

The economic benefits of improved hygiene in Poultry processing.

Poultry Hygiene: Hurdle to hurdle with Undine microdroplets by IWC-International

This white paper describes the economic aspects of good hygiene and how to implement improvements in poultry processing. It describes the financial consequences of poor hygiene and how a properly implemented hurdle concept can improve hygiene and operational performance.

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How hygiene is contributing to your results

If Hygiene is already at your highest standard

The microdroplet technology saves up to 50% on water consumption and cleans for both visual and microbial hygiene. Microdroplets clean on bacteriological level and lower the CFU Log values on your end products. A higher product quality and longer shelf life gives you an advantage towards your competitors. Your current hygiene standard will be even higher against a much lower water consumption.

Financial factors of hygiene in poultry processing

Lots of processors consider hygiene as a cost factor without any return on investment. Many aim for the hygiene level as enforced by authorities. However, with a good hygiene you can save and earn lots of money. And with the proper technology lots of water can be saved at the same time. The main causes for loosing money in poultry processing are:

1. Rejections and downgrade because of visual contamination:
 - Did you know that for 12.000/hr processing lines every 0.1% Rejections easily adds up to €60.000,- per year per 8 hour shift?
 - And that in praxis easily 0.2% of the rejections are avoidable visual contaminations?
2. Visual clean birds is a “must a have” due to European directives and that some countries enforce a zero tolerance at the end of evisceration lines?
3. Pathogen related product recalls:
 - Direct costs related to logistics and lost products
 - Indirect costs in trust of the products and damaged brand image towards customers.
4. Little pricing power due to a non competitive short shelf life:
 - A high total CFU counts results in a non competitive short shelf life, whereas a longer shelf life can optimize both the logistics and sales channels. This gives pricing power towards clients.
5. High water consumption means high water supply and waste water treatment costs
 - 50% less water consumption can save on 2 sides: it means 50% less water production for your water purification system, but also a 50% lower load on your wastewater treatment plant. Sometimes it can be as easy as that!

Some issues can be addressed with a single cleaning step, where others require implementing multiple hurdles. All with a quick ROI.

How poultry processors make money with improved hygiene in praxis

Over the time IWC installed various solutions for all kinds of customer issues. Some of them are listed below with their solution and results.

Customer issue	Solution	Result
A customer had issues with high overall rejections on the vet. station because of visual contaminations.	A washer after pluckers and directly after eviscerator were installed.	<ul style="list-style-type: none"> • 0.4% less rejections equalling €350.000,- / year. • 5% more A-grade quality on the optical automatic grading system. • Reduced water consumption 50% • ROI: 3 months

Customer issue	Solution	Result
Customer had issues with authorities on meeting the EU zero tolerance on visual contaminations at end of the evisceration line.	Installed full hurdle concept, additional cleaning on the vacuum inspection machine and after venter.	<ul style="list-style-type: none"> • Inspection found no contaminations • Reduced water consumption from 28m³/hr to 14 m³/hr.
Red organ parts in carcass and immersion chilling	Installed I/O washer prior to vacuum machine	<ul style="list-style-type: none"> • Decommissioned vacuum machine • No loose parts of red organs • Clean crops

The hygiene aspect of poultry processing: a hygiene process approach

Due to the complex nature of poultry products, each operational step has a high risk of introducing different types of processing contaminants in semi-finished or finished products. The risk of processing cross-contamination creates specific hygiene challenges.

Removing visible contaminations is vital

The visible contamination on broilers carcasses from loose feathers, faecal, biliary and gastric material is the most critical because it can cause microbial contaminations or growth. This type of visible contamination is inherent to the poultry processing.

Some operations risk causing a pathogen contamination. For example:

1. during plucking operation when external pressure is applied to remove feathers, or
2. during evisceration operation where intestines can be punctured resulting in leaking of bile or faeces onto the inside cavity or outside of the carcass.
3. Besides faeces from intestines, the crop content that often consists of undigested feed is a potential source of Salmonella contaminations.
4. During the evisceration step when the intestine pack is removed from the breast cavity, the crop can be damaged and also leak into the poultry carcass causing the undigested feed contamination can be spread inside of the breast cavity

Cross contamination in poultry processing

Each contamination can lead to cross contaminations through tools or water baths. On high capacity lines, 200.000 birds pass all machines each day. Whereas a single unit in a 16 unit rotating machine processes 12.500 birds, the pluckers touch all of them. The water in such as in immersion chillers also touches all products. Immersion chillers collect pollutants over a production day and are often overlooked as cause of dirt and bacteria pickup after the evisceration.

Ensuring food safety: immediate removal of visible contamination

To ensure high level of food safety in poultry the whole product must be visibly cleaned and be free from pathogens on both exterior surface and internal breast cavity. In addition to pathogens, it is essential to decrease the total plate count because it determines the product shelf-life. To prevent fixation and enable removal of microflora, this must be accomplished at multiple points of the production process. For a maximum effect, the poultry microflora needs to be removed before fixation after each step.

Conventional pressurized water and hurdles



Micro droplets in Hurdle to Hurdle concept



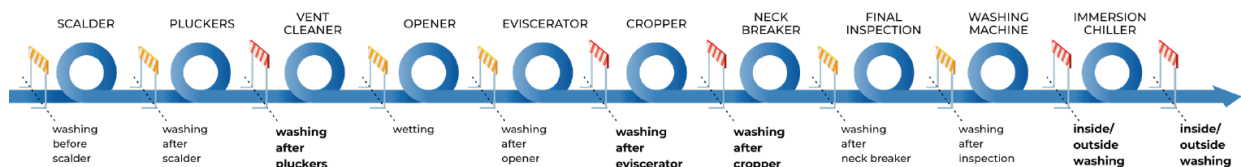
Visible contaminants have to be removed almost immediately after their incidence to prevent risk of microbial pathogenic or spoilage organisms growth. In addition to industry experience, numerous research has identified that the origin of pathogen contamination in poultry is linked to visible contamination and the processing step. For example, *Campylobacter* has been found in/after pluckers, whereas the majority of *Salmonella* is found in the breast cavity with the crop.

Hurdle to Hurdle poultry hygiene by IWC-International

A single sanitation step in your process is not enough to ensure pathogen free products that are low in spoilage bacteria for a long shelf life. Also because most sanitation methods require a visual clean product to be effective. This explains why hygiene is a process that consists of multiple hurdles that ensure a visual clean product and prevent dirt and bacteria to pass on to the next processing step.

The Hurdle concept

The so-called hurdle concept has been around in poultry processing for many years now. Scientists have done lots of research on the hurdle concept and the poultry industry has implemented many of their findings in their processes, in order to improve hygiene. In fact, most process implementations in the industry can be understood in the context of the hurdle approach. IWC added an extra added value to the Hurdle to Hurdle concept



The main principle of the hurdle concept is to prevent dirt and bacteria from passing on to the next processing step. For example, loose feathers, attached to skin or shackles, must be kept from entering the evisceration process. The better dirt and bacteria are removed, the less likely bacteria are passed on further into the process and eventually end up in or on the end products. Each hurdle is designed dedicated to the hygiene challenges of the processing step it is installed after.

Water usage vs. extra hurdles and improved hygiene

Many poultry processors are struggling with their water consumption for economic or availability reasons. Many measures to reduce water consumption, such as lowering the water pressure or install smaller nozzles lead to a less hygienic process and end-product.

IWC's Hurdle to Hurdle concept uses the Undine® technology that creates high speed microdroplets and saves up to 50% on water. This technology has 2 advantages:

1. The high speed microdroplets save lots of water because they are much more efficient in product cleaning,
2. Ensure a higher hygiene because the high speed micro droplets are very effective in removing dirt and bacteria,
3. The reduced water usage makes it possible to setup extra hurdles, while still saving water.

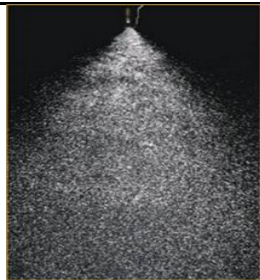

This takes the hurdle approach to the next level and makes it possible to significantly improve the overall hygiene level of a poultry processing plant. Existing hurdles will be more effective, but also additional hurdles that were not feasible before can be created, thanks to the huge water savings that the use of Undine brings. And after all hurdles installed still up to 50% of the water consumption is reduced. An average high capacity line with the Undine concept uses 1 litre per bird to deliver the best performance.

Undine microdroplet technology

At its core, our [Undine technology](#) is a combination of pressurized air and water. This mix is created in the mixing chamber and directed via nozzles to the surface/product to be cleaned. These mixing chambers combined in a manifold are mounted together in a cabin. And multiple cabins together complete the [hurdle-to-hurdle concept](#).

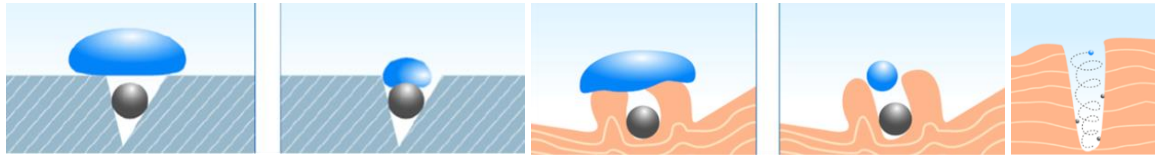
The droplets created by this technology are about as small as bacteria and feel like stinging needles because many of them touch a surface in succession. This ensures very intense cleaning, even in small cavities and hard-to-reach places, with very low water consumption due to the small droplet size.

Due to the sophisticated Undine technology with its small droplet sizes at high speeds, there is no risk of damaging delicate products such as meat or soft fruit. Something that is the case when using normal high-pressure cleaning due to the larger drops.

		
Method	Conventional high pressure	Water-Air mix
Supply pressure	Water 40 bar	Water 40 bar / Air 6 bar
Droplet Velocity	Up to 120 km/h	up to 900 km/h
Droplet size	250-500 μm	5-25 μm

Schematic illustration of action of large droplets and microdroplets of water

Existing conventional pressurized water spray technology is characterized by large droplets size that can damage the quality of product and are not effective against microbial contamination. As shown below, large water droplets can't access the microcavities where bacteria are harboured and droplets energy are not sufficient to remove bacteria.



In contrast, microdroplets of 5-25 μm at ultra-high velocities are

- i. small enough to access cavities such as skin pores and feather follicles,
- ii. almost the same size as most bacteria including *Campylobacter* and *Salmonella*, and
- iii. microdroplets are more efficient to transform the kinetic energy and to remove bacteria

Transforming a volume of water into water-air mixture creates billions microdroplets in an air flow. When a product surface is hit by such a high number of microdroplets, consequently they are lined up and form needles of microdroplets. As a result, dirt and bacteria are hit by hundred thousand of such needles in a split of second. The micro size of the droplets allows them to reach and remove bacteria from skin pores or feather follicles and still be non-destructive to the product surface. For example, water plus air solution allowed to remove contaminations and bacteria from soft fruits without damaging their surface or texture.

Contact us for more information

We'd love to meet face to face or online to share results and discuss what we can achieve in your process. For more information, a calculation of your benefits or an expert meeting, contact [Ton Winters](#) or [Twan Koenen](#) via LinkedIn and we'll get in touch with you.

Or fill out the contact form on <https://iwc-international.com/contact/>

We are "Cleaning the Impossible"

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