



WORLD WIDE WEAVE

Manufacturing with clockwork precision

MAXFLOW Compact Filter System in the luxury watch industry

Luxury watches enjoy immense popularity, thanks to the emotions associated with them. The most frequently cited argument for buying one is pure passion for ultimate precision, complicated mechanisms and meticulous craftsmanship. A premium manufacturer located in the Swiss Jura, about an hour from Berne or Lausanne, produces clockwork components that ensure the promised precision and reliability in the world's most prestigious luxury watches. The so-called ébauches – finished blanks – and bridges manufactured here are main components for the movement of high-quality mechanical watches. The factory produces tens of thousands of ébauches each year according to state-of-the-art manufacturing standards. The precision of these clockwork components depends to a great degree on the plate, also referred to as the 'platine'. These pieces are processed using double-disk grinding technology. For the filtration of the cooling lubricant for the double-disk grinder, the company set out to find a filter system that combined a small footprint with high performance and cost-efficiency. To meet the surface roughness requirement of 0.8 μm for the surface of the platine, the cooling lubricant has to be filtered with a retention rate of $\leq 5 \mu\text{m}$ at a throughput rate of 220 l/min. They chose the MAXFLOW CS 1000 compact filter system made by GKD – Gebr. Kufferath AG with integrated briquetting.



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Prominent watch manufacturers live from the good reputation of their products. To achieve the exclusive quality of these products cost-effectively, these companies complement traditional techniques, manual finesse and the watchmaker's loupe with computer-controlled processes and state-of-the-art processing machines. This is also how coveted Swiss watches are made. They are the epitome of precision and traditional horology, combined with innovative manufacturing technology and highly complex mechanics. Pure luxury – and not only because of the precious metals used in the casing. Alongside the watchmakers, there are lots of engineers here working in close alliance with the craftsmen to achieve up-to-date interpretations of the old techniques through modern manufacturing methods. The basis of every piece of mechanical clockwork is the platine, on which the countless parts of the movement, many of them only few tenths of a millimetre in size, are mounted. Bridges also play an important role. They support the moving parts and are screwed to the platine. It is the individual construction of these two elements that gives a luxury watch its unique character. And the evenness, parallelism and surface roughness of the workpiece are the decisive quality parameters that ensure the promised accuracy rate and power reserve.

Perfection right down to the last detail

The precision manufactory in the Swiss Jura has a staff of more than 150 employees who are working in the platine processing zone. The manufactory also produces other watch components for internationally renowned watch manufacturers. The basic pieces are 50 x 50 millimetre rectangular brass plates with thicknesses from 0.7 to 4.5 millimetres. After each work stage – machining, milling, drilling – a new grinding pass is required in which the platines are face ground in a double disk grinding machine to the respective depth. For this process they are automatically



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transported from the various processing zones to the grinding machine in small trays. After the grinding pass, they are removed from the machine by a robot and deposited back into their different trays. By the time all the necessary drilling and milling has been completed, each platine will have gone through up to five grinding passes in the double-disk grinder. Most of the plates are thermally treated before grinding to guarantee a perfect flatness. To give them a uniform surface finish, all the platines are then bead blasted, and oil and swarf are removed in a washing line before further processing. Next, a computer-controlled inspection unit conducts three-dimensional measurements to ensure that all finishing details have been accomplished to the required level of precision. In the final stage, the perfectly dimensioned round platine is milled out of the rectangular form of the original platine. The processing from the rectangular blank to the round milled platine takes up to 60 minutes. In this way, several hundreds of these platines are produced here every day. This process is followed by surface treatment and decoration of the platines. In this stage, for example, the company name of the watch manufacturer is laser engraved and the letters are blue or black lacquered for better legibility. All in all, about 250 parts like cogwheels, springs, flywheels, arbors, hammers or balance wheels are mounted into drilled holes on different levels of the platine. Subsequently, a watchmaker will work hours to assembly the finished blank with all the movement parts in a clean room, test its accuracy rate, and oil and move all the parts. Only when he is certain that its functions are absolutely flawless will he fasten the movement to the casing with the final screws.

Only the best is good enough

Efficient filtration of the cooling lubricant for the double-disk grinder makes a significant contribution to compliance with high standards of quality and



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process reliability. Particle-contaminated cooling lubricant would scratch the ultra-smooth surface and compromise the roughness average required for exclusive product quality. The prime task of a filtration system in precision processes like this is, therefore, to keep the cooling lubricant at a high level of purity for as long as possible. The Swiss clockwork manufactory had been using a conventional precoat filtration system for more than six years. The plant had a huge footprint and was also expensive to run. Every six months, the old filters had to be replaced with new ones. On top of all that, there was also the cost and effort involved in the dirty job of cleaning the tanks and pipe systems. The company was looking to replace this plant with a compact filter system that would guarantee a filter fineness of $\leq 5 \mu\text{m}$ at a throughput rate of 220 l/min – and at the same time reduce the costs of consumables and do away with laborious handling of contaminated sludge. On the recommendation of the grinding machinery manufacturer, the maintenance manager of the clockwork manufactory contacted the specialists for filtration capital equipment and engineering: GKD in Düren in Germany's Rhineland. GKD presented the MAXFLOW compact filter system at the manufactory and explained the possibilities for custom adaptation of the equipment. The manufactory decided on the MAXFLOW CS 1000 with integrated briquetting. What convinced them was the compact construction in stainless steel and the filter discs made of stainless steel wire mesh specifically configured for the particular customer, which guarantee long service life, low maintenance costs and corrosion resistance. The MAXFLOW concept also provides filtration to the required fineness without filter aids. Tailored exactly to the needs of the clockwork manufactory, the system has two filter packages, each with two static filter discs, a round tank system with integrated dirt tank and a lifting pump. Furthermore, the dirt tank's tapered run-off prevents deposits from accumulating on the tank floor.



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Advantage through perfect performance

The compact filter is connected to the manufactory's central cooling system, which is fed with 14 to 15° C cold water from a nearby stream. To compensate for the temperature difference, GKD installed a cooling coil with its own separate temperature regulator in between. The filter discs are fitted with process-customised multi-dimensional YMAX[®] type mesh and vertically installed in the filter head. With a footprint of just two square metres, the MAXFLOW is also considerably more compact than the previously installed precoat filter. The water-based cooling lubricant with a four-percent concentration streams around the filter discs according to the cross-flow principle. Automatic backwashing detaches the filter cake of milling waste and aluminium oxide dust from the discs, presses it into dry briquets in its integrated briquetting unit and ejects the briquets ready for easy disposal. This also ensures considerably lower loss of cooling lubricant through entrainment. In addition to the compact construction, the Swiss customer was also very impressed by the sheer ease of maintenance. "The GKD solution saves us so much time and money compared to our previous filter system. Once a week, we exchange the one filter package for the other, cleaned one. That takes only 15 minutes. With our old system we needed two to three days to change the filters," says the Maintenance Manager of the Swiss clockwork manufactory. And then there is the proven reliability of the compact filter's performance. Since its installation it has been running non-stop five days a week in two shifts. Reliable compliance with the specified retention rate of $\leq 5 \mu\text{m}$ and the consistently high throughput rate completely fulfil the high expectations of the manufactory. No wonder, then, that the Maintenance Manager is satisfied: "The MAXFLOW filter system is the perfect complement to our



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double-disk grinding machine and thus contributes substantially to the quality of our precision clockwork.“

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GKD – GEBR. KUFFERATH AG

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