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Clockwork precision

MAXFLOW filter systems meet the highest standards

Swiss clocks and watches are world renowned for their precision. The more complicated the mechanism, the more sought-after the model – with production times of up to a year. Elaborate hand-made techniques of old are increasingly being supported by modern production processes, to update exclusive craftsmanship with the required efficiency. Leading manufacturers of luxury Swiss watches rely therefore on the double disk grinding technology from Supfina Grieshaber GmbH & Co. KG. The brass plates which carry the various components of a clockwork mechanism are precision ground to a tolerance of microns in the innovative Planet V4 and Planet V7 machines. The cooling lubricant is processed using the MAXFLOW compact filter system CS 1000-503 developed by GKD - Gebr. Kufferath AG (GKD). In addition to the required filtration level of $\leq 5 \mu\text{m}$, it's the unique unit design without filter aids but with integrated briquetting that sets the MAXFLOW filtration concept apart.

Supfina Grieshaber GmbH & Co. KG is a leading manufacturer of super finishing machinery at the highest technical level. Founded in 1903 in Wolfach in the Black Forest, the company employs 190 staff at its three sites in Germany, the USA and China. With its super finishing and ultrafine grinding machines and attachments Supfina supplies world-renowned solutions to the automotive, aerospace and anti-friction bearing industries. For example the Supfina SpeedFinish® process is setting standards in ultrafine grinding with time savings of up to 75 per cent. Another ground-breaker is the double disk grinding machinery for rapid, high-precision material removal on mass-produced flat work pieces, thanks to state-of-the-



WORLD WIDE WEAVE

art tooling and dressing technology. Innovative features such as a patented tilted navigation system or an integrated tool-change device reduce additional costs to a minimum. The unfailing performance and precision of machine series Planet V4 and V7 are relied on by leading companies in the watch, blanking and precision blanking industries worldwide. As a systems supplier, Supfina brings together complete process-wide solutions comprising machines for double disk grinding and super finishing, years of process know-how, and tried and tested tools as a one-stop shop. It's this range of expertise that qualifies Supfina for both complex and sophisticated tasks in precision industries.

Tailor-made design

The first stage in creating a bespoke design for a double disk grinding unit is a technical drawing of the component that the customer is looking to produce and for which a suitable machine is needed. This is the basis on which Supfina applications engineers use trials to develop the necessary specifications for grinding wheels, cooling lubricants, grinding and cutting speeds etc. The parameters for flatness, parallelism and roughness defined here later determine the quality of the finished work piece and efficiency of the process. Preliminary tests lead to validation of the unit design selected, with commissioning following customer approval. The next step sees Supfina customise the machine to the customer's particular process and plant specifications with application-specific transport disks and handling mechanisms for work piece feeding and removal. Depending on the thickness of the parts to be ground, the transport disks are made of fibreglass-reinforced plastic or steel. For very thin parts, used extensively in the watch industry for example – with a lower limit of 0.5 millimetres for double disk grinding – the transport disk measures between just 0.3 and 0.4 millimetres and is laser cut from steel according to CAD drawings.



WORLD WIDE WEAVE

Plastic disks on the other hand are used in trials or with thicker parts such as gear wheels. The units' great flexibility facilitates small batches as well as outputs of several million pieces per year. Cycle times range from 0.3 to 10 seconds. In addition to this flexibility, speed and precision, what particularly sets Supfina's double disk grinding Planet series apart is its great reliability, which means maximum process reliability for the customer.

Playing a major role

A Swiss manufacturer of luxury watches commissioned Supfina to develop a unit for the double disk grinding of watch plates. The machine selected was the Planet V4 with vertical grinding spindles, which was designed for finishing work piece diameters of up to 85 mm. It can be loaded and unloaded manually or automatically. Its simultaneous finishing of two parallel surfaces, preliminary work piece monitoring as well as measurement during and after processing, plus a dressing device, guarantee optimum work piece quality with short processing times and low investment costs. Decisive factors in the desirability of luxury mechanical watches are accuracy, precision and quality. These depend on the sophisticated, ever-evolving geometries of clockwork components that are often only a few hundredths of a millimetre in size. All the bearing and mounting points for the tiny wheels and working parts of a mechanical chronometer are incorporated in the so-called (work) plates. They carry the various components of the clockwork mechanism and thereby give it its unmistakable character. The Swiss watch manufacturer commissioned Supfina to build a unit to produce such plates with a roughness of 0.2 μm . To achieve the extremely smooth surface required, the cooling lubricant needed a filter fineness of $\leq 5 \mu\text{m}$. As the watch manufacturer's former preferred filter supplier had declared insolvency, a new partner was



WORLD WIDE WEAVE

needed. The customer rejected the company suggested by Supfina, as the pre-coating time needed for the required filter fineness was too long.

A positive first impression

As a result, Torsten Bergmann, Supfina's head of mechanical construction for double disk grinding, approached GKD at GrindTec 2010. He was impressed right from the start: "GKD came straight to see us in Wolfach, where the process and machine were already prepared", Torsten Bergmann recalls. The commission was discussed in detail and a filtrate specimen was taken back to the Rhine town of Düren. Following extensive laboratory testing GKD soon determined the filter mesh construction and the number of filter disks. The next step saw the specialist for filter system construction and engineering configure the compact filter system MAXFLOW CS 1000-503 with a filter head comprising four static disks and a round tank system with integrated cooling coil for the test unit. The unit housing, filter disks and mesh are made entirely of stainless steel. A filter disk package covered with multidimensional YMAX[®] composite mesh, designed specifically for the given process, is installed vertically in the filter head. The filter disks are sited in the crossflow as cooling lubricant emulsion contaminated with grinding waste and particles streams around them. With the required filtration level of $\leq 5 \mu\text{m}$ the filtration rate is 200 litres per minute. The clean tank has an integrated dirt tank with a tapered run-off that prevents a build-up of deposits at the bottom of the tank. The filter cake is detached from the disks by automatic backwashing and is pressed into a dry briquette by the integrated pressing unit and then discharged.



WORLD WIDE WEAVE

A giant leap forward

The briquette pressing was of immediate interest to the watch manufacturer focused on extreme cleanliness during production. Torsten Bergmann and his Supfina colleagues loved the dirt tank's conical design on sight: "This tapered solution is much better than the usual angular designs. Everything collects in the corners", was the unanimous opinion. However, before finally recommending the MAXFLOW filter to the watch manufacturer, Supfina drew up a comprehensive for-and-against list that compared the GKD compact filter with an alternative filter cartridge solution. All its advantages meant a resounding vote in favour of the MAXFLOW compact filter: much simpler handling, better accessibility, easier maintenance plus a residue-free dirt tank. MAXFLOW also scored well on account of the fact that the cooling lubricant is not displaced. By contrast, the fineness of the filter made no difference and both filters work without pre-coating. The decisive factors however in Supfina's clear recommendation of the MAXFLOW solution were two unique selling points above all else: in contrast to the dripping filter bags on the alternative filter, the residue briquettes pressed in the MAXFLOW are dry. This is more than just an advance in cleanliness because it also allows the filtration of gold dust particles, as the valuable discharge in its dry state is ready for immediate reuse. A factor which is naturally very important for the manufacturer of luxury watches made of precious metals. Furthermore, the much longer service life and the greatly reduced follow-up costs as a result were points in favour of the GKD compact filter system. Supfina also gave a hearty 'thumbs-up' to GKD's service. "Whether we're talking training sessions on how to use it or times when there were problems: GKD was always there. Appointments were kept without fail and reaction times were quick", was the glowing opinion. "Contact and service were miles better with GKD", is Torsten Bergmann's keen evaluation. Even when the



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customer subsequently needed a lifting station, his GKD contact was on the phone straight away and the upgrade was quickly completed.

Huge demand

As a result of huge demand another leading watch manufacturer is interested in a second double disk grinding unit of the Planet V4 type. The unit this Swiss company currently uses has a pre-coat filter that is no longer on the market. The new Planet V4 is to produce plates of approximately 5 x 4 cm from which components are milled in varying sizes and stages. In order to constantly achieve the required dimensional accuracy, flatness and parallelism, the brass or gold plates undergo several grindings in just a few seconds on the Planet V4. Here too Supfina operates a customised MAXFLOW compact filter test system for reconditioning the cooling lubricant emulsion. Once again all the results favoured the GKD solution.

A clean sweep

The trouble-free cooperation led Supfina to expand their double disk grinding operation with a MAXFLOW belt filter. The filter volumes here reach 250 l/min with the V4 and up to 350 l/min with the V7. Up to now Supfina has been using paper belt filters for this. One of Supfina's in-house specifications stipulates a filter fineness of at least 60 µm here. A value clearly undercut by the MAXFLOW belt filter's fineness of 40 µm. So it is suitable for use with all Supfina systems. The self-cleaning continuous belt filter with stainless steel mesh is the easy alternative to units with paper belts – with similar filtration performance. A fact that Torsten Bergmann is particularly struck by, as it does away with the generally high costs till now of consumables and their disposal. Another major plus point for him is the solid discharge from the belt filter and therefore improved cleanliness. Supfina requested a modification of the belt by fitting a removable partial



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cover, to stop the surface moisture evaporating from the filter cake so quickly. The plate was made and so the belt filter is now also as regular as clockwork.

Ideal conditions

So Torsten Bergmann is convinced: after one year of working together with GKD and the MAXLOW filter system family he is pleased to recommend them to his customers. "Both units are running completely problem-free, very cleanly, without consumables and with much lower disposal costs." The exemplary service and straightforward exchanges are the best foundations for a learning process that will continue to be mutually rewarding. For Supfina is already considering ways for both parties to investigate and expand the use of MAXLOW filter systems with different cooling lubricants and grinding media.

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GKD – GEBR. KUFFERATH AG

The owner-run technical weaver GKD – GEBR. KUFFERATH AG is the global market leader for metal and plastic woven solutions as well as transparent media facades. Under the umbrella of GKD – WORLD WIDE WEAVE the company combines three independent business units: SOLID WEAVE (industrial meshes), WEAVE IN MOTION (process belt meshes) and CREATIVE WEAVE (architectural meshes). With its six plants – including the headquarters in Germany and other facilities in the US, South Africa, China, India and Chile – as well as its branches in France, Great



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Britain, Spain, Dubai, Qatar and worldwide representatives, GKD is never far from its customers.

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