

## R&D Electronics Newsletter (2015 Issue 3)

Welcome to our 3rd issue of newsletters in 2015!

**R&D Electronics** is the **exclusive Sales-Channel of TECHSEM**, which is a well-known Chinese developer and manufacturer of **diode / thyristor modules and capsules** with more than 48 years experience. In our well-structured B2B e-commerce-portal [www.rd-ebusiness.com](http://www.rd-ebusiness.com) you can quickly find and order all products with the help of the integrated user-friendly search and ordering process. The online-shop is presented in **English, German and Portuguese** language.

In this issue we would like to present a case study with TECHSEM capsule thyristors (disc cells) in Medium Frequency Power Supply (MFPS) for induction heating equipment. MFPS is one of the main applications in which TECHSEM capsules have been used. In 2014 alone, more than **680,000** pieces of **TECHSEM capsule devices** have been used worldwide in the applications such as MFPS, High Power DC Supply and Medium Voltage Softstarters among others.

Also in this year R&D Electronics will exhibit together with TECHSEM at **PCIM fair** in Nuremberg Germany. Please find detailed information in this newsletter.

All of our newsletters are archived in our online-shop. More information is available under: [www.rd-ebusiness.com](http://www.rd-ebusiness.com)

Yours faithfully

R&D Electronics Team

### Case Study – TECHSEM Capsule Thyristors Used in MFPS

Hardening is one of the most important procedures in the metal processing. For the cases that the quenching hardness layer shall be thicker than 3mm, medium frequency induction heating equipment has to be used. The frequency can be in the range of 300Hz to 20kHz. For the power supply devices in the mentioned frequency range, thyristors have been mostly used because of the advantages they can offer such as higher forward current and lower forward voltage.

#### Case Description

A power supply with the operation frequency of 300Hz and output power of 800kW has been required for hardening equipment. The main circuit of the power supply is showed in Fig.1. The power supply consists of rectifier, filter and inverter. The current waves of each section can be seen in Fig.1 as well. The input current of the power supply from the transformer is 50Hz three-phase current. The three-phase input voltage of the power supply is 575V and the single-phase output voltage amounts to 1200V.

#### Rectifier

Calculated with a factor of 1.3, the input voltage on the single thyristor of the rectifier will be then  $575V \times 1.3 = 747.5V$ . That means the maximum value of the blocking voltage shall be  $747.5V \times 1.414 = 1056.97V$ . With the consideration of a safety factor 2, we need here the thyristors with the peak blocking voltage VRRM of 2200V. The mean forward current ITAV of the thyristors can be calculated as  $ITAV = 800kW / 747.5V = 1070.3A$ . Also here we need to calculate with 30% safety margin. So ITAV of the thyristors shall not be less than 1400A.

#### Inverter

The peak blocking voltage can be calculated as  $1200V \times 1.414 = 1696.8V$ . With a factor of 1.3, the VRRM of each single thyristor shall be then:  $VRRM = 1696.8V \times 1.3 = 2205.84V$ . For the mean forward current, we can use 0.9 as the ratio to the rectifier current:  $800kW / 747.5V \times 0.9 = 963.3A$ . It is recommended to calculate with a factor 2 to determine the ITAV of the used thyristors:  $ITAV = 963.3A \times 2 = 1926.6A$ . For the inverter here we need to use fast turn-off thyristors to ensure the short circuit commutated turn-off time.

#### Solution

As the solution for rectifier, 6 pieces TECHSEM phase control thyristors (Y55KPH) with ITAV of 1430A and blocking voltage VRRM of 2200V have been used. The inverter can be realized with 4 pieces fast turn-off thyristors (Y70KKG). This component has an ITAV of 2160A and VRRM of 2500V (Fig.2).

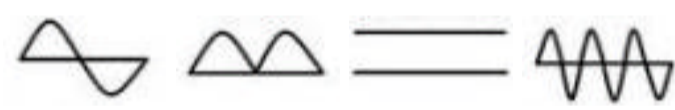
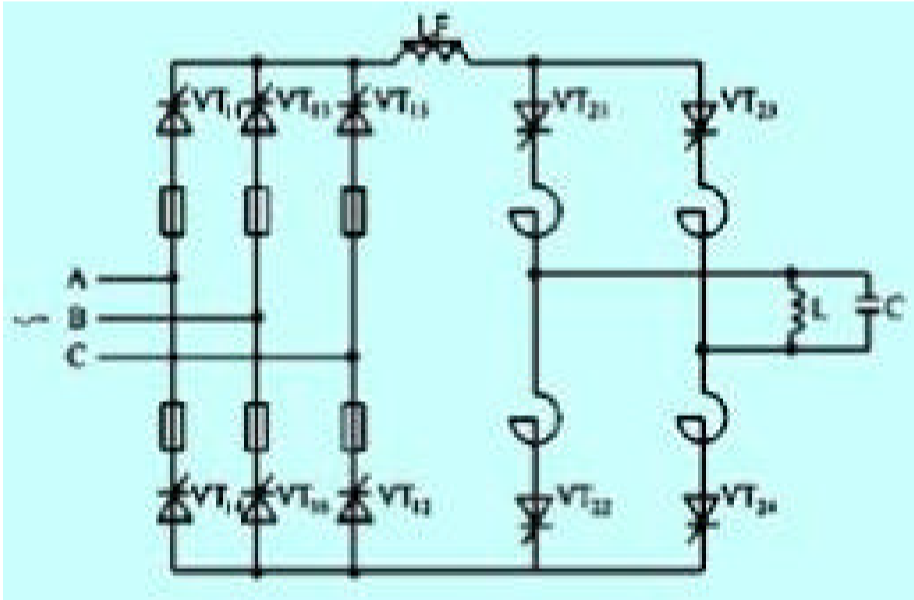


Fig.1: The main circuit of a MFPS and the current waves of each section



Fig.2: TECHSEM Phase Control Thyristor (Y55KPH) for Rectifier and Fast Turn-off Thyristor (Y70KKG) for Inverter



Fig.3: 800kW MFPS with TECHSEM Capsule Devices

Visit us at our booth during the PCIM in Nuremberg

**PCIM**  
EUROPE

Visit us at PCIM Europe:  
From 19 - 21 May 2015 in Nuremberg, Germany,  
Hall 9, Stand 9-429

We are looking forward to meeting you. For meeting arrangement please contact us via [info@rd-ebusiness.com](mailto:info@rd-ebusiness.com) or by phone +852-3421-2216.

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