Cleaning and Sanitizing in the Food and Beverage Industry

The advantages of low-pressure cleaning with boosted water

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Outbreaks of foodborne diseases occur regularly all over the world, and the causes of these outbreaks can be manifold. The various steps in the production chain, from the breeding or farming through to the processing operations and finally to the consumption stage, all pose a wide range of instances where a breach can occur.

Contamination during the processing stage can be caused by a range of different things: storage at wrong temperature, inadequate preservation, too slow refrigeration, human contamination, or lack of cleaning of surfaces and equipment to mention a few.

THE IMPORTANCE OF PRODUCTION HYGIENE

Compared to the vast number of possible contamination points, the occurrences of massive outbreaks are rare. During the processing stage, this is mainly due to strict production hygiene and food safety legislation and compliance. GMP (Good Manufacturing Practice), HACCP (Hazard Analysis and Critical Control Point) and similar guidelines are created and implemented to ensure basic food safety in all stages of processing.

Good production hygiene and correct cleaning are vital when you wish to produce quality products with a high level of food safety and optimal shelf life. It is not only essential to keep the production area clean and orderly during processing – it is also necessary to ensure that all surfaces and not readily accessible areas are cleaned correctly and properly in between production cycles. This is especially important for surfaces in direct contact with the product. Any residues of organic material left on the equipment can form the basis of bacterial growth. Such pools of bacteria may contaminate the products with pathogenic or spoilage bacteria during the following production cycle.

HYGIENE EXTENDS SHELF LIFE

Studies show that the better production hygiene, the longer shelf life. Even a small variation in bacterial load in the product may result in differences of weeks in shelf life. For a company distributing its products globally, this is of great significance.

Moreover, as consumers are demanding 'cleaner' products with less preservatives and additives, it puts demands on processors to ensure optimal food safety and hygiene through proper cleaning, and at the same time increase production time to cope with demands. To obtain a good production hygiene, cleaning and sanitizing is of utmost importance. Implementation of effective and systematic cleaning procedures is essential.

But what is the most effective method for cleaning in a food or beverage production? As the title of the guide states, the claim is that it is low-pressure cleaning with boosted water. Then why is it the most effective method?

In this guide, the advantages of cleaning with low-pressure technology and boosted water are explained in comparison with high-pressure cleaning. In many parts of the food and beverage industry and in many countries, high-pressure is still the prevailing method for cleaning. However, as you will discover, this is not the most effective method.

Cleaning and Sanitizing: Definition and Key Elements

The process of cleaning and sanitizing in a processing facility must be based on analysis of the food safety hazards present in the facility and how to prevent contamination stemming from these hazards.

A thorough knowledge of the conditions of the plant and product is essential to this analysis:

- What is the nature of the soils to be removed?
- How is the water quality in the plant?
- Are there hidden areas on the equipment that needs special attention?
- Does the cleaning process involve situations where special steps need to be taken, e.g., proximity of delicate equipment?

Key elements

Having identified the hazards, it is vital that you pay attention to the following four variables which have an impact on the cleaning result:

CHEMICAL MIX

Make sure that the chemicals used for cleaning and sanitizing are effective in dealing with the soils and residues they are meant to remove and dissolve. Having the correct chemical mix is a key factor. Always consult your chemical supplier in the process of adjusting your cleaning procedures to ensure that the chemicals are still effective. The quality of the water used for cleaning and sanitizing is also a factor in the choice of chemicals.

TEMPERATURE

The temperature of the water in combination with the chemicals must be suited to dissolve and remove the soil. Different soils require different temperatures. The efficiency of the chemicals is also depending on the temperature so enquire with your chemical supplier about the appropriate temperature.

CONTACT TIME OF CHEMICAL

Having applied the chemical, leave it on the surface for an appropriate number of minutes to take effect and dissolve the soil. The contact time may vary depending on chemical and soil type. Always consult your chemical supplier for advice on this.

Definitions

Cleaning

the complete removal of visible soil from surfaces and equipment using chemicals tailored to the conditions.

Sanitizing

the application of a disinfectant to surfaces and equipment that effectively destroys pathogens and reduces the level of microorganisms to an acceptable level.

Mechanical action

Before moving on to the cleaning stage, prep the facility by removing waste, loose soil, and debris. Dry clean and sanitize equipment that must not be subjected to water and cover them up. Disassemble where necessary and place the parts on a sanitation cart or similar.

A standard cleaning process contain the following steps:

1. Rinse to remove visible soils.
2. Apply foam on all surfaces.
3. Allow for contact time.
   Make sure the foam does not dry up.
4. Rinse.

Before moving on to the next step, the operator should inspect all surfaces to ensure they are visually clean, if applicable use rapid kits (ATP for example).

5. Sanitize all clean surfaces to reduce microorganisms to an acceptable level (bacteriologically clean).

Applying a sanitizer/disinfectant on an unclean surface renders the sanitizing step ineffective.

6. Final rinse.
7. Allow to dry.

Segment your cleaning procedures to make sure that residues are not being transferred to already cleaned surfaces. Be aware that the aerosols formed by the impact of the water jet carry microorganisms.

Make sure to clean the 'dark spots' on your processing equipment to prevent microbial growth that can eventually lead to lower product quality and a lower level of food safety.

Cleaning and sanitizing are key components in achieving a high level of food safety and thus product quality. The operators must have the proper training to secure good production hygiene.

Technology explained:

Low-pressure vs. high-pressure cleaning

The prevailing method for cleaning in the food and beverage industry differs across continents. In Europe, low-pressure cleaning with boosted water (also referred to as medium pressure by some) has by far been the most common method in the past decades, but in many other parts of the world, this technology is just beginning to be accepted as the most effective means to improve hygiene and food safety.

DEFINITIONS

Low pressure with boosted water:10-40 bar/145-580 psi (sometimes also referred to as medium pressure)

High pressure: 40+ bar/580+ psi

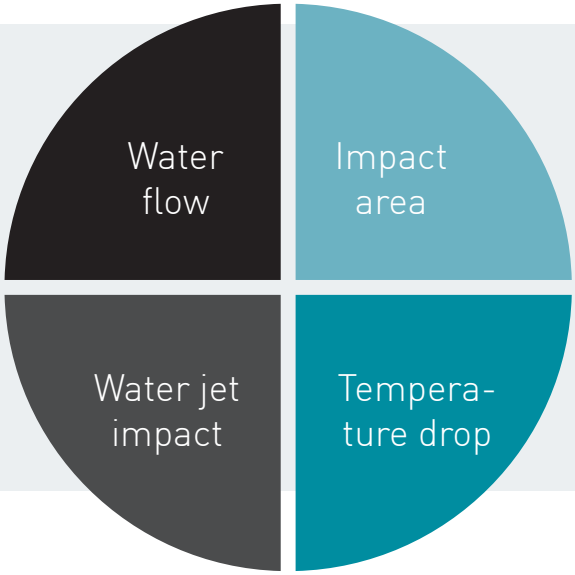
So, what is it that makes less water pressure more effective? It would, logically speaking, make more sense that the more pressure, the easier removal of residues. However, this is not the case.

Studies show that low-pressure cleaning with boosted water is the most efficient way of cleaning difficult surfaces compared to high-pressure cleaning. The independent Norwegian research organization Sintef has carried out a series of tests comparing the two, and the figures below are based on these tests.

The efficiency of low-pressure technology

Stating that low-pressure cleaning with boosted water is more efficient than high-pressure has several aspects:

- Increased water flow
- Higher water jet impact
- Larger impact area of water jet
- Lower temperature drop



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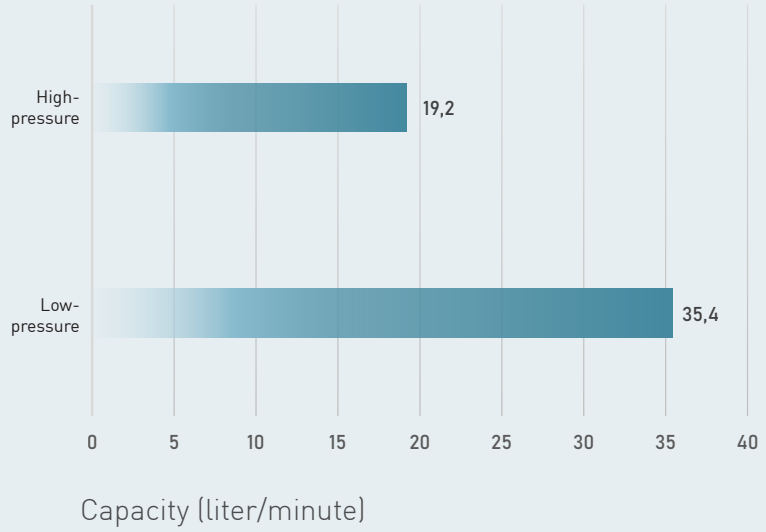
Increased water flow

The tests showed that almost twice as much water reaches the surface with low-pressure cleaning than with high-pressure. To be precise, 84%. The high-pressure jet atomizes before reaching the surface.

More water on the surface significantly reduces cleaning time and speeds up the removal of soils. Additionally, the efficiency of the increased flow reduces the total consumption of water.



Water flow

84%

higher

Higher water jet impact

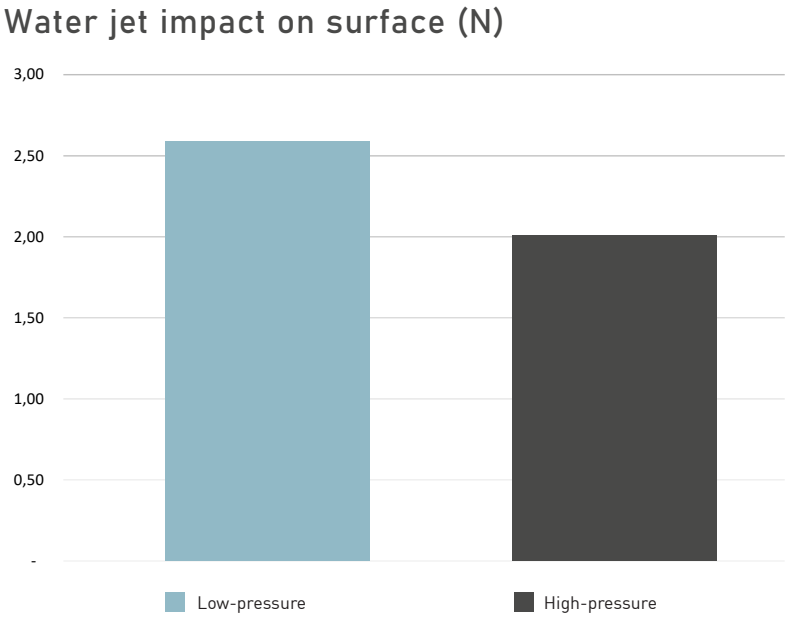
The tests also showed that a higher water jet impact is obtained with low-pressure cleaning. When rinsing from 5 different distances, the impact of the water jet on the surface is on average 22% higher with low-pressure.

A higher water jet impact means residues will loosen faster thereby saving time in the cleaning process.

Water jet impact

22%

higher



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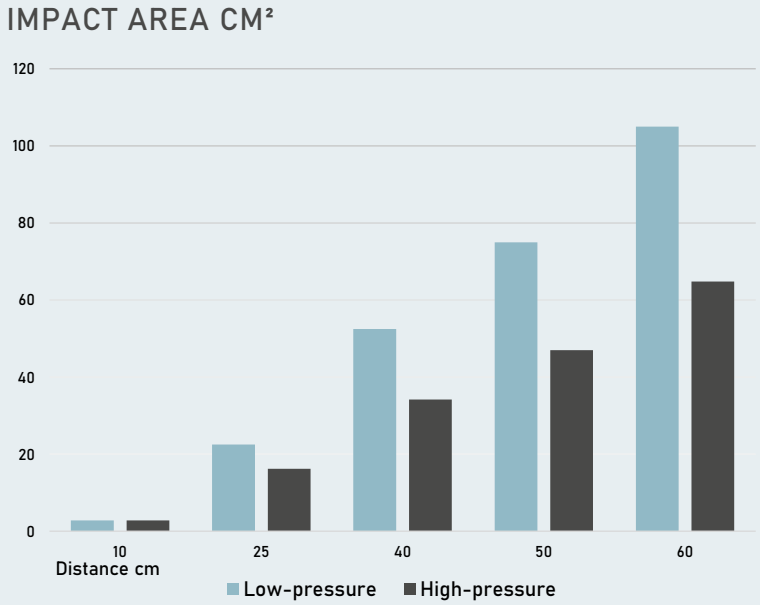
Larger impact area of water jet

It is commonly known that you must get quite close to the object when you are cleaning with high-pressure and because of this, the impact area of the water jet is not very large. The chart shows that the difference in impact area increases the further away from the object you get.

The impact area is of great significance to the efficiency of the cleaning as it is possible to cover a larger area in a shorter span of time, thereby reducing the cleaning time.



Impact area up to

62%

larger

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Lower temperature drop

The efficiency of a cleaning system depends a lot on its ability to transfer the temperature of the water to the surface. A stable temperature of the water impacting the surface is vital for water jet's ability to dissolve the soils.

The increased water flow of low-pressure results in a more efficient transfer of the water's heat energy. The difference in temperature is significant at distances over 25 cm, and the difference increases as the distance to the surface increases.

At 60 cm, the difference in temperature is a fully 13.5°C/56°F.

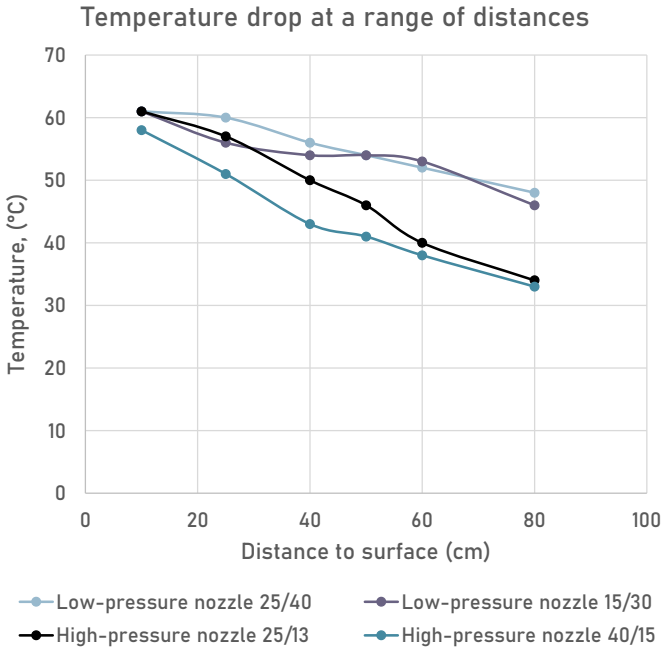
The temperature is of great significance to the ability of the water jet to dissolve and remove e.g., fat.

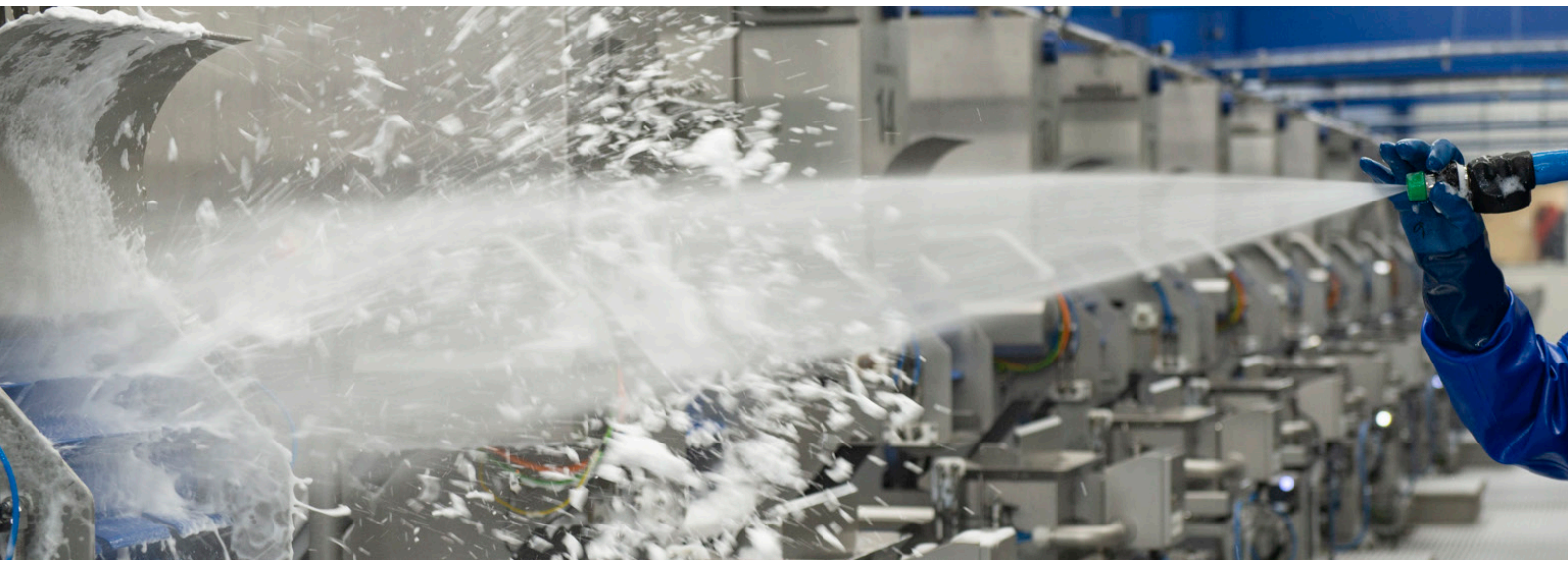
A quick drop in temperature results in reduced ability to dissolve the soils, thereby extending cleaning time and decreasing efficiency.

Temperature drop

13°C

lower





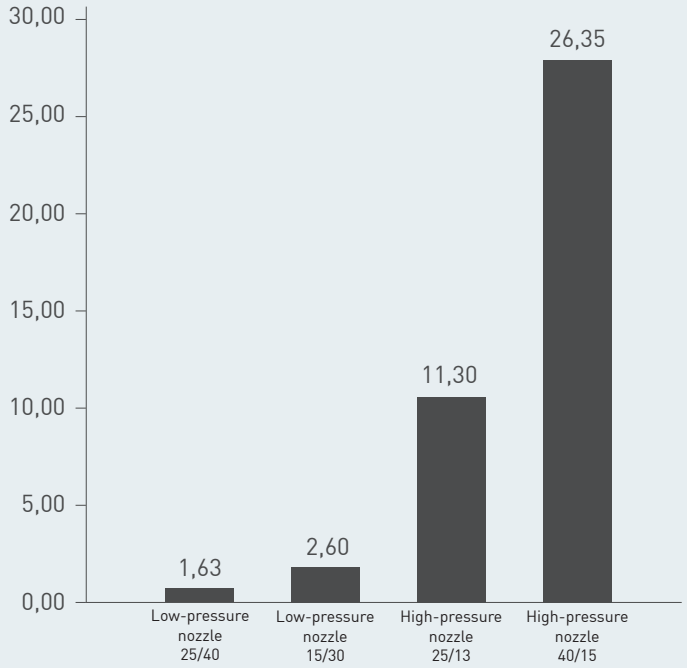
Residues after rinsing at a distance of 50 cm

To illustrate the significantly more efficient performance of low-pressure cleaning compared to high-pressure, a test of both at a distance of 50 cm to the surface was performed.

The results clearly show that low-pressure cleaning removes residues more effectively.

The perfect combination of the correct temperature and volume of water in interaction with chemicals means that low-pressure cleaning with boosted water is the optimal way of cleaning surfaces in all types of food and beverages processing facilities contaminated with fat, bacteria, yeast, limescales or other deposits.

This way surfaces are not only visually clean, but also bacteriologically clean.



The formation of aerosols

When the water jet hits the surface with a considerable pressure, it will inevitably cause formation of aerosols. The aerosols stay afloat in the air for several minutes, sometimes longer. The Working Environment Authority cautions against the exposure to bioaerosols in the food and beverage industry in general.

Aerosol formation during cleaning and sanitizing in the food and beverage industry poses two problems:

- Cross-contamination
- Health and safety for staff (see next chapter)

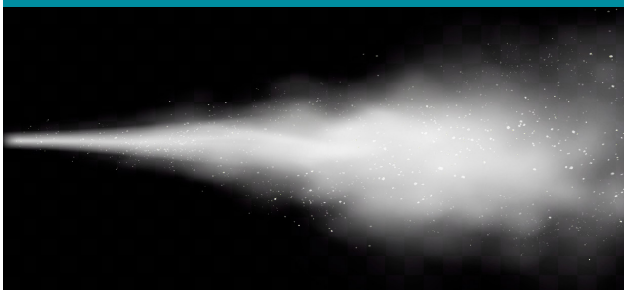
The formed aerosols dispersed in the air contain viable microorganisms which can facilitate cross-contamination. Air currents within the processing area can transport contaminated particles to already cleaned surfaces. The distance which they travel and the time they can stay suspended in the air depends on the size of the droplets.

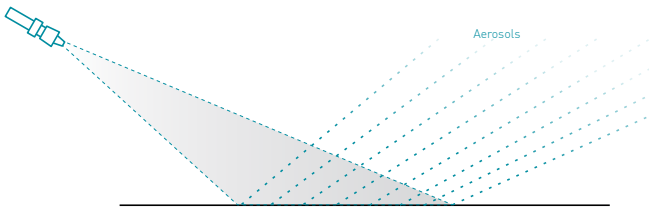
The tests performed by Sintef show that applying low-pressure cleaning with boosted water reduces the formation of aerosols by at least 50%. The droplets that are formed are larger and reach the surface faster.

Consequently, the risk of cross-contamination is significantly reduced compared to that of high-pressure.

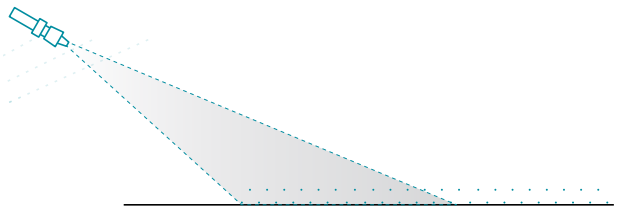
DEFINITION

An aerosol is a generic term for a suspension of fine solid particles or liquid droplets in air or another gas.

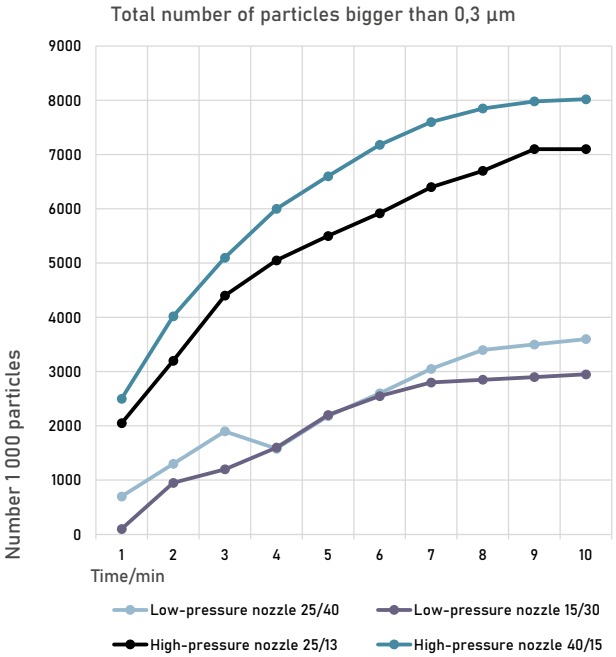




High pressure



Low pressure



Aerosol formation

50%

reduction

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Health and safety for staff

Low-pressure cleaning with boosted water also has several benefits when it comes to the health and safety for the cleaning staff.

RESPIRATORY DISEASES

As mentioned in the previous chapter, the formation of aerosols also has an impact on the health and safety for cleaning staff. The finest droplets are easily inhaled and settle at the bottom of the lungs or in the respiratory tract. This can cause respiratory diseases.

There has been a focus on aerosols in connection with the spraying of detergents as these form tiny droplets dispersing in the air and easily inhaled. Disinfection chemicals pose a particular risk.

By reducing the aerosols significantly, the health risk for staff is also reduced significantly.

SKIN DISEASES

In addition to the reduced risk of respiratory diseases, the reduced level of aerosols also has the benefit of reducing the risk of skin diseases. The degree of PPE (Personal Protective Equipment) utilization varies across the industry, and where the cleaning staff are not adequately protected, the aerosols may settle on the skin causing anything from temporary rashes to permanent diseases.

LESS VIBRATIONS

It is commonly known that working with high-pressure hoses puts strain on the operator. It can eventually result in the operator getting hand-arm vibration syndrome (HAVS). HAVS causes symptoms in fingers, hand, and arm because of the vibrations in the hose. If the small nerves and blood vessels in the hand and fingers are repeatedly damaged, it will eventually result in sensory changes, a feeling of numbness or tickling. The fingers can turn white at the tips as if they are very cold. Often is it only transitory, but recurring. In severe cases, the numbness becomes permanent.

Applying low-pressure eliminates this issue as the hand-arm vibration level is under 2.5 m/s2.

Overall, the application of low-pressure cleaning will improve the working environment for the cleaning staff

LESS NOISE

Regarding noise, low-pressure cleaning is clearly to be preferred as the level of noise is under 70 dB compared to high-pressure which is 85+ dB.

With the right cleaning technology you will be able to optimize on key parameters within four main categories.

Production time

YOUR PAIN	YOUR GAIN WITH LOW-PRESSURE CLEANING
Prolonged cleaning time	Reduced cleaning time due to the increased efficiency of water jet
Thorough cleaning requires extended production stops	Reduced cleaning times enable shorter production shutdowns
Lack of capacity	Increased uptime → higher throughput Increased capacity - postpone investment in new equipment/facilities
Processing equipment breaks down due to the application of high-pressure cleaning	Low-pressure cleaning with boosted water reduces wear on processing equipment and other surfaces

Cleaning with low-pressure has a range of benefits

- Significant reduction in cleaning time
- Reduced water and chemical consumption
- Less wear on processing equipment and affected surfaces
- Low maintenance and service requirements
- Improved work environment
- Better heat transmission

Product quality/food safety

YOUR PAIN	YOUR GAIN WITH LOW-PRESSURE CLEANING
Problems with product quality due to inadequate cleaning	The efficiency of the low-pressure water jet enables a good cleaning result
Aerosols from high-pressure cleaning carry microorganisms and cause cross-contamination	Significant reduction in aerosol formation (50%) reduces the risk of cross-contamination
Product call-backs	Better cleaning → better product quality
Low level of food safety and hygiene	Improved levels of food safety and hygiene due to effective cleaning

Health & safety

YOUR PAIN		YOUR GAIN WITH LOW-PRESSURE CLEANING
Staff only allowed to work high-pressure hoses for a limited period	»	No limitations
Staff experience health issues such as skin rashes and respiratory problems	»	Minimizes formation of aerosols which can settle in respiratory tract and on the skin possibly causing health issues
Hand-arm vibration syndrome (HAVS) Noise level too high	»	Vibration level below 2.5 m/s^2 Noise level below 70 dB

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Financial aspects/ROI

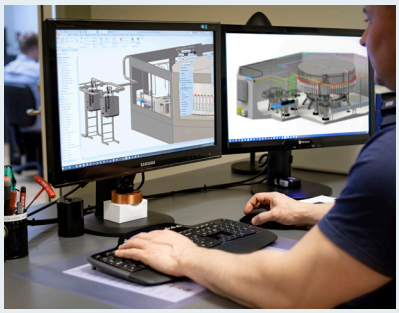
YOUR PAIN	YOUR GAIN WITH LOW-PRESSURE CLEANING
Profit loss due to equipment breakdowns caused by the application of high-pressure	Low-pressure technology reduces wear on equipment Service and maintenance significantly reduced
High water and chemical consumption	Resource saving technology
Lack of capacity	More uptime → higher throughput → more profit Increased capacity - postpone investment in new equipment/facilities
Short life on current cleaning equipment	Easy to replace components and easy to service High-quality components, long life

Enabling you to trust what you eat and drink

When you choose System Cleaners as your partner in open plant cleaning solutions for the food and beverage industry, you'll notice one thing straight away: We don't compromise, and we don't complicate things.

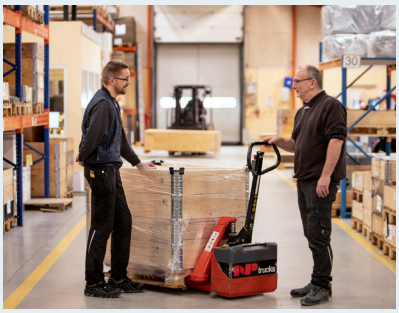
Our high-quality automatic and manual solutions are as solid as they are easy to use and let you benefit from reduced cleaning times and a chance to lower your chemical and water consumption. No matter what part of the food and beverage industry you are engaged in we'll provide you with the perfect match for your hygiene challenges. No more and no less.

We've been safe-guarding food and beverage brands all over the world for three decades and we can help ensure consistent product quality in your production too. So, say goodbye to sleepless nights caused by poor hygiene and hello to System Cleaners and pure confidence.



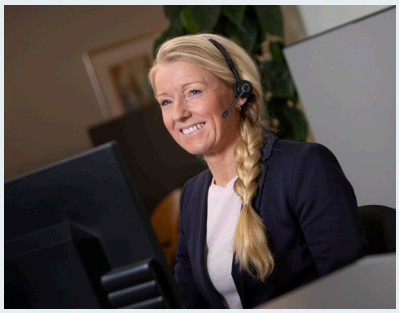
We are skilled

When it comes to hygiene and food safety, nothing beats a skilled partner. We know the ins and outs of the food and beverage industry and can guide you every step of the way in your choice of cleaning solution. Sometimes a standard product will do the job and sometimes it takes a customized solution. What matters is that the solution perfectly matches your specific requirements and challenges. We'll make sure you never use more chemicals or more water than you absolutely have to – for the sake of both the environment and your wallet.



We are solid

A System Cleaners solution is designed to deliver and to last. And that's a promise. Our products are built on three decades of dedicated experience from the food and beverage industry and their performance is solid as a rock. We never compromise on quality – and we don't think you should either.



We are straightforward

In everything we do, we apply a straightforward approach. Our products are easy to use – even for the untrained worker. Our online customer tools are easily accessible to save you time. And more than anything you'll find us a truly uncomplicated partner to do business with. If you have a request we'll meet it, if you have a problem we'll fix it and if you need help in any way we're here for you. It's as simple as that.

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