



# Power Transformers

Up to 1000 MVA, 525 kV





## BEST Transformers

BEST Transformers offers high quality and reliable products from its state of the art facilities and provides a product range of up to 1000 MVA, 525 kV with an annual capacity of 32,500 MVA and having an extensive engineering and production background since 1966.

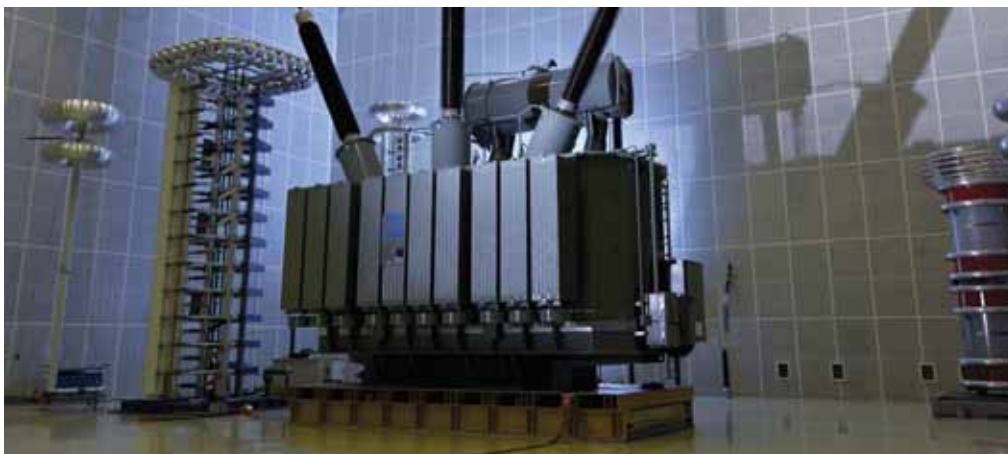
Power transformers from BEST achieved a perfect reputation in more than 50 countries. BEST Transformers is certified to ISO 9001, ISO 14001 and ISO 18001 management systems for Quality, Environmental and Health & Safety respectively.

Test laboratories of BEST Transformers are accredited and equipped with state of art testing and controlling devices.

With half a century of experience in this field, BEST Transformers holds several references for short circuit type tested equipment ranging from 11 kV up to 380 kV power transformers in reputable test laboratories such as KEMA and CESI.



• View of the Main Assembly Hole



• Our Accredited Test Laboratory

Power Transformers



• Logistics



• Step lap design



• Core stacking



• Inspection

## Core

Constructing the iron core is the process of building the heart of the transformer. The core design is studied carefully to fulfill the customer requests in terms of noise emissions and loss evaluation.

0,23 mm to 0,30 mm thick grain oriented steel laminations from the world's leading manufacturers are cut into plates or sheets on a microprocessor controlled slitting and cutting line in order to comply with the design.

Years of experience proved that, our step-lap core design technique is the best method ever applied for lamination. Cores with this design not only have superior core loss performance, but also exhibit lower sound levels.



• 1000mm GEORG length core cutting machine



## Windings

All winding workshops of BEST Transformers are in closed dedicated facilities and working on positive pressure principle.

To build the most efficient and accurate transformer, different types of winding designs are used for various voltage levels.

For the low voltage levels, layer and helical windings are utilised. For the high voltage levels, disc and interleaved disc winding design are applied.

Depending on the winding type, the appropriate machine type is selected.

Disc windings are more easily produced on vertical winding machines whereas horizontal winding machines offer the greatest benefits for the manufacture of all types of layer winding.



• Vertical winding machine



• Horizontal winding machine



• Winding process



## Active Part & Drying

Each winding is stabilized by drying and application of axial pressure by Dynamic Pressing System.

The core, windings, clamping devices, on-load tap changers are put together to form the active part of the transformer in the preassembly workshop. Once the active part is fully assembled, a team consisting of Production, Quality, Design and Test engineers inspect the active part before the oven process.

The vapor phase drying & vacuum process is used for each winding and active part in order to ensure the stabilization and drying.

To accelerate the drying process, hot kerosene is sprayed on the active part components under low pressure as vapor.

As the solvent vaporize, moisture is extracted from the insulation and other components.



• Winding drying oven (Dynamic pressing)



• Connection



• Vapor phase drying up to 1000MVA



• The active part being placed into the tank



## Final Assembly

After the installation of the active part in the main tank, bushings and conservator are mounted and the tank is put under vacuum. At the end of this process, the tank is filled with high-grade insulating oil and left for resting until factory testing.

Finally all the built on parts -such as motor drive control cabinet, cooling control cabinet, accessories and monitoring devices are installed.

BEST Transformers has already applied several advanced monitoring techniques such as fiber optic core, winding and oil temperature monitoring.



• Fiber optic sensors application



• Final assembly hall



• Bushing assembly



• Radiators on main tank



• Fan control panel

## Cooling

The effectiveness of the cooling ensures the life span and the reliability of the transformer operation.

### Cooling Methods

#### ONAN (Oil Natural and Air Natural Cooling)

Oil is kept in circulation by the gravitational buoyancy in the closed-loop cooling system.

#### ONAF (Oil Natural and Air Forced Cooling)

Fans are used to blow the air on the cooling surfaces of the radiators.

The heat transfer coefficient is increased according to ONAN cooling method.

#### OFAF (Oil Forced and Air Forced Cooling)

In this type of cooling an external pump is used to circulate the oil and also fans are used.

#### OFWF (Oil Forced and Water Forced Cooling)

Oil/Water coolers are used for cooling the transformer oil. Depending on the type of oil circulation, The transformer cooling system is termed as OFWF or ODWF (Oil Directed and Water Forced).



• Transformer with OFWF cooling



## Tank and Cover

Besides core and coil, the tank is one of the main components of the transformer.

The transformer tanks are designed of the optimization of pressure and vacuum loads, transportation limits (weights and size), structural loads (lifting and jacking), seismic loads etc.

The tank is made of steel plates which are blasted and protected from corrosion of various environmental conditions. (Heavy industrial, salty, tropical, etc.)

BEST Transformers applies advanced manufacturing techniques for cutting, welding, sand-blasting and painting in its dedicated mechanical factory.



• Sandblasting



• Painting



• Tank steel cutting line



• Welding



## Final Testing

### Testing Capability;

- Power Transformers up to 1000 MVA and 525 kV
- Shunt Reactors up to 250 MVA and 525 kV
- Furnace & Rectifier Transformers up to 150 MVA 34.5 kV.

Our test laboratories are designed to complete all routine, type and special tests except short circuit withstand as per International Standards.

The design and construction of the test laboratories create a noise level difference of at least 30 dB between out and in walls.

All test laboratories of BEST Transformers are accredited.



• Test field



• Oil testing



• Test field control room



## Logistics

BEST Transformers has been utilising the ORACLE ERP system, which completely integrates the entire production process including sales, manufacturing, accounting, supply chain and project management activities.

Our aim is to make sure the products are on time by close monitoring of our processes and for this reason, BEST Transformers has decided to implement a system called ICRON, a Process Management Application, in which all our resources (Engineering, Production, Logistics, Procurement) and processes are integrated in this system. The system allows us to perfectly reach desired levels of On-Time delivery.

The factories are located in very convenient locations which brings several alternative solutions for transportation. The factories are close to several main port of Turkey and all types of transportation is within our capabilities.



• Loading at factory  
Power Transformers



• ERP (Oracle) processes



• 310MVA, 400kV GSU Transformer in Antalya CAPP



• 230MVA, 380kV - IÇTAŞ



• 250MVA, 380kV Autotransformer - TEİAŞ



• 73MVA, 110kV Jeddah - ICY5

## World Wide References

### Some of reference customers:

- TEIAS - TURKEY
- SIEMENS - GERMANY
- SCHNEIDER - GERMANY
- SEC - K. SAUDI ARABIA
- DEWA - UAE
- SONELGAZ - ALGERIA
- ONE - MOROC
- ADWEA, U.A.E
- GECOL, LIBYA
- ESB, IRELAND

### List of Short Circuit Type Tested Equipment

- 250 MVA, 380 KV
- 125 MVA, 380 KV
- 100 MVA, 154 KV
- 62,5 MVA, 154 KV
- 25 MVA, 33 KV



• 67MVA, 110kV Al-Haramain

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