Reliable Cleaning and Drying of Miniature Parts for Watches

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High cleanliness and drying requirements apply for cleaning watch parts.

The Swiss company processes miniature parts of sizes ranging from below one millimetre to as much as several centimetres. The parts are made from various materials including copper, steel and noble metals. Some of them have extremely complex geometries which is a big challenge for the automatic process control in the cleaning system. Some of the company's existing systems were past their best in terms of quality. The major goal for investing in a new system was to improve cost efficiency.

At this point, the watch manufacturer brought in their long-term partner KKS Ultraschall AG who had supplied several of their cleaning systems. The supplier of ultrasonic cleaning solutions was requested to plan the new system including water demineralisation, automatic cleaning and anticorrosive agent dosing to the individual tanks, complete drying as well as after-sales service.

High Requirements

The specified requirements were high – complete cleaning and drying of the whole portfolio of parts within a cycle time of less than three minutes. The drying temperature was not to exceed 40 °C.

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To cope with the enormous diversity of the parts to be cleaned a special support system was developed with two rotating baskets attached to each individual support.

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The whole system including ultrasonic cleaning and condensation drying ensures that parts are cleaned and dried as required within the specified cycle time.

To meet these requirements KKS called in drying system manufacturer HARTER. HARTER with their heat pump based condensation drying technology is a well-known specialist for low temperature drying, and more specifically for drying bulk material.

Absolute Cleanliness

Drawing on their decades-long knowhow of cleaning miniature parts for medical and micromechanical applications KKS developed a suitable system layout. It includes a customized support system to cope with the enormous diversity of the micromechanical parts to be processed. Two rotating baskets are attached to each individual support. The baskets have different mesh widths – with apertures as small as < 0.3 mm – as required for the various part sizes.
The whole system consists of thirteen process tanks. Two robot systems transfer the items to be processed to ensure that the multitude of job recipes can be executed within the specified cycle time. Basket rotation promotes the cleaning, rinsing and drying process. Also, specific media are used to clean the parts satisfactorily. State-of-the-art system control and process visualization provide highest autonomy and ease of use.

Fast Drying

Two of the thirteen stations are available for drying. The stations have a so-called Airgenex dehumidification module attached to condition the required process air, which in this case has a temperature of 40 °C. The process air is extremely dry and thus unsaturated, a condition that allows it to very quickly absorb moisture from the products to be dried. For bulk material, it is essential to route the air inside the dryer such that it actually passes through the baskets and out again.
Drying is always accomplished in a system that is closed air- wise. Therefore, the dryers include an automatic lid system in order to retain the heat inside the drying system. The baskets are subject to minimal movement, only, in the drying process. The connected load of the drying station is only nine kilowatts. Heat pump based dryers are meanwhile eligible for government promotion.

Significant Throughput Increase

The solution found allowed KKS to replace the existing obsolete systems by a single new system that can stand the pace with the production volume. Also, the throughput of the cleaning/drying system could be increased by 100 percent. The quality requirements for the two processes are fully met.
The watch manufacturer could realize their specified throughput, and their process is reproducible. The system control is capable of monitoring and recording the whole process as well as all specific parameters and of ensuring that all requirements are met at any time. The combined ultrasonic cleaning and condensation drying system provides maximum flexibility to the operator while ensuring full reliability.

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