



Evaluation of FluidWorker® 150 at GKN ePowertrain, Sweden

Maintenance of process fluids is a manual routine by the machine operator that in practice is challenging to perform with quality. Incorrect fluid care causes quality problems, production stops, high consumption of cutting fluid, poor work environment and unnecessary change-outs. The extent of the problem is difficult to overview as there are many departments involved and represent a significant part of the production cost.

Strong focus on sustainability

There is continuous works to minimize GKN's impact on the external as well as the internal environment. This includes optimizing production so that a reduced environmental impact and a safer working environment can be achieved. As the use of chemicals within productions is extensive, there is a special chemistry team responsible for the selection and handling of chemical products.

FluidWorker 150 at GKN

CNC machines are in operation up to 3 shifts. During nights and weekends the operation can occasionally be off depending on order situation. At one of these CNC machines, FluidWorker 150 was installed during a test period of 2 months.

Competitiveness thru Savings

– Annual savings EUR 9910

In the competitive industry in which GKN operates, there is always a need for further efficiencies, productivity improvements and cost savings.

Cut time spent on fluid maintenance

– Saving EUR 3500. Machine operators and maintenance personnel spend time on tasks such as daily measurements, adjustments, documentation as well as cleaning and replacements. By automating these tasks, GKN wants to enable staff to focus on production-related duties such as programming, tool changes and quality control. Change out of poor fluid, causes unplanned production stops and work for the maintenance department.

Reduced consumption of cutting fluid

– Saving EUR 4500. The optimal concentration for the process was set to 5%. Previously, manual measurements had shown that the concentration could vary between 2–15%. One reason for the variation is believed to be a lack of time to perform the tasks often enough.

Reduced tool wear/tool breakage

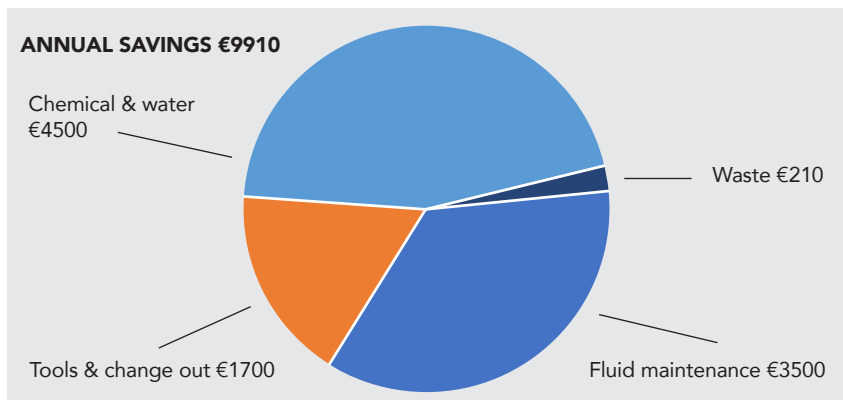
– Saving EUR 1700. Cutting tools are used for a pre-determined period based on experience and where periods of too low or too high concentration are likely to have a negative effect on wear.

Less waste disposal – Saving EUR 210.

When the process fluid needs to be replaced, a hazardous waste arises that must be disposed. The reduced waste in the test machine was estimated at 4,700 litres per year.

Improved production quality

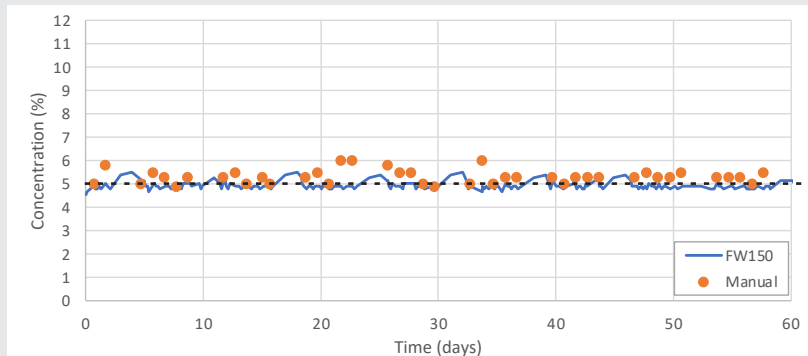
Production quality issues are costly and the GKN quality manager in the project group was interested to follow up on the quality aspect.



Bacterial levels in sumps normally fluctuate over time depending on the environmental conditions and changes in e.g. nutrition and temperature levels. Staff report that historically, before installation of the FluidWorker 150, bacteria levels could reach up to 10^7 CFU/ml with bad smell. The results show that the bacterial levels are with FluidWorker below the accepted level; $<10^4$ CFU/ml and with no bad smell, which is a consequence of overall steady fluid conditions and UV-treatment.

Stable Concentration - Results in Fluid Quality

The automatic adjustment of the concentration by FluidWorker 150 has been very stable at the target concentration 5% with a \pm variation of 0-5%



pH is an important parameter that indicates the fluid stability and can indirectly indicate microbial growth. A stable and high pH is advantageous for a maximum fluid lifetime. The metalworking fluid used in the tank has an acceptable usage level above pH 9. Generally, if the concentration is kept stable it also helps control and maintain the pH level, which is a further advantage of the FluidWorker 150. The levels were kept stable between pH 9-9.2 during the FluidWorker test period without any addition of tank side additives.

No impact of tramp oil during tests.

Tramp oil is normally present in metalworking and it is an unwanted substance that can lead to numerous problems such as decreased coolant performance and lifetime as well as shortened tool life.

Tramp oils also promote anaerobic bacterial growth, which can generate an unpleasant odor and cause dermatitis. Despite the increased tramp oil levels, no fluid parameter was negatively affected and bacterial levels were kept below $<10^4$ CFU/ml. The

operators also commented that the fluid visually seemed to be in a better condition than before.

Correct fluid level was maintained by FluidWorker 150 which has a positive impact on quality and wear. When the fluid evaporates and is lost via chips and work pieces, the fluid volume decreases. At the same time, the contamination remains, which leads to an increased concentration of particles. Fluctuations in fluid level have an impact on machine temperatures. This affects the quality of the processed material and enhances the wear on machine and tools. In addition, the risk of foaming increases as small particles can bind the foam and make it more stable.

Manual fluid handling has challenges, risks and is often heavy. Water hoses and barrels with concentrate must be moved to the machine and sometimes the fill-up is made with heavy buckets or containers. When the human factor is part of the process, flooding or incorrect water/concentrate ratio is not unusual. Operators

are relieved from manual work since FluidWorker 150 controls the tank level automatically and the level is kept constant.

Data is recorded by FluidWorker 150 for concentration. For the 400-litre machine tank the average water consumption was 58L/day. The fluid consumption with FluidWorker 150 is 0.8 L/day, which is heavily reduced compared to manual handling which normally reaches up to 3.5 L/day.

Summary & Conclusions

The completed test installation of FluidWorker 150 at GKN ePowertrain has been very satisfying and successful. The chemical team who performed all daily control measurements have expressed that the tests even exceeded the high expectations both technically, financially and environmentally. **The operators at the machine can now focus entirely on production-related tasks.** The concentration and fluid volume have been stable and accurate within the desired range without any deviations. **The metalworking fluid has worked optimally and is perceived as visually cleaner and without any unpleasant odour, improving the working environment.**

The consumption of fluid has decreased by 75% from about 100 litres per month to 25 litres per month. The optimal concentration achieved has resulted in less smudge, foam and a safer fluid with a significant saving and minimal environmental impact. **With a bio-stable metalworking fluid, GKN expects a longer service life, which in turn means less production stoppages and handling of hazardous waste.**

The financial calculation performed by GKN ePowertrain shows an annual saving of EUR 9 910.

Fluid Maintenance	Manual task	Automated with FluidWorker 150
Operations	Refractometer, manual additions of metalworking fluid and tank side additives	Automatic control of concentration and tank level. Magnetic filter and UV-treatment.
Target concentration	5% which vary between 2-15%	Stable at 5% \pm 0.5%
Fluid consumption	3.5 L/day – 100 litres per month	0.8L/day – 25 litres per month
Biostability	Bacteria levels up to 10^7 CFU/ml, bad smell	Below stipulated level 10^4 CFU/ml
pH	\sim 9.1 with pH drop when bacteria are present, use of pH adjuster	9-9.2 without any addition of tank side additives
Appearance	Smudge, foam	Better; less smudge and foam

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Wallenius Water Innovation is a Swedish company that develops sustainable and profitable solutions addressing significant health, safety, and environmental challenges within a variety of applications and industry segments. The main product families are, FluidWorker[®] which offers non-toxic and automated control of industrial process fluids, and AquaWorker[®] used for chemical free disinfection in water systems.