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**Interview With Dr. Andreas Funk,
product manager process water treatment and
consumables at Walther Trowal GmbH & Co. KG**

What To Do With The Process Water From Mass-Finishing Applications?

**WALTHER
TROWAL!**

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What To Do With The Process Water From Mass-Finishing Applications?

MFN had the opportunity to talk to **Dr. Andreas Funk**, product manager process water treatment and consumables at **Walther Trowal GmbH & Co. KG**, Haan, Germany.

(?) MFN: When we are talking with the users of mass-finishing technologies, the machines and the media are usually at the center of our discussions. We have the impression that the cleaning of the process water often receives very little attention.

(!) A. F.: While this may have been the case in the not-too-distant past, today, process water treatment has become an extremely important subject: A well-

planned process water-cleaning system protects not only the environment but helps to save a lot of money as well.

(?) MFN: Let's try to clarify some basics: What exactly is process water?

(!) A. F.: The primary goal of the mass-finishing process is the deburring, edge radiusing, surface grinding, polishing, etc., of all kinds of workpieces. This involves the removal of a small amount of material from the workpiece surface. The process as such, is an intensive interaction between the grinding/polishing media and a mixture of water and the finishing compound. This discharged mixture, the so-called process water, contains all kinds of contaminants such as metal fines from the workpieces, media fines, oil and grease carried into the process and, occasionally, chelated metals from the mass-finishing machine. Of course, the question then arises: "What should I do with the contaminated process water? Should I just discharge it to drain, or can I re-use it in a sensible manner?" Untreated waste water - this includes the process water from mass-finishing operations - cannot be simply discharged to drain in most countries. Doing so would be a serious violation of the prevailing environmental laws. The users have two alternatives: Running their -finishing processes with fresh water in flow-through/loss mode and cleaning the generated waste water before discharging it to drain or re-using it in a closed-loop recycling system.

The general water directive of the European Union (Directive 2000/60/EC of the European Parliament and of the Council) and the various national laws derived from this directive stipulate that the waste water must be cleaned before discharge; moreover, it requires an official approval by the water authorities. Waste water treatment by



Dr. Andreas Funk adjusting a ZM 03 basket centrifuge

flocculation is a chemical process and discharging the cleaned water to drain is controlled by strict governmental rules; additionally, chemical water treatment requires qualified personnel with an in-depth knowledge of the treatment process and the required adjustments.

(?) MFN: So, what is your recommendation?

(!) A. F.: Our company philosophy has always been guided by our desire for a sustainable protection of the environment: "Prevention of waste is always better than its disposal." We feel that whenever technically possible, the process water should be re-used in a recycling system. In other words: Waste water that is not generated, must not be cleaned!"

For this reason, as a first choice, we recommend the use of recycling centrifuges. Based on our experience with hundreds of systems operating in the field we have found that process water recycling with centrifuges is by far the best alternative for 80 - 90% of all mass-finishing applications. It is a purely mechanical process that protects not only the environment but also helps reduce



In mass-finishing process, the process water is an essential component



At the exit of the processing channel of the mass-finishing machine, the media and work pieces are separated from each other

capital expenditures as well as the costs of operation and waste disposal.

(?) MFN: How is the centrifugal process working?

(!) A. F.: Centrifuges are separating the solid contaminants from the liquid phase with a centrifugal force corresponding to about 2000 g. While the solids are deposited on the wall of the rotating drum in the form of sludge, the liquid – a mixture of water and compound – remains on the inside. From there, the now clean process water is returned to the mass-finishing process.

(?) MFN: What kind of waste do I have to dispose of?

(!) A. F.: Not much! The cleaned water is re-used in the finishing process, and no liquids are discharged to drain. Of course, some of the process water evaporates or is carried out of the system with the workpieces. These losses, usually just a few liters per week, must be replenished.

The utilized compound does not evaporate and remains in the process water. A small portion is lost with the water carried out of the finishing machine by the workpieces. From time to time the minor compound losses, like with the water, must be replaced. But as I said,

these losses are minimal.

All that must be disposed of, is the sludge. It consists mainly of media fines. In addition, it can contain metal ions, colloids, some fines from the workpieces, and possibly debris from burs, gates and risers, etc. Sometimes it also contains oil that was carried into the process by the workpieces such as stampings.

The dried sludge can be disposed of as solid waste per the disposal rules for abrasives used in honing and grinding operations. The respective sludge quantities are determined by the amount of generated media fines. The following rough rule of thumb provides a good estimate of the sludge quantity: A consumption of 70 kg of finishing media per cubic meter of water generates about 100 kg of sludge. This represents about one-tenth of the weight that would be generated, if the entire process water was disposed of. Since the disposal companies usually base their fees on the weight of the waste material, this is an important cost factor.

(?) MFN: What about the overall costs?

(!) A. F.: Centrifugal filtering proves convincingly that environmental protection can actually save money. If a user changes from using fresh water in flow-through/loss mode to process



To take the sludge basket out of the drum of a basket centrifuge, four wing bolts must be removed

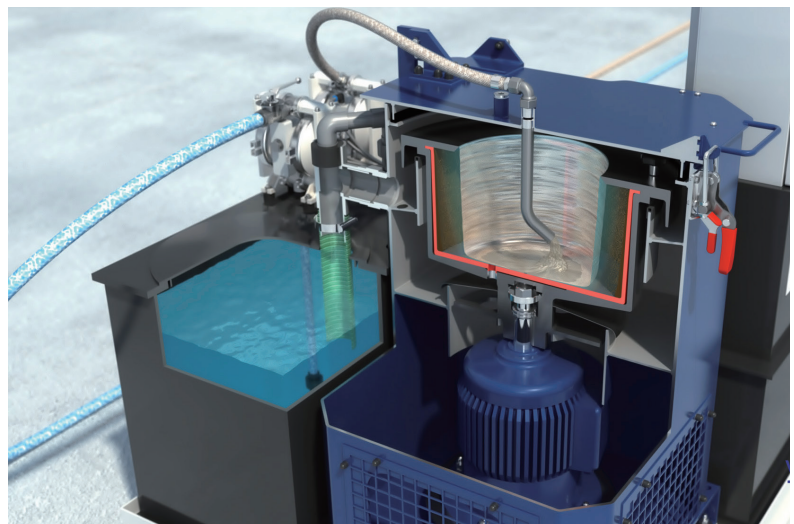
water recycling, he will save up to 80% in compound and up to 98% in water usage.

The capital expenditures for a centrifuge are significantly lower than those for a water treatment plant. And the users have lower waste disposal costs, because compared to the sludge quantity generated by flocculation systems, the amount of sludge is cut in half; moreover, no discharge approval from the water authority is needed, so this eliminates a lot of time-consuming bureaucracy.

(?) MFN: “Process water” creates the impression of chemistry. Is the centrifugal process very complicated?



Basket centrifuges are highly compact machines and require very little operator involvement



The sludge is deposited on the wall of the sludge basket in the rotating drum. The process water is returned to the mass-finishing process

(!) A. F.: Centrifugal filtering is a simple mechanical technology that requires no special chemical knowledge. The centrifuge is simply turned on and off. That's all. As a matter of fact, once the recycling system has been calibrated at the time of its commissioning, no further changes are necessary. This means that the recycling process is very safe and totally stable.

Whenever the process parameters are changing – for example, a different compound or media is used, or the metal alloy of the workpieces has changed – the user simply contacts the specialists at Walther Trowal to recalibrate the process. In addition, along with the annual preventive maintenance work per accident prevention regulations, we offer a regular technical service that is in full compliance with the legal requirements.

(?) MFN: We understand that you offer two different types of centrifuges. When and how are they used?

(!) A. F.: The centrifuge choice depends entirely on the generated amount of sludge.

In so-called basket centrifuges, the solids are collected in a sludge basket inserted into the rotating drum. Once the basket is full, it is removed from the drum and emptied. Provided the basket must be emptied only about one time

per shift, this is very economical. Such relatively small sludge quantities can be easily handled with one IBC container per month.

When larger sludge quantities are generated, so-called peeling centrifuges represent the better alternative. In these centrifugal systems, the sludge is automatically peeled from the rotating drum in pre-set time intervals and dumped into a sludge container. Since the container has a large holding capacity, it does not have to be emptied very often.

(?) MFN: What factors must be considered to select the right centrifuge?

(!) A. F.: The centrifuge selection depends less on the amount of recycling water but more on the amount of generated sludge. For example, a user must make sure that the sludge basket is big enough to safely remove all solid particles accumulating in the recycling system. In this respect, we can help our customers with a wealth of empirical data.

Let me illustrate this with a practical example: Let's assume that a customer utilizes a medium-sized centrifugal disk-finishing system; for example, a Walther Trowal machine, model TT 90, with small, relatively fast cutting ceramic grinding media. About 80 to 100 liters of water are passing through the finishing machine per hour, and such

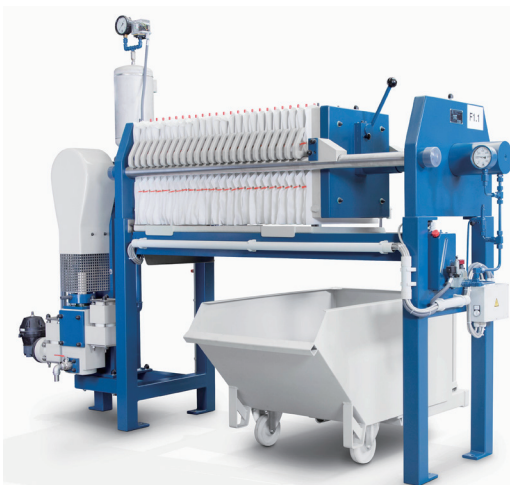
a water volume can normally easily be handled by a basket centrifuge; however, the media consumption amounts to around 7 kg/hour, and when adding 3 kg/hour residual water content in the sludge, the total hourly sludge quantity increases to 10 kg. This would require emptying the sludge basket every 2 hours. In this case a peeling centrifuge is much more economical and relieves the operator from strenuous manual work.

(?) MFN: What would I do if the workpieces were dirty?

(!) A. F.: Centrifuges can easily deal with residual stamping oil on the workpieces. However, if large amounts of oil are involved, the work pieces might have to be washed beforehand. Many times, it helps to simply let the oil drip off the workpieces for a while before they are loaded into the finishing machine, but in extreme cases, the workpieces might have to pass through a washing machine prior to the mass-finishing operation.

(?) MFN: What are the limits of centrifugal systems?

(!) A. F.: Of course, centrifugal filtering cannot be used for every mass-finishing process. With some applications the process water cannot be re-cycled. For



The sludge is de-watered in a chamber filter press, the process water is returned to the mass-finishing process, and the dried sludge is disposed of



Very little work is required to exchange the full sludge container of a peeling centrifuge with an empty one

example, when acidic compounds are used for pickling operations, it is difficult to consistently maintain the right pH value, because the process water always contains acids, additives and residual surfactants. This makes the targeted water/compound replenishment very difficult so that it is safer to use fresh water in flow-through/loss mode. Also, in multi-stage processes where multiple compounds are used at the same time, the process water must be cleaned in a flocculation system and subsequently be disposed of.

Let me give you another practical example: Let's assume that a customer is using two processes, one with a strong degreasing compound and another with a compound with only a slight degreasing but an excellent brightening effect. The workpiece volume does not justify two separate finishing machines. So, the customer is first running a workpiece batch for degreasing followed by a batch for brightening. Using one centrifuge for both processes would result in a mix of the two compounds. The resulting process water would be unsuitable for recycling.

In principle, three solutions are possible for resolving this dilemma. The customer could use two centrifuges, one for each of the two processes. Or the customer can run the two processes in flow-through/loss mode without recycling. In this case the installation of a flocculation system would be neces-

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Dr. Andreas Funk, product manager process water treatment and consumables at Walther Trowal GmbH & Co. KG

sary. The third possibility, actually the one with the potentially best outcome, would be for the customer to contact our specialists. They might be able to propose a single-compound recycling system that provides a good degreasing and brightening result. The development of finishing processes in our test lab is done free of charge without any costs to our customers!

Flocculation systems are reliably removing solids as well as oil and grease from the contaminated process water, therefore the cleaned water can be discharged to drain in full compliance with the legal requirements. This usually works very well, but in most cases, process water recycling with centrifuges is more eco-friendly and more economical.

(?) MFN: Where do I get help, when I have to deal with difficult mass-finishing processes?

(!) A. F.: You can always turn to our experts for advice. In most cases they are able to develop solutions that allow running finishing processes with process water recycling. In our test lab in Haan, they will analyze process water samples to determine how finishing processes can be run in recycling mode and what equipment modifications will be necessary.

MFN would like to thank Andreas Funk for this interview!

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