

On-Line Monitoring of Process Measurement Quality

A new measurement data analysis system has been developed to monitor the quality of process measurements on-line. The system not only assures the continuous quality of the process measurements, but also supports efficient instrument maintenance. It is applicable in power plants as well as other industrial processes.

VILLE LAUKKANEN
 Development Manager
 Indmeas Oy - Finland
 ville.laukkanen@
 indmeas.com



A comprehensive database, consisting of accredited on-site calibration results, shows that the large measurement errors are much more common than generally assumed (FIGURE 1). Traditionally the measurement quality is assured by regular on-site calibration to reveal the systematic measurement errors. The weakness is that they provide information about the measurement error in the calibration situation only. What takes place between the calibrations, due to different process conditions, drift of the instrument or even its total malfunctioning remains unknown or will be detected only by good luck. Because the calibrations are costly, their repetition intervals are normally long.

To achieve a continuous good measurement quality the calibration programme should be complemented by another system controlling the measurement quality in real-time between the calibrations.

Development of an On-Line System

Indmeas Oy and Tampere University of Technology have developed an on-line system for continuous measurement quality analysis. The system has been in test use at two power plants, one of them is a power plant producing district heating and electricity for the capital area (Helsingin Energia's Salmisaari plant) and the other is providing energy

for a paper mill. The core of the on-line system is an intelligent software package installed in the plant's automation system. The software analyses the consistence of the measurement data at one-hour intervals utilizing the measurement history database.

The Analysis of Measurement Quality

The quality of a single measurement is first studied simply by evaluating its trend curve. This uncovers zero point errors, freezing of the meter signal and instability and excess noise etc. The most powerful tool, however, is based on the fact that the different measurements are to a great extent mutually de-

pendent through energy and mass balances. This enables a deep analysis of the measurement quality in different positions and the tool is especially powerful if some key measurements have documented calibration history. The on-line analysis system evaluates the quality of each measurement by testing it against several different quality criteria and in the case of violation the system sends an alert.

A Shared Communication Tool

The web-based user interface can be accessed by the power plant operators from the plant intranet as well as through a secure remote access from the Indmeas office. The error

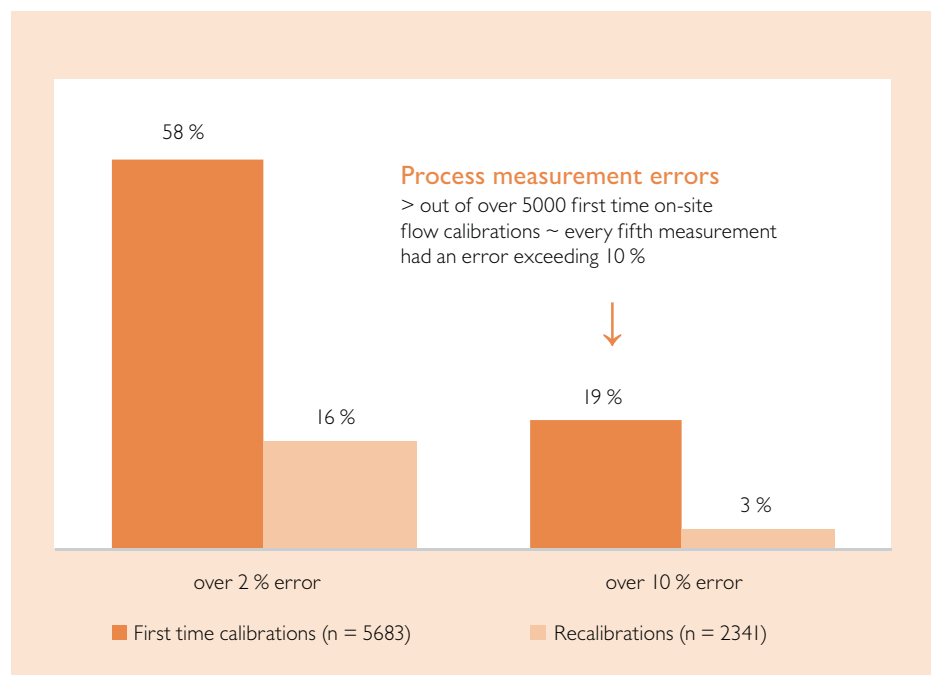


FIGURE 1. Large measurement errors are much more common in process plants than generally assumed.



FIGURE 2. The on-line monitoring system is in use at the Helsingin Energia's Salmisaari Power Plant.

diagnostics results are regularly examined by measurement specialists and discussed with the plant's staff.

Validated Data Is Returned to the Plant's History Data Base

All plants have some kind of system for production and environmental reporting. The on-line monitoring, being built up on the

plant's automation system, is able to replace the erroneous measurement values by validated values and return these to the data base. Therefore no changes to the existing reporting and data management practices are needed.

A simple but illustrative example was obtained from the paper mill power plant. One of the plant's steam lines was shut down for

a week. The measurement of the steam line continued however to show almost 12 kg/s due to a malfunction in a differential pressure transmitter of the orifice measurement. The analysis system estimated correctly the real flow to be approx. 0 kg/s. The system alerted and the erroneous value was replaced by the validated correct value in the plant's measurement history database (FIGURE 3).

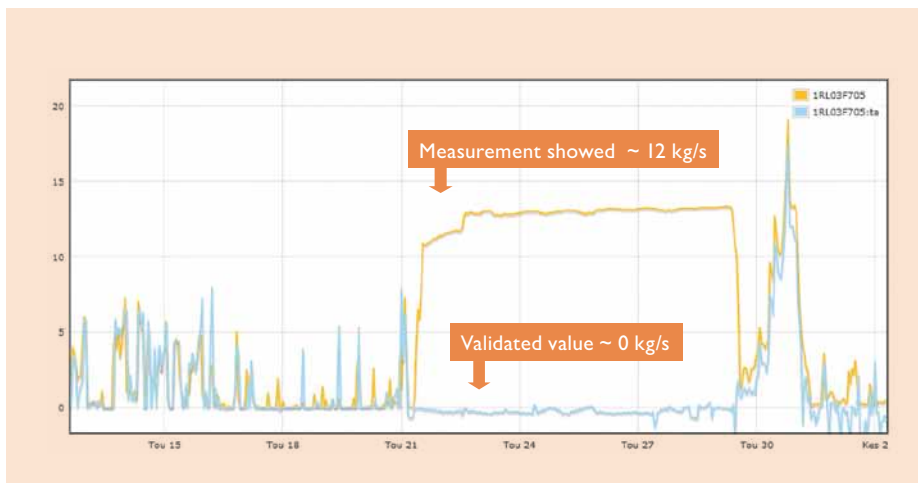


FIGURE 3. Due to a malfunction, the measurement of the steam line continued to show ~ 12 kg/s during shut down. The on-line monitoring system alerted and the false value was replaced by the validated correct value (~ 0 kg/s).

Efficient Instrument Maintenance

There are hundreds of measurement points in an "average" power plant that normally need some level of systematic maintenance, which means a large work load. With an alerting monitoring system, the maintenance work can be steered just to the positions that really need it. "The application is especially useful in cases where the measurement is frozen and starts to show a fairly reasonable constant value within the control range. These kinds of errors may be very difficult to observe in the control room. With the on-line analysis system we can repair measurement errors almost immediately after their occurrence", says Anton Laari from Helsingin Energia. ■