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# Operating old drinking water installations without rusty water

Although no longer state of the art, many old hot water pipes are still made of steel. Replacing the old steel pipes is often not feasible in a timely manner in many buildings. To get the problems under control nevertheless, a combination of mechanical cleaning using the Comprex process and subsequent dosing of corrosion inhibitors is recommended. This can significantly extend the service life of the drinking water installation until it is replaced at a later date.

In the drinking water installations of many old buildings, galvanized steel pipes are installed. At the time, this corresponded to the generally recognized rules of technology. Pipes and fittings were available in the required sizes. Specialist companies processed and installed the components in accordance with the regulations. However, problems often occurred after a certain period of operation, especially in hot water pipes. Defects were visible and reddish-brown discoloration of the water. Further problems became apparent when filters, strainers, fittings or corner valves became clogged and incrustations impaired the flow. Finally, breakthroughs indicate the urgency of a renovation.

Today we know that every material has its own areas of application. Materials for new installation systems must be fundamentally materials should always be selected in such a way that protective measures are not required. However, if damage is to be expected as a result of a non-standard material selection, protective measures can help to prevent this. The DVGW's information on drinking water installations - TWIN "Materials in drinking water installations" - provides information on the technical rules for pipes and pipe connections for the materials in question.

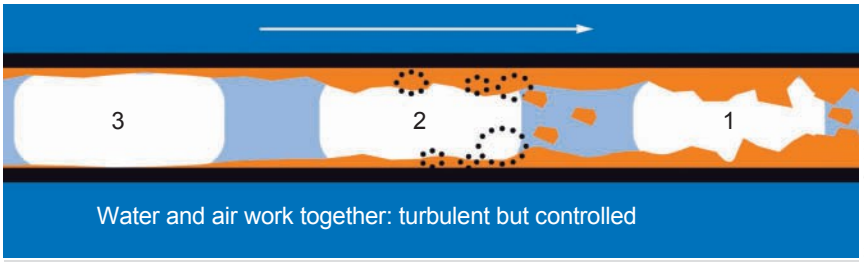
and the selection of materials is based on DIN 50 930-6, according to which the use of hot-dip galvanized iron materials in the hot water sector is not recommended. For new drinking water installations, the DVGW only recommends materials that comply with the recognized rules of technology such as DIN 1988-7 and do not require any additional corrosion protection measures. Use in the cold water sector requires the following conditions in addition to the Drinking Water Ordinance: $_{KB8.2}$ ≤ 0.5 $^{mol/m3}$ and $_{KS4.3}$ ? 1.0 $^{mol/m3}$. These conditions can be taken into account for new installations, but not for existing installations. Replacing the old steel pipes is not possible or financially feasible in many buildings. Other solutions are required. This is where the idea of upgrading old steel pipes comes in.

1. Curative measure: remove disruptive corrosive products from pipes with as little effort as possible
2. Preventive measure: slow down corrosion to a reasonable rate by treating the water

Both measures are intended to ensure the function of the drinking water installation for the extended service life.

## Cleaning using the Comprex process

The Comprex pulse rinsing process is initially suitable for removing loose and less adherent deposits and thus eliminating the turbidity and clogging problem. Once these deposits have been removed, the effectiveness can be increased to such an extent that corrosion products adhering to incrustations can be mobilized and removed. Due to the restored flow




Source: Hammann GmbH

Fig. 1: Functional principle of the Comprex pulse flushing process

Table 1: Causes of corrosion

| | |
|---|---|
| Unfavorable water quality | • Free carbon dioxide<br>• Conductivity<br>• Salts<br>• Carbonate hardness<br>• pH value |
| Incorrect operating conditions | • Low water consumption<br>• Stagnation<br>• Lack of maintenance<br>• Used water filters<br>• Incorrect cable dimensioning<br>• Incorrect temperatures |
| faulty installations | • No drinking water filter available<br>• No flushing of the pipe system after installation (this leaves sand, dirt and hemp residues that promote corrosion)<br>• Stagnation of the drinking water in the period between the pressure test of the system and commissioning |

Source: Hammann GmbH

hydraulically balanced, which is particularly important for circulation pipes.

The impulse flushing process is particularly suitable for cleaning existing installations. It is based on a controlled, pulsed addition of compressed, pure air within a defined flushing section (Fig. 1 + 2). The important thing here is that precisely metered blocks of air are placed in the throttled water flow. They flow through, the diameter

Very strong turbulent flows of approx. 10 to 15 m/s develop around them, which are capable of disrupting the laminar sub-layer of the water flow. In combination with cavitation phenomen… drag forces, they cause… to detach from… wa… tapping points, cyclone … separate the dischar… water and deposits. … air is, if necessary ►

Fig. 2: The air is fed in via the distribution battery

Source: Hammann GmbH

Fig. 3: Heavy discharge in the Bad Bergzabern residential building

Source: Hammann GmbH

discharged via filters. Solid cover layers are not affected and remain in the system. To prevent damage to pipe systems, some of which are quite old, the impulse pressure always remains below the resting pressure of the pipe network.

The Comprex process has already proven its effectiveness in numerous cases of legionella contamination in drinking water installations. This is because it is ideally suited to removing biofilms from the system. In combination with other measures tailored to the respective installation, it makes an indispensable contribution to reliably extending the service life of the drinking water installation.

## Treating the water with corrosion inhibitors

According to current regulations, steel pipes are not suitable for transporting drinking water due to the water parameters of some supply areas. However, the water parameters can be adapted by treating the water. Furthermore, the dosing of corrosion inhibitors makes it possible to slow down corrosion to an acceptable rate. Specialist companies supply products and equipment for treatment in accordance with the generally recognized rules of technology. The quality of drinking water may only be changed with the additives listed in the Drinking Water Ordinance (§ 11 list). The parameter values specified in the Drinking Water Ordinance must not be exceeded.

The aim of dosing corrosion inhibitors at the transfer station is to form top layers on the cleaned inner surface of the pipe. Phosphates or silicate mixtures are used. Specialist companies recommend agents and their dosage according to the water quality. The concentrations of corrosion inhibitors required initially can normally be reduced over time so that only low concentrations are required once the top layers have formed. This requires suitable operating conditions, i.e. sufficient flow velocity and avoidance of long stagnation phases. Checks on water parameters such as active ingredient content and concentration of corrosion products are necessary to monitor the consumption and the formation of cover layers.

## Example case: Residential building in Bad Bergzabern

In a residential building with twelve flats in Bad Bergzabern, residents repeatedly complained about cloudy drinking water in the cold water area. The hot water /The circulation system was not affected as it had recently been completely replaced with copper pipes. The responsible building management contacted Hammann. An on-site visit was organized, during which an inventory of the cold water installation including all associated taps was carried out. This information is essential for estimating the cleaning time and a corresponding quotation.

Water meters were installed in the individual apartments. As cleaning the drinking water pipes would lead to the destruction of the installed meters, they were removed before cleaning and reinstalled later. During cleaning, the meter housings were closed with dummy caps. The building was divided into two blocks. These were cleaned one after the other. A 3-man team had to clean 71 taps with the associated pipes within two working days. This time was necessary because the cleaning process resulted in very heavy discharges of corrosion products of up to 3 millimetres over several hours, accompanied by heavy, very long-lasting turbidity (Fig. 3 + 4). In order to achieve the highest possible cleaning performance, all taps were cleaned several times at intervals of several hours.

Once the work had been completed, the property management company responsible arranged for the installation of a system for dosing si- likates/phosphates. This step is intended to guarantee the long-term success of the cleaning measures. Many people have concerns about the addition of minerals. However, drinking the treated water is completely harmless to health. According to drinking water regulations, a maximum of 5 mg phos- phate per liter of drinking water may be added. For comparison: the average person consumes approx. 6,000 mg of phosphates per day. Precise dosing is ensured by the electronically controlled dosing system.

► Fig. 5: Due to massive leaks, many bathtub fittings had to be removed and replaced with flush fittings.

▼ Fig. 4: Angle valve clogged with corrosion products

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sier system, which measures the exact water flow with its own water meter and can therefore add the exact amount of minerals required.

Thanks to cleaning with the Comprex pulse rinsing process and the use of the dosing system, no more turbidity problems have occurred since then (now more than 1 year). Only the thorough removal of the soft, slightly to moderately adhering rust layer made it possible for the phosphate inhibition to take effect quickly.

## Example case: Apartment block in Friedrichsdorf

This property was a multi-storey residential building with 32 apartments. The galvanized steel installation was built in 1976. Turbidity also occurred here. In addition to the cold water pipes, the hot water and circulation pipes were also affected. The pipes have become increasingly overgrown in recent years due to corrosion. However, there was still sufficient flow until the time of the repair. If no countermeasures had been taken, the situation would have worsened and there would have been a significant reduction in water flow.

The owners' association was looking for a solution to stop the corrosion as far as possible. The aim was to operate the pipes for another ten years without any noticeable loss of throughput or pipe bursts. The site inspection

The assessment resulted in a workload of approx. two working weeks with a 3-man team. This was due to the number of sanitary objects with a total of 217 cold water/120 hot water taps and the expected high discharge of corrosion products and turbidity. Cleaning proved to be extremely time-consuming due to the already very advanced corrosion. There were massive deposits of rust up to 8 millimetres in size. Many fittings had to be dismantled and replaced with flushing fittings (Fig. 5).

The residents were able to confirm the success of the cleaning measure immediately afterwards: no more turbidity and noticeably improved water throughput in all pipe systems. To ensure long-term success, a system for dosing corrosion inhibitors was also installed here.

## Conclusion

Corrosion on galvanized steel pipes and its negative effects are a problem in most older buildings in Germany today. However, replacing the pipes is often not feasible in a timely manner for various reasons. Mechanical cleaning with the Comprex pulse flushing process is an efficient way of removing the loose, slightly to moderately adhering corrosion products and removing them from the system. This creates the decisive prerequisite for the use and effectiveness of a water treatment system.

system for dosing corrosion inhibitors. This significantly extends the time window until the drinking water installation needs to be replaced at a later date.


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