Special from **etz** 22/2001 • VDE VERLAG GMBH • Berlin • Offenbach

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Elektrotechnik + Automation

30 ms High Speed Transfer System for optimized supply of energy

Kai Jantke • Ralf Krumm • René Vieille

Modern industrial plants and service centers require a reliable and safe supply of electrical energy. Due to increasing degrees of automation, even a very short failure in an electrical supply can lead to considerable disruptions in production. One way of solving this problem is to provide a second power supply, and to use an Automatic Transfer System to switch the load to the undisturbed power supply in the case of a malfunction. The High Speed Transfer System has already been applied in the central medium voltage supply of a shipping center, where it has been shown that transfer times of 30 ms have no detrimental influence on the load. The system has been successfully switched over many times since it was first put into operation in November 2000, solving many previous

Depending on the load requirements, various different concepts can been applied. An important factor is the maximum interruption time at which continued operation of the system is still guaranteed. Another significant role is played by the connected load to be secured or switched over.

For extreme transfer demands in the microsecond range, only Thyristor-based, static systems are considered. However, these typically have a limited connected load capacity, require considerable investments and have considerably high running costs, e.g. due to permanent losses through the cooling system. For this reason, their use is usually reserved to the protection of important mainframe computer systems.

Large rotating loads, such as pumps or fans, can often be switched over with simple, e.g. residual voltage dependent transfers in the range > 300 ms.

Research has shown that there is a growing need for transfer systems which allow transfer times between these two alternatives.

Here, we describe a transfer system based on optimized medium voltage circuit breakers which obtains transfer times of 30 ms. With this transfer time, industrial load groups, which are normally characterized by a mixture of rotating and non-rotating loads, can be operated continuously, without interruption.

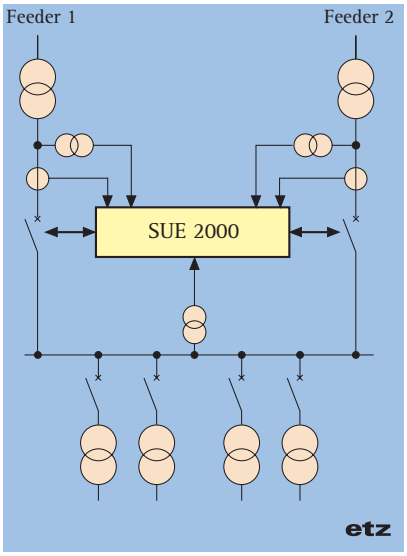

Fig. 1. *Schematic installation of the High Speed Transfer System*

Control of the High Speed Transfer System

The control system of the transfer system must guarantee both the shortest possible processing time and the highest possible level of safety. The control sy-

Fig. 2. *The Otto Shipping Center in Haldensleben, Saxony-Anhalt, Germany*

stem is based on the High Speed Transfer Device from ABB [1], which has proven itself in use in power plants and industrial facilities.

The system is alerted via optimized under- or overvoltage detection as well as power direction recognition, ensuring fast initiation of the transfer. All general technical conditions affecting the implementation of the transfer are monitored and taken into account by the system.

If the prerequisites for a transfer are met, a open command is issued to the supplying circuit breaker and a close command is sent to the circuit breaker of the stand-by feeder simultaneously.

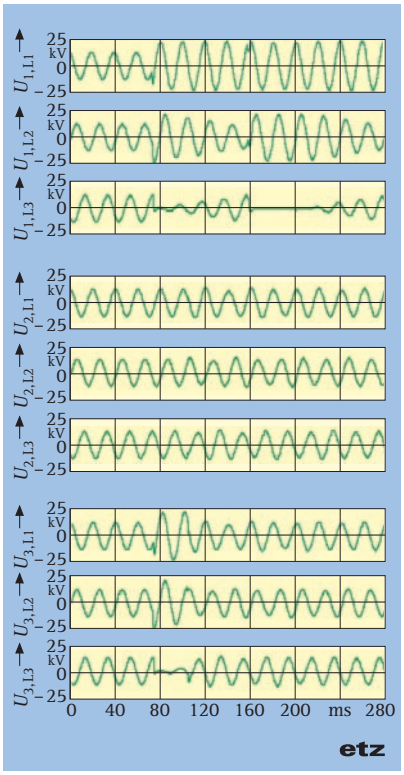

Fig. 3. *Oscillogram of a 30 ms transfer in the Haldensleben Shipping Center*
U1 Voltage of the main feeder
U2 Voltage of the stand-by feeder
U3 Voltage of the busbar

Optimized switching device: Circuit breaker in vacuum technology

As a switching device the ABB circuit breaker type VM 1-T in vacuum technology is used. With regard to its response time, this circuit breaker with magnetic drive was considerably optimized for the High Speed Transfer System and achieves a opening time of 9 ms as well as a closing time of 16 ms. It is available for operating currents from 24 kV and nominal currents of up to a maximum of 2 500 A.

Example of use – Shipping Center

Otto [2], the worlds mail-order-business leader operates a Shipping Center for small volume articles (Fig. 2) in the town of Haldensleben in Saxony-Anhalt, Germany. Thanks to its highly automated material flow systems, the logistics center is a central element of Otto's logistics, and also plays a major role in providing the customer with excellent service.

The Shipping Center is supplied by a total of 12 1-MVA transformers from four medium voltage stations. Lighting, ventilation/air conditioning and materials handling make up each a third of the electrical load in the logistics center.

As in every medium voltage network, short circuits and shorts to earth were causing production interruptions in the system. Despite UPS buffering of important computer and automation systems, a loss of voltage in the electric supply meant protracted resumption of the synchronized material flow processes.

Otto and the local energy supplier, the public utility company Haldensleben GmbH [3], investigated various solutions for stabilizing the voltage conditions. The investment costs of each variant were between 150.000 EUR and 1.5 million EUR. On the basis of the comparably low investment costs, along with the possibility of creating a second medium voltage power supply and the very short transfer time of 30 ms, they decided in favor of the High Speed Transfer System from ABB, consisting of an air-isolated ZS1 switchgear assembly with circuit breakers of the type VM 1-T and the transfer control unit SUE 2000 (Figs. 1 and 3).

When the asynchronous motors run in generating mode following a supply failure, the consumers are supplied with usable energy to support the process for short periods of time through the existing rotating machines in the domestic and conveying technology areas.

Literature

[1] www.abb.com
[2] www.otto.com
[3] www.swhdl.de

Dipl.-Ing. (FH) Kai Jantke (39) studied electrical engineering for energy management at Hamburg Technical College. He is responsible for energy management and automation in the technology and buildings department at Otto GmbH & Co KG, Hamburg.
E-mail: kai.jantke@otto.de

Dipl.-Ing. Ralf Krumm (36) studied electrical engineering for electrical energy technology at the University GH Siegen. He is a group leader with responsibility for product management and also for development coordination of High Speed Transfer Devices at ABB Calor Emag Hochspannung GmbH in Mannheim.
E-mail: ralf.krumm@de.abb.com

Dipl.-Ing. (FH) René Vieille (36) studied electrical engineering for electrical energy systems at the Magdeburg College of Mechanical and Electrical Engineering. He is technical procurator of the public utility facility Haldensleben GmbH and is responsible for the entire technical department.
E-mail: rene.vieille@swhdl.de