

# **SYNCHRONOUS MEASUREMENT IN ELECTRICAL NETWORKS**

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The quality of data obtained from measurement in electric networks all levels is affected, apart from other influences, by time diversity of individual information. Result of it is limit of exactness of such data sets analysis. This paper contains analysis of influence of asynchronous measurement and possibilities of reduction or elimination of these errors. The analysis is focused to measurement of synchronous phasors for the purpose of dispatcher control of distribution networks.

The need of reliable electricity supply poses high claims to modern systems of network control, to support systems and to software tools for secure, effective and cost optimal network control. The control is based on status vector of electric network. Available redundant measurements are used for estimation of this vector, i.e. voltages, currents, real and reactive power. However, the calculation algorithms are valid only for simultaneously measured data. The inexactness of measured quantities comes from errors of individual parts of measuring chain in the switching station control system, i.e. measuring transformers, A/D converters or delta criterion algorithm. Another source of errors is asynchronous measurement of measured quantities and data delay in communication lines. All these errors mean aggravation of exactness of calculations.

Relative phasors between network nodes are specific variables. Methods of their measurement are synchronous by principle and they are not dependent on the error of amplitude. The demands on their quality differ according to the way of their utilization.

Optimization of utilization of distribution networks with high load raises need of real time knowledge of actual steady operation and dynamic transitions. Asynchronous real time measurement brings considerable errors to subsequent control processes and control system calculations. Devices for synchronous measurement of voltage phasors, improved communication between objects and dispatching center and powerful computer hardware represent the solution of these problems.

Synchronous measurement plays key role for the estimation of very high voltage network. Practical experience shows that delay of information concerning changed measurement can significantly damage the results of estimation. The benefit of expanding the measured group by synchronous voltage phasors is possible to evaluate by comparative calculation of estimation criterion. Adding of several number of phasor measurements can significantly reduce consequences of traditional asynchronous measurement of real and reactive power.

Further, the FOTEL system for measurement of synchronous phasors is described. This system is used in 297 nodes, 89 switching stations in 4 distribution companies in Czech Republic (year 2004).