

SAS2000®

the next generation in substation automation

The SAS2000 substation co-ordinated control system is the flexible control concept of a new generation of digital control systems. It is specifically designed to meet the changing demands in high voltage transmission substations.

In substations the process plant consists of transformers, switchgear, such as circuit breakers, protection relays, and other Intelligent Electronic Devices. All of this equipment interfaces with the SAS2000 control system.

The SAS2000 concept is based on open systems architecture with a strong emphasis on flexible functionality. One system concept for all your applications, from centralised Remote Terminal Unit up to fully integrated protection and control schemes.

One system concept for all (tele-)control applications yields savings in training and education, maintenance and spare parts. The openness of the system guarantees the capability to pursue the increasing demand for information on process parameters and the company assets to enable the reduction of all kind of operational costs.

The advanced design of SAS2000 focuses on the ease of operation and the flexibility to satisfy the changing demands of the electrical supply industry.

Features

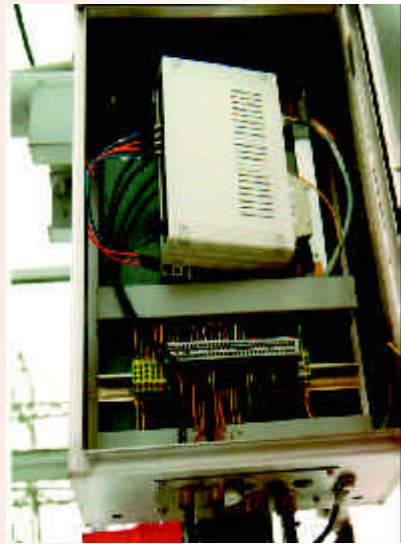
SAS2000 is the data and control centre of the substation and offers many capabilities of which the following are the most striking features:

- control of primary plant
- alarming and sequence of event recording
- graphical user interface services based on Internet technology

- application functions like interlocking of plant, advanced automatic tap changer control and free configurable application functions
- trend recording and viewing
- archiving of historical data
- integrated communication with remote operations like Control Centres, trouble shooters and maintenance staff
- integration with Intelligent Electronic Devices (IED)

Cost of Ownership

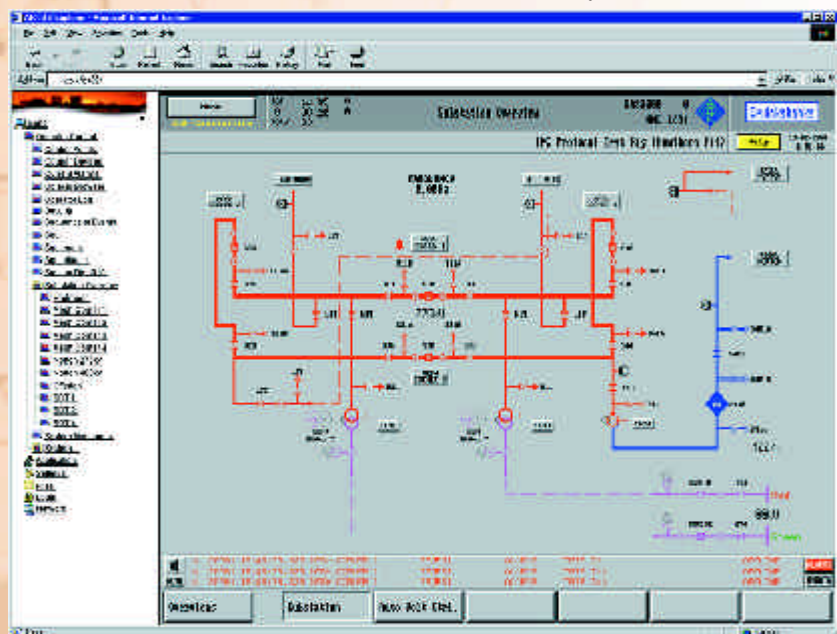
Cost aspects are increasingly emphasised by the electrical utilities in the evaluation of the feasibility of substation co-ordinated control systems. Not only the initial and operational costs are important, but also the total sum of all direct and indirect costs. The SAS2000



system is a concept that complies with both the most demanding technical criteria and cost aspects like the reduction of engineering effort, the scope for future expansion and the flexibility to select hardware components, without the need to adapt the basic concepts.

Hardware Concept

Primary and secondary installations are interconnected using cables. Substations are normally equipped with a central building that houses the complete secondary installation. The layout for a primary installation, which is the repeated occurrence of a number of bays, should also be reflected in the layout of the secondary installation. In this way, the plant layout repeats itself in the secondary installation. This modu-



lar layout can yield savings with respect to cabling and re-application of the hardware design of the secondary installation at bay level. Further distribution of the process interface at primary equipment level can save even more cabling, which might be interesting for green field sites or total replacement jobs.

Flexible and distributed processing offers advantages in software engineering and maintenance. Modifications and upgrades are easy to manage and administrate. Modifications to the structure of the process interface of the installation are expensive, due to engineering and installation work. Subsequent deliveries for components that are applied in the distributed process interface are guaranteed for many years due to the applied components. At substation level the system is designed as functionally dual redundant. In the event of a failure in one Control Unit, the standby system takes over all the control and monitoring functions of the substation.

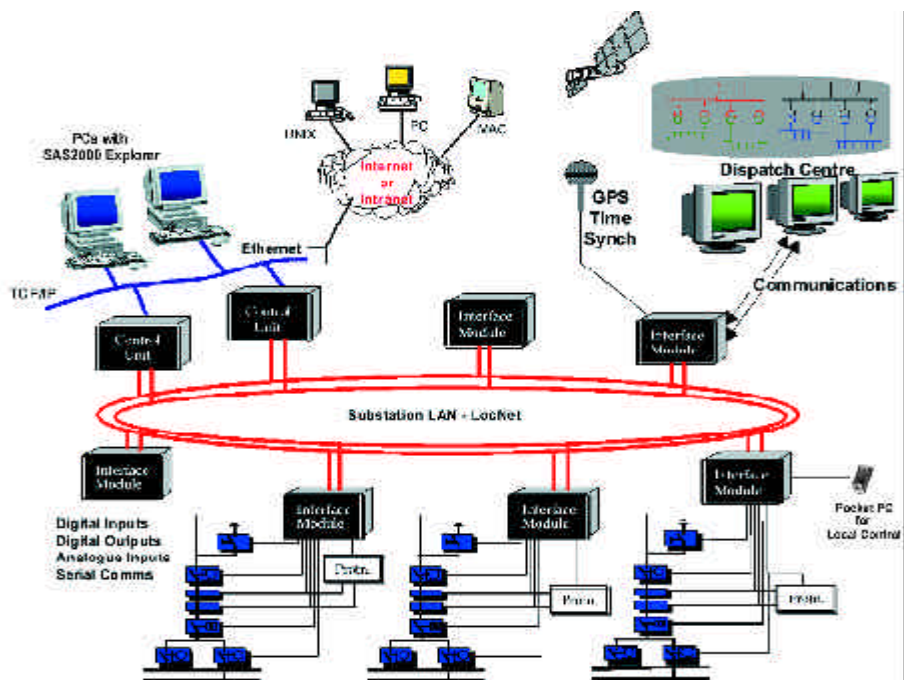
Central substation level

Central located Control Units handle all substation control and monitoring functions. A Control Unit is constructed as a multi-processor machine. Locnet handles the communication with the distributed Interface Modules. Multiple Interface Modules are handled in one ring network. A Control Unit can hold up to seven rings.

Distributed Interface Module

All the process interfacing, integration with IED's and local (bay) control are performed in the distributed Interface Modules e.g.:

- Digital input signals are derived directly from the plant.
- Digital output boards are available



with on board command relays which have heavy-duty contacts.

- Analogue signals can be either bipolar or direct readings of the Current and Voltage Transformer values. Reactive and active power is calculated in the software by using the current, voltage and power factor measurements.
- The processor board handles all serial data-exchange between SAS2000 and IED's or remote control centres and the local process control functions by use of web browser control displays.

SAS2000 Explorer

The graphical user interface for the substation control facility is based on Internet web browser technology. The graphics web server is running on the Control Units and the Internet browser is running on PCs, local or remote. Since the PC is an output device, it can be turned off when the substation is

unmanned. The SAS2000 Explorer provides excellent remote facilities, like interrogation, diagnostics and service, database handling and file management such as uploading disturbance data. The facility is fully capable of functioning as a backup control point. Security of access is implemented in multiple stages to prevent access or data retrieval by unauthorised persons.

Local bay control is based on identical SAS2000 Explorer technology.

Protocols

Many different protocols are supported in SAS2000 for communication with remote control centres and IED's. Besides a large number of proprietary protocols, (defacto) standard ones such as IEC60870-5-101 and 103, DNP3, Elcom90, Modbus, and Alstom Courier are supported.

References

SAS2000 has been installed in substations in many countries in the voltage range of 100kV to 400kV. In industrial plants SAS2000 easily integrates with medium voltage protection systems. Due to its realtime processing capabilities, functions such as load shedding, power sharing and overall voltage control can be implemented in to the SAS2000 system. This gives extra benefits to the end user as power management system on the industrial plant.

- Redundant central Control Units
- Distributed Interface Modules with indoor and outdoor process interfacing
- Dual redundant fibre optic communication ring networks between central Control Units and distributed Interfaces Modules
- SAS2000 Explorer as graphical user interface, locally or remote, based on standard PC's with Internet Web browsers