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Power and Distribution Trsansformers – Technologies, Materials, Applications, New Developments, Industry Structure and Global Markets

https://marketpublishers.com/r/P03838415FDEN.html
Date: March 2015
Pages: 81
Price: US$ 2,950.00 (Single User License)
ID: P03838415FDEN

Abstracts

Transformers are a vital link to the entire supply chain for electric power, from generation to transmission to distribution networks, either within a country or within a continent to connect country to country, as in Europe. Electrical energy is delivered to consumers by utility power transmission and distribution systems. The transmission network delivers power at high voltages (110kV to 765 kV) from power plants to local distribution systems, where the electrical energy is transformed to lower primary distribution voltages (ranging from 4kV to 35 kV). High transmission voltages are used to transmit high levels of power over long distances.

At the transmission end, large power transformers are used. A large power transformer (LPT) is a large, custom-built piece of equipment that is a critical component of the bulk transmission grid. Because LPTs are very expensive and tailored to customers' specifications, they are usually neither interchangeable with each other nor produced for extensive spare inventories. According to an industry source, approximately 1.3 transformers are produced for each transformer design.

High transmission voltages require lower currents, which reduce line losses, conductor material, and costs. Once the electrical power has reached the distribution system, it is transformed to lower primary distribution voltages that are more economical for the short distances within distribution systems. The primary distribution voltage is transformed by distribution transformers to lower secondary voltages (120V to 480V) that are suitable for customer equipment. Distribution transformers are thus the final link in the chain of power transmission and distribution from the generating source to the customer.

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STUDY GOAL AND OBJECTIVES

In the last decade, several new developments have taken place in the power and distribution transformers industry. As the original domestic, country-based networks have been built out and matured, markets have opened up and been deregulated in the western world to promote competition and efficient interconnections and creation of regional networks and markets. This evolution led to a change in the relationship between transformer manufacturers and buyers, from a local to a more global perspective, with a greater focus on economics on both sides. As a result, manufacturers also had to become more global, leading to consolidation and concentration of the industry.

Simultaneously, the emerging markets in Asia and South America started to have a major influence, and these came to dominate the demand for power transformers. The rapid build-out in China and later India and other emerging markets created a boom period for transformers during the first decade of the new century, causing very high material prices for copper and core steel, and long delivery times and various other imbalances. A very rapid build-out of manufacturing capacity occurred, particularly in Asia, causing a substantial overcapacity at the end of the period, with new imbalances and instabilities in material prices. Multinationals, with global positions and common technologies emerged as a major force during this period.

This report has been prepared to:

provide an overview of power and distribution transformers, their production technologies and applications;

identify technological and business issues related to the commercial production of power and distribution transformers;

analyze the industry structure, including domestic and international competition among companies within power and distribution transformers market segments;

determine the current size and future growth of the global markets for power and distribution transformers; and

identify and profile all global producers and suppliers of power and distribution transformers.

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REASONS FOR DOING THE STUDY

Key drivers for future transformer market development include an increase in electricity demand in developing countries, replacement of old electric power equipment in matured economies, and a boost for high-voltage power transformers and capital expenditure in the power sector worldwide. In addition, the adoption of energy-efficiency standards in developed markets such as Europe and the United States, as well as in emerging markets such as China and India, are expected to create demand for new, more efficient electricity equipment, including power transformers. Also, new efficient transformer designs using amorphous magnetic materials for cores will become increasingly preferred because they can cut down iron losses and noise and demonstrate longer functional life. These developments have created a need to make a proper analysis of the technological and business issues, trends in manufacturing, markets and foreign competition. In addition, there was a need to look at the increasing demand, especially from China and India, and changes in industry structure and market trends.

CONTRIBUTIONS OF THE STUDY

iRAP's technical/economic study covers technology and industry overviews, materials, current and emerging production methods, new developments in materials and processing techniques, business and technology issues, current and emerging applications, and an extensive market analysis. Current size and future growth of the global markets are estimated for 2014 and 2019.

FORMAT AND SCOPE

This report reviews the technology of power and distribution transformers, the types of power and distribution transformers, their applications, and current and anticipated demand for power and distribution transformers, The report provides an analysis of material and product types in that category, processing technologies, properties, applications, new developments and patents, the global markets, and competition.

The qualitative and quantitative judgments embodied in this report are a valuable contribution to the current knowledge of power and distribution transformers, their manufacturing technologies, applications, and markets. Moreover, this study has been conducted at a vital stage when new soft magnetic materials such as amorphous steel are revolutionizing the application areas. Because of the very low magnetic loss, these materials are replacing some of the current materials, as well as finding new

applications especially in distribution transformers.

TO WHOM THE STUDY CATERS

This report is directed to executives of organizations that are interested in the developments in this field, including:

- power and distribution/transformer manufacturers;
- companies involved in the development, manufacturing, and supplying of power and distribution transformers;
- manufacturers and suppliers of amorphous magnetic materials, grain oriented electrical steel and fabricated stamping/laminations used in cores of transformers;
- manufacturers and suppliers of systems and subsystems which incorporate power and distribution transformers;
- engineering, procurement and construction (EPC) contractors and power plant owners; and
- independent power producers (IPPs), non-utility generators (NUGs),public utilities, intermediaries such as stocking distributors and electrical contractors, and turnkey power project construction companies.

REPORT SUMMARY

The large global transformer industry results from the interplay between participating agencies at local, national and international levels, such as the bulk buyers of power transformers (PTs) consisting of independent power producers (IPPs), turnkey project construction companies, top utilities/power distribution companies, and electrical contractors engaged in transformer purchase. The industry also involves a large number of stamping/lamination fabricators and a mix of well-known multinational companies for PTs as well as many small/medium industrial units specialized in assembly and testing of distribution transformers (DTs).

Utilities are demanding compliance to higher efficiency requirements in distribution

transformers. Most utilities now use purchasing formulae that factored the effect of transformer efficiency into the purchasing decision. Manufacturers have responded by tailoring their products to the energy evaluation factors specified by customers, so that it is now possible to purchase a high-cost, high-efficiency transformer or a unit with a lower first cost and lesser efficiency.

In the last two decades, amorphous metal transformers (AMTs) used as distribution transformers have reduced system losses. These novel and highly energy-efficient units were slightly more expensive but had significantly lower operating costs than conventional units, resulting in lower life-cycle (LC) or total ownership costs (TOC).

According to a new iRAP report, the global market reached to about $41,560 million in 2014, and it is estimated to increase to $63,500 million by 2019 at a CAGR of 8.8 % per year from 2014 to 2019. China has the largest market share followed by the US, Europe, India and Japan.

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Semiprocessed grades
Fully processed grades
High permeability steel (HIB)
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