WE DO THE JOB EFFICIENTLY.

comprex

FLOCO PROCESS

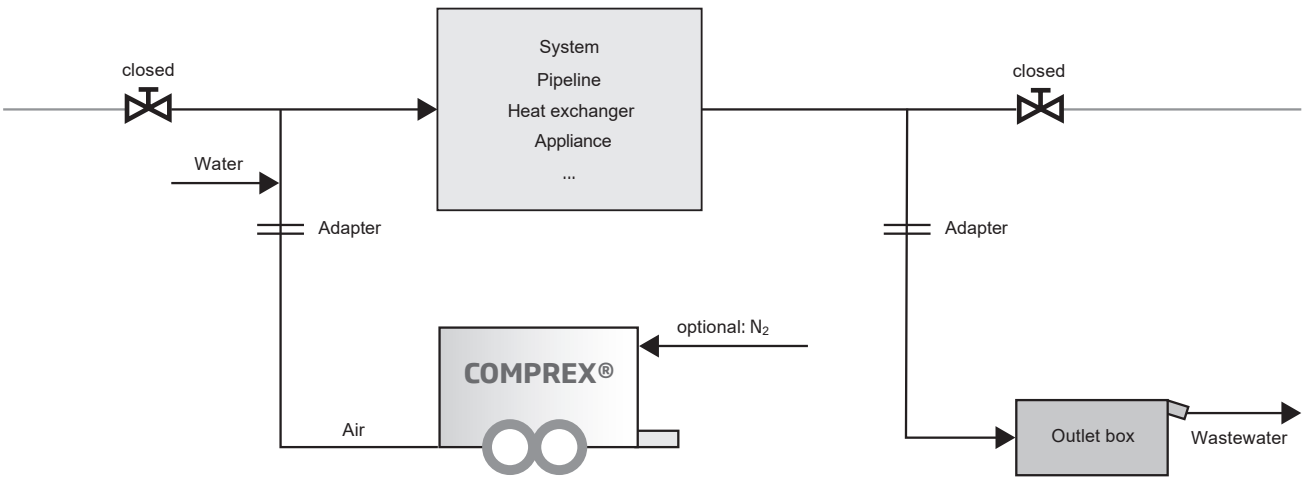
CLEANING OF HEAT EXCHANGERS, COOLING CIRCUITS AND INDUSTRIAL PIPELINE SYSTEMS

Energy-efficient, economical and gentle: Whether heat exchangers or pipelines – we ensure quick and thorough cleaning of industrial systems. We remove deposits, biofilms and fouling without any disassembly during short downtimes and often even during operation.

Car manufacturers, breweries, chemical plants …
we clean mechanically – only with air and water.

Whether car manufacturers or companies in the food industry, from pharmaceutical companies to paper plants – application areas and their challenges are just as diverse as their industrial fields:
Deposits in pipelines, biofilms in cooling circuits, foiling in heat exchangers – cleaning of partly complex systems requires special expertise and requires a lot of effort with conventional methods: Disassembly of the system, cleaning of system components (often with chemicals), reassembly and final pressure testing before recommissioning.

We explore new ways to overcome these challenges:
As experts in the field of mechanical cleaning, we have been using our COMPREX® procedure, our tried-and-tested technology for communal applications, for years also in industrial fields. We have still not used its full potential and discover more and more new applications. Our success shows, however, that COMPREX® is the right approach to offer highly economic and efficient cleaning solutions to our industrial customers.



COMPREX®
for efficient cleaning.

- Thorough cleaning of pressurised systems with any nominal width
- Reliable discharge of mobilised deposits
- Restoration of intended system functions in hydraulics and heat transfer
- Prevention of excessive energy demand and pumping times due to fouling and reductions in cross-section

COMPREX®
for economic cleaning.

- Easy and quick cleaning without disassembly, leakage check and assembly of systems
- Short downtimes during offline cleaning or often even possible during operation
- Low effort for regular and condition-based servicing and maintenance
- Regular cleaning for prevention of system damage, failures and high costs
- Supply and return flow circuits included in cleaning

COMPREX®
for gentle cleaning.

- Mechanical cleaning without any chemicals with water and pressure pulses below the operating pressure of the system
- Less water required and less wastewater in comparison to water flushing
- Easy disposal of flushing water by deposition of flushed-out solids
- Prevention of damage caused by pressure peaks thanks to the airbag effect of air blocks between the water blocks
- Without chemicals to prevent undesired effects on materials

CONDITION-BASED INSTEAD OF FOLLOWING A FAILURE.

Act now before failure of your system!
We also offer preventive cleaning to save you from system damage – and unnecessary costs.

Fields of application: COMPREX® in action

Pipelines in industrial systems are just as diverse as their applications:
They transfer gases of fluids for various purposes. As supply lines, they convey valuable drinking water or high-purity demineralised water. Other lines convey water from wells, rivers or industrial systems for treatment. Cooling water circulates in circuits. Product lines serve for transport of valuable resources. Pipelines for process water used in specific production procedures are subject to strict requirements. Wastewater is discharged in wastewater pressure lines or sewage systems. Fire extinguishing lines should also not be forgotten. But two things have all pipelines in common: First of all, their function is compromised by deposits, biofilms, fouling and other foreign objects, which form over time. And secondly, they require servicing and maintenance: COMPREX® is the ideal solution for cleaning of pipelines.

RECUPERATOR?
CHILLER?
HEAT EXCHANGER?
NO MATTER HOW YOU CALL IT –
WE UNDERSTAND WHAT'S BEHIND.

COMPREX® in heat exchangers

Heat exchangers are industrial systems for transfer of thermal energy from one flow to another. The lower the heat transfer resistance the higher their efficiency. Dirt or other deposits, also referred to as fouling, increase the transfer resistance and compromise the function of heat exchangers. Then it's time for COMPREX®: By means of special flushing programmes, which are adjusted to the respective system, our cleaning procedure enables efficient cleaning of heat exchangers on the medium side as well as on the side of the heat carrier just by connecting adapters to the inlets and outlets. This way, any resistance due to fouling can be thoroughly removed to restore the heat transfer efficiency – and all that without time-consuming and expensive disassembly and leakage testing of the system.

With COMPREX® we clean:

- **Plate heat exchangers**
- **Tubular heat exchangers**
- **Spiral heat exchangers**

COMPREX®
in cooling circuits

The cooling water in industrial cooling circuits is often treated well water and contains corrosion products which may eventually have a negative impact on hydraulic system and heat transfer. In open cooling circuits, microorganisms, dust and other particles may enter via the open cooling tower or storage tank. These negative effects cannot be prevented in practice. For this reason, cooling water lines require regular cleaning in the context of maintenance or repairs.

COMPREX® enables cleaning in plannable time intervals, for example during maintenance of individual units or as required. In this process, COMPREX® is first applied for quick and efficient cleaning of main lines and afterwards of distribution lines.

COMPREX® even handles inaccessible cooling circuits – closed or open. This way, also areas with reduced flows like shut-off valves can be cleaned during mobilisation and discharge of deposits and biofilms from supply and return flow lines at the cooling tower. The air blocks do not get stuck in the pipelines. Solids discharged from the cooling circuits are separated in intermediate tanks for proper disposal.

We clean:

- **Open cooling circuits**
- **Closed cooling circuits**

COMPREX®
in pipeline systems

In pipeline systems - for example for well, river or process water -, sludge, biofilm or solid deposits occur during operation. These deposits must be removed as they reduce the cross-section of pipelines and compromise the flow rate, pump efficiency and energy consumption. In process water lines, the product quality and efficiency are reduced, and in fire extinguishing lines, the compromised function of fittings and nozzles lead to a risk in case of fire.

We clean, for example:

- **Well, raw and industrial water lines**
- **River water lines**
- **Fire extinguishing systems and sprinklers**
- **Process water/demineralised water lines**
- **Emulsion lines**
- **Wastewater pressure lines**

Usually, cleaning of industrial systems takes days.
With us, get it done in a few hours.

TIME-CONSUMING
AND COSTLY
CLEANING?

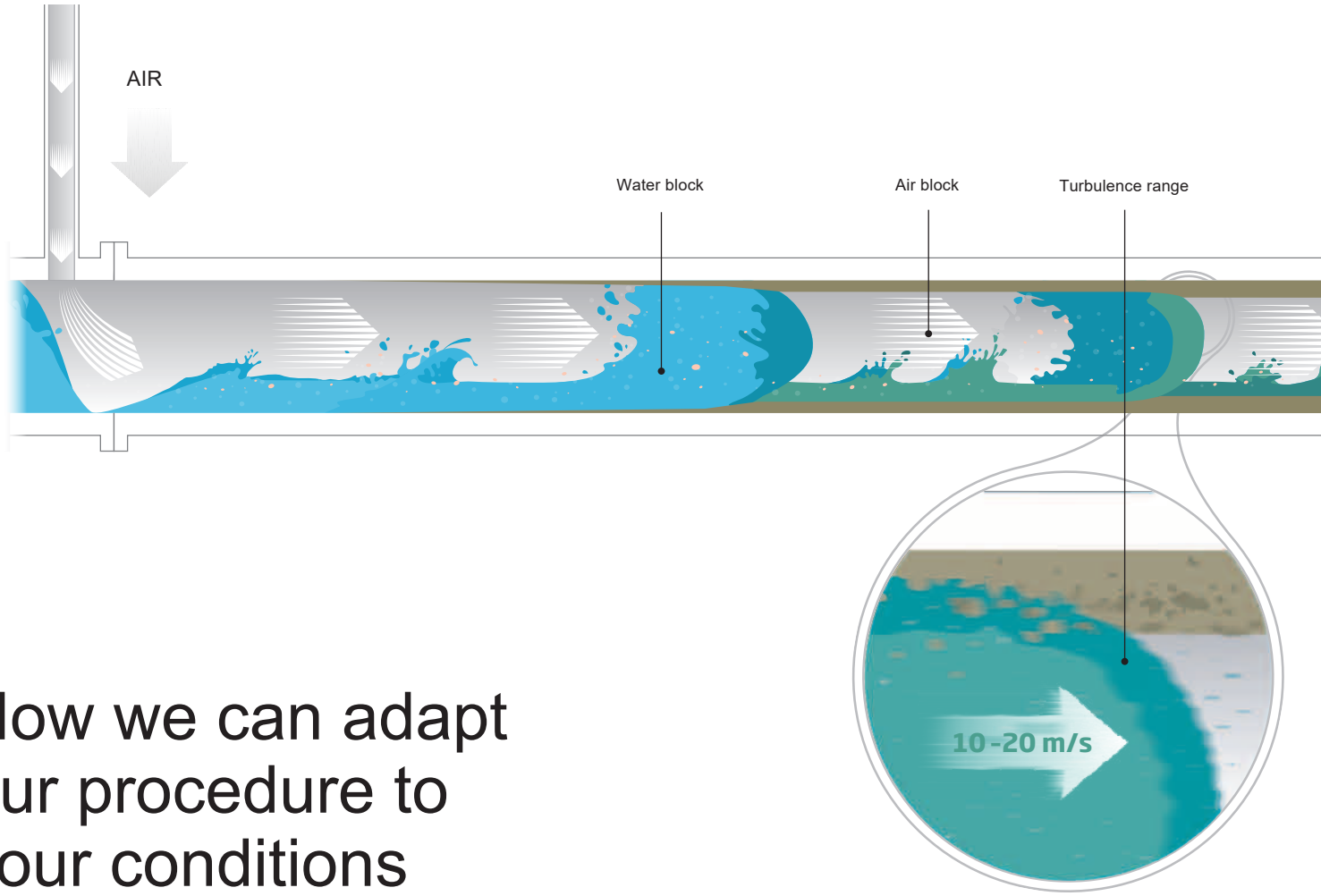
NOT WITH US!

Our patented solution: COMPREX®

COMPREX® is our practically proven impulse flushing procedure. Its performance is constantly redefined by innovations and patents. COMPREX® works without chemical cleaning agents, but completely based on physical effects – just with air and water.

The principle

For cleaning, any available inlets and outlets can be used. In one defined flushing section, there is an initial flow, laminar flow of water before it escapes again at the outlet point. We now use the water already in place and inject impulses of filtered air through the inlet point. This is done in such a way that packages of air and water blocks are generated and flowing through the flushing section at high rates of 10 to 20 m/s.



How we can adapt our procedure to your conditions

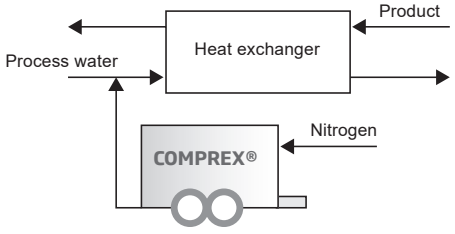
The COMPREX® procedure is here illustrated by example of a drinking water line but can be adjusted to almost any industrial system. This makes COMPREX® an efficient solution for all kinds of applications.

The following illustrations provide three examples of how COMPREX® is used in the industry.

1 COMPREX® cleaning of the process water side of a heat exchanger (petrochemistry) during running operation

2 COMPREX® cleaning of individual heat exchangers (external water supply) during short-term shutdown of cells of a recooling system

3 COMPREX® cleaning of the amine side of a heat exchanger during shutdown of a biogas plant



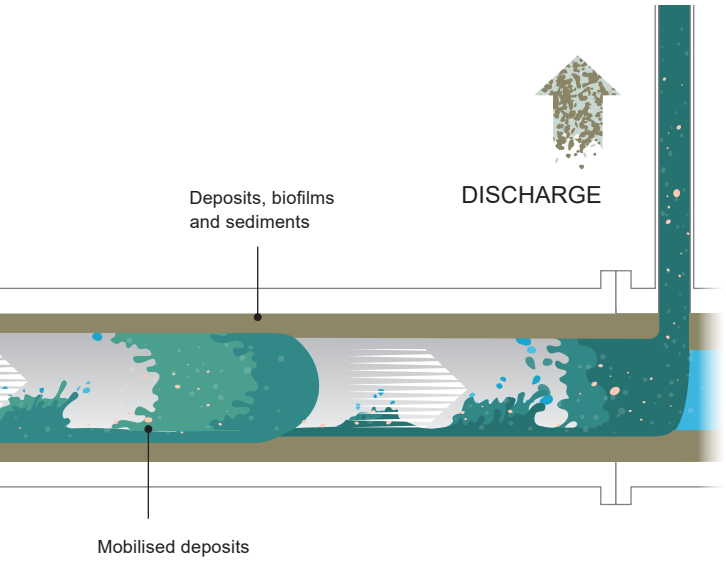
The effect

These strongly accelerated packages cause high turbulences with strong shear and drag forces for mobilisation of deposits and reliable discharge. Industrial systems are reliably and gently cleaned as the admissible system pressure is never exceeded.

The use

To bring our entire COMPREX® technology to the place where it is needed, our equipment is transported in our own vehicles with special trailers. These carry everything required for perfect application in industrial systems:

- High-power screw compressors for supply of high-purity and filtered air
- Sensors and control equipment for targeted generation of air and water blocks
- One comprehensive computer workstation with communication equipment
- A variety of equipment for quick access to systems and secure discharge of flushing water and deposits on site



Turbulences with high drag forces are applied directly at the pipeline walls for mobilisation and discharge of deposits.

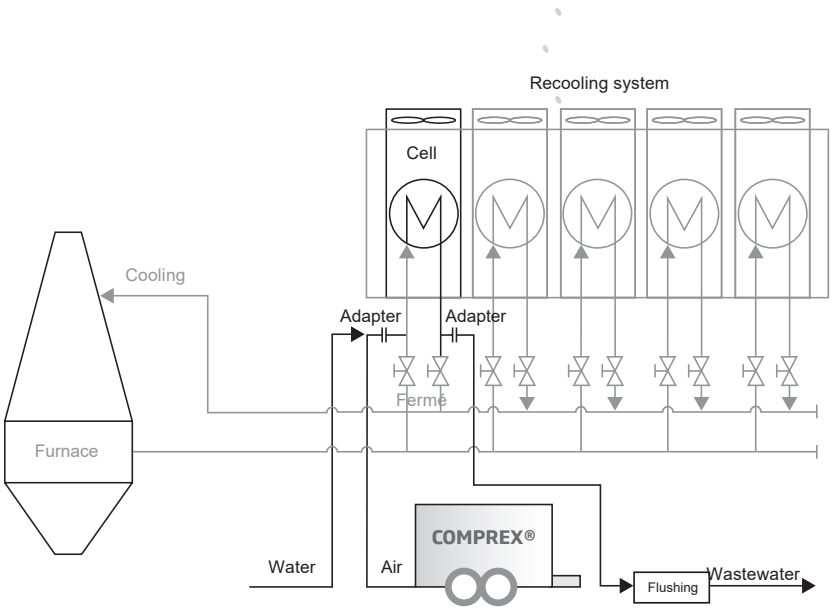
WHICH DEPOSITS CAN BE REMOVED BY US WITH COMPREX®?

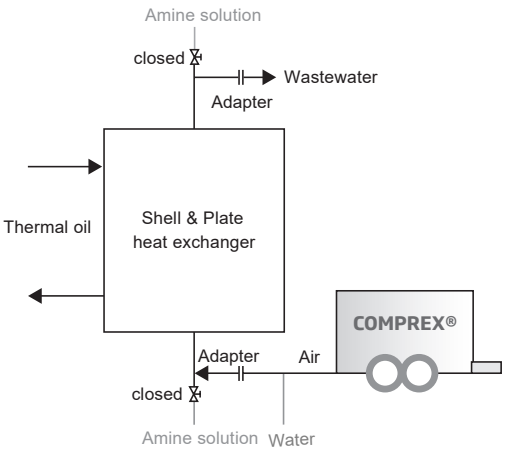
ALL DEPOSITS THAT CAN BE MOBILISED. A GOOD INDICATOR FOR THIS IS MOVEMENT UNDER FINGER PRESSURE.

Our approach in the industry

First of all, we define cleaning sections with inlet and outlet points. For injection of air, we can often use the ports in place at the pipeline. If there are no ports available, these must be arranged by you.

Depending on the actual conditions, we use the water in the pipeline itself or water from other lines for cleaning. In combination with compressed air, the water is injected at the inlet points. We do not require any power connection as our COMPREX® trailers work independently.






COMPREX
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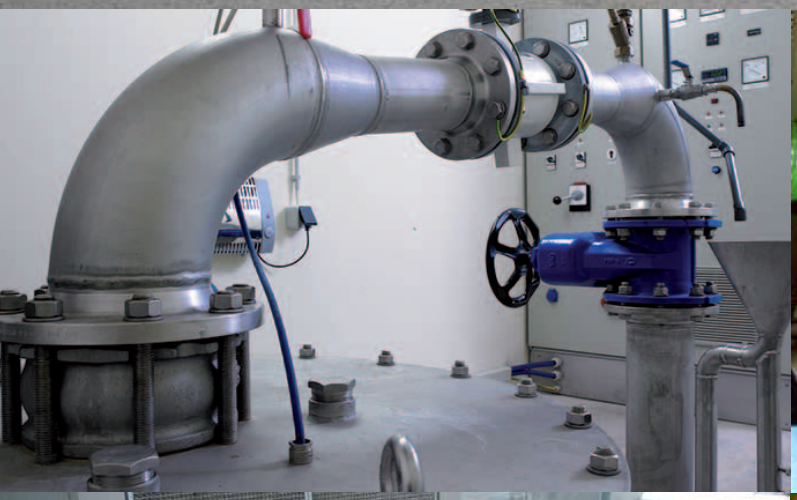
HAMMANN



Three cases – one solution: COMPREX® in different applications

Numerous examples confirm that COMPREX® is the right solution for different types of industrial systems.
We have summarised three for you:

COMPREX® in automotive factory
Pipeline system in painting line

The issue:
- Deposits in pipelines
- Deposits and biofilms of water-based paint systems
- Painting flaws on car bodies
- Microbial contamination in the system

The precondition:
- Cleaning possible during standstill

The solution:
- COMPREX® cleaning with process water first until turbidity is reduced
- Subsequent flushing with demineralised water
- Drying with pure air supply from the COMPREX® vehicle with quadruple filtration
- Based on the development of turbidity in the flushing water, treatment of paint waste from initial flushing is possible
- Thorough removal of deposits, biofilms, microorganisms to restore flawless function of the paint line

COMPREX® in chemical plant
Spiral and plate heat exchanger, cooling by river water flow

The issue:
- Deposits: Fine sand, biofilm, seashells

The precondition:
- No treatment of cooling water
- Not any or very short standstill Offline cleaning or chemical
- cleaning not possible

The solution:
- Online cleaning with COMPREX®
- Cleaning of heat exchangers including supply and return flow lines
- Temperature control is possible online
- COMPREX® cleaning can be carried out with process water
- Control of cleaning based on turbidity and temperature
- Energy saving is a primary factor during cleaning

COMPREX® in food industry
Welded plate heat exchanger, coolant: Glycol solution

The issue:
- Deposits from food and coolant

The precondition:
- Only mechanical cleaning to prevent contamination
- No chemical cleaning to prevent damage from corrosion
- Cleaning possible during short standstill

The solution:
- COMPREX® cleaning with drinking water
- Cleaning of heat exchangers including supply and return flow lines
- COMPREX® cleaning with injection of solids for mobilisation of hard deposits (curative)
- Regular cleaning to prevent incrustation and deposits (preventive)
- Cleaning with drinking water without additives
- Special cleaning technology for food industry
- Hygiene is a primary factor
- Good heat transfer to ensure production security and quality of products

YOUR INDUSTRY
WAS NOT COVERED
BY THESE EXAMPLES?

For further references and application examples, please refer to our website.
Visit HAMMANN on www.hammann-gmbh.de

Our research for you: for the industry.

ZIM joint project "WÄRMER"
Wärmeübertrager
mechanisch **e**ffizient **r**einigen
[*for effective cleaning of heat exchangers without chemical cleaning agents*]

Research period:
July 2014 to June 2016

The goal
Development and validation of an innovative service package for efficient cleaning of heat exchangers without any chemicals

The goal of this research project in cooperation with two research facilities is the development of an innovative service package for efficient cleaning of heat exchangers without disassembly.

This service package includes preparations, cleaning and monitoring. It is based on our COMPREX® procedure, which is to be further developed for efficient use for cleaning of heat exchangers.

Cleaning without disassembly of heat exchangers reduces standstill periods and the effort. As no chemicals are used, the costs and effort for disposal for the system owner are considerably reduced.

This innovative procedure includes monitoring during cleaning as a precondition for automatic control and supervision of the cleaning procedure.

The IWW develops model deposits, characterises and quantifies sedimentation and checks the cleaning efficiency of biofilms and mixed sedimentation. In pilot systems, case studies and test series are observed and the efficiency of the COMPREX® procedure is assessed. The TUBS (*Technical University of Braunschweig*) is concerned with the assessment of applications and instrumental requirements. The performed tests are thermally assessed.

Gefördert durch:
Bundesministerium für Wirtschaft und Energie
aufgrund eines Beschlusses des Deutschen Bundestages
ZIM Zentrales Innovationsprogramm Mittelstand

IWW
Technische Universität Braunschweig
Institut für Chemische und Thermische Verfahrenstechnik ICTV

Our research: Testing of the efficiency of COMPREX®
in our test facility in Landau

OUR EXPERIENCE AND COMPETENCE IN RESEARCH

For us, research is an important factor: In our **special test facility in Landau**, we constantly test and research the potentials to release deposits. This way, our procedures are constantly improved and further optimised.

Research partners in BMBF joint projects

We have been and are still involved in various joint projects, for example in cooperation with the Federal Ministry for Education and Research (BMBF) on the accumulation of bulky aggregates in technical systems [*Mikrobielle Verockerung in technischen Systemen*]. In this project, our COMPREX® procedure was able to convince with the removal of accumulations in raw water and well pipelines as well as risers.

Innovations and patents

Research is the driving factor for our innovations. This way, we were able to develop two patents in the course of the BMBF joint project.
The first has already been granted an European patent. This new procedure redefines the efficiency of our COMPREX® impulse flushing procedure with the revolutionary technology of modulated air impulses. This additional tool is always used when additional force is required for removal of deposits while the water consumption is to be reduced.

We come to you to provide advice on site!

Do you need information on our service offer or require cleaning of your specific industrial systems? We can support you with advice and assistance.

We will gladly visit you on site to assess the situation and provide dedicated recommendation for cleaning according to your requirements.

- **Detailed planning:** We plan our measures according to local conditions and requirements to ensure cleaning with maximum efficiency.
- **Specific offers:** You will receive an offer for us for comprehensive planning. The costs for the offer will be invoiced with the cleaning order. Based on detailed planning, we can estimate the costs for the cleaning measures and submit you an offer.
- **Efficient cleaning:** We clean your systems with our COMPREX® procedure according to latest scientific findings and based on our research results.
- **Reliable customer service:** We document all measures step by step and will be ready to provide further assistance.

Contact us now to arrange an appointment!
Depending on the region and task at hand, we will refer you to one of our specialists. Just send us an e-mail to industrie@hammann-gmbh.de.

AND WHAT CAN WE DO FOR YOU?

PUT US TO THE TEST.

WATER IS OUR ELEMENT. ENSURING ITS FLOW IS OUR COMPASSION.

For this reason, Hammann has been cleaning pipeline systems all over Germany and abroad for many years. Our service is based on our COMPREX® impulse flushing procedure, which is constantly improved for you.

Our team of highly qualified and experienced technicians offers a professional approach, competence and modern equipment for perfect results and satisfied customers. Under the management of its founder Dipl.-Ing Hans-Gerd Hammann, the company is today a centre of competence for aspects all around water. Our effort: Working responsibly, transparently and forward-thinking today and in the future.

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FLOCO PROCESS

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