Electrical utilities and heavy industries have many requirements related to reactive power such as voltage sags, poor power factor, distortion or flicker on the electrical network.

The utmost target is to stabilise the grid voltage and minimise any transient disturbances. Alstom Grid’s SVC MaxSine STATCOMs are designed to mitigate the described phenomena. Control systems provide the following control features:
- Flicker mitigation
- Voltage control
- Power factor correction
- Active harmonics cancellation
- Load balancing

Alstom Grid’s reactive power compensation solution uses voltage source converters (VSC) integrated as a variable source of reactive power. These systems offer several advantages compared to standard reactive power compensation solutions.

Reactive power control generated by generators or capacitor banks alone normally is too slow for sharp load changes and demanding applications, such as wind farms or arc furnaces. SVC MaxSine will provide constant control, dynamic behavior due to fast response times and, with single-phase control, will also compensate unbalanced loads.

SVC MaxSine system can be provided alone or together with filter capacitor banks. The final solution will be designed to meet your requirements based on a system analysis.

Typical SVC MaxSine applications
- Utilities
- Welding operations
- Arc furnaces
- Rolling mills
- Wind farms
- Mining
- Harbor cranes

Customer benefits
- Improved power quality
- Energy efficiency
- Improved grid code compliance through better fault ride through capability
- Quick return-on-investment
- Possibility for remote supervision
- Smart Grid compliant
- Solution for both reactive power and harmonic problems
- Modular design - high redundancy and improved availability

Standardised modular design

The SVC MaxSine is a modular compensation system based on proven power electronics units (PEU). Due to the modular design, the size of the compensation system can easily be adjusted to the customer’s needs. Each PEU of the SVC MaxSine compensation system consists of a voltage source converter, which is implemented using standardised state-of-the-art semiconductor technology. The converter is based on utilisation of the IGBT transistors that are controlled using Alstom Grid’s patented control system.
An effective solution

Alstom Grid’s patented direct current control is the fastest high power compensation equipment in the market. Our SVC MaxSine can compensate fundamental reactive power, control voltage and eliminate harmonic currents depending on the selected operation mode with a high dynamic performance.

The SVC MaxSine consists of a phase current-regulated inverter, which can be viewed as a current source. This current source feeds inverted current to compensate reactive power and also harmonic distortions.

Since the compensation current of the SVC MaxSine is regulated, the compensation quality is independent of both network impedance and of the mains voltage distortion caused by voltage harmonics, dips or flicker. The operation of any other loads connected to the network is not influenced by the SVC MaxSine.

### SVC MaxSine – Tested Performance

The performance of Alstom Grid’s SVC MaxSine is verified with a custom-made network simulation model on a Real Time Digital Simulation (RTDS®) system during the factory tests.

### SVC MaxSine - Examples of Dynamic Performance

To demonstrate the operation of the SVC MaxSine, measurements were made on a DC-drive with and without the SVC MaxSine. As can be seen, below, the wave form of the supply current is almost a fundamental current only when the active filter is on. It should also be noted that the fast changes of the supply current can be easily followed.

Network current of a DC-drive without SVC MaxSine (A) and with SVC MaxSine (B)
Thanks to fast IGBT-technology, the SVC MaxSine compensation system is extremely well-suited for applications that require fast dynamic response.

The SVC MaxSine compensation system has several other benefits compared to traditional solutions.

### Technical Features

- Integrates renewable energies into network
- Compact, modular design
- Enables future hybrid solution related to configurations
- Ultra fast dynamic response \(< 1\text{ms}\)
- Switching frequencies up to 4 kHz
- Stepless control characteristics
- Independent phase control
- More than just a STATCOM, it’s an active harmonic filter (using IGBT)
- Patented technology
- Solution for both reactive power and harmonic problems
- Modular design – high redundancy and improved availability
- Short time overloading capability – reduced system sizing
- Compensation independent of network parameters or distortion
- Control algorithm very easily updated to the system

### Protection and Monitoring

- RMS line-to-line voltages and frequency
- Voltage harmonics and total harmonic distortion THD(u) measurement
- Root mean square (RMS) load current measurement
- Load current harmonics and total harmonic distortion THD(I) measurement
- Crest factor load current measurement
- Cabinet temperature measurement
- Inverter temperature measurement
- DC link voltage measurement

### Communications

- Remote HMI available via EC 60870-5-104 or DNP 3.0 protocols
- Remote monitoring available

### Problems solved with SVC MaxSine

- Voltage fluctuation
- Flicker phenomena
- The need for reactive power from the network
- Real time response to changes in reactive power
- Active harmonic filtering
- Load balancing

---

Alstom Grid Worldwide Contact Centre
www.grid.alstom.com/contactcentre/
Tel: +44 (0) 1785 250 070
www.grid.alstom.com