



Distribution Capacitor Bank Automation Using SYNC 2100 And SYNC 4900

Application Note

Application Description

Capacitor bank monitoring is fast becoming a very important requirement in distribution networks, the need necessitated by:

- Low voltage profiles and high AT&C losses are the characteristics of the distribution operation during peak hours, which need to be addressed by the utilities
- During peak hours distribution networks are operated nearer to its maximum capacities with low power factors
- Unavailability of transformers for voltage improvement as the taps are operated to clip high demands
- Pumping loads /ACs stalls at low voltages induces a prolonged voltage recovery during contingencies

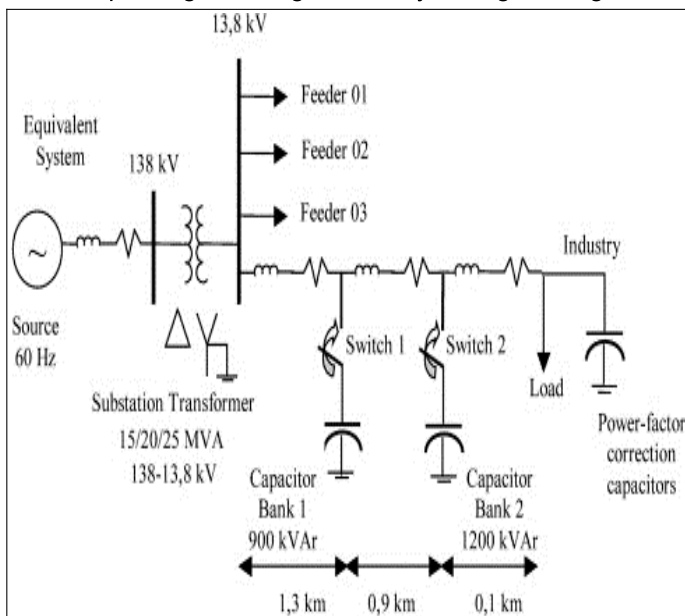


Figure 1: Distribution Network

In order to supplement reactive power, capacitor banks are deployed in distribution network, with placement either within the station or distributed across the distribution network. However, reactive power shall be compensated at

the origins than at a central point for achieving better reactive power flows throughout the system. Generally capacitor banks for 3-phase 11KV (50Hz) system can be fixed value type (KVAR) or variable depending upon the requirements. However, fixed capacitor banks have numerous drawbacks as it uses SF6 interrupter for breaking the circuit, and controlling capacitor banks in small steps is not feasible in such arrangements. Step capacitor banks are relatively new and consists of series / parallel combination of small units of capacitor cells per phase, each with an output rating of 100 or 200 or 400 KVAR, 7.3 KV single-phase. Capacitor units connected in externally star with appropriate number of capacitors in parallel as per requirement. In case of single phase construction the switching of capacitor shall be preferably near voltage zero i.e. when system voltage and capacitor voltage is zero.

Application Solution

The automated capacitor bank control unit comprises of a compact RTU, that operates switching control mechanisms connected to 3-Phase capacitor banks, where the capacitor phase switches are operated by a motor controlled load break switches/Relays. The micro RTU shall manage switching of banks and monitoring of reactive power and voltages of the phases, operation mode selected (Auto, manual). Capacitor banks will be switched based on the rules configured in the micro RTU as well as the present condition of system parameters (V, KVAR etc). The configured rules consist of limit checks and status check of the equipments, and the rules' output result a Boolean YES condition, which switches on the device.

There will be multiple rules and each shall be executed periodically or by an event, the event being, say, a value change. In case, multiple capacitor bank are to switched simultaneously, a common single switching instruction can be executed from the control central station operator.

Intelligent Remote Terminal Units (FRTUs) are ideal for the above application, and perform data concentration, executive logic operations, as well as commands. RTU devices have protocol capabilities and wide communication media support like GPRS/ CDMA/ RF to help it to transmit data to control center.

SYNC 2101 is one such device that is responsible for

fetching the data from multi-function transducer and also directly from field IOs and converting the data to the IEC60870-5-104/ DNP3.0 format which the control center software can read. SYNC 2101 is also capable of controlling field devices using DO modules.

card

- SYNC 4911 M2M gateway at control center

Advantages

- Kalkitech M2M application ensures end to end VPN connection from Nodes to gateway apart from other solutions which offer only VPN security provided by the telecom provider
- SYNC 4911 M2M Gateway provides virtualization support which helps applications to scale up to 10000-20000 M2M connections
- Transparent channel concept can be utilized for downloading the configuration and firmware of the end devices

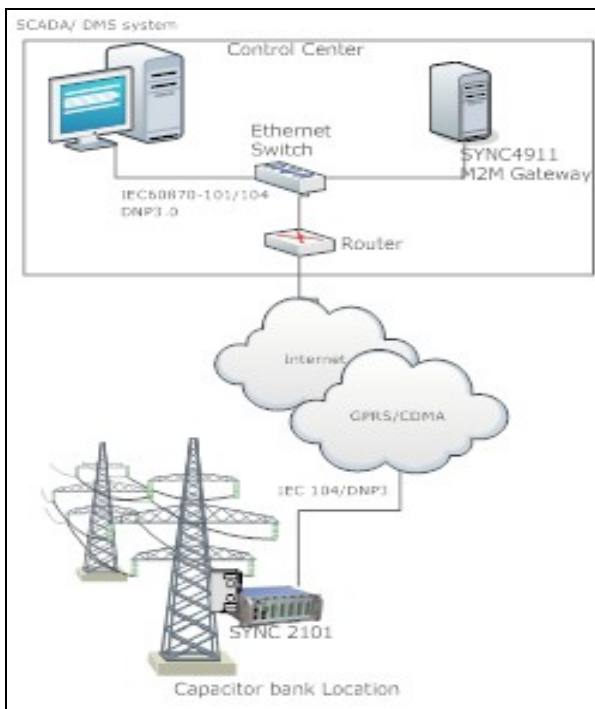


Figure 2: Application Solution

DI, DO and AI cards can be chosen depending upon the application requirement.

An M2M Gateway is also required for manage remote connection of FRTU located in multiple locations in field, supporting secure VPN connections over dynamic IP, and support for GPRS/CDMA as well as 3G technologies.

SYNC 4911 M2M Gateway is used as the communication front end (CFE) for interconnecting the automation system (SCADA/DMS) LAN to public radio networks like GPRS/CDMA/UMTS without compromising on the security of the network. The M2M Gateway creates a trusted network of widely distributed FRTUs. The security is guaranteed by Open-VPN, a virtual private network achieved by creating a tunneling between sites using SSL/TLS. VPN is the term used to refer to any device that is capable of creating a semi-permanent encrypted tunnel over the public network between two private machines.

Features

- High end security over VPN and CIP enabled devices
- Remote configuration of the FRTU from control center.
- Transparent channel connectivity to the end devices having propriety protocols

Products Used

Products used for this application are:

- SYNC 2101 with GPRS/CDMA/RF modem and IO