Oil Immersed Transformers

www.hyosungpni.com
Global Top Energy, Machinery & Plant Solution Provider
Hyosung Power & Industrial Systems PG is a division under Hyosung which consists of seven performance groups (PGs). In addition to establishing itself as a world-class manufacturer of electrical equipment, Hyosung is also the largest producer of tire cords and spandex in the global market and the second largest supplier of ATMs in the USA.

Our Business

Brief introduction of Hyosung Power & Industrial Systems

Hyosung Power Systems Performance Unit

Hyosung's Power Systems Performance Unit provides a full spectrum of power generation, transmission, and distribution services, from design and engineering to the maintenance of equipment and has been building us on cutting-edge information technology solutions and developing substation automation systems, such as power monitor and control systems, and early detection and prevention systems.

Such vast product assortment and technical know-how is based on our product development history. In 1992, Hyosung was the first in Korea, and the fifth in the world, to develop a 750kV ultra-high voltage (UHV) transformer, and, in 1999, was the first in the world to manufacture the 800kV gas insulated switchgear (GIS), which has put Hyosung on an equal technological ground as its top global competitors.

Having such world-class technology, we established Baoding Hyosung Tianwei Transformer Co., Ltd., a joint venture with the Baoding Tianwei Organization, to hold the largest share of the market in Baoding City, China. This venture was established in 2003, and by the end of 2004, we established a production plant producing 11,000 transformers per year. In 2006 we acquired one of the top five competitors.

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R&D

Inspiring innovation, creation and expertise

Hyosung R&D Center identifies innovation, creation, and expertise as core value, and concentrates on world class R&D activities in the 21st century with a philosophy aspiring after customer satisfaction, quality priority, and performance orientation. Hyosung pursues to be the world’s best company in the field of heavy electrical machinery, industrial & electrical electronics engineering, and energy system.

Established in 1978, R&D Center had led the development of domestic technology. Along with the Anyang and Changwon labs, the group has endeavored to produce core technology and wind turbine products, etc. in the areas of heavy electrical machinery, energy system, electronic electronics engineering, and industrial automation system.

Research Areas

Hyosung R&D Center engages in the activities in the field of energy system, solution & service, applied electrical and electronic technology, basic core technology, technology of improved reliability, core components, and new materials.

Energy System

• Renewable energy (wind system, wind turbine, wind PCS, solar system, PV PCS, fuel cell, co-generation)
• Electric vehicle (EV charger, EV motor)

Solution & Service

• Power facility diagnosis algorithm and system
• Power facility lifecycle evaluation system
• Service solution for service degradation for prevention

Applied Electrical & Electronic Technology

• Power conversion system
• Flexible AC transmission system and high voltage direct current
• Power quality solution

Basic Core Technology

• Fortified technology in structural dynamics, electromagnetics, heat transfer analysis, etc.
• Skills for system simulation, analysis and evaluation
• Business support technology

Technology with Improved Reliability

• Fault diagnosis and testing facility
• Analysis of Reliability and causes of errors
• Reliability assessment (environmental hardness, durability, long-term degradation, and more)

Core Components and New Materials

• Organic and inorganic insulation materials
• Silicon forming technology
• Intelligent sensor (battery diagnosis, CT, PT, VT, LA, and more)

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Oil Immersed Transformers

Hyosung is the leading supplier of the power transformer industry. Starting with the development of the 154kV high-voltage transformer in 1969, Hyosung introduced the 345kV and the 765kV transformers subsequently for the first time in the country, and only the sixth in the world.

Hyosung's oil immersed transformers are designed to withstand all environmental hazards. In the rated power range up to 60MVA and operating voltage up to 66kV, these transformers have off-load or on-load tap changers to adapt it to various network conditions. Hyosung manufactures transformers under IEC, JEC, ANSI, BS and every required national standard. We offer individual solutions for satisfying requirements related to types of operation, low noise and low losses, connection technology, type of cooling, transportation, installation and so on.

With Hyosung Oil Immersed Transformers, you obtain not only the transformer but also an Energy Partner for your business

- Excellent short-circuit resistance
- Meets the various load conditions required by customers
- Low-loss step lap laminated core
- Uses latest insulation material with high short-circuit strength to realize high thermal capacity
- Cold steel sheet is used for radiating pipe to ensure a sufficient cooling effect and aesthetic exterior
- Compact, light, and low-noise transformer with standard efficiency and noise level which can be easily installed even in a small indoor or outdoor area

General

Based on know-how accumulated over several years, Hyosung's oil-immersed transformers have been supplied to various industries including semiconductor, steel work, and petrochemical. Further, as an outstanding and comprehensive solution provider, we respond to the demanding requirements of our customers by developing and manufacturing both eco-friendly and high-efficiency transformers. Hyosung exports its oil-immersed transformers to more than 25 countries all over the world.
Minimize Losses  
Minimize Hottest-Spot  
Max. Withstand Short-Circuit

For highest customer value, Hyosung supplies world-class quality transformers at a reasonable price. High quality starts from the design process. For transformer design, accumulated experience level and computer technology are the two most important aspects in evaluating transformer engineering. Well-trained engineers with a high quality training program help to assure high quality design. With more than 40 years of engineering database network system and optimum design program experiences, Hyosung guarantees customers a trustworthy transformer. Our computerized design system, including 3D analysis (Electric field, magnetic field and mechanical analysis) reinforces not only the insulation system but also the dielectric strength. With Hyosung’s advanced design program, the actual finish product can be reviewed in advance. Dedicated and customer-centered engineers always provide defect-free and optimized products to customers.

**01 Windings**  
Windings are composed of two parts, namely, a conductor and insulation material. For the conductor, Hyosung uses high grade electrolytic copper or aluminium. Hyosung Oil Immersed Transformers obtain high thermal capacity with the use of Epoxy coated Insulak Kraft Paper, which has higher short time overload capacity than any other Kraft paper type.

**02 Core**  
Core design is essential because it determines the transformer’s efficiency and noise level. For high dimensional accuracy, the core cutting processing of Hyosung is controlled by a computerized system. By Step-Lap core stacking, Hyosung Oil Immersed Transformers attain to optimal characteristics for each customer.

**03 Winding Support System**  
Coils are sized and clamped by being pressed with a special hydraulic fixture after assembly with the core. With Axial and Radial direction, we reinforce the winding support system. This secure structure helps withstand harsh short circuit forces.

**04 Radiator**  
The transformer will be furnished with panel or corrugated radiators assuring that the temperature rise of the windings or oil will not exceed their specified limit when the transformer continuously operates at the rated full load.
Hyosung Oil Immersed Transformers,
Your Reliable Energy Partner

Product Arrangement

**Ratings**
- Single or 3 - Phase Unit
- Rated Frequency : 50Hz or 60Hz
- Thermal Insulation Class : A
- Winding Conductor : Copper or Aluminum
- kVA Range : From 100kVA up to 60MVA
- High Voltage : 3.3kV - 66kV
  (with taps, N.L.T.C. or O.L.T.C.)
- Low Voltage : 600V below
- Production Capacity : 12,000MVA/year
- Basic Insulation Level : 30kV BIL through 350kV BIL

**Temperature Rise**
- 55°C, 55/65°C, 65°C (Optional : special temp. Rise)

**Other Options and Accessories**
- Oil temperature indicator
- Winding temperature indicator
- Oil level indicator
- Buchholz relay
- Pressure relief device
- Sudden pressure relay
- Thermometer pocket
- Skid base or bi-directional rollers
- Cooling fan and fan control panel
- Various oil preservation system
- Other accessories are available upon request

Transformer for Special Applications

- For Rectifiers
- For Harmonic Distortion
- For Arc Furnaces
- For Variable Speed Drives
- For Reactors
- For Inverter and Converters
- Earthing Transformers
- Excitation Transformers
- High Efficiency Transformers
- Earthing Transformers

**Hyosung Offers**
- Maintenance and Site testing
- Site assembling and Installation
- Commissioning
- Training
- Spare parts procurement
- Technical solutions
- Retrofit and Upgrading

For Petrochemical & Chemical Plants

Petrochemical and chemical plants are processing industries, and operate continuously 24/7. If one facility stops, everything else must be gradually stopped. Moreover once this happens, petrochemical and chemical raw materials become solid and transmute, it should be burned and purified before the facilities start to operate again, so the damage is huge.

By thinking from the customer’s point of view, Hyosung ensures the Stability of transformers. We have been actively engaged in large-scale petrochemical and chemical projects around the world.

**Main Service Areas**
- Naphtha Cracking Complexes
- Aromatics Complexes
- Fertilizer & Pesticide Complexes
- Chemical Plants
- Fine Chemical Plants

Hyosung provides customized solution for individual customer’s needs.
Products and Details

For Oil & Gas Plants

Different from the past, most oil and gas plants accept electric furnaces for the production process. These types of facilities use an immense amount of electricity. Because good quality of electricity is directly related to good quality of oil and gas, Stability and Lasting Quality are key factors for transformers. Hyosung has supplied high and secure stability transformers for field of oil and gas facilities, such as oil production, refinery and gas processing facilities.

Main Service Areas
- Oil and Gas Production Facilities
- Oil Refinery Facilities
- HOU (Heavy Oil Upgrading) Facilities
- FCC (Fluidized Catalytic Cracking) Facilities
- Gas Processing Facilities
- LNG Facilities

For Power Plants & Substations

Electricity is vital for most everyday activities. Power plants connect to a huge network of people, electric lines, and generating equipment. Because of this network, transformers in power plants and substations are very important.

Power plants need to generate high quality power, and very stable loads, so the top element of a transformer is Efficiency. With Hyosung transformer’s top-class efficiency, Hyosung has supplied the product to various power plants, such as nuclear and thermal power plants and substations. With extensive experience records and accumulated experience, Hyosung offers high quality transformers to the power sectors.

Main Service Areas
- Combined Cycle Power Plants
- Thermal Power Plants
- Cogeneration Power Plants
- Diesel Engine Power Plants
- Geothermal Power Plants
- Hydro, Pumped Storage Power Plants
- Wind Power Plants
- Transmission, Substation & Distribution
- Nuclear Facilities
For Industrial Plants

If a semiconductor factory stops for even a few seconds, the damage is enormous because it needs long time to adjust the optimal manufacturing condition. The secure electric supply is directly connected with customer’s benefits in the industrial plant. Hyosung understands the importance of the transformer for industrial plants, we provide Individual Solutions for satisfying various kinds of requirements: types of operation, high efficiency, resistance against harmonic distortion, maintenance, installation and so on.

Main Service Areas
- Semiconductor & LCD related Plants
- Steel Mills & Metal Plants
- Automobile Plants
- Cement Plants
- Pulp / Paper Mills
- Material Recycling Plants

For Environmental Plants

In environmental plants, such as seawater desalination facilities and wastewater treatment facilities, the main equipment is a pump. Loads of such equipment are very unsteady and undergo dramatical changes. Hyosung transformers are designed for environmental plants with Mechanical Strength to bear short-time overload.

Main Service Areas
- Seawater Desalination Facilities
- Flue Gas Desulphurization / Denitrification
- Wastewater Treatment Facilities
- Solid Waste Management Facilities
Total Quality Assurance

At Hyosung, our goal is not only to meet the needs of our customers today but also to provide them better life in the future.

Hyosung’s total quality commitment to our customers is demonstrated by providing the highest quality product at the most competitive prices with on time delivery. We achieve these high quality levels through our integrated quality assurance program. Our products are used extensively both at home and abroad. This level of experience allows Hyosung’s quality assurance and reliability to exceed those of our competitors. We share our customer’s goals with high quality products. From design to assembly, testing and installation, our customers’ requirements are our minimum standards.

All tests are based on international standards and our customers’ requirements. Through additional testing, Hyosung seeks to exceed established testing criteria, thereby producing more reliable products.

Our special process operators and technicians are highly trained. Continued professional growth and advanced training is encouraged through internal training groups and outside courses. All our products have ISO 9001 and ISO 14001 certifications. At Hyosung, we endeavor to maintain the highest quality.

Scope
In line with major international standards for quality assurance, the quality assurance program of our plants includes the following elements:
- Contract review
- Inspection/test control
- Design control
- Measuring and test equipment
- Procurement document control
- Storage, handling and shipping
- Purchased material
- Nonconforming item
- Identification
- Quality assurance records
- Special Process

Product Development History

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<th>Milestones</th>
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<tr>
<td>2009</td>
<td>High Efficiency Certificate for Oil-Immersed Transformers</td>
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<tr>
<td>2007</td>
<td>Development of Eco-Friendly Transformers Short-Circuit Test for 45MVA and 2.5MVA Oil-Immersed Transformers</td>
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<td>2004</td>
<td>Development of Low Loss Oil-Immersed Transformers for Export to Japan</td>
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<td>1998</td>
<td>Development of 170kV Gas V/T for GIS</td>
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<td>1997</td>
<td>Supply of 30MVA Shunt Reactors for KEPCO</td>
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<tr>
<td>1995</td>
<td>Development of PAD Transformers for KEPCO</td>
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<td>1993</td>
<td>Development of Self-Diagnostic Pole Transformers for KEPCO</td>
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<td>1990</td>
<td>Development of Amorphous Core Type Pole Transformers</td>
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<td>1984</td>
<td>Earthquake-proof Test for 630kVA Mold Transformers</td>
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<td>1981</td>
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<td>1962</td>
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Global Network