

Power Oscillation Monitoring

A PSGuard Wide Area Monitoring System application



Application

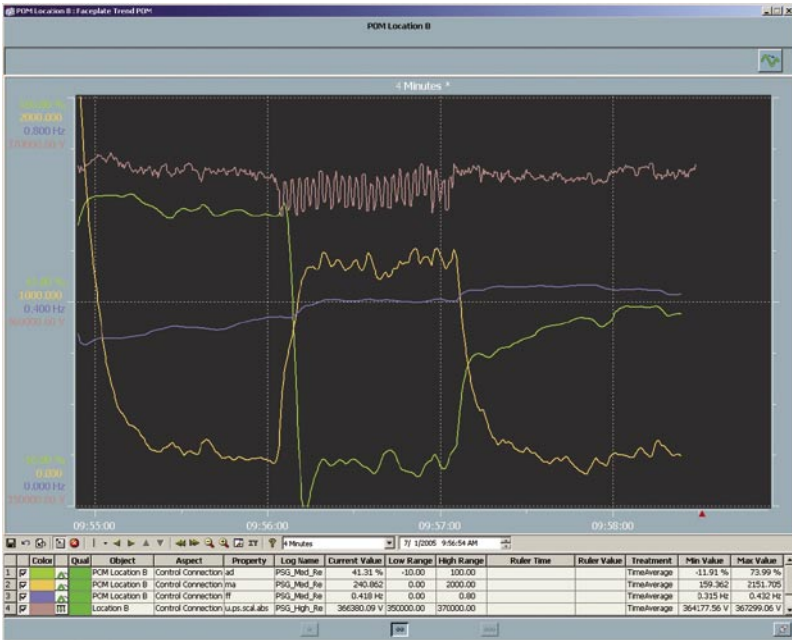
Power oscillation monitoring is a PSGuard application used for the detection of power swings in a high voltage power system. POM gives the operating personal an immediate awareness of the power system state in terms of oscillations, so that operators will see the urgency of the situation more quickly.

The POM algorithm processes the selected voltage and current phasor inputs and detects the various power swing modes, which can e.g. lead to angular instability causing disturbances. POM quickly identifies the frequency and the damping of swing modes and, in the first instance, it provides improved power system visibility. Additionally POM indicates the frequency of an oscillation, which may then be compared with the existing known modes of the power system, i.e., the operator may distinguish if a local or inter-area mode is excited.

When oscillations in a power system are known and monitored constantly, it is possible for the utilities to safely operate power-carrying components closer to their design limits without jeopardising the stability, security or reliability. This means that bottlenecks will be avoided. Thus POM helps utilities to reduce costs and achieve greater functionality from P&C systems. Typically, no costs are incurred for the transmission of the measurement values.

Function

The POM algorithm only needs time synchronized Phasor measurements taken by two Phasor Measurement Units (PMUs) as a base for further calculations, no additional sensors are necessary. Oscillations are detected in the measured signals by employing the Kalman filtering techniques algorithm, which tries to fit the measurements



To analyse and reinterpret past oscillation scenarios or events, historical data can be easily accessed in the PSG Database, where all output values are stored with a time resolution of 100 milliseconds. With the export module included, the user can export this data as CSV files offline, which can then be easily imported into business applications such as Excel.

With the help of the stored data, long-term statistics can be collected and based on its evaluation; system improvements can be executed for example: retuning of Power System Stabilizers (PSS) to damp the frequencies that appear to be the most dangerous ones.

to a linearized model. The oscillation properties are extracted from the linearized model parameters.

The signal types in which oscillations may be best observed are: voltage magnitude, voltage phase angle difference, frequency and current magnitude. A measured signal is continuously provided with a constant sampling period, this means that the highest detectable oscillation has a frequency of 1 Hz.

User defined warning and alarm levels can be set online, as a significant help in detecting dangerous changes in the power system.

POM works as a support tool for reducing the impact of unavoidable disturbances by warning before local protection tools might trip a heavily loaded line.

The results of the POM application are visualized with the PSGuard Basic Monitoring module and can additionally be integrated in SCADA EMS / Network control systems with RTU-live interfaces.



ABB Switzerland Ltd
 Power Technology Systems
 Brown Boveri Strasse 6
 CH-5400 Baden/Switzerland
 Phone +41-58-585 77 44
 Fax +41-58-585 55 77
 E-mail wide.area@ch.abb.com

www.abb.com/poweroutage

Online output provided

- Frequency of the most important oscillation mode
- Amplitude of the most important oscillation mode
- Damping of the most important oscillation mode
- Estimated oscillation amplitude of the analyzed signal
- Trend indication of the oscillations, the damping and the amplitude updated every 100 milliseconds
- Online warning and emergency alerting

Offline output provided

- Access to historical data
- Data export to business applications such as Excel

Benefits

Short-term operation benefits

- Immediate awareness of the power system state in terms of the presence of oscillations, thus an operator sees the urgency of the situation
- Increased power transfer at defined security
- Early warning to avoid power system collapse
- Online assessment of actual power system damping
- Indication of the frequency of an oscillation which may then be compared with the known existing modes of the power system, i.e. the operator may distinguish if a local or inter-area mode is excited

Long-term scheduling and planning benefits

- With the help of the stored data, long-term statistics can be collected and, based on their evaluation, system improvements can be implemented
- Provides a basis for tuning Power System Stabilizers (PSS) in the network planning process