Dry-type transformers
Innovative Technology
What is a dry transformer?

ABB manufactures a transformer which does not use any kind of liquid for cooling, it has windings encapsulated under vacuum, in epoxy resin reinforced with glass net.

- It is the most technologically advanced design for extreme conditions.
- ABB has flexibility to produce transformers for optimum space utilization, and special requirements.
- These transformers meet strict parameters with respect to electrical system demands, are virtually maintenance free and are manufactured in accordance with industry and international standards including, IEC 60076-11, ISO 9001 and ISO 14001.
Vacuum cast coil dry-type distribution transformers
Main advantages
Dry-type transformers
Impressive advantages

- Safety for People and Property
- No Fire Hazard
- Environmental Friendly
- No Maintenance and Pollution
- Reduced Civil Works
- Enhanced Withstand to Short Circuit Stress
- Applicable for Damp and Contaminated Areas
- No Specific Fire Detection Systems (compact housings)
- Improved Performance against Seismic Phenomena
Dry type transformers
Technical benefits

- Stronger resistance against short-circuit stress.
- Linear distribution of BIL.
- The lowest partial discharge value thanks to the most advanced casting technology.
  The typical partial discharges is below 5 pC (maximum allowed 10 pC).
- Epoxy resin cast under vacuum avoids entry of moisture and protects against aggressive environments.
- High capacity to support overloads.
- High performance in dealing with seismic phenomenon, most severe of rolling and vibrating conditions.
- Highest possible security against cracks on coils.
- No silicone during coil manufacturing.
- Step lap core configuration granting lower values of no load losses, no load current and noise level.
- Unique coil finishing provides smooth surface eliminating dust accumulation.
Our product
Environmental benefits

- Reduced environmental contamination.
- Zero risk of leakage of flammable or contaminating substances.
- Environmental safe in production.
- Well suited to damp and contaminated areas.
- No fire hazard.
- Transformers are non flammable and self-extinguishing.
Our product
Economical benefits

- Less space needed.
- Less civil work needed.
- No special safety features required. (fire detection)
- Maintenance free.
- Longer transformer life due to low thermal and dialectic ageing.
- Can be installed closer to the point of consumption reducing load cable losses.
- Optimal design subject to constant improvements in design as new materials become available.
- Produced in high throughput, specialised and efficient ABB factories.
Dry-type distribution transformers
Product’s
Dry-type transformers
For your requirement the right solution

From left to right:
- RESIBLOC
- Vacuum cast
- Open wound

Three different dry-type technologies:
RESIBLOC®
Vacuum cast coil (VCC)
Open wound
Our product
The product basic range

- Vacuum Cast Coils
  - VCC
Our product VCC

Applications

1. Wind MV transformers (onshore and offshore)
2. Railway Substation
3. HiDry$^{72}$
Our product VCC
Wind MV transformers (onshore and offshore)

- Transformers for both on and off shore environments
- Reduced transformer dimensions able to pass through tower door
- Optimized design transformer to be mounted on the nacelle platform
- Transformer designed to fit clients requirements with space limitations.
- Reduced losses
- Transformers with tertiary winding for auxiliary service
- Insulation class both F and H
HiDry
Where to use it?

- Fire Safety, even for outdoors installations
  - National Parks and forests
- Environmentally sensitive areas (eg, water protection areas)
- Urban (inner-city) substations
- Indoor and underground substations (eg. commercial buildings, traction, …)
- Heavy industry: chemical, paper, oil&gas, metals
- Renewable generation (eg, hydro, off-shore wind turbines)
- Retrofits
Our product
Standard technical features – HiDry72

- Standards
- Rated power
- Rated voltage
- Cooling
- Protection degree
- High voltage winding
- Low voltage winding
- Temperature rise
- Insulation system temperature
- Partial discharges
- On load Tap Changer

IEC EN 60076-11, CENELEC HD 464, DIN 42563
- up to 63 MVA
- up to 72.5 kV
- AN
- IP00
- Encapsulated, Aluminium
- Encapsulated, Aluminium
- 100K
- 155 °C (Class F)
- < 10 pC
Our product
Furthermore, any option is available

- Conductor material: aluminium / copper
- Low Voltage terminals located at the bottom of transformer
- Impregnated high voltage winding
- Encapsulated low voltage
- Delta connection encapsulated
- Plug-in connector
- Dual primary / secondary
- 6/12/24 pulse rectifying transformer
- Bus bar flanges can be accommodated
Our product
The product basic range

- Resibloc
Our product Resibloc

Applications

- 1. Marine and offshore Oil and Gas
- 2. Transformer outdoor > IP33
- 3. Nuclear applications
- 4. VSD over 12 pulses
Preem Lysekil
Sweden Oil and Gas

Customer need
- Dry-type transformer for outdoor installation in cold (min -40°C) harsh climate close to the sea
- Parallell operation with existing oil transformer

ABB response
- 1 unit 25 MVA 22 / 11 kV RESIBLOC cast-resin transformer
- IPX4D enclosure for outdoor installation

Customer benefits
- No need for oil pit, easy installation and almost maintenance free
- Fire risk reduced
Dry-type transformers
Dry-type comparison - the advantages of RESIBLOC

All technologies are performing according to international standards

Nevertheless, RESIBLOC has

- stronger resistance against short-circuit stress
- superior behaviour on load changes
- linear distribution of BIL
- highest possible security against cracks on coils
- no silicone during coil manufacturing
- better performance under dynamic Loads
- more flexibility in design (no molds)
- better performance under severe ambiental conditions (exceeding E2)
- more suitability for extreme cold conditions
- vacuum circuit breaker proven
RESIBLOC technology – Overview

Parameters

- Rated power from 250 kVA to 63,000 kVA
- Primary voltage up to 72.5 kV
- Secondary voltage up to 45 kV
- Frequencies: 50 Hz / 60 Hz / 16 2/3 Hz
- Cooling: AN / ANAN / ANAF / AFWF
- Insulation F and H (optional LV-winding)
- Unique technical attributes
- Designed for extreme environmental conditions
Vacuum cast coil dry-type distribution transformers
Class
Our product
Environmental, climatic and fire classes

Environment
- **E0** Normal indoor installation, no condensation, no considerable pollution.
- **E1** Limited pollution, occasional condensation eg off circuit periods.
- **E2 ✓** Heavy pollution, frequent condensation.

Climatic
- **C1** Ambient temperatures:
  - Operation -5 °C
  - Storage and transport -25 °C
- **C2** Lower ambient temperatures:
  - Operation -25 °C
  - Storage and transport -25 °C
- > **C2 ✓** Lower ambient temperatures:
  - Operation -40 °C (option -50°C)
  - Storage and transport -40 °C (option -50°C)

Fire
- **F0** No special requirements except typical characteristics for dry type transformers.
- **F1 ✓** Increase demands.
  - All material practically free of halogens & self extinguishing transformer fire
  - Limited formation of fumes and limited contribution with calorific energy to the source of fire
Our product
Vibration proof

- The vibration to which the transformer is exposed to during its lifetime, was summarized in an acceleration spectrum with the simulation of its life cycle loads.

- Multi-axis vibration tests, and shock tests were performed as per IEC 68-2-6/59, German edition EN 60068 parts 2-6 and 2-59 as well as particular customer’s requirements.

- Extreme accelerations due to handling or harsh vibration were also considered in these tests.
Our product
Lowest partial discharge

- The lowest partial discharges value guaranteed, due to:
  - good execution of vacuum filling
  - proper winding

- Most technologically advanced design for extreme conditions.
Vacuum cast coil dry-type distribution transformers Briefing
VCC
This is what makes the Technology different

- Possibility to install any kind of accessories
- Step-lap configure
- Aluminium foil disk in High Voltage winding
- Lowest partial discharge (<5 pC) due to epoxy resin casted under vacuum (horizontal process)
- Dust / pollution resistance thanks to the sealed technology
- Self-extinguish
- Axial short-circuit forces retained & high short circuit withstand
- Radial short circuit forces retained
- Bidirectional wheels
- High impulse withstand through foil-disk winding
- Unique coil finishing: Smooth surface that eliminates dust accumulation
- High capacity to withstand overloads due to high thermal inertia
RESIBLOC technology – Overview
Solutions for demanding requirements

RESIBLOC® characteristics
- Unique mechanical strength and short circuit behaviour
- Satisfies different economical and safety requirements
- Certified for many standards and organisations
- High design flexibility and product variety

Customer advantages
- Fits for most demanding applications
- Great variety of applications
- Long service life with minimum maintenance requirements
- Excellent and global ABB service
- Certified for many standards and organisations
Questions and discussion