

# Better to rinse with impulse

## Professional cleaning of drinking water installations

Contaminants of various kinds can impair the water quality in drinking water installations. Organic substances, for example, serve as a nutrient substrate for microorganisms. Deposits of inorganic substances narrow the cross-section, which is particularly critical in circulation pipes if the required return temperature is no longer reached. The aim of cleaning drinking water installations is to remove impurities, deposits and other undesirable substances.

In the first step, these substances must be mobilized and then completely removed from the system. Under no circumstances should they be allowed to be deposited elsewhere and thus affect the drinking water or the drinking water installation again. The Complex impulse flushing process from Hammann GmbH has proven its worth, particularly in the case of critical contamination. When cleaning, a distinction must be made between newly constructed and existing pipes.

### Flushing new systems

Newly installed pipes contain assembly aids and unintentional contamination. If the components are handled and installed correctly, flushing with water or flushing compressors, as described in DVGW W 557 (A), is sufficient in many cases to remove these substances. In the event of "accidents", such as contamination due to missing caps on components or the use of too many assembly aids, intensive flushing is necessary. This is where the pulse rinsing process comes into play. It mobilizes these substances as a result of the increased drag forces.

The cleaning agent removes the microorganisms from the inner surfaces of the pipes and reliably removes them. The aim is to remove microorganisms and, above all, nutrient substrates for microorganisms from the pipes. The more thorough the cleaning, the more effective and promising a subsequent disinfection measure will be.

### Flushing existing systems

Deposits and biofilms form in existing pipes during operation. In unprotected steel pipes, corrosion products can lead to incrustations. Both deposits and incrustations reduce the cross-section of the pipes and thus impair the flow. In circulation pipes, the return temperature is therefore often no longer reached. Loosely adhering deposits and biofilms can partially detach, causing turbidity and browning of the water. Larger particles clog filters. Mobilized biofilms lead to microbial impairment of the drinking water, which is particularly evident in drinking water analyses.

### Relevant regulations

- DIN EN ISO 19458, Water quality - Sampling for microbiological testing
- DVGW W 270 (A), Reproduction of microorganisms on materials for drinking water - Testing and evaluation
- DVGW W 551 (A), Drinking water heating and drinking water supply systems - Technical measures to reduce the growth of legionella - Planning, installation, operation and renovation of drinking water installations
- DVGW W 556 (A), Hygienic-microbial abnormalities in drinking water installations; methodology and measures for their elimination

in increased colony numbers. The aim of cleaning existing pipes is therefore, on the one hand, to restore them to a hygienically perfect condition and, on the other hand, to restore the originally planned flow rate. In addition, existing corrosion-protective cover layers should remain intact as far as possible.

### Disinfection only after cleaning

Disinfection is often required in contaminated pipes. This is only effective if impurities and deposits have been removed. Disinfection with the minimum recommended disinfectant concentration and exposure time is then usually sufficient. The addition of inhibitors helps to reduce iron migration (re-ironing) in steel pipes after cleaning.



Compressed air supply to distributor.

**In demand**

**IKZ-HAUSTECHNIK:** What exactly is the difference between the Complex process and rinsing with a water/air mixture?

**Dr. Norbert Klein:** Flushing with a water/air mixture is described in DVGW Code of Practice W 557, section 6.3.2.2. A distinction is made there between manual actuation of the air and water supply and automatic pressure pulse generation. One variant is the pulse flushing process. Here, the addition of air is regulated in such a way that separate air and water flows are generated.

The water is then sent alternately through the drinking water installations.

The Complex process is a further developed pulse flushing process. Tests and practical experience have shown that different settings are optimal for removing and removing deposits. The Complex process takes these findings into account when regulating the compressed air pulses. Based on the now patented operating mode, the process optimally cleans pipes and heat exchangers.

**IKZ-HAUSTECHNIK:** How time-consuming is the cleaning of a drinking water installation? Are there any estimates/experience values for residential units or buildings? **Dr. Norbert Klein:** The Complex process is mainly used in drinking water installations when the water is cloudy or contaminated, for example by pathogens or increased concentrations of legionella. Depending on the design of the drinking water installation and sedimentation or contamination

cleaning is more or less time-consuming. Cleaning old steel pipes with a lot of deposits is particularly time-consuming.

Three examples illustrate the effort involved. In each case, three employees carried out the cleaning.

- Residential building, 50 residential units, lots of deposits  
Working time: 15 days
- School, 50 taps, storage moderate  
Working time: 2.5 days
- Office building, 100 taps, few deposits

Working time: 4 days  
(2 days each on 2 weekends)

**IKZ-HAUSTECHNIK:** What are the areas of application for the process?

**Dr. Norbert Klein:** The process is mainly used for pressure systems, primarily to clean pressure pipes and heat exchangers. Sensitive components must be removed beforehand and cleaned manually (DVGW worksheet W 557, Table 2). Mobilized deposits are reliably removed. Care must be taken to flush out dead spaces in branches, for example.

There are limits to the process for very hard deposits. These include hard limescale deposits in hot water pipes or aged rust layers and rust pustules. The finger test is used to assess whether deposits can be mobilized: What can be pushed off the surface with a finger can also be removed with Complex cleaning.

**IKZ-HAUSTECHNIK:** Does flushing always include disinfecting the pipes?

**Dr. Norbert Klein:** DVGW W 557 (A) provides information on this. Rinsing or cleaning is always necessary, while system disinfection is an additional safety measure. In the event of contamination, microorganisms often settle in particles. It is virtually impossible to kill them there using disinfectants. Therefore, cleaning with a process that has great power to mobilize the deposits is necessary.

However, cleaning and disinfection measures are only sustainable when

effective when the causes of the contamination have been identified and eliminated. For this reason, preliminary planning or or even a hazard analysis

DVGW W 556 (A) is required. Typical causes of contamination are dead pipes or unsuitable materials, especially seals or membranes without a certificate in accordance with DVGW W 270 (A). DVGW W 556 (A), Table 3, provides an overview of technical anomalies and their possible effect on the hygienic quality of the drinking water.

**IKZ-HAUSTECHNIK:** How can the success of the measure be proven and documented?

**Dr. Norbert Klein:** After cleaning and disinfection measures, sampling and tests are required to document the perfect microbiological quality of the drinking water. Sampling is carried out in accordance with DIN EN ISO 19458, Table 1, purpose b. Prior to the initial commissioning of a drinking water installation, the microbiological tests specified in DVGW W 557 (A), Table 4 must be carried out. For recommissioning, the selection of microbiological parameters may depend on the microbial contamination previously detected. The sustainability of the measure must be verified by a further microbiological test. If legionella are found in a drinking water installation, the tests for both initial commissioning and recommissioning are based on the requirements of the Drinking Water Ordinance, the public health department and DVGW W 551 (A). Examples for documenting the cleaning and disinfection measures for drinking water installations can be found in the appendix of DVGW W 557 (A).

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Compressed air supply via adapter.



Tapping points with centrifugal separators.

### Cleaning with the Complex method

During systematic cleaning with the Complex process, cold and hot water lines are flushed individually. Normally, compressed air is injected into the manifold after the water meter. Sometimes it is necessary to remove components and connect the pressure hoses via adapters. At the tapping points



Centrifugal separator in action.

Special cyclone separators or centrifugal separators are located in the air ducts. Their task is to separate the discharged air from water and deposits. If necessary, the separated air is discharged via filters. During cleaning, the pulse pressure always remains below the operating pressure to prevent damage, especially to older pipe systems in existing buildings.

### Cleaning heat exchangers

Recently, new cleaning tasks have emerged. When using geothermal energy, for example, groundwater containing iron or manganese leads to deposits in heat exchangers and impairs heat transfer. The Complex process enables cleaning without dismantling the heat exchanger and without the use of chemicals.

### Cleaning ring mains

Another application example is ring circuits with dynamic currents.

or Venturi nozzles. They

have the purpose of reducing the dwell times in ring pipes of drinking water installations. Deposits and biofilms can also form in these systems during operation, making cleaning necessary. The cleaning options were investigated in a test system using the network model developed by Hammann GmbH. The test facility contained various ring line variants for both floor and corridor distribution. The investigations at the test facility showed that neither water flushing nor classic flushing with water/air mixtures are sufficient. Only the Complex process is suitable for mobilizing and removing the model impurities. In principle, the previous flushing sequence from bottom to top has been confirmed. However, it is only necessary to clean one ring at a time in the case of ring pipes in the stockworks, while the other rings are closed. Always flush in the direction of flow and prevent the water from circulating in the ring pipes. These measures are necessary to prevent the backwashing of particles into sections that have already been cleaned.



Hydrocyclone with filter for WC.

**Cleaning large pipelines** Another interesting request came from installers for cleaning large pipelines (DN > 80) in buildings that cannot be cleaned using conventional methods. The Complex process meets precisely these requirements thanks to its scalability. It is suitable for pipes in drinking water installations (DVGW W 557) as well as those in water distribution systems (DVGW W 291). ◀

#### Literature:

- [1] Hammann, H.-G. and Birnbaum, K.; Operating old drinking water installations without rust water: energie | wasser-praxis 4/2010 p. 12 - 15
- [2] <http://complex.de/trinkwasser-installation>
- [3] <http://complex.de/grosse-leitungen-sollten-expert-cleaning>
- [4] DVGW W 557 (A): Cleaning and disinfection of drinking water installations
- [5] DVGW W 291 (A): Cleaning and disinfection of water distribution systems

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<http://complex.de/>  
[www.hammann-gmbh.de](http://www.hammann-gmbh.de)



Hydrocyclone with filter for shower tray.