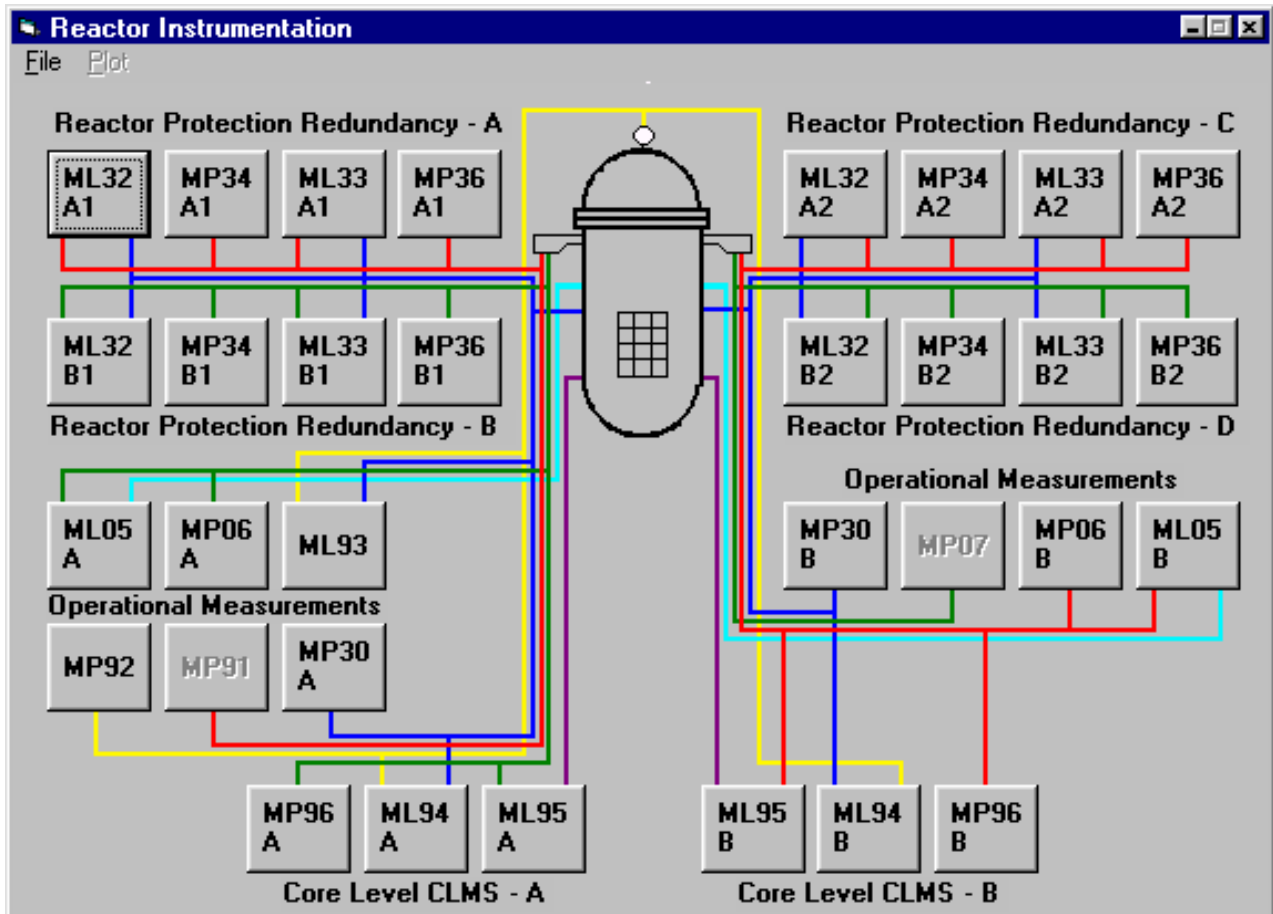


SensBase™, a database system with sensor health test results



Background

Sensors are part of the protection system in a nuclear power plant. They are the first link in the chain with influence to the protection system. It is therefore of importance that the sensors fulfil the demands of reliability and response time.

In practice the dynamic characteristics of sensor systems are seldom or never tested in BWR's. The static character, however, is tested with the sensor calibration during the annual outage of the plant.

Transmitters and other instrument components will be exchanged to different models in an aging nuclear power plant. This implies that different sensor types and models will be available. Furthermore it is not unusual that

complete systems with sensing lines are exchanged or rebuilt and new developed condensate pots are installed. This implies that the dynamic character during the test operation of the plant has changed.

Dynamic investigations of the sensor systems are possible to perform during operation of the plant with the aid of advanced signal analysis. Correctly performed, such an investigation indicates if any sensor with attached sensing lines deviates from dynamic point of view.

The sensing lines are often many tenths of metres and connect the transmitter with the pressure taps on the reactor vessel. Many sensors are connected to the same sensing line. This was a common method to reduce the

number of sensing lines in older reactors. The drawback, however, is that blockage or gas in a sensing line can make coincident influence on many sensors.

The reactor water level measurement includes e.g. a density compensation. This is performed in an electronic unit. The filtering effect in the compensation unit can be investigated with the aid of process identification.

The annual sensor tests performed by GSE Power Systems AB include measurements, analysis & interpretation and storage of the analysis parameters in SensBase™.

Following results are stored in SensBase™ for each sensor or sensor pairs:

- Short time series data (30 seconds)
- APSD (Auto Power Spectral Density)
- Histogram with mean value, standard deviation, skewness and kurtosis
- Time constant
- Multiple sensor information in time domain with gain, offset and amplitude ratio
- Component information: installation year, type, manufacture, range, unit

Sensor errors can be observed with SensBase™:

- By multiple sensor comparison in frequency domain with APSD
- By multiple sensor comparison in time domain with gain, offset and amplitude ratio.
- Time constant
- By database parameter comparison with history for each individual sensor.

User friendly GUI's (Graphic User Interface):

- The transmitters with their sensing lines and connections to the process are presented with graphics in different windows, see e.g. the above presented window.
- The transmitter acts like a push button in the window
- The different stored results in SensBase™ are presented with diagrams or bar graphs
- Multiple sensors or historical data can be chosen for presentation. SensBase™ is working under Windows 95 or Windows NT.

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