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# FACTS: Solutions for industry

Eliminating power perturbations  
to boost your production

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Large and variable loads with abrupt changes in active and reactive power are a challenge for power supply solutions. The rapid growth in the use of variable-speed drives increases the generation of harmonic distortions. FACTS solutions help improve your industrial production.

#### Harmonic filter circuits

Filter circuits provide capacitive power, which improves the power factor. By tuning the filter circuits to specific harmonic frequencies, compliance with respective utility regulations can be achieved. This enables a higher utilization of transmission assets and saves energy.

#### SVC Classic

The heart of the SVC system is the light-triggered thyristor (LTT) valve system. Working alongside the controlled reactor, the filter circuits, and the control system Simatic TDC, a fast and dynamic compensation is created.

The system improves flicker values, balances and controls reactive power, and reduces harmonics. More than 100 SVC systems are in operation worldwide in industrial plants, including metals and mining operations, large compressor units, and other drive applications.

#### SVC PLUS®

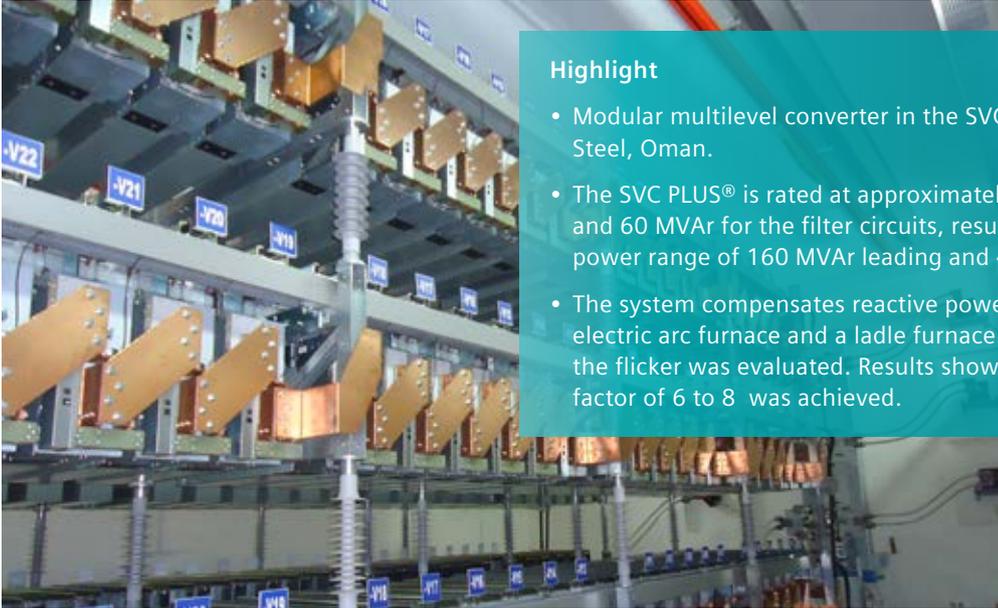
SVC PLUS® uses voltage-sourced converter (VSC) technology based on a modular multilevel converter (MMC) design. It offers a high degree of flexibility in converter design and station layout. The direct connection to the load bus usually eliminates the need for a transformer and increases speed.

Robust and proven standard components ensure excellent reliability in our latest generation of STATCOM. A small physical footprint reduces turnkey costs and offers an ideal solution when limited space is available. With an extremely good flicker reduction in the range of 4.5 or more, low harmonic generation, and low losses, the SVC PLUS® stabilizes your power supply even when fed by weak networks.

We have installed SVC PLUS® systems in industrial plants in the U.S., Russia, Qatar, Saudi Arabia, and Oman.

#### Modular Multilevel Converter (MMC)

Very fast and accurate control of the compensating device is necessary in order to compensate fluctuating loads. The large number of series-connected sub-modules in the MMC provides the flexibility and response time to achieve an ideal waveform for this compensation task. Our innovative concept enables a combination of high dynamic output behavior with low switching losses. The sub-modules



### Highlight

- Modular multilevel converter in the SVC PLUS® system at Sohar Steel, Oman.
- The SVC PLUS® is rated at approximately  $\pm 100$  MVar for the VSC and 60 MVar for the filter circuits, resulting in a compensation power range of 160 MVar leading and 40 MVar lagging.
- The system compensates reactive power and mitigates flicker of an electric arc furnace and a ladle furnace. Based on measurements the flicker was evaluated. Results showed, that a flicker reduction factor of 6 to 8 was achieved.

contain IGBTs, a capacitor in the DC link, and a bypass switch. Thanks to our solution, the safe and rapid bypass of a failed sub-module permits uninterrupted operation with inbuilt redundancy. After proper training, the sub-modules can be easily exchanged by operator's maintenance staff.

### Direct light-triggered thyristor modules (LTT)

This technology is used for both HVDC and SVC applications. The LTT needs neither electric gate contacts, nor auxiliary energy and large electronic boards at high voltage. It is therefore inherently more reliable.

### Perfectly designed filter circuits

A detailed knowledge of load behavior in different industries is the key to expertly designed filter circuits. Optimizing tuning frequencies, damping, and losses leads to an ideal selection of components. And we go even further: We combine the filter design with control and protection and operating concepts to craft a complete static compensation system.

### Reliable control and protection system

Simatic TDC (technology and drive control) is a well-proven and widely used industrial control system for high-performance applications. This platform delivers all the advantages of a long-term product strategy, reducing the incompatibility risks of PC-based architectures in the event of future repair.

The system implements open- and closed-loop control as well as special protection functions for the power electronics. It works seamlessly with the special filter protection relays, which provide algorithms for determining reactor overload and capacitor overvoltage.

### Modern HMI system

The interface between human and machine connects the world of automation with the individual requirements of the operator. The WinCC system is frequently used for this purpose. As part of the Simatic family, WinCC is widely used in a variety of industrial production lines and is well known for its ease of use.

### E-house solutions

A variety of standardized E-house solutions are available for the valve and control systems of SVC Classic, SVC PLUS, and filter circuits. E-house solutions are especially popular in the oil, gas, and mining industries. Pre-tested systems are delivered directly to prepared foundations on site, which results in reduced effort for civil works and fast installation, and commissioning.

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