DRY-TYPE TRANSFORMERS

RESIBLOC®
Transformer technology reducing environmental impact
Environmental protection, reliability and enhanced safety

The challenge
Dry-type transformers are frequently used in applications where contamination and fire risks for people and the environment have to be eliminated. In addition to eliminating these hazards, there are stringent electrical parameters that must also be met.

Reliable transformer technology is essential not only in oil and gas, marine, mining and steel, paper and chemical industries but also in the fields of power generation and distribution.

For applications involving exceptionally tough environmental conditions, conventional solutions frequently do not meet all the transformer requirements.

The solution
The RESIBLOC® cast-resin transformer. RESIBLOC® is the solution when a transformer must meet the following requirements:

- no risk for humans and the natural environment due to contamination
- non-explosive and flame-retardant
- heavy load cycles (cold start to maximum load)
- high short-circuit withstand capability
- stress due to tough ambient conditions
- stress due to harmonics
- overvoltage peaks
- variable power factor control
- minimized maintenance

RESIBLOC® has proven its worth for decades in applications requiring a high level of reliability or where special environmental conditions apply.

Thanks to its glass-fibre content of approximately 80%, RESIBLOC® provides outstanding mechanical strength, meaning it is ideal for use in applications involving high mechanical stresses. For example, RESIBLOC® is ideal for use in environments prone to earthquakes or applications with continual shocks. In addition, the glass fibres extend the range of temperatures at which the transformer can be utilized; unrestricted use is possible even at a temperature of -60°C.

Other advantages of RESIBLOC® technology relate to protection of the environment. It is entirely oil-free and the use of other flammable materials has also been reduced to a minimum, thus avoiding any contamination in the transformer’s surroundings and eliminating any additional fire risk.

RESIBLOC® provides a lot of potential for cost savings: its special construction minimizes both the requirement for spares inventories and the amount of maintenance work needed.

Additional cost savings can be achieved with the newly developed EcoDry transformers which offer even higher energy efficiency thanks to loss optimization. Thus, not only the costs are minimized, but the environmental impact as well.

The flexible production technology used allows for application-responsive, customized transformers to be designed. These include double-tier transformers, multi-winding models, single-phase transformers and customized versions, e.g. with on-load tap changers or special cooling systems.
Coping comfortably right up to the limits

Overload withstand capability
The high winding time constant of RESIBLOC® transformers enables them to be operated at high short-time overload values: this can be factored in when deciding on the rating.

The maximum allowable hot-spot temperature of 155°C in the winding is not exceeded during a brief overload if at the beginning of the specific overload the transformer is being operated at partial load and/or the ambient temperature is lower than the design temperature.

Overload protection
In order to avoid thermal overloading due to high ambient temperatures, inadequate cooling, and overload operation, RESIBLOC® transformers are equipped with a temperature warning system. As a standard feature, the temperature relay installed monitors up to three sensors simultaneously for up to three limit values. Different types of sensors can also be connected and evaluated, such as Pt100s. Also available are monitoring capabilities for additional sensors or for bus system connections.

Forced air cooling
There is an option for fitting RESIBLOC® transformers with quiet-running cross-flow fans. When lengthy overload periods are involved, they can improve the transformer’s power output by up to 40% of its rating. Fan utilization is controlled automatically using sensors.
The delivery package for RESIBLOC® will contain many additional services besides the transformer itself. A team of knowledgeable engineers clarifies all the technical details with the customer and formulates the optimum solution for the application involved. Customers can confidently put their trust in ABB’s experience which has been gained from exposure to a wide range of transformer applications.

All production processes are run under an integrated management system, designed to ensure that the manufacturing operation remains at a level of maximized efficiency while minimizing environmental impact and assuring staff safety.

All processes are performed in compliance with the DIN EN ISO 9001, DIN EN ISO 14001 and BS OHSAS 18001 standard, and continuously monitored.

Each RESIBLOC® transformer is subjected to comprehensive testing in conformity with international standards. Further tests can be agreed upon for a specific project.

RESIBLOC® transformers are frequently used in applications where strict requirements have to be met, for example, oil and gas industry applications. As a result, these transformers can be manufactured in conformity with the specifications of different classification societies (e.g. DNV, ABS, Bureau Veritas or German Lloyd).

After the transformer has been manufactured, we can support our customers with a comprehensive range of services, not only for delivery and commissioning but also extending beyond the warranty period.

Our team can carry out maintenance jobs on site during the transformer’s entire operating lifetime such as professional cleaning routines or tests for analyzing the transformer’s ongoing condition. This is useful for safeguarding against failures and improving system dependability.

Our retrofit capabilities include more elaborate on-site jobs, like replacing or retrofitting particular components, even an entire coil if necessary. Accessory parts like converters, fans or rain roofs can also be retrofitted as needed.

Our service capabilities are available to you all year round, so you can ensure that your systems are operating reliably day in and day out.
The technology

The RESIBLOC® cast-resin transformer is a path-breaking innovation in the field of naturally cooled dry-type transformers. The RESIBLOC® technology has been continually designenhanced; nowadays it is available for ratings of up to 60 MVA and insulation voltages of up to 72.5 kV.

Glass-fibre reinforcement – a guarantee against crack formation
Epoxy resin, reinforced with glass-fibre rovings, is a material of superior mechanical and dielectric strength. The low and high-voltage windings are positively joined to create a single compact block, a design that gives RESIBLOC® a high shortcircuit withstand capability, and protects it against crack formation even when exposed to extremely tough operating conditions.

Low-voltage winding
Aluminium or copper foils are used for the low-voltage winding of the RESIBLOC® transformer, and a winding insulation of thermal class F. The foil winding concept ensures a significant reduction in axial short-circuit forces. To increase the fill factor, the low-voltage windings for transformers with a relatively low rating are constructed as wire layer windings.

High-voltage winding
The used layered design ensures outstanding lightning impulse voltage withstand capability thanks to its linear impulse voltage distribution. Round (or in the case of the more sizeable cross-sectional areas, rectangular) conductors made of aluminium or copper are used. Layer insulation and the outer encapsulation of the windings is made from glass-fibre-reinforced epoxy resin of thermal class F. The individual conductor layers are coated using the roving wet winding process. After the winding operation has been completed, the block windings are hardened in special ovens. Winding and core – optimized material, optimized geometry.

The high-voltage winding is wound directly onto its low-voltage counterpart. The positive connection between the high and low-voltage windings can be relied upon to prevent the windings shifting either axially or radially against each other when exposed to short-circuit forces. The mutual spacing between the high and low-voltage windings, important for the dielectric strength, is assured even in the event of a short-circuit or after a lengthy period in transit.

The high glass-fibre content of around 80% and the combination of radial rovings and axial-reinforcement glass-fibre contents create a mechanically sturdy winding block exhibiting very high radial and axial strength. This can be relied upon over the transformer’s entire lifetime to prevent crack formation which can be caused by different thermal expansion coefficients for the solid insulation and the conductor materials or by temperature differentials in the solid insulation sheath.

This is also applicable under extreme operating situations, such as low ambient temperatures or sudden peak overloads.

Since no moulds are required for manufacturing a RESIBLOC® transformer, windings can be individually dimensioned to take into account a customer’s specific requirements. In order to ensure adequate cooling, for example, axial cooling channels can also be incorporated in the windings.
Core construction
The construction of the core is highly determinant of the quality of a transformer. The material used and its geometrical configuration exert a substantial influence on the loss figures and the noise emissions. For the core of RESIBLOC® grain-oriented transformer laminations are used which are layered to form leg and yoke stacks. Meticulous dimensional accuracy ensures that noise emissions and losses are rigorously minimized.

In order to assure optimum matching of the flow pattern to the magnetic preferential direction, the joints between the leg and yoke laminations are executed with 45° cuts and arranged in overlapping layers. In modern-day step-lap technology, the joints between the leg and yoke laminations exhibit multiple offsets. An epoxy resin coating protects the core against potential corrosion.

Climate, environmental and fire classes
The standard versions of RESIBLOC® dry-type transformers meet the most stringent requirements for climate, environmental and fire classes in conformity with IEC 60076-11.