

Getting to the bottom of things

A joint project between viscose fibre manufacturer Kelheim Fibres, Abwasserzweckverband Saal (waste water authority) and pump manufacturer WILO took the three partners down into the sewers. The focus was on wet wipes which can cause enormous problems in sewage systems all over the world. The reason for this is the rapidly growing popularity of these convenient products as well as the often incorrect disposal of the wipes via the toilet. The latter is often a result of unclear classification of different wipes: The packages often lack a description of the wipe's material as well as a plain information regarding the correct disposal.

The project was designed to test whether moist toilet tissue made with Viloft(R) short cut fibres, designed and produced by Kelheim Fibres specifically for biodegradable wet wipes, disperse in water and can prevent the problem of blocked pumps .

These speciality fibres are characterized by their flat cross-section and their short fibre length – both have proven particularly beneficial for a fast disintegration of wet wipes.

The short fibres prevent an entanglement of the filaments. At the same time, the different stiffness offers a high impulse transmission, which enables an easy separation and therefore a fast disintegration of the nonwovens. The situation in the sewage plants has changed as the market penetration of wet wipe products has increased: Johann Schicklgruber, managing director of AZV Saal, confirms that meanwhile there is a pump truck on standby 24/7 to set acutely blocked pumps in motion again. These blockages are mostly caused by non-dispersible wet wipes which are incorrectly disposed of through the sewage system and agglomerate and build larger blockages. This leads to increasing costs, either through the use of pump trucks, as well as by higher maintenance costs and shorter machine life, or through additionally installed shredders, or the growing amount of solids which the sewage plants need to dispose of subsequently.

On the manufacturer's side, there are also efforts to adapt to the challenging situation: The European and American Nonwovens Associations EDANA and INDA have been dealing with the "flushability" topic for more than 10 years. A corresponding guideline currently exists in the third version. It describes in detail tests that reflect the different aspects of our sewage system.

These tests define the requirements for flushable wipes. The two most important criteria are: The disintegration of the wipe in the sewer as well as the biodegradability of the material.

The project partners focused on the bottleneck of our wastewater treatment system. Horst Wörner, project manager at Kelheim Fibres: "We concentrated on the pumps. And then we went a step further and verified the lab results in a real pump station. After all, it has to work in practice!"

The laboratory test

For the lab test at WILO, Hof, a container was built to copy a real situation in a pump station. Reference products to the wipes made of VILOFT® (30 percent VILOFT® Viscose Fibre Short Cut, 70 percent pulp) were standard wet wipes from a well-known drugstore brand (15 percent viscose long fibres, 85 percent polyester) as well as regular dry toilet paper (100 percent pulp, 5-ply folded). During the test, the electric current consumption and vibration of the pump were all electronically monitored. This test already showed clear results, particularly a significant increase in current consumption and vibration culminating in a total blockage of the pump when the conventional wipes were added – and in contrast a smooth operation of the pump with VILOFT® wipes and with regular toilet paper.

The test in the sewer system

The next tests were conducted to prove the transferability of these results to everyday practice. The test took place in the local sewage system of AZV Saal / Kelheim upstream of the pump station in Gronsdorf. The wipes were added to a free flowing canal system upstream from the pump chamber. The pumps were the same as in the lab test at WILO. Electric current, voltage and vibration of the pumps were monitored online. The overload cut-off of the pumps was raised to 20 A. The condition of the wipes in the inlet of the pumping station was monitored via video.

After an average retention time of 12 minutes, the conventional wipes arrived intact at the pump sump. They showed no sign of disintegration and tended to agglomerate.

Starting at stage 3 (50 wipes in 10 minutes) there was a significant rise in the pump load, from stage 5 (170 wipes in 10 minutes) on the shutdown of the pump could only be prevented by raising the overload limits.

A significant proportion of the wipes could not be transported through the pumps and thus led to blockages in both pumps. To continue operations, it was necessary to request a pump truck for the cleaning of the pump chamber.

The flushable VILOFT® wipes also arrived intact at the pump sump. But even with 300 wipes in 10 minutes, there was NO measurable increase in the pump load: The pump worked smoothly and there was no recognisable vibration. Projected for one day, this would amount to a load of 40 000 wipes!

Even the toilet paper had not completely disintegrated when arriving at the pump sump. Nevertheless, there was no recognisable



increase of the pump load, not even with 300 x 5 sheets in 10 minutes. The power consumption remained constantly at a low level, the pump operated smoothly and without recognisable vibration.

Overview (300 wipes in 10 minutes)

	A	s [A]
Spunlace	18,43	0,60
VILOFT®	12,22	0,06
Toilet paper	12,17	0,05

Conclusion

The field test clearly proves the results from the previous test at the WILO laboratory: In none of the tests did regular wet wipes as available in our drugstores fulfil the requirements of EDANA/INDA for flushable wipes. They lead to a significant increase of the load or even to an overload of the pumps, which in turn means higher maintenance costs as well as a shorter machine life and therefore higher costs.

The use of flushable VILOFT® wipes on the other hand prevents the problem from the outset. Projections have shown that by the use of VILOFT® wipes the maintenance costs of the pump stations could be reduced by more than 50 percent! Already today, this would mean savings of almost 200 Mio Euro for the German waste water authorities. And therefore the charges for waste water could be adapted by 4 percent.

At the same time, the use of VILOFT® wipes could use the energy consumption for waste water transport by 4 percent! This corresponds to a saving of almost 100 GWh per year or the output of 20 wind turbines.

Furthermore, VILOFT® wipes are completely biodegradable and don't leave plastic particles in the waste water.

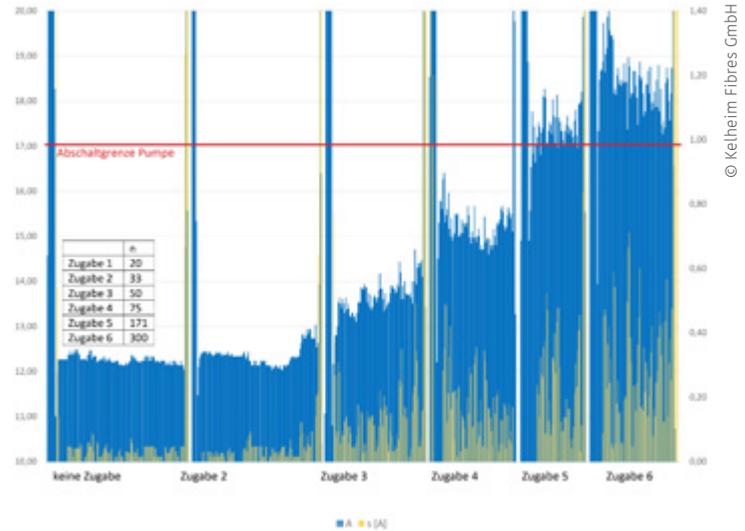
The plant manager at the waste water treatment plant in Saal, Peter Grabinger, is impressed: "VILOFT® technology offers a comprehensive solution for the current clogging problems in our pumps. It is now important to make VILOFT® wipes commercially available in the market!"

Beside the commercial availability of these wipes – the VILOFT® wipes used in the test came from one of Kelheim Fibres' American customers – a clear labelling of wet wipes and consumer education are other important steps for an increasing proliferation of appropriate flushable wipes and therefore for a future cost-effective wastewater management with affordable charges.

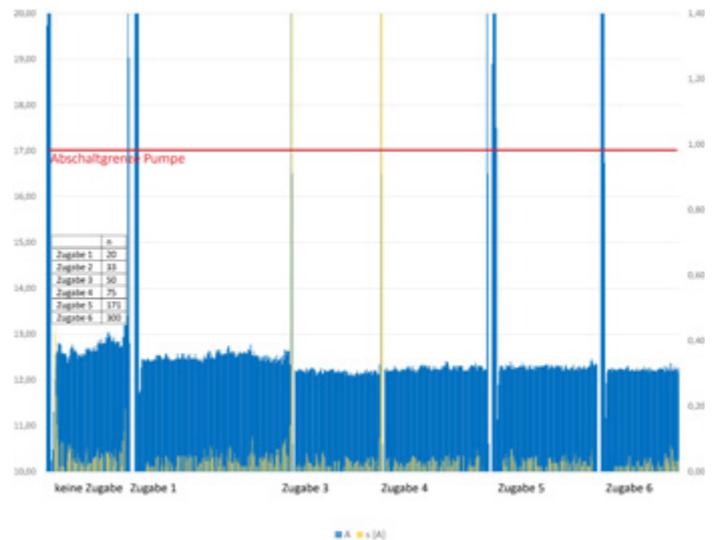
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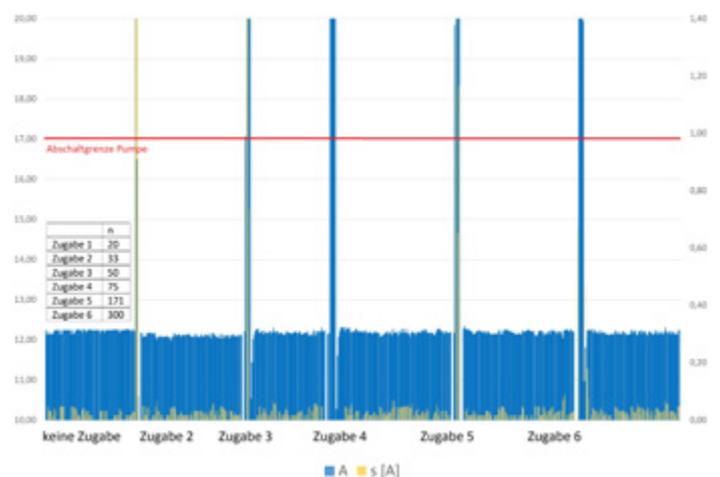
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Conventional Spunlace Wet Wipes



Flushable Wet Wipes made of VILOFT(R) Fibres



Regular Toilet Paper

Comparison of current consumption of the pump when confronted with different wipes