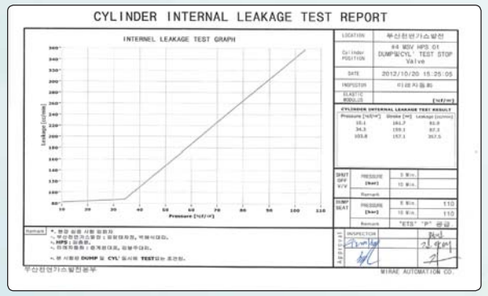

14 Self-performance verification test and testing machine operation training after maintenance

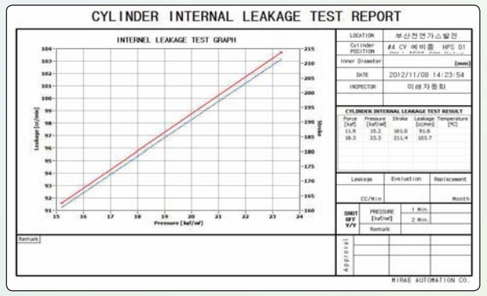





Turbine Valve Actuator Tester(TVAT) for Power Plants

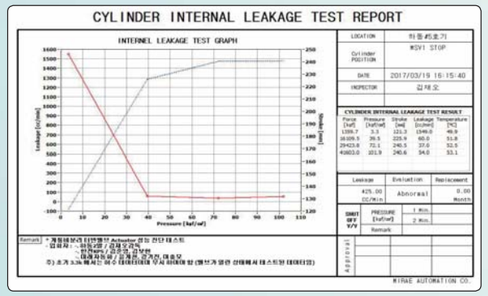
15 Cases of preventing malfunctioning factors in advance and diagnosis result report document

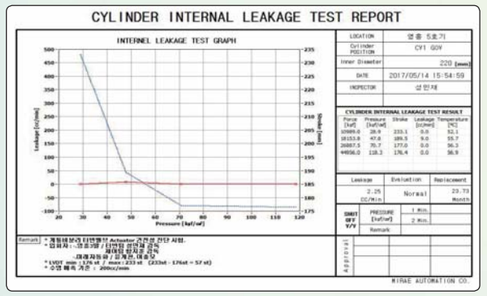
Before installation in the system after maintenance of the hydraulic actuator, there was a successful case of actual preventive preservation by filtering out nonconformity (rejection) systems using the “test system” after the performance verification test of the power plant.

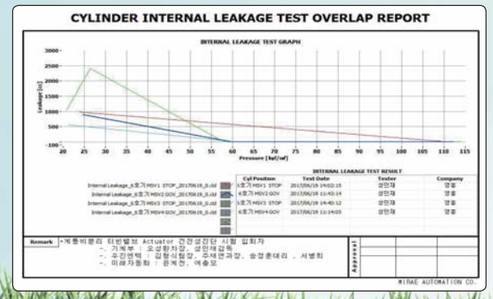


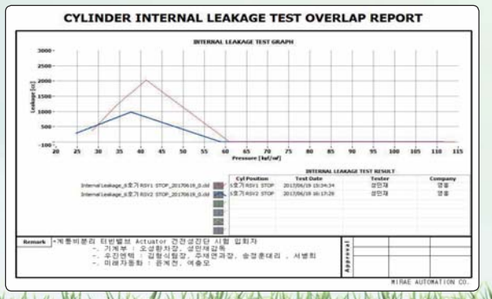


Example of performance report









16 Expected Effect

Realization of reliable maintenance of power generation through actual preventive maintenance and dramatic reduction in diagnosis and maintenance costs due to shortened maintenance period.

Expected to stably provide electricity through improvement in operation efficiency and prevention in cutbacks due to performance evaluation of power plants before malfunction takes place.

Before whole inspection of turbine valve hydraulic actuators and installation of spare parts for maintenance, and after performance verification test of power plant, it improves reliability and maintenance quality and power generation efficiency. Establishes new maintenance (diagnosis) environment.

- Increase efficiency of power plant operation by systematic management of malfunctioning cycle in replacement of hydraulic actuator and repairs
- Reduced maintenance cost by shortening maintenance period
- Actual preventive maintenance and prevention of cutbacks in advance through prediction diagnosis of malfunctions
- Eliminate the factors of malfunction by carrying out the performance verifying test of the power plant before installing the system and after installation and maintenance
- Periodical maintenance and establishment of a diagnosis system

Turbine Valve Actuator Tester(TVAT) for Power Plants

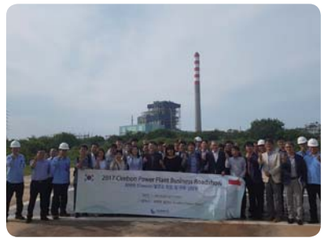
17 Power plant company's tour purchase consultation

18 Current Status of Overseas Marketing and Buyer Consultation

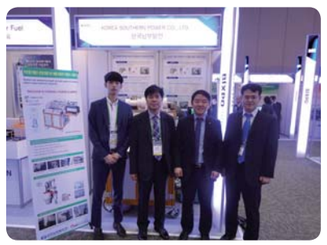
Visit to China Nuclear Power Plant (CNNP), product introduction



Visit to Southeast Asia


Current status of exhibiting in exhibitions in Korea and abroad




Items for Sale

- Turbine Valve Actuator Tester(TVAT) for Power Plants
- Hydraulic servo system and pneumatic servo system
- Vacuum system

FUTURE AUTOMATION CO.
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