



Press release

Nexans leads co-operative project to develop 110 kV superconducting fault current limiters

HTS (high temperature superconductors) will enable utilities to achieve optimum cost efficiency and network reliability for their high voltage grids

Paris, November 16, 2005 – Nexans, the worldwide leader in the cable industry, is leading a consortium to develop a superconducting fault current limiter (SCFCL), based on high temperature superconductors (HTS), for use on 110 kV networks. The other partners in the project are Forschungszentrum Karlsruhe, the University of Hanover, EnBW Energie Baden-Württemberg AG and RWE Energy.

The project, which started in September 2005, will focus initially on the creation of a single-phase SCFCL module for laboratory tests. Nexans will then construct two three-phase prototypes for network trials by EnBW Energie Baden-Württemberg AG and RWE Energy.

New possibilities for optimising network infrastructure

HTS based fault current limiters offer new possibilities for optimising network infrastructure by considerably improving resistance to short circuit currents. The capability of HTS current limiters has already been proved during the CURL 10 project, in which a demonstration model using Nexans components was tested successfully in RWE Energy's 10 kV network.

HTS components

The core of the 110 kV HTS current limiter will be formed from the same BSCCO 2212 superconducting material, developed and manufactured by Nexans SuperConductors GmbH (NSC), a Nexans company based in Hürth (Germany) and specialised in superconductors, that was used in the CURL 10 project. At temperatures below -180°C (its 'critical temperature'), this material becomes superconducting and behaves like a loss-free electric conductor. If however, the ceramic metal-oxide warms up above the critical temperature, or if the current density becomes too high, it loses its superconductivity. The same happens when the superconductor is exposed to a high electromagnetic field. The current limiter uses these effects to automatically reduce unacceptably high currents to a pre-set value. The system is intrinsically safe; only seconds after the network error is cleared it restores the superconducting state and is ready for the next use.

Current limiter operation principle

For the 110 kV current limiter, Nexans has further developed the CURL 10 concept by introducing magnetic field triggering. *“The superconductor is put into a coil and connected in parallel to it,”* explains Dr. Joachim Bock, Managing Director of NSC. *“As soon as the current density exceeds the critical value, the superconductor loses locally its superconducting state and the current flows through the parallel connected coil. This current then creates a magnetic field that instantaneously forces the superconductor into the non-superconducting state along its entire length, which improves and accelerates the current limitation.”* Dr. Bock predicts that this new concept will result in an economic breakthrough in the application of superconducting current limiters, since *“we can minimize the use of the material and reduce the cost of cooling at the same time.”*

In the 110 kV project, NSC is not only responsible for the development and production of the superconductors, but will also integrate the cryostat and the current leads; Nexans, Hanover will define the refrigeration technology. The Institute for Technical Physics at the Forschungszentrum Karlsruhe will develop the high-voltage technology and performs specialized tests on components. Its focus will be on electric isolation in liquid nitrogen, because isolation materials may not change appreciably during their service-life of up to 30 years. Furthermore, the University of Hanover (simulations) and the Mannheim University of Applied Sciences (scientific consulting) are also involved in the project.

Utility interest in coupling 110 kV networks

“CURL 10 is certainly one of the most successful projects in the high-temperature superconductor field in Germany. So the utilities are particularly interested in the following project, short circuit current limiters for 110 kV,” said Dr. Joachim Fröhlingdorf from the VDI Technologiezentrum, the official organisation that carries out projects for the Ministry of Research and Technology (BMBF). *“We expect the superconducting current limiter to provide an improved network structure and cost-savings on network components,”* said Prof. Claus Neumann, the Director of Operative Asset Management, RWE Transportnetz Strom GmbH. He already knows what the most important application will be: the coupling of 110 kV network groups. Currently, the 110 kV network is divided into isolated network groups in order to avoid excessively high short circuit currents. These network groups are fed through transformers from the 220 kV or 380 kV network. The number of these transformers is selected such that, if one breaks down, sufficient redundancy remains. By adding superconducting short circuit current limiters, network groups could be coupled and transformers could thus become unnecessary. That offers the potential for cost-savings. Dr. Wolfram Münch, Director of Research at EnBW, said: *“We have been following superconductor technology for a long time and view the current limiter as the most interesting application. That is why we are involved in the project.”*

Bringing superconductors into the mainstream

According to Dr. Bock *“The short circuit current limiter is the key application that will bring superconductors into the mainstream.”* Other promising applications for superconductors in energy technology also include power cables for transmitting high power at limited voltage and fly wheels equipped with superconducting bearings for storing energy.

About Nexans

Nexans is the worldwide leader in the cable industry. The Group provides an extensive range of advanced copper and optical fibre cable solutions for the infrastructure, industry and building markets. Nexans cables and cabling systems can be found in every area of people's lives, from telecommunications, information and energy networks in aeronautics and aerospace, the automobile industry, railways and construction to petrochemical and medical applications. With an industrial presence in 29 countries and offices and commercial activities across the world, Nexans employs 20,000 people and generated sales of EUR 4.8 billion in 2004. Nexans is listed on the Paris stock exchange. You can find further information at www.nexans.com.

Nexans develops and manufactures superconducting materials, components and systems, in particular superconducting cables and fault current limiter elements, as well as flexible and rigid cryostats which constitute key components for superconducting systems.

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