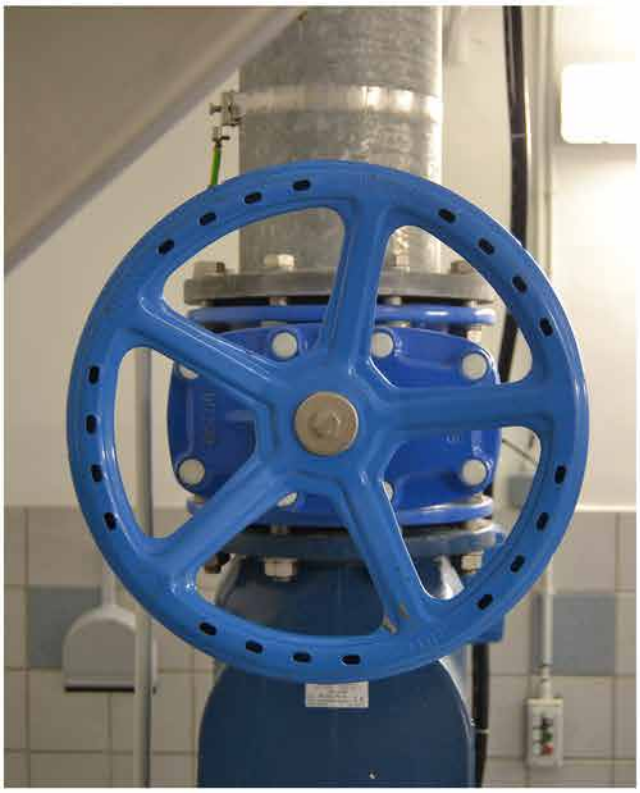

fatBERG
Revolutionising pumping stations
Cleaning with microorganisms
Biologically eliminating grease

Revolutionising pumping stations

How to turn a pumping station into a grease trap – tests with fatBERG® and its enzymes in sufficient concentration at the Ingelheim pumping station.

Otto Just



The Ingelheim pumping station was commissioned in 2007. In 2014, the pumping station had to be renovated due to corroded concrete. This was caused by factors such as the aggressive wastewater from a brewery with a restaurant.

The triggers included, for example:

- Dish-washing lines that may be operated at temperatures of up to 85° for rinsing (except for glassware).

- The use of chemicals, such as emulsification for degreasing, phosphates for complex formation with hardeners, surfactants for reducing surface tension in water etc.

Technical data:

Pumping station 41 consists of two wet well pumps made by Flygt.

Flygt 3201 090 immersion pumps

Sump design:
Flygt Top Retrofit GRP

Technical data, top 100:
reduction of the water level in the sump

Residual volume approximately 240 l
Coupling base in accordance with DN 100
Flush valve at pump 1
Dosing pump: Jesco, MINIDOS A8

The renovation of the pumping station was carried out with an epoxy resin that is also suitable for high temperatures.

The sewer uses a gravity gradient and runs for approximately 350 m to the restaurant (brewery with beer garden). Due to the aforementioned circumstances, the grease sets only when it reaches the pumping station.

The first tests with fatBERG® were carried out in August 2016.

The objective was to demonstrate a practical assessment of the function of the micro-organisms used and present a brief description of the process technology. The pumping station was already equipped with dosing technology for masking (concealing the odour of) the wastewater. A dose of 5 l/h was used to begin with, starting at 23:00.

However, it became apparent that the dosing quantity was too low. Grease deposits did not increase, but neither did they decrease.

The grease had not been siphoned off to date. It was important to establish whether the agent would also break down the existing grease deposits. In mid-December, the use of fatBERG® was discontinued due to sub-zero temperatures that would have frozen the agent.

In February, an employee notified me of a malfunction at the pumping station. On site, the grease deposits were found to have grown considerably. The grease deposits had merely been hosed down with water and deliberately left in the sump.

Treatment with fatBERG® was resumed.

In early March, after the sump had been examined, the decision was made to retrofit the station with fatBERG®. One side effect showed that the slime that had accrued in the pumping station due to cleaning cleaning of the brew kettle was no longer there.

The process steps:

- Use of a dosing pump at 8 l/h.
- The stock cabinet is designed with an insulating layer and can be heated.
- The dispensing point is to be kept intact to begin with.
- Dosing begins at 23:00 in order to achieve the longest possible dwell time here for the bacteria.

The minimum level is also reconsidered.
The Flygt Top Retrofit GRP enables siphoning off up to the pump level, which accelerates the discharge of bacterial mass.

The findings

from these tests were that particular attention must be paid to the system's ejectors (effect of the communicating pipes).

Several versions of Y-type valves were used without any success. Various sealing materials were tested. A coating had formed on the seals, which may have caused the the leakage. Consideration was given to whether a hose pump should be used here.

The expectations
are that a cleaning vehicle will not have to be ordered every two months to clean the pumping station.

Odour problems will not be allowed to occur as a built-up area is now only 10 m from the pumping station.

Working conditions of the employees responsible for cleaning the pumping station will improve.

Biologically eliminating grease

A cost-effective and environmentally friendly alternative in sewer cleaning

Dr Barbara Maier

Grease in wastewater from households, restaurants and dairies is washed through the pipes at sewage works every single day It accumulates on the interior walls of waste-water pipes and solidifies as a result of mixing with mineral impurities such as sand and fine gravel or with other solid materials, thus narrowing the cross-sections of the pipes. This causes a reduction in flow rates and can result in blockages or, ultimately, sewage backing up.
Mechanical cleaning processes are suitable for removing grease only to a limited extent and frequently lead to mechanical damage that entails costly repairs.
Systematic treatment with a culture of highly active, fat-splitting microorganisms is a method of reducing grease deposits that is not only demonstrably effective, but also gentle on materials and environmentally friendly. The culture is able to metabolise animal and vegetable fats in wastewater and is therefore exceptionally well suited to use as a biological degreasing agent in sewer systems. The pipes are cleared once more, thus ensuring smooth sewerage operations.

Before treatment

After treatment

Besides blockages, the growth of biomass in the sewer film is a further undesirable effect of grease in wastewater. Experts agree that the formation of harmful hydrogen sulphide (H2S) takes place not so much in the body of water as in the sewer film.
The airtight grease deposits make a substantial contribution to the sewer film's anaerobic environment and provide the desulphurising bacteria with an ideal breeding ground. If the neurotoxic and odorous hydrogen sulphide gets into aerobic zones in the system (pump shafts, transfer points etc.), it will undergo several stages of oxidation with the aid of sulphurising bacteria thiobacilli) to become sulphuric acid (H2SO4), which is principally responsible for the biogenic concrete corrosion in sewer systems. Here, too, the microorganisms expertly provide a remedy with their liking for grease. The removal of the grease and the anaerobic bacteria living within it tackles the sulphide problem and therefore the biogenesis of sulphuric acid by natural means.
Grease in wastewater also has a huge impact on the performance of system components such as pumps, fittings and measuring devices. As a result of being coated in grease, the effectiveness of these technical is reduced considerably, which has a negative effect on energy consumption.
In pumping stations, a layer of grease can even cause overheating.
Furthermore, grease encourages the formation of floating layers that impair oxygen transfer and therefore the decomposition activity of the microorganisms in the biological treatment stage.

How it works

The microorganisms in this culture occur naturally in our environment, i.e. they are not genetically modified or manipulated.
They were selected due to their extraordinarily high level of fat-splitting enzyme activity for targeted deployment in sewage systems in order to biocatalytically break down grease deposits. From a biochemical perspective, this process is an enzyme-catalysed saponification reaction in which the fat molecule is split into its components – glycerine and fatty acids. These cleavage products are very easily biodegradable and, unlike grease, cannot form any further deposits.

Application

The application of this microbial culture is highly user-friendly. It merely involves one

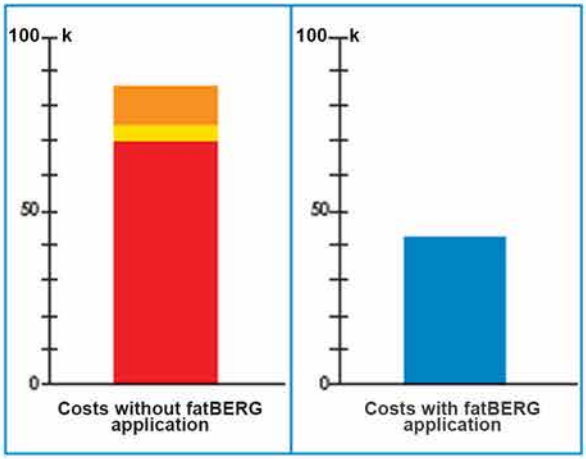
component that is ready to use on delivery and is fed into the system by an automatic dosing unit.
The suspension is primarily dispensed into the affected sewers during the station's idle periods by means of a time-controlled dosing pump. This takes place at suitable sewer entrances such as gullies, drains etc.
During the incubation period lasting several hours, the bacteria enzymatically breaks down the grease on the surfaces covered by the suspension.
As the bacteria are assigned to risk group 1 according to the TRBA and are thus not pathogenic, they pose no risk to people or the environment.
After every application, the microorganisms and their metabolites are transported away by the current of the water. In systems with heavy deposits, a cleaning effect is achieved through intensive treatment over a number of weeks. After that, a continual maintenance dose is used to keep this condition intact.
As no two facilities are the same, cleaning plans for the dosage are created on a case-by-case basis, with the exposure time, the duration of the application and the necessary dosing quantity dependent on the respective conditions on site. Here, the calculations follow the principle of 'as much as necessary, as little as possible' in order to achieve the best possible cleaning effect in the long run whilst also keeping cost efficiency in mind.

Summary

Due to the various problems associated with deposits of grease in sewage systems, preventative maintenance of sewer systems is becoming increasingly important. Regularly clearing sewers of grease deposits not only ensures a free hydraulic flow, but also eliminates the cause of sulphide formation.

Unpleasant odours caused by H2S and risk of poisoning are reduced significantly without using chemicals and ventilation is needed less frequently. A further principal argument for preventative system cleaning with this bacterial suspension is surely the containment of the biogenic corrosion of concrete surfaces by sulphuric acid, which is reflected in considerably lower maintenance costs.
From both an environmental and an economic perspective, this microbial treatment method for sewer systems represents great progress comparison with conventional cleaning measures, and involves no compromises whatsoever.

Example*: calculation of costs for pumping stations with continuing grease loads over seven years



Renovation of concrete walls due to corrosion damage from grease exposure
Approx. €70,000.00

Damage to fittings and pumps plus additional power consumption etc.
Approx. €5,000.00

Cleaning costs for regular cleaning
Approx. €10,000.00

Total
Over seven years:
Approx. €85,000.00

Application of fatBERG suspension
Approx. €500.00 per month, approx. €6,000.00 per year

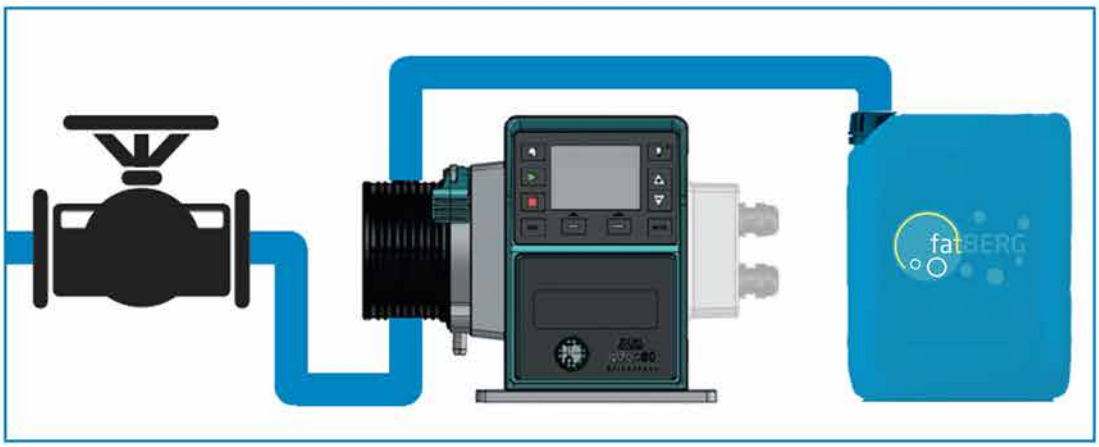
Total
Over seven years:
approx. €42,000.00

- **Cost reduction of €43,000.00 per pumping station**
- **Plus a continuously functioning station and a saving on energy costs**

*Tests with fatBERG at the Ingelheim pumping station, pumping station B41, 2016–2017, article 1, Baktivaktuell (Baktiv news) 1/17

Fat-splitting microorganisms

Visible results in pump shafts at sewage works



Grease that gets into wastewater systems causes a number of problems on its way from the inflow point to the sewage works, such as:

- Deposits on mechanical system components that prevent them from working properly.
- Development of unpleasant odours due to non-specific biological processes.
- Blockages in wastewater pipes, which then require complex, expensive mechanical cleaning and are often damaged in the process.
- Damage to shaft walls due to the long-term deposition of the fatty substances.

Thanks to a microbiological process, such deposits can be eradicated in an environmentally compatible, gentle and cost-effective way In this process, special bacteria cultures are fed into the wastewater systems in dosed amounts in order to eliminate grease deposits by means of targeted biological splitting.

fatBERG®

The product is a mixture of natural bacteria that have been selected for their high lipase activity and wide pH tolerance range.In addition, they are – like the microorganisms used in food production, for example – classified in risk group 1 and are therefore harmless. A special biotechnical culturing process also ensures that they have maximum lipase activity.

How it works

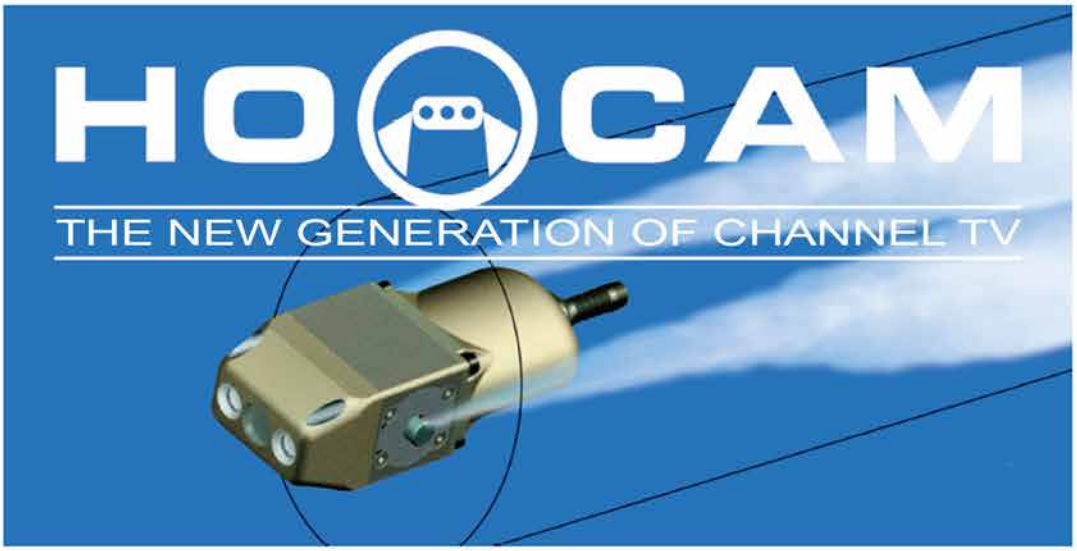
The bacteria are fed into the wastewater system in dosed amounts. They attack the grease deposits and split them into glycerine and fatty acids. These cleavage products pass into the aqueous phase (see soap!) and the deposits disintegrate. As the bacteria are carried away by the current of the water, they also take effect in the subsequent sections of sewer right up to the sewage works and contribute to the reduction of grease deposits there as well.

Application

The liquid product is dispensed into suitable drains from containers by means of dosing pumps. Once the system has been cleared of grease deposits, the effect is maintained by a daily dose. It is advisable to dispense the product during idle periods at the facility (e.g. at night) in order to extend the dwell time of the bacteria in the system. The size and capacity of the facility and the dimensions of the sewer systems through to the mouth of the sewer are to taken into consideration in the preparation of the dosage plan.

All the benefits at a glance

- Grease deposits with a number of negative consequences for waster water systems are entirely removed in an environmentally compatible way.
- Pipelines remain clear.
- Annoying side effects such as unpleasant odours are eliminated.
- No aggressive chemicals are used.
- The product has a continuous action and is therefore long-lasting.
- The cleavage products of the biochemical reaction (glycerine and fatty acids) are substances that are very easily biodegradable. They can also be absorbed by microorganisms without lipase activity and utilised.
  This promotes the entire biodegradation process that already takes place in the sewer in large part and continues later at the sewage works.
- System components (pipes, fittings etc.) are protected. Costly repairs that become necessary due to damage during mechanical cleaning are no longer required.
- The bottom line is that the product results in lower costs and, last but not least, more pleasant working conditions.



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www.fatberg.de

YouNamelt Sales/ Sascha Manke

Schultheissenweg 105c
60489 Frankfurt am Main, Germany
info@fatberg.de

Tel.: +49 (0)694 786 9700

Text:
Dr Barbara Maier
Otto Just