Cleaning process proves its efficiency in BMBF joint project

The effectiveness of the Comprex process for removing ochre deposits from raw water and well pipes as well as risers is the title of sub-project 8 in the BMBF joint project "Microbial ochre deposits in technical systems". With the help of the BMBF, Hammann GmbH was able to demonstrate the cleaning efficiency of this purely mechanical process in a test facility with transparent pipes and magnetically held test specimens - to simulate deposits or clogging of varying degrees of adhesion to the pipe wall - and measurably increase the cleaning performance based on the new findings. The aim is to upgrade clogged systems in order to conserve resources: economical water consumption for cleaning, energy savings through regularly cleaned systems.

In February 2011, the project funded by the Federal Ministry of Education and Research (BMBF) was launched.

"Microbial ochre formation in technical systems". This BMBF joint project consists of eight sub-projects [1]. As a research partner, Hammann is working on sub-project 8 on the effectiveness of the Comprex process for removing clogging. For the research work, it was first necessary to expand the existing test facility.

The test system consists of transparent pipes. It contains components for testing cleaning processes in different pipe lengths and runs. A test section (***Fig. 1***) makes it possible to use these methods to clean blocked pipe sections or to remove magnetically adhering steel test specimens from transparent pipe sections.

This model for the adhesion of deposits to the pipe wall also leads to an estimation of the shear forces required to mobilize differently adhering deposits. For this purpose, magnets with different forces can be attached to a pipe section (***Fig. 2***). The shear forces required to mobilize, for example, steel cubes can be measured using a spring balance with a drag indicator. The drag tension can be calculated from this.

A puller with a surface area of 1 cm^2 was used in the tests (***Fig. 3***). When using steel cubes, the surface area depends on the edge length. The measured values are converted to 1 cm^2 . The magnets previously used for testing require shear forces of up to 400 g. To mobilize the well-adhering test specimens, the drag force must be more than

60,000 N/m^2 .

The model with magnetic adhesion allows deposits to be classified according to their adhesion to the pipe wall. Just like the steel test specimens, the same device can also be used to test real deposits such as ochre deposits. When installed in the test section, the conditions for removing the deposits and the magnetically held steel test specimens can be tested and optimized using various cleaning methods.

The results to date show that steel test specimens can only be mobilized by the weak magnets using water flushing with flow velocities of 3.5 m/s. Flow

Figure 1*: Test track at the test facility*

Figure 2*: Holding device with magnets of different forces*

Image 4: *"Comprex you can touch" exhibit*

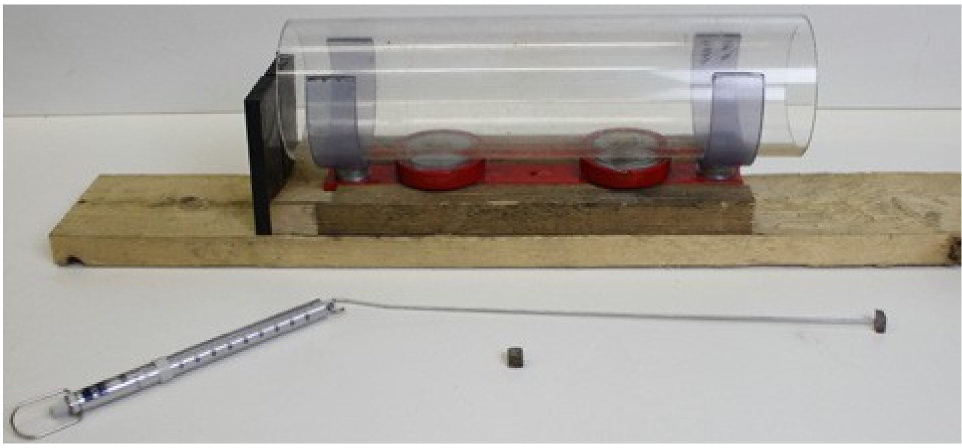

Figure 3: *Puller for determining the shear forces with steel cube*

Flow velocities of 2-3 m/s are described in regulations such as DVGW W 291 and DVGW W 557 for flushing pipes. The tests on the test system showed that flow velocities of around 2 m/s only led to the removal of steel test specimens that showed values of a maximum of 15 g on the spring balance of the device. At flow velocities of around 3 m/s, the measured values were below 40 g. These tests clearly show the limits of water flushing.

Rinsing with water-air mixtures is advantageous. However, the limits are also apparent here if the settings are not optimized. The Comprex impulse rinsing process developed from this can remove deposits even better. Compared to water flushing, it was possible to remove the steel test specimens from all the magnets used for testing. The measured flow velocity of the water blocks produced is over 15 m/s. But even here, optimization is still possible. Process control optimally adjusted to the cleaning section reduces the water requirement and increases the efficiency of the cleaning process, even with longer pipe sections. Thanks to the pilot plant, new findings and correlations have emerged from numerous test series. The demonstration plant "Comprex to touch" from Hammann visualizes the cleaning efficiency of the Comprex process in comparison to classic water flushing (***Fig. 4***). The exhibit can be seen at the BMBF stand a t Wasser Berlin International.

LITERATURE

[1] http://www.anti-ocker.de/de

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