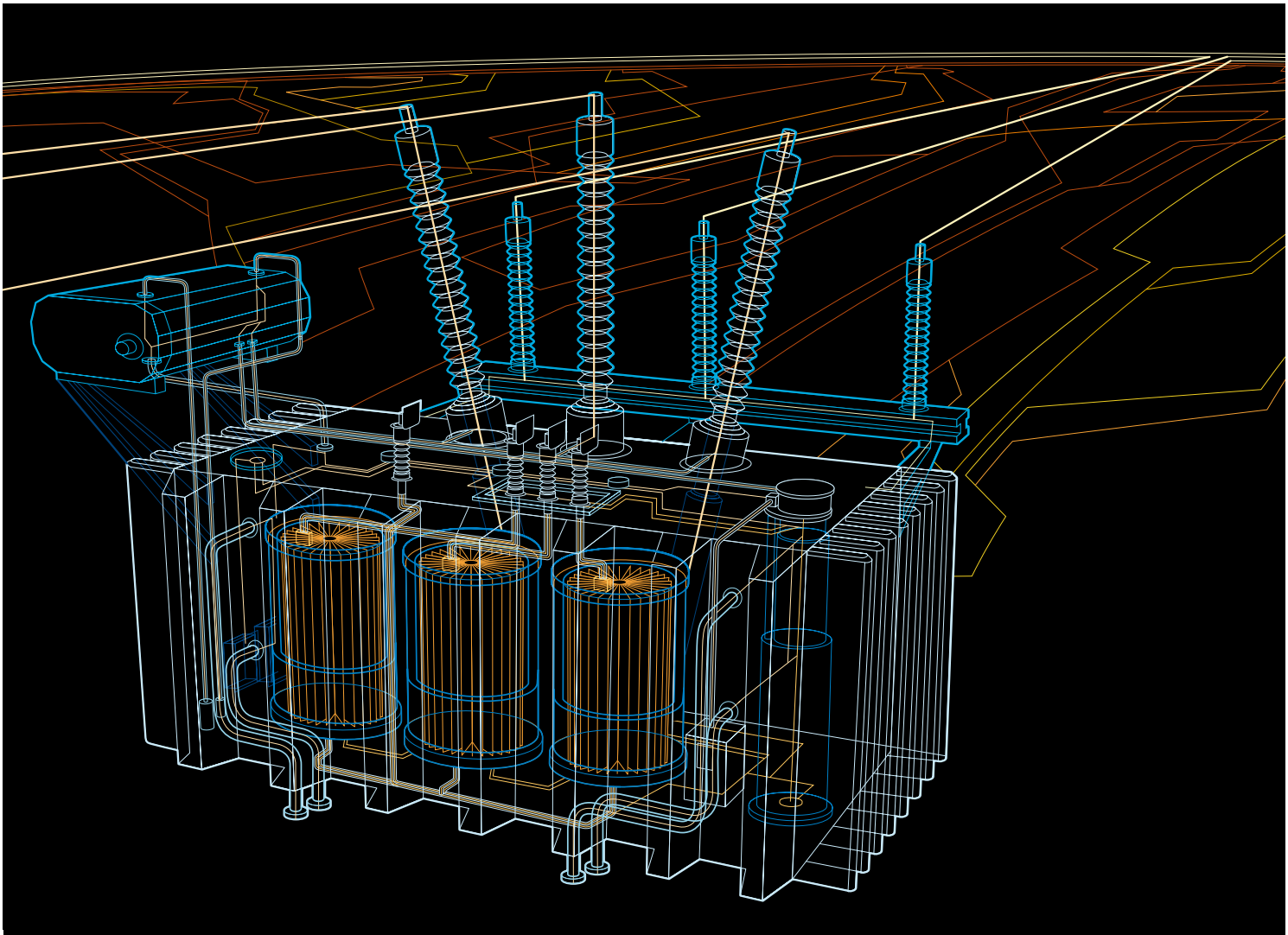


Liquid-filled power transformers

Power and productivity
for a better world™

ABB – a global leader

ABB is a global leader in power and automation technologies that enable utility and industry customers to improve performance while lowering environmental impact. The ABB Group operates in around 100 countries.

As one of the world's leading engineering companies, we help our customers to use electrical power efficiently, to increase industrial productivity and to lower environmental impact in a sustainable way.

ABB advantages:
— 120 years of technology and innovation
— unparalleled domain competence
— vast global experience
— total solution provider
— large installed base
— environment friendly technologies.

Power Products are the key components to transmit and distribute electricity. Division runs about 100 plants in more than 60 countries, producing transformers, switchgear, breakers, capacitors and other products for high and medium voltage applications. The division contains three business units: High Voltage Products, Medium Voltage Products and Transformers.

BU Transformers offers:
— large, medium and small power transformers
— industrial transformers
— large, medium and small distribution transformers
— dry type transformers
— insulation and components
— service
— traction transformers

ABB has been known to the Polish power generation and automation industry for many years. The firm's logo of the three letters ABB in red has always symbolised the highest quality, precision and the most advanced technology. The company has been present in Poland for 20 years. It is not only synonymous with reliable equipment, but a firm that is friendly to both people and the environment. Over these years we have become a part of the Polish economy, employing more than two thousand people forming a power generation and automation "family". We have a large share of the market in products and services. We run a responsible business, ensuring safe and good working conditions, respecting professional ethics and never forgetting that achieving business goals can not override the values of the natural environment around us.

ABB – power transformers
Customized solutions by dedicated people in focused factories

Experience

ABB is the leader in power transformers and the largest transformer manufacturer worldwide. ABB offers a complete range of power and distribution transformers, associated products and services. When you buy an ABB transformer, you get more than just a piece of equipment. You buy the combined experience of 100 years of transformer manufacturing.
ABB provides the most extensive short circuit test record on power transformers. We are committed to being a flexible and knowledgeable worldwide partner for you. Our technology, coupled with the sales force of highest integrity, results in an unbeatable combination. Together with the customer, we analyze his individual needs and help to ensure that the customer will receive the optimal transformer and the best quality on time!

Reliable delivery partners

No matter in which ABB factory your transformer has been produced, you can expect the highest quality. Our global manufacturing capabilities and our back up factory strategy enable us to offer you the most suitable solution in terms of factory, on-time delivery and product. Our focused factory concept enable us to source our products from highly specialized factories increasing operating efficiencies and achieving worldwide excellence. Our global presence means that we are an experienced partner across the globe being a local customer interface, talking the customer's language and providing local service.

Quality

The right quality from the start is our ultimate goal. Quality is a vital element of the product and can never be achieved by checks and control alone.
Built-in quality procedures are implemented even before design work begins ensuring correct interpretation of customer requirements. ABB has TrafoStar – a common global design and manufacturing concept. This concept is based on core type technology and is a set of common ABB principles for the design and manufacture of power transformers covering voltages from 72.5 up to 800 kV.
ABB TrafoStar is implemented in our power transformers factories worldwide. It is a modular system with common design rules supported by the SixSigma quality system. It guarantees uniform quality, high reliability and low maintenance requirements.

R&D

The ABB transformer team has direct access to all the combined transformer, technical experience and expertise within the ABB Group. The ABB transformers R&D supports customers in solving their present and future challenges. Questions concerning critical factors such as return on investment, reduced operation, maintenance costs, and the management of aging assets need answers. We have the solutions through our backup network with compact substations, power flow control, on-line monitoring, the replacement of mineral oils and smart equipment with built-in intelligence. One major R&D initiative is the support of high quality conventional oil insulated power transformers: TrafoStar concept. Our development is directed towards providing efficient, low loss, low sound transformers with low cycle costs.
Our expert teams are active in all areas starting from low cycle costs to new transformer concepts. ABB means comprehensive solutions for all the issues related with power transformers within one company.

93,3 MVA transformer for the industrial application

ABB – power transformers in Lodz

The history of the transformer factory in Lodz goes back to 1925 when Elektrobudowa manufactured the first transformers. Its activity was slowed down by the Second World War but the factory was not destroyed.
In 1958 at the suburb of Lodz, the building of a new large transformer company named ELTA, was started as the continuation of the old one. Following the change of the political system in Poland, the factory obtained the status of a limited liability company and 51% of its shares were purchased from the state by the ABB Group.

The Power Transformer Factory in Lodz has the technical capability to produce large power units – 500 MVA and voltage up to 550 kV. However, we focus on the production of transformers rated from 63 to 200 MVA and voltage up to 275 kV so called Medium Power Transformers (MPT). Over 80 percent of our production is exported to most of the countries in Europe and to North America.

Our successes:
— modernization of the highest power generator step up (GSU) transformer 670 MVA, 400/22 kV
— the highest voltage network autotransformer 250 MVA, 525/121/38.5 kV
— the highest power autotransformer 500 MVA, 410/245/15.75 kV.

Why it is worth buying from our factory:
– we have been producing and supplying transformers for the power generation, transmission, distribution for over 80 years and exporting for almost 40 years. Transformers produced in Lodz work in various electrical power systems worldwide
– our transformers are produced in Trafo-Star technology based on the knowledge and experience of the many factories around the world in the ABB Group
– we have introduced and maintain a management system covering quality (ISO 9001), environmental protection (ISO 14001) working conditions (PN-N-180001) and welding constructions TÜV (DIN EN 729-2, AD 2000-Merkblatt HP 0)
– we are constantly improving our processes by means of the SixSigma methodology
– we only use proven and tested suppliers for our materials, components and parts (all suppliers are approved by the ABB Group)
– we cooperate with national and international research centers active in the field of power technologies
– we provide a variety of services: design, manufacturing, installation, measurement, testing and after sales support
– we have modern manufacturing machinery and a very well equipped testing field with low interference levels: partial discharge noise background level 10 pC, noise background level 34 dB(A). Our procedures, modern laboratory and well educated staff allow us to test trafo in line with IEC/ANSI/CSA/GOST/BS/DIN/VDE standards
– we are constantly improving the skills of our employees (training and courses, job rotations, conferences and seminars)
– we constantly follow the latest technological developments, requirements and expectations of our clients (through direct contact, teleconferences, seminars), and put these into practice
– we are prequalified supplier for many major power utilities in Europe, Russia and North America.

Air cushions workshop transport

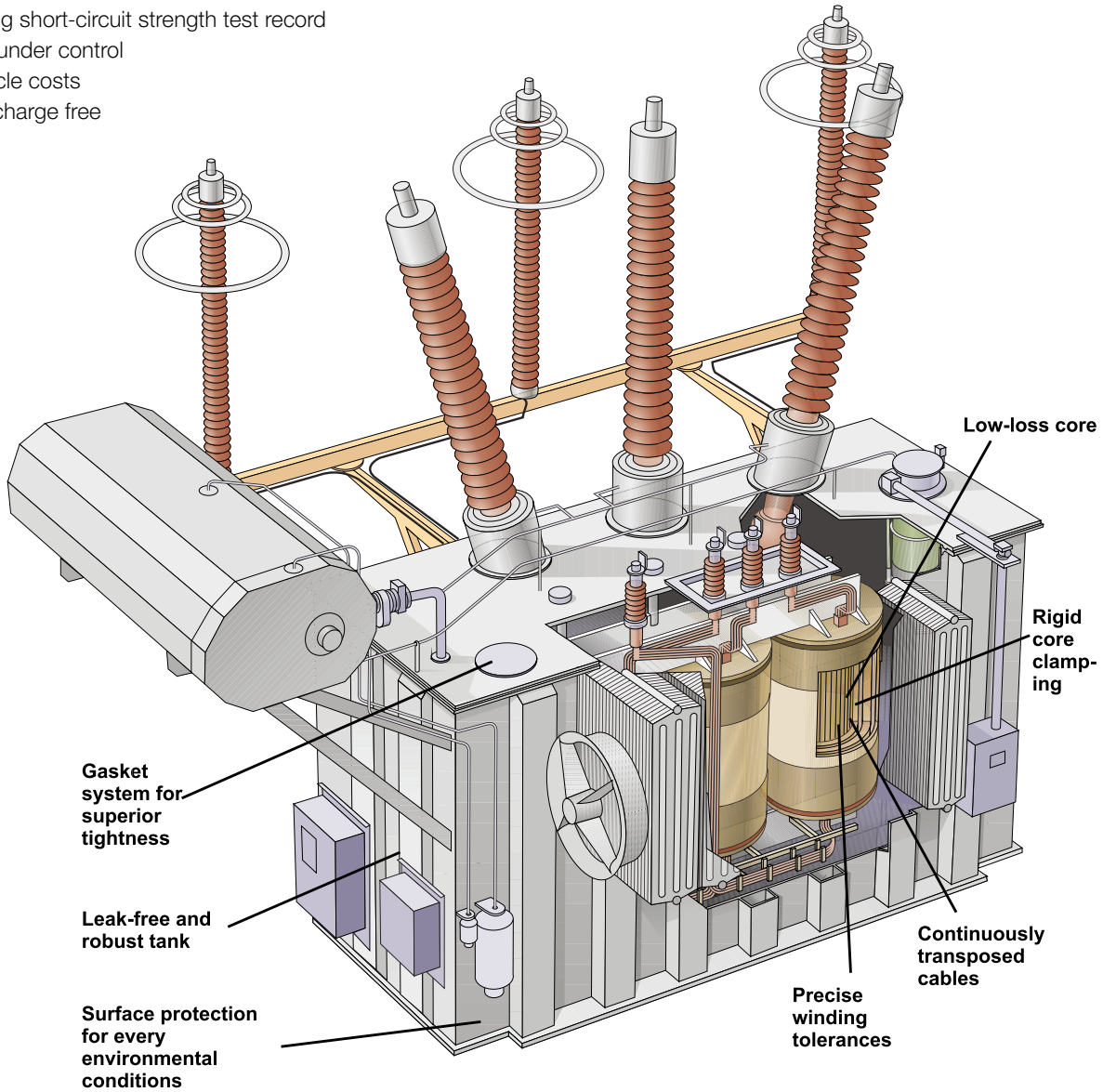
TrafoStar – for efficient and reliable transformers

TrafoStar is the common ABB concept used for the design and manufacture of Power Transformers across all its manufacturing facilities worldwide. It is based on the best practices and know-how acquired over several decades coupled with its global manufacturing experience. Every TrafoStar transformer is built from standardized, service proven components and modules ensuring flexible, dependable and tailor-made products which in turn ensure maximum availability, lower maintenance costs and reduced life-cycle costs.

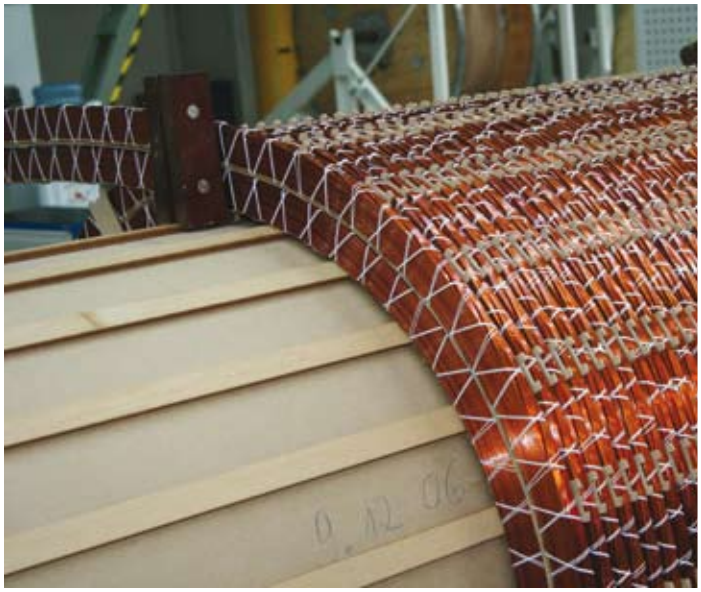
The TrafoStar design used for core type transformers has a circular shaped core limb, surrounded by concentrically arranged, cylinder shaped windings. This facilitates the most efficient use of active material and reduces production time. Cylindrical windings can be easily designed to withstand short circuit forces even under extreme fault conditions.

TrafoStar – major features:

– building blocks in parametric modules
– strict quality control measurements
– outstanding short-circuit strength test record
– hot spots under control
– low life-cycle costs
– partial discharge free



TrafoStar



Helical layer winding

Disc winding

Windings

Transformer windings are the most critical part of the transformer. They decide about major transformer parameters which must suit to the customer specification and all related standards. Winding design has to take into consideration nominal power, voltage ratio, regulation type and range, system and test voltages, short circuit apparent power of the network, cooling medium parameters and so forth. Low voltage windings are generally helical, layer or disc type.

Depending on current density they have single or multiple design. Commonly used are twin, triple or continuously interleaved conductors enameled, paper wrapped or both. High voltage windings are wound as disc windings, partially or fully interleaved to increase longitudinal capacitances and reduce transient overvoltages which can occur inside the windings in operating and fault conditions. Another method giving a similar capacitance effect is using shield conductors inside winding discs. They are potentially connected with the winding but do not carry winding current.

Regulating windings can be layer loop or disc type dependent on current and regulation range. They are normally arranged as a separate physical winding shell. This design allows a balanced ampere turn distribution, avoiding excessive short circuit forces and additional losses.

Paper insulation of copper conductors is made of thermally stabilized cable paper or special thermally upgraded paper allowing higher temperature rises for the windings. The structure of winding blocks consists of rings, cylinders, vertical strips and horizontal spacers between individual coils. It is properly designed to ensure sufficient electrical withstand, proper flow of cooling medium and mechanical strength at working and transportation conditions.

All these parts are made of high density pressboard with very good electrical and mechanical properties. Only in areas where electrical field is not crucial laminated wood is used. All mentioned materials have excellent dielectric properties in contact with oil.

Core

Different core types are possible. The core of 3-phase power transformer can be a 3 or 5 limb design.

The core of 1-phase transformer can have 2, 3 or 4 limbs conditioned by winding distribution. Yokes are pressed and fixed together by steel bolts connecting steel beams and going through the core windows and outside the core structure. All beams are fully insulated from magnetic steel and one from the others by fiberglass spacers. Copper connections are made separately from the core and beams to the bushings located on the transformer cover for grounding the core to the tank externally. Core material is high-grade, cold-rolled, grain-oriented, highly permeable silicon alloy steel of low-histeresis loss, free of burrs and sharp projections. Lamination thickness is in range of 0.23 to 0.35 mm dependent on the material grade (domain refined to regular grain oriented respectively).

The legs and yokes are stocked from individual sheets cut with a 45 degrees angle and overlapped using the STEP-LAP method which guarantees the lowest possible additional losses in the core. The core legs are wrapped with an ASECOND-band, a semiconductive, epoxy resin based material, which after curing, becomes very strong-screening cylinder protecting core against mechanical shocks as well.

Tanks

The tank has a welded steel plate construction. All seams and joints are welded on inside and outside. Tank cover can be welded or bolted to the tank. The external and internal surface of the tank and cover is properly cleaned (shoot blasted) and painted according to one of the approved methods depending on climate and environment conditions. Additionally the cover surface is coated with antiskid paint. Manholes, handholes and flanges for mounting bushing and other accessories are raised, machined and furnished with grooves for nitrile rubber O-ring gaskets.

Oil preservation systems normally used in transformers are: Conservator (with air bag) and Inert Gas-Pressure. Every time when this is possible the bushings are mounted on the turrets designed in that way that it is not necessary to lower the oil level below the upper part of windings for replacement of the bushings or current transformers.

In order to limit losses from the magnetic leakage flux in large transformers and to avoid local overheatings close to high current leads, non-magnetic steel inserts and magnetic shunts made of transformer core steel sheets are used. For the transformers exceeding typical transportation profile, the tank shape is adapted to the means of transport.

The factory also builds “bell” type tanks, which are the standard solutions for French & Russian markets.

1. Denmark 120 MVA | 2. Russia 250 MVA | 3. Switzerland 160 MVA | 4. Singapore 300 MVA | 5. Great Britain 340 MVA | 6. Netherland 140 MVA | 7. France 60 MVA | 8. Great Britain 60 MVA | 9. United States 56 MVA


1


2

3


4


5


6


7


8


9

Test field

Our new test field has modern and specialistic equipment from manufacturers who are known throughout the world. It has a low interference level -< 10 pC, < 34 dB(A).

The test field has voltage and power sources enabling us to carry out tests on large rating transformers (approx. 700 MVA) and very high voltage (up to 750 kV inclusive) in accordance with European, American and Russian standards. Moreover, we have at our disposal a 50/60 Hz generator, which is important for testing transformers destined for North American markets (USA, Canada). Among the other important items of equipment are:

– impulse generator, 12 levels with voltage range setting while using full energy, in the ratio 1:2:3:4:6:12, chopping device (4x600 kV), three-component voltage divider (2400 kV) and control, calibration, measurement and analysis (HIAS) systems. Maximum voltage: Lightning Impulse (LI) 2400 kV/240 kJ, Switching Impulse (SI) 2280 kV/215 kJ
– HV transformer (50 Hz) 2-component, ready for work in series (2x500 kV), 1 A or in – parallel (500) kV, 2 A
– AC Generator 35 MVA, 6.3/ kV, 50 Hz,
– capacitors bank 90 MVA
– TMS 580 Control desk and power measurement system for power tests – HAEFELY
– TTS Transformer Test System for very low resistance measurement, ratio (used for HRT) – HAEFALY
– PULSE 7533 system for sound level measurement Bruel & Kjear.

Test Field

Test Field control room

Assembly of 250 MVA autotransformer in Russia

Transformer Service

The ABB transformer maintenance and service program ensures that your transformers are operating at optimum performance. With our unique processes of testing, diagnostic, prevention, and damage limitation, ABB can ensure maximum utilization.
The Mature Transformer Management Program for fleet assessment and the ABB Life Assessment program are the cornerstones of the health, fitness and life expectancy of the transformer. The result is that the customers can make the right decision regarding their capital expenditure.
ABB's unique diagnostics tools are drawn from its global design library. These tools provide an assessment of the health, fitness and life expectancy of the transformer, quantify the impact of changes in operating condition and ensure the correct decision regarding overloading.
ABB offers a total service solution. Whether it is Field Service, Factory Repair or Advanced Engineering Analysis, ABB's service capabilities are unparalleled when it comes to transformers. From installation, repair to removal, ABB has the team, the equipment and the solutions to provide a total transformer care. The right equipment, people, resources and solution on site ensures that your transformer is functional on the date promised. ABB has logistics experts and within 24 hours, one of our full trained field service experts can be on-site working with you.
Let us work with you to establish a fully integrated program of diagnostics, prevention, and damage limitation to recovery for your transformer fleet.

We offer to our Clients:
— diagnosis + life assessment
— preventive maintenance
— refurbishment + enhancement
— on site repair
— transformer fleet management

ABB transformers – the solution for a cleaner future

Environment

ABB is working globally as well as locally to ensure that environmental awareness moves from a sideline topic to a central theme. ABB is continuously improving its product range. Technology along with expertise means progress towards cleaner standards that it shares with its customers and towards a better future.
We are also the first power transformer manufacturer in the world to have an Environmental Product Declaration (EPD).
We have clear strategies and principles backed up by on site certified management systems. These systems provide regular reports concerning environmental performance that form the basis for deriving concrete solutions. Our aim is to change today's ideas into reality.
We have a clear list of initiatives for the future. Total incorporation means that we regard ourselves as a catalyst for change. Product improvement, customer awareness, advanced solutions, and permanent on-line contact with our partners are the key to our future.
The health and safety of our employees, contractors, customers and others affected by our activities is a key priority for ABB. Our long-term goal is to have zero injuries in our factories worldwide. To achieve this goal, everyone must work together to prevent unsafe behaviours and conditions.

Transportation of 160 MVA transformer

60 MVA transformer installed on site

Our Success

ABB Factory in Lodz has a great experience in delivery of transformers for different and special markets where requirements of the Clients and working conditions of our transformers are very hard. Long Reference List is the best proof of our transformer knowledge and experience. Below we want to present few examples of projects, chosen from our Reference List:

Transformer 340 MVA, 17.5/145 kV Great Britain

Short description:

The new generator transformer, which stepped up 17.5 kV terminal voltage to the 145 kV required for the british network operator, replaced the existing unit which failed in March 2004, causing Reactor of the nuclear power station's two reactors to be taken off-line. The 17.5/145 kV 340 MVA generator transformer was based on ABB's Trafostar common design and engineering platform for power transformers and was manufactured in ABB's Lodz factory in Poland. In addition to the challenge of manufacturing the transformer on a fast-track basis, the logistics of delivery presented an extra challenge as we had to move the 168 tones load across to the Baltic Coast, out through the Kiel Canal and then sail it across the channel from Cuxhaven, Germany to Lowestoft. After a series of final checks to ensure it had not been damaged in transit, the transformer was brought by road to the destination in the early hours of the morning. Thanks to the excellent cooperation between ABB UK, ABB Poland and the Customer we were able not just to meet an already exceptional delivery time, but to deliver the transformer nine days earlier.

Autotransformers 250 MVA, 500 and 330 kV Russia

Short description:

ABB had delivered autotransformer to one of the biggest power company in Russia. They have more than 100 000 km of transmission lines and about 800 substations of total transformation capacity of more than 300 000 MVA. This is a most important element in infrastructure of the created Russian Energy market. ABB Lodz factory was delivered GOST type autotransformer 250 MVA, 500 kV and 250 MVA 330 kV installed in power substations. ABB Lodz factory successfully designed, manufactured, tested and delivered GOST types autotransformers meeting severe short-circuit network condition. For these types of autotransformers ABB Lodz received the Attestation which means that may be used in all Russian network.

Transformer 160 MVA, 230/65 kV Switzerland

Short description:
It was the first delivery of such big unit from Lodz Poland to Switzerland, comparing to previously delivered small rating units. The scope of this project included design, production, testing, transportation and off-loading of transformer on site. From the whole project the one of the most essential activities was the transportation from the Lodz factory to Swiss Site through the Alps. The transportation chain was organized by ABB personnel and included: railway transportation from Lodz facility to port of loading Szczecin Poland, barge shipment from Szczecin to Basel Switzerland, road transportation from Basel to the Customer. All the operations were scheduled very detailed and performed on-time.

Transformer 60 MVA, 132/33 kV
Great Britain

Short description:
60 MVA, 132/33 kV transformers have been delivering to one of the major UK energy supplier by ABB as the scope of the frame agreement from ABB factories in Dundee, Bad Honnef and Vaasa. In year 2004 production of these transformers was moved to the factory in Lodz, Poland and the last 19 transformers were produced in Lodz facility. The latest 60 MVA unit was delivered in September 2008, this project had extended scope what means that ABB was responsible for the delivery, off-loading, installation on the foundation, assembly and commissioning of transformer on site. All on site activities were performed by ABB Poland service team who hed been trained and obtained necessary authorizations that allowed ABB Poland personnel to work on the Customers Substations.

Transformer 120 MVA, 132/33 kV
Denmark

Short description:
Our Customer is one of the leading energy groups in Northern Europe. One of the major activities is developing off-shore wind power generation. ABB Lodz Factory has already delivered four units of 120 MVA transformers in 2008 and 2009. Two further units are during production process in our transformer factory to support another off-shore wind farms projects. The project covers design and manufacturing of transformer as well as transportation, assembly and testing at construction site in sea harbour. The transformer design itself is very complex to match severe marine condition. It incorporate highest available corrosion protection class C5M and plug-in bushing to connect with submarine cable to transfer energy to onshore substation. The design was developed in close cooperation with off-shore platform designers in order the transformers perfectly fit to the off-shore platform structure.

Transformer 140 MVA, 150/22/22 kV Netherland

Short description:

140 MVA, 150/22/22 kV transformer has been delivered to one of the leading energy companies in Netherland.
Transformer was produced in anticorrosive coating class – C5M, which ensures suitable durability in maritime conditions. The radiators, which have been installed on the outside of the platform building, were be especially exposed to maritime corrosion conditions. An additional obstacle in carrying out the project was the strict mass and dimensional requirements. In February 2007 this transformer was installed on a platform in the Danish port of Aalborg and towed to the Dutch coast. It is connected with land by over 200 km of submarine cable, which supplies energy from the wind farm.

Transformer 56 MVA, 108/46.24 kV
United States

Short description:
In 2005 ABB Lodz Poland started cooperation with one of the major power energy supplier in US. Our factory was positively approved by engineers represented Customer.
In February 2006 we delivered first two identical units. In May 2006 we received the order for the next three units provided with de-energized tap changer located in HV side. In November 2006 ABB PS had won key project and main part of this contract were three transformers from ABB Lodz.

Autotransformer 250MVA, 220/110/10 kV Russia

Short description:
Main activity of our Customer is providing electricity transmission services to consumers in Moscow and Moscow Region. ABB Lodz Factory delivered 4 units autotransformers 250 MVA 220 kV to power substations. ABB Lodz factory successfully designed, manufactured, tested and delivered compact 250 MVA autotransformers with on-tank OFAF cooling system to replace old 200 MVA with free-standing OFWF ones.
Additionally ABB Lodz Factory delivered 2 units of these GOST type autotransformers to the industrial segment.

Contact us:

Agnieszka Małkus
Medium Power Transformers Product Group Unit Manager
Phone: +48 (42) 29 93 101
Fax: +48 (42) 29 93 102
Mobile: +48 601 227 067
E-mail: agnieszka.malkus@pl.abb.com

Paweł Pryliński
Marketing & Sales Manager
Phone: +48 (42) 29 93 114
Fax: +48 (42) 29 93 102
Mobile: +48 601 252 981
E-mail: pawel.prylinski@pl.abb.com

Krzysztof Lubowiecki
Senior Area Sales Manager
responsible for Russia
Phone: +7 495 960 22 97 ext. 2356
Fax: +7 495 232 41 53
Mobile: +7 916 518 28 56
E-mail: krzysztof.lubowiecki@ru.abb.com

Andrzej Rajski
Area Sales Manager
responsible for Scandinavia
Phone: +48 (42) 29 93 116
Fax: +48 (42) 29 93 102
Mobile: +48 695 600 026
E-mail: andrzej.rajski@pl.abb.com

Sergiusz Kapka
Area Sales Manager
responsible for North American
Phone: +1 314 679 4799
Fax: +1 314 679 4810
Mobile: +1 314 223 5082
E-mail: sergiusz.m.kapka@us.abb.com

Marcin Pietraszczyk
Area Sales Manager
responsible for German, Austria and Switzerland
Phone: +48 (42) 29 93 119
Fax: +48 (42) 29 93 102
Mobile: +48 691 980 099
E-mail: marcin.pietraszczyk@pl.abb.com

Robert Szejn
Area Sales Manager
responsible for Poland
Phone: +48 (42) 29 93 108
Fax: +48 (42) 29 93 102
Mobile: +48 609 202 929
E-mail: robert.szejn@pl.abb.com

Bogusław Walkiewicz
Sales Engineer
responsible for Great Britain, Iceland and Ukraine
Phone: +48 (42) 29 93 118
Fax: +48 (42) 29 93 102
Mobile: +48 609 121 926
E-mail: boguslaw.walkiewicz@pl.abb.com

Waldemar Jabłoński
Sales Engineer
responsible for Central and East Europe
Phone: +48 (42) 29 93 109
Fax: +48 (42) 29 93 102
Mobile: +48 691 510 114
E-mail: waldemar.jablonski@pl.abb.com

Artur Chwiałkowski
Sales Engineer
responsible for Benelux and France
Phone: +48 (42) 29 93 117
Fax: +48 (42) 29 93 102
Mobile: +48 605 281 626
E-mail: artur.chwialkowski@pl.abb.com

Paweł Brzeszczyński
Marketing Specialist
Phone: +48 (42) 29 93 082
Fax: +48 (42) 29 93 102
Mobile: +48 693 284 061
E-mail: pawel.brzeszczynski@pl.abb.com

Marta Kacprzyk
Lawyer, specialist in contractual risk assessment
Phone: +48 42 29 93 081
Fax: +48 (42) 29 93 102
Mobile: +48 663 190 744
E-mail: marta.kacprzyk@pl.abb.com

2406PL170-W1-en. Edition 11.2009

ABB Sp. z o.o.
67/93 Aleksandrowska Str.
91-205 Łódź
Poland

www.abb.com

Power and productivity for a better world™