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# 20 years of preventive network maintenance in Rüsselsheim

Anniversary: Stadtwerke Rüsselsheim has been working successfully with water suppliers and service providers on preventive network maintenance for 20 years.



Fig. 1 Employees of the water supplier and Hammann technicians in front of the Complex trailer, which generates the compressed air pulses at the feed point.

Source: Hammann GmbH

Drinking water networks require regular maintenance in order to ensure the perfect quality of the drinking water for the consumer. The patented Complex impulse flushing process from Hammann is used both for the maintenance cleaning of

existing networks and for intensive basic cleaning in the event of contamination. Stadtwerke Rüsselsheim has been using this process for 20 years to maintain its

Almost 205 km of drinking water distribution pipelines. The municipal utilities do not operate their own water supply by Hessenwasser. The

copper installations - avoid copper back-soldering.

Stadtwerke Rüsselsheim distributes drinking water via pipelines made of various materials in nominal diameters from DN 80 to DN 300. Table 1 provides information on the pipe network as of 2018. In addition, there are around 13 km of connecting pipes to the upstream suppliers in nominal diameters over DN 300.

Today, the supply area still consists of pipes from the early days, i.e. from the period after 1948. Until the 1970s, the cast iron pipes installed at the time did not have a cement mortar lining. The Drinking Water Ordinance with limit values for corrosion-relevant parameters did not exist at that time either. As a result, these old pipes tended to suffer from internal corrosion and deposits of corrosion products when exposed to lime-attacking water. These problems are less of a problem with limescale-reducing water and especially when phosphate is added as a corrosion inhibitor. Nevertheless, deposits do form in the pipe network.

### Avoid supply bottlenecks for the end consumer

In certain cases, the deposits can impair both the quality of the drinking water and the water supply. Pipes with a restricted cross-section do not supply enough water in the event of a fire. If there is a high water demand, swirled-up fine particles from so-called loose deposits can cause a fire.

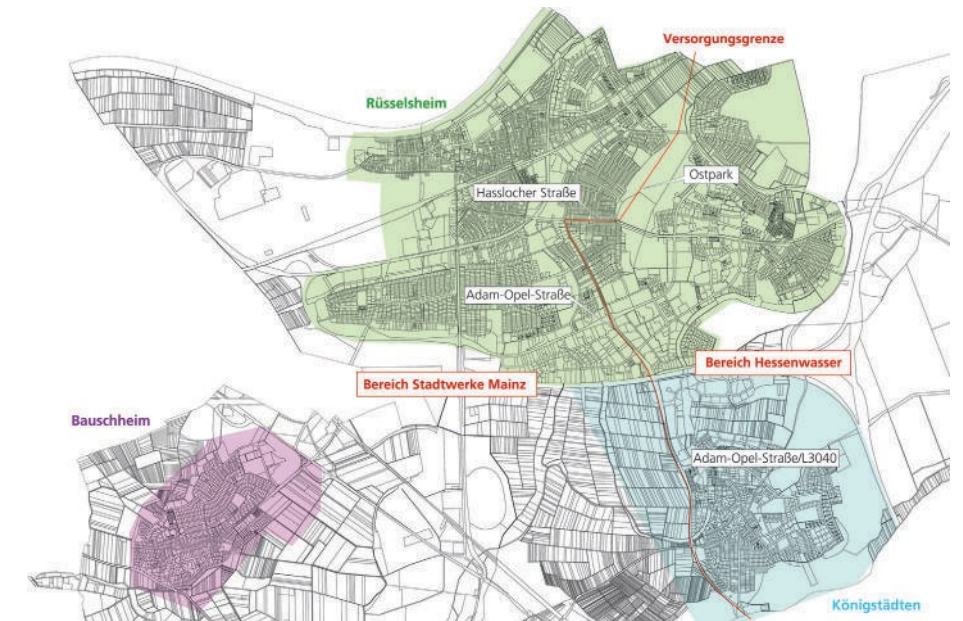


Figure 2 Drinking water distribution of Stadtwerke Rüsselsheim. The water analyses from the upstream suppliers (Hessenwasser and Stadtwerke Mainz Hof Schönau) can be found on the website of Stadtwerke Rüsselsheim. Source: SW Rüsselsheim

Table 1: Drinking water distribution of Stadtwerke Rüsselsheim, lengths according to nominal widths and materials in m

Nominal diameter DN	Gray cast iron	Ductile cast iron	Steel	PE	unknown
≤ 100	71.862	12.950		15.159	621
101 - 150	28.399	11.224	37	22.859	379
151 - 250	15.723	6.869		5.743	384
251 - 300	9.231	1.825	43	899	3
Total	125.215	32.868	80	44.660	1.387
Total length: 204,210					

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considered hard with a total hardness of over 21 °dH. It is calcareous in both supply areas. The drinking water of Stadtwerke Mainz from the Hof Schönau waterworks contains a higher concentration of salts - primarily chloride and phosphate - in order to prevent corrosion and - in the case of drinking water - limescale.



Fig. 3 Setting the cleaning parameters on the Complex trailer  
Source: Hammann GmbH

lead to turbidity. It is therefore necessary to clean the pipes in good time in order to supply customers with clean drinking water at all times and maintain the security of supply.

The municipal utilities regularly clean their drinking water pipes themselves with conventional water flushing. This removes loose deposits and largely prevents turbidity. However, in order to remove harder deposits from the pipes, water master Roger Schneider and head of the Network Service & Energy Services department Sven Halling have been working together with the Hammann company since 2001. At that time, they were looking for a suitable cleaning process and first contacted Managing Director Hans-Gerd

Hammann in contact. Since then, Stadtwerke Rüsselsheim has commissioned the service provider from the Southern Palatinate region once a year.

Schneider and Halling rely on the maintenance of the existing network through regular Complex cleaning. The regular deployment of Hammann technicians is already a firmly established part of the annual cleaning routine. Every year in the fall, Hammann is on site for four to six weeks with its own equipment to subject the city's drinking water network to intensive cleaning in sections using the Complex process. The impulse flushing process developed and patented by Hammann GmbH works with targeted pulses of compressed air to mobilize and reliably remove deposits inside the pipes.

#### Economic advantages

Clean pipelines are essential and a prerequisite for the high operational safety of the drinking water supply. In addition to hygiene and safety aspects, the measures implemented in Rüsselsheim have economic relevance, especially when considering the costs and benefits. Regularly cleaned pipes have a longer service life.

The savings from not having to replace parts of the piping system compensate for the costs of cleaning - even over many years.

The Complex process also maintains the current condition of heavily encrusted pipes. Pipes are only replaced due to age and due to increased susceptibility to faults such as burst pipes and insufficient water pressure. To date, the renewal rate for the Rüsselsheim network has been 1% - which means that it would take 100 years to completely replace the gray cast iron and cast iron pipes. However, the municipal utilities' renewal program runs independently of the flushing. The rate is to be increased to 2% with the aim of replacing the worn-out pipes within 50 years.

Roger Schneider and Sven Halling report on 20 years of experience in cooperation between water suppliers and service providers for preventive network maintenance.

Roger Schneider: "Our initial skepticism that Complex could be too intense for our piping system was unfounded. The impulse pressure always remains below the mains pressure and so we don't have to worry about pipe bursts due to excessive pressure. The pulse flushing process can

reduce the deposits in our old network so significantly that maintenance is absolutely economically viable compared to replacement."

For over 20 years, Hammann GmbH has been the expert for the mechanical cleaning of pipelines using the Complex process. The process is based on the controlled use of compressed air in a partially filled pipe section. There, the air expands abruptly, forming impulse-like blocks of water and air that are effective for cleaning. The effectiveness of the cleaning initially depends on the speed at which these water blocks move through the pipe. In the Complex process, this is over 15 m/s, often even well over 20 m/s. Acceleration and speed together cause the drag stress, which mobilizes and removes deposits from the pipe wall. This is orders of magnitude higher with the Complex process than with simple water flushing.

#### Flexible procedure

The mobile Complex technology can be used specifically on individual pipe sections. Even nominal diameter changes are no problem for Complex. In contrast to pigging, the air and water blocks adapt to the geometry of the pipeline and cannot get stuck.

The daily output depends primarily on the nominal diameter and degree of soiling. It takes longer for basic cleaning of very constricted pipes than for regular maintenance cleaning. Under the conditions prevailing in Rüsselsheim due to the old cast iron pipes and the quality of the drinking water, it is around 500 m/day to 700 m/day. The results of the cleaning show that the targeted removal of deposits restores pipe cross-sections, increases the flow rate and maintains a flawless water supply through clean pipes. Intensive cleaning with Complex significantly reduces the amount of flushing required by the municipal utilities. There are also fewer call-outs as a result of customer complaints about cloudy water.

#### Own flushing strategy

Starting with the event-related basic cleaning and the annual repetition of the cleaning of individual sections of the route, Hammann has carried out a total of around

380 km of pipes cleaned by Stadtwerke Rüsselsheim. After detailed preliminary planning, one district after another is cleaned year after year. Some pipe sections have already been cleaned several times using the Complex process. Sven Halling: "We have had very good experiences with Complex and are very satisfied with the cooperation that has grown over the years. The Hammann GmbH technicians know our network, arrangements are quick and uncomplicated and the assignments are already a fixed part of our annual planning for network maintenance."

Complex cleaning ensures perfect hydraulic and hygienic conditions in the pipe network. The employees of the municipal utilities and the service provider work hand in hand, both in the preliminary planning and during cleaning on site (Fig. 1). This trusting cooperation has now existed for more than 20 years.

■ Hammann GmbH  
[www.hammann-gmbh.de](http://www.hammann-gmbh.de)



Figure 4 Cleaning a transport line  
Source: Hammann GmbH



Figure 5 Technicians and equipment at the exit point  
Source: Hammann GmbH



Fig. 6 Sight glass at the outlet point for inspection and documentation of the turbidity.  
Source: Hammann GmbH



Figure 7 Discharge at the outlet point  
Source: Hammann GmbH