



Power Stability Expert

Static Var Compensator (SVC) Solution

The efficient way to improve system stability and reliability



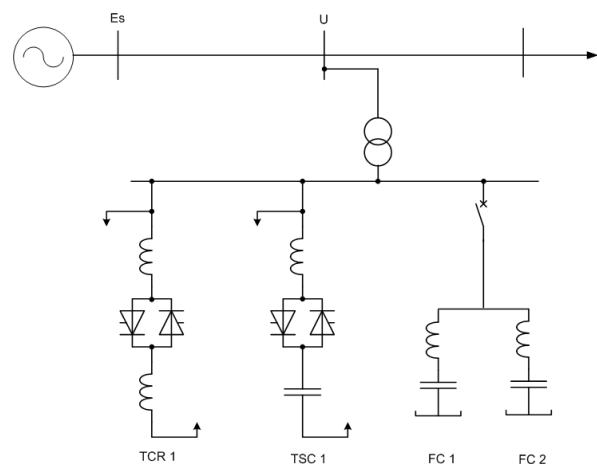
Modern society relied consistently on electrical power, requiring higher standards of power stability and power quality. But high-power rapid impact loads, asymmetrical impact loads, inevitable power system faults and so on are adverse factors which can lead to considerable reactive disturbances in power system and affect power stability, power quality and economy of power grid operation.

To solve this problem, it is essential to adjust reactive power in the power grid expeditiously to achieve a reasonable power flow distribution.

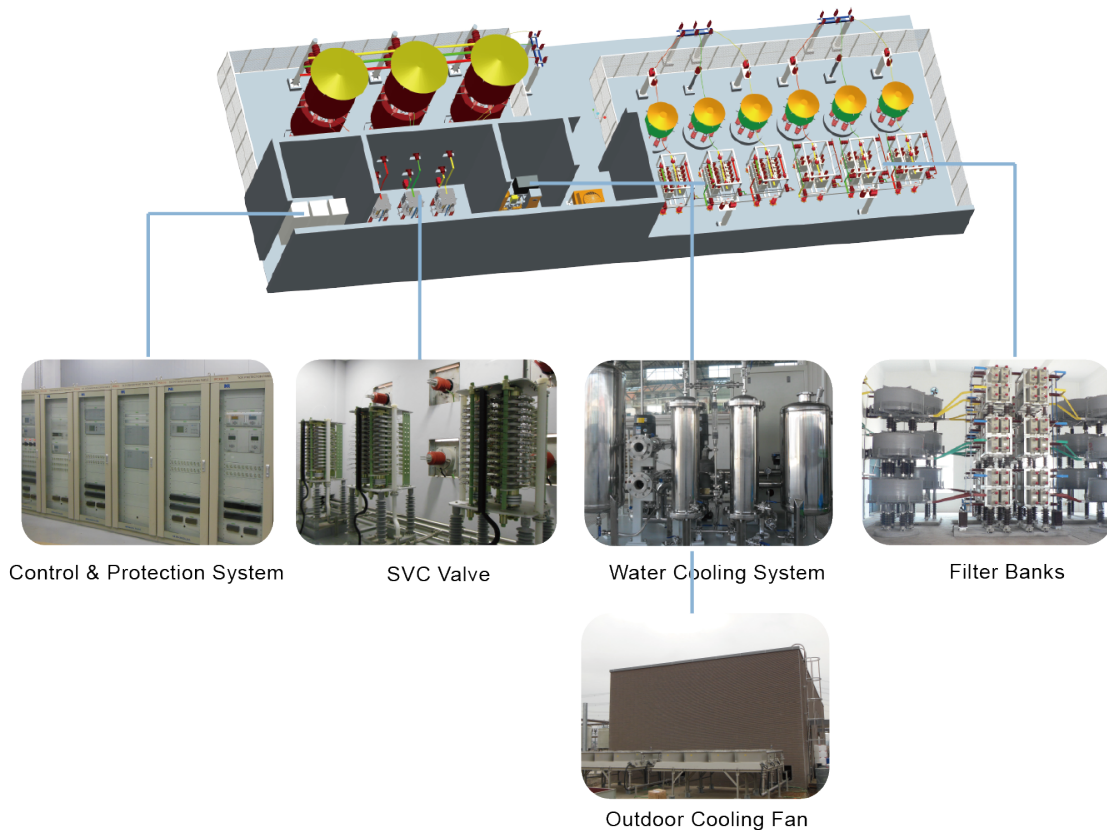
The Static Var Compensator (or SVC) can be considered as a static reactive power source, providing the grid with reactive power (capacitive) or absorbing superfluous reactive power (inductive) at common coupling point. Reactive power can be obtained by connecting capacitor groups (normally is designed as filter banks) to grid and continuous controlling an air core reactor in parallel in order to absorb excess capacitive reactive power.

NR SVC solution can facilitate the utility and industry to realize voltage regulation, effective active power control and load flow control, therefore to enhance the quality of power supply.

NR SVC solution can be widely applied into power transmission systems, industry fields and renewable energy grid connection.



Schematic diagram of SVC



Structure

NR Electric's SVC System consists of the following devices:

- Step-down transformer (optional)
- Medium voltage switchgear cabinet
- Linear (air-core) reactor
- Thyristor valve group
- Capacitor/Filtering banks
- Water cooling System
- Control & protection system

Step-down Transformer

The SVC valve is always connected to medium voltage bus in substation, and a step-down transformer is required in case of higher voltage level at incoming line.

Medium Voltage Switchgear

A medium voltage switchgear can be installed indoor or outdoor. It includes isolating disconnecter, grounding switch, and circuit breaker.

Linear (air-core) Reactor

Air-core reactors are stable in reactance and have good linear performance. An air-core reactor is able to absorb reactive power. Air-core reactors are always connected in series with thyristor valve in delta-connected type. This circuit can form inductive reactive power source in continuous regulating method.

Thyristor Valve

Thyristor valves are main component of SVC system. This valve is composed of several series-connected thyristor units mounted with auxiliary element. Each thyristor is turned on by firing signals through optical fiber cable. Compact heat sink is applied to do heat dissipation for thyristor semiconductor. It adopts concise shape and gets lower heat resistance.

Capacitor/Filtering Banks

Capacitor/filtering banks can supply sufficient capacitive reactive power to a given power grid and filter harmful harmonics. Banks are composed of multiple capacitors and other auxiliary components.

Water Cooling System

A water cooling system is essential to ensure safe operating of thyristor valves. The cooling system uses deionized pure water as internal cooling medium and air as external cooling medium.

Control & Protection System

SVC control system consists of controller device, workstation computer, LAN switch, and printer. It realizes SVC remote control, monitoring and event alarm function from the control room. It is the brain of entire SVC system, and completely tailor-made configuration.

Benefits

- Regulate voltage continuously
- Improve power factor
- Power oscillation damping
- Minimize power loss
- Strengthen grid stability
- Save energy cost
- Increase productivity
- Filter harmonics

Functions and Features

Professional System Design

- Optimize SVC control scheme and filter parameters for good power quality.
- Overall impedance scan to avoid system resonance.
- Regulation mode and gain adjustment for grid stability

Thyristor Valve

NR valve group has many advantages like compacted structures and light weight. Therefore , smaller footprint, and easy to install and maintenance.

Electric-optical Triggering System

The optic triggering system uses light to trigger thyristor. It integrates forward overvoltage protection components, and thyristor management units are used instead of thyristor control units.

Thyristor breaker-over voltage protection

NR invented the unique circuit integrated thyristor protection valves. It reduces the break-over voltage deviation to a minimum value, so that the break-over voltage can be fixed manually in order to accomodate different types of thyristor.

Water cooling system

NR SVC system uses the industrial-class hermetic water cooling system with de-ionized water for heat dissipation. This patented cooling radiator features can lower thermal resistance and water resistance.

Well-proven protection and control system

The protection and control of the Static Var Compensator system uses graphic programming and test tools to realize diverse control functions. The universal hardware platform is equipped with multi-functional modular PCB to achieve data acquisition, control and monitoring functions.

References

Voltage Support with SVC at 750 kV Shazhou Station

The project of second electric power corridor of Xinjiang-Northwest grid connection at 750 kV is built to meet the transmission demands of thermal power in Xinjiang and wind power in Jiuquan. With covering many stations, like HaMi, ShaZhou, Yuqia, ChaiDamu etc, the transmission corridor needs a strong voltage support which is implemented with SVC solution and supplied by NR electric.

System voltage	750kV/66kV
Rating (Mvar)	±360Mvar
Scheme	TCR+FC
Main devices	Thyristor valve, capacitor, reactor, control & protection

Customer benefits

- Reduce Voltage Fluctuation range approximately by 20kV~25kV in local substation and 10~12 kV in adjacent substation.
- Enhance voltage stability limits and increases the tie-line transmission capacity from 200MW to 800MW depending on system operation conditions.



Power Quality Improvement with SVC at 90 ton of Steel Plant

The heavy inertial loads on the steel plant especially arc furnace creates severe power disturbance in both steel plant and outside power grid. To overcome the issue, NR electric supplied the SVC system to improve power quality significantly in the steel plant.

System voltage	110kV/35kV
Rating (Mvar)	100Mvar
Scheme	TCR+FC
Main devices	Thyristor valve, capacitor, reactor, control & protection

Customer benefits

- Improve power factor from 0.71 to 0.93
- Control voltage flicker value to 0.34

