Mission possible: Achieving hygienically flawless pipelines

| CIP | Cleaning | Pipelines | Process Technology | Sustainable Management |

For beverage manufacturers, keeping production lines clean is a major challenge. They must comply with strict hygiene regulations while managing rising costs. At the same time, ecological considerations are becoming increasingly important. The Comprex Group has introduced a patented system that delivers superior cleaning performance while being more energy-, water-, and time-efficient, cost-effective, and environmentally friendly than conventional methods.

For Vincent Hammann, CIP (Cleaning in Place) has long seemed set in stone. Despite technological advances such as intelligent sensor systems, automation, and adaptive, demand-oriented cleaning, the core steps have remained unchanged: pre-rinsing, caustic cleaning, intermediate rinsing, acid cleaning, clear rinsing, and disinfecting. “As if cast in concrete,” says Hammann, Managing Partner of Comprex Engineering GmbH.

Comprex® Pulse800 *© all Comprex*

Now, his company is taking a bold new approach – breaking with decades of convention to introduce a true shift in CIP process technology. “What initially sounds almost unbelievable to prospective customers, regularly turns into amazement during the first live demonstration,” Hammann explains, describing the typical “wow-moment” that transforms skepticism into genuine enthusiasm.

Certified technology

The cleaning system marketed by his company, based in Landau in Germany, is called Pulse800 and uses the Comprex® technology. This process was developed and continuously refined by senior partner Hans-Gerd Hammann, often in close collaboration with research institutions and scientific experts. He jokes that the dictionary has yet to include the new term, but wherever hygienic and efficient flushing of fluid-carrying pipes is discussed, “to comprex it” is increasingly becoming part of the technical vocabulary.

Powerful cleaning gas are highly compressed and then released in bursts into the minimally filled flushing section of the pipeline. This process removes loose deposits as quickly and thoroughly as even the most stubborn product residues. The key advantage: the purely mechanical method relies solely on air and water pulses, yet achieves flow velocities of up to 20 m/s, ten times higher than conventional water flushing. The system uses up to 90 percent less water and, even without chemicals, delivers up to 100 times greater dissolving power thanks to increased shear forces, all while remaining gentle on the pipes.

Benefiting from sustainable management

This approach not only delivers substantial cost savings on alkaline and acidic cleaners, disinfectants and surfactants. Reducing the reliance on chemicals in such a critical part of the production also strengthens the company’s ecological sustainability, enhancing its

Integration of the stationary Comprex® Pulse800 into a production system

reputation, increasing employer attractiveness, and meeting current social and political expectations.

Moreover, using fewer chemicals to flush pipe systems reduces the effort required to remove residues from the system after cleaning. This significantly extends the service life of the pipes. Any remaining residues can be removed far more quickly with Comprex® than with conventional flushing.

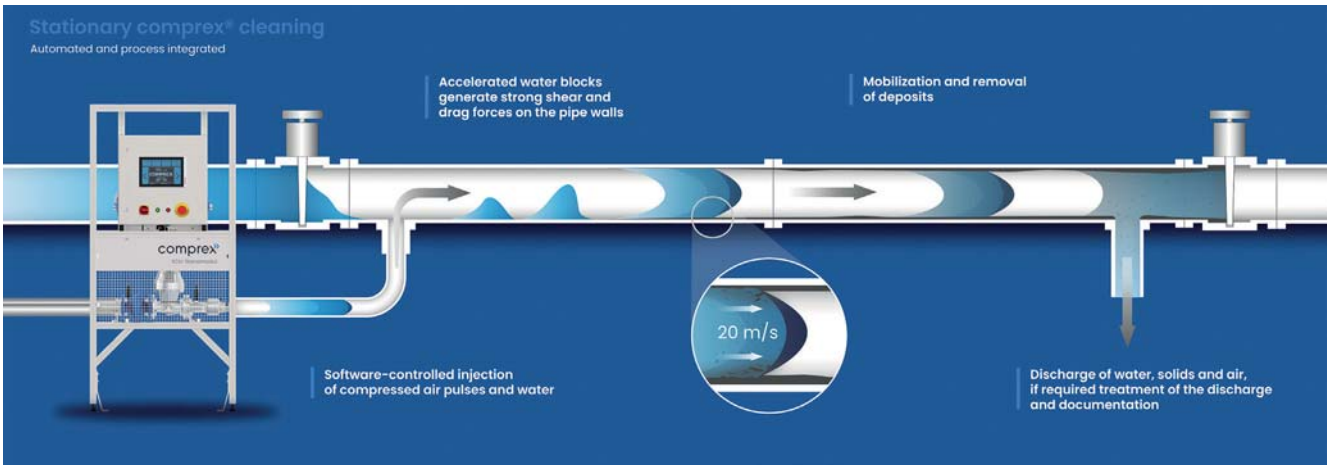
Significant water savings during cleaning also reduce the volume of wastewater, which is already cleaner – eliminating the need for follow-up cleaning steps. This minimises energy consumption, especially when temperature-controlled cleaning fluids are used. Overall, the rinsing process is accelerated dramatically, reducing costly production downtime. Vincent Hammann reports cleaning times cut by 70 to 80 percent, eliminating the need for redundant systems.

He acknowledges that these promised improvements sound almost unbelievable. That's why his strongest sales argument is tangible results. Hammann invites interested parties to send product samples, which are then tested on a dedicated track in Landau. The effects of Comprex® are compared with conventional water flushing on a laboratory scale, offered as a free proof of feasibility.

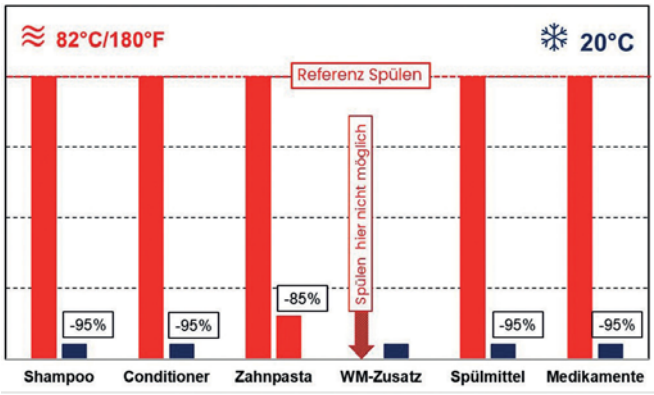
Versatile application scenarios …

The innovative Pulse800 system is engineered for broad applicability across diverse industrial environments. It is already deployed successfully in multiple sectors, including chemical processing, plastics manufacturing, cosmetics and detergent production, and the paints and coatings industry. Beyond industrial use, the technology is also integrated into municipal water treatment and wastewater management systems, as well as medical technology applications.

Fully integrated Pulse800 installations are operational in real-world production lines for products such as cough syrups, toothpaste, dishwashing and laundry detergents, and fabric softeners. Recent validation trials with high-viscosity and shear-sensitive products, such as baby food, ketchup, and mayonnaise, have delivered outstanding results under controlled test conditions. The next phase involves site-specific pilot runs to confirm performance under actual production parameters.



Comprex® technology accelerates water blocks to a flow velocity of 20 meters per second in less than 0.1 seconds.



"Cleaning with comprex® saves considerable amounts of water and heating energy." The graph compares the water consumption of six products: Each pair of bars represents the amount of water required for water rinsing (left) and comprex® cleaning (right). Red bars symbolise warm water and blue bars symbolise cold water.

... and strong potential for the beverage industry

The impressive potential for the beverage sector rests on several key factors. The Pulse800 meets the highest hygiene standards – even those required for pharmaceutical production. It features a dead-space-free design, complete drainability, and the ability to be steam sterilised. Materials and weld seams adhere to uncompromising quality criteria, and renowned national and international suppliers guarantee excellence. Ruland Engineering & Consulting GmbH, based in Neustadt an der Weinstraße, manufactures Comprex® systems across Europe and actively supports customer projects. Ruland is a trusted name in planning and building process plants for the beverage industry and enjoys an outstanding reputation in this field.

"Compared to traditional rinsing procedures, we achieve exceptional results with fruit juice-like consistencies – whether thin or concentrated, as well as with drinking yogurts and vegetable juices," says Vincent Hammann confidently. "We can even handle highly viscous media, such as jellies and pulps." Hammann has recently filed a new patent related to viscous liquids, including applications involving hydraulic oil.

No contradiction: Standardised custom solutions

The highly scalable standard platform can be configured for nominal diameters up to 200 mm and more, depending on the product line. Each installation is unique, engineered to meet the specific requirements of the operating facility – such as spatial constraints, control unit positioning, and integration needs. From initial design to on-site commissioning, the process typically spans around six months.

The Pulse800 software is developed in-house by Comprex Automation and is precisely aligned with the customer's primary production control system. This ensures seamless integration of the cleaning units into existing workflows. Built for maximum durability, the system offers extremely short inspection intervals and a streamlined maintenance schedule. Both maintenance and product-specific system adjustments can be executed efficiently via remote access.

Installation options include direct integration into the production line as a loop or deployment as a flexible bypass when required. The capability to store multiple cleaning programmes for different pipeline configurations adds significant flexibility and operational advantage.

A true technological breakthrough

Vincent Hammann

Vincent Hammann is convinced that the new approach represents a fundamental shift in CIP process engineering. Together with his team, he is working to further extend its capabilities. Instead of relying on interactive air pulses combined with water for product displacement – as is standard practice today – the future concept aims to clean product lines using ultra-high-velocity air and the product medium itself. This eliminates the need for third-party cleaning agents, apart from extremely pure, precisely conditioned air.

The benefits are significant. "Not only does this enable faster product changeovers while maintaining product integrity after filtration and quality assurance," Hammann explains, "but it also allows for non-invasive flushing cycles to be performed more frequently and in much shorter intervals – essentially preventive cleaning before any deposits can form."

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