

Clean Rooms – Savings in operation and maintenance thanks to accurate measurement technology

Nowadays in state-of-the-art clean rooms the measurement technology plays a more and more important role. Not only on assuring a stable and reliable production process but also in the aspect of economic and ecologic operation and maintenance.

Thereby it should be paid special attention to the accuracy of the measurement sensors. Very often the evaluation of measurement equipment is only driven by the purchase costs of the devices. This goes at the expense of the measurement accuracy, reproducibility and stability. But just these characteristics are not only essential for a stable operation, but allow also considerable cost savings during the operation of a facility. Unfortunately recurrent costs caused by operation and maintenance are not considered sufficiently in the capital budgeting.



Following example shall demonstrate the savings potential.

A rule of thumb says that for controlling a process parameter the measurement has to be at least 6 to 8 times more accurate than the finally required actual value at the point of action. This factor is defined by the cumulated tolerances over the whole control process. Measurement devices, controlling units, ventilation flaps, air humidifiers, filters etc., all of these units have a certain inaccuracy. Adding all these tolerance fields results in a amplification factor between 6 and 8.

Example:

In a clean room the relative air humidity shall be controlled within a tolerance of $\pm 6\%$ RH. If a factor 6 is applied, the required accuracy for the measurement value is $\pm 1\%$ RH. With factor 8 even $\pm 0.75\%$ RH.

Only few measurement instruments and sensors achieve such values. For that purpose specific measurement technologies are required. For example electrolytic sensors for relative humidity or mass flow sensors for air differential pressure measurement.

As mentioned before, not only the accuracy and stability are important but also the cost optimisation. Avoiding instable controlling processes and keeping stable environmental parameters lead to an efficient clean air preparation and distribution.

Where costs can be saved:

- Minimizing the pure water preparation for air humidification
- Longer lifetime of filter systems
- Extended lifetime of air humidification systems
- Longer calibration cycles
- Energy savings by less controlling cycles
- Less maintenance (replacement of air and water filters, ventilation flaps, humidifier electrodes etc.)

In conclusion we can say that the higher initial costs by the choice of high-end measurement equipment charges off after a short operation time. Thanks to a stable clean room environment the product quality remains at high level. Moreover the reduced energy consumption is an important contribution to the ambience, what is nowadays also very important in times of global warming. Therefore a real WIN-WIN situation arises.