SVC MaxSine™ provides a superior solution for dynamic reactive power compensation, voltage regulation, flicker mitigation, and fault-ride through improvement as demanded by most grid operators today.

SVC MaxSine™: STATCOM solution for the future

Electrical utilities, wind farms and heavy industries have many requirements related to reactive power such as voltage sags, poor power factor, distortion or flicker on the electrical network. SVC MaxSine™ helps to exploit full generated power by optimizing transmission. It has overall low power losses and offers sufficient overload capability.

The utmost target is to stabilise the grid voltage and minimise any transient disturbances. Alstom’s SVC MaxSine™ STATCOMs are designed to mitigate the described phenomena. Control systems provide the following features:

- Reactive power control
- Voltage control
- Fault-ride-through support
- Power factor correction
- Flicker mitigation
- Load balancing
- Active harmonics cancellation

Alstom’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 produced by generators or capacitor banks alone is rather slow for sharp load changes and demanding applications, such as wind farms or arc furnaces. SVC MaxSine provides constant control and fast response times for even unbalanced loads.

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

**CUSTOMER BENEFITS**

- Network stability
- Improved power quality
- Improved grid code compliance through better fault-ride-through capability
- Energy efficiency
- Quick return-on-investment

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AN EFFECTIVE SOLUTION

Alstom’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 source feeds inverted current to compensate reactive power and also harmonic distortions. As 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.

TYPICAL SVC MaxSine™ APPLICATIONS

- Utilities
- Wind farms
- Arc furnaces
- Rolling mills
- Welding operations
- Mining
- Harbor cranes

MORE CUSTOMER BENEFITS

- 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). Thus the rating of the compensation system can easily be tailored 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 IGB-transistors that are controlled using Alstom’s patented control system.
**SVC MaxSine™ – TESTED PERFORMANCE**

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

**EXAMPLE OF NETWORK STABILIZATION**

To demonstrate the operation of the SVC MaxSine voltage control the following case is presented below. Interruption occurs at t=0.25 s causing network voltage dip to 0.85 pu without compensation (blue line). Disruption is cleared at 0.5 and voltage is stabilized to 0.95 pu level. The same case is presented with parallel SVC MaxSine (red line). The reactive power support of SVC MaxSine maintains network voltage at nominal value during and after disturbance.
Thanks to fast and modern IGBT-technology, the SVC MaxSine compensation system is extremely well-suited for applications that require fast dynamic response and it has superior low voltage operation characteristics.

**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

**TECHNICAL FEATURES**

<table>
<thead>
<tr>
<th>Feature</th>
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<tbody>
<tr>
<td>Integrates renewable energies into network to achieve grid code compliance</td>
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<td>Compact, modular design</td>
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<tr>
<td>Enables future hybrid solution related to configurations</td>
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<tr>
<td>Ultra fast dynamic response &lt;&lt; 1ms</td>
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<tr>
<td>Switching frequencies up to 4 kHz</td>
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<tr>
<td>Stepless control characteristics</td>
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<tr>
<td>Compatible with any MV/HV voltage level</td>
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<td>More than just a STATCOM, it’s an active harmonic filter (using IGBT)</td>
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<td>Patented technology</td>
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<td>Solution for both reactive power and harmonic problems</td>
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<td>Modular design – high redundancy and improved availability</td>
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<tr>
<td>Short time overloading capability – reduced system sizing</td>
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<tr>
<td>Compensation independent of network parameters or distortion</td>
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<td>Control algorithm very easily updated to the system</td>
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**COMMUNICATIONS**
- Remote HMI available via Modbus
- 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

For more information, please contact Alstom Grid:

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