

Chemical-free cleaning-in-place technology

As broader-scale environmental issues become more prominent and the supply of good quality source water becomes more unreliable, SA food and beverage manufacturers are likely to seek out alternative products and technologies which can reduce their environmental footprint through water and energy savings, as well as improve their operating efficiencies.

Most food and beverage processing environments rely on water as a fundamental ingredient and its quality therefore needs to be of the highest possible standard. Under typical conditions, process or ingredient water is treated repeatedly by filtration before being used. While this procedure is relatively effective, other possible sources of microbial contamination do exist, and if left unchecked, will inevitably result in product contamination and spoilage.

Dr Robin Kirkpatrick, MD of Radical Waters Intellectual Property (RWIP), says: "The issue, until recently, has been that plants have had limited choices other than chemicals to treat source water. The use of traditional chemicals during cleaning-in-place (CIP) applications not only contradicts the current 'green school of thought', but is also in many instances an ineffective way in which to consistently ensure low microbial counts and subsequent water quality.

Furthermore, under the existing chemical regime, beverage processors need to endure lengthier CIP cycles due to the number of rinse steps necessary to purge out any remaining chemical residues."

Kirkpatrick says that electro chemical activation (ECA) technology is a natural substitute (for chemicals) as it uses a combination of water, salt and electricity (activation) to clean and disinfect food and beverage manufacturing plants.

Carla Fiford, MD of Radical Waters (Pty) Ltd, explains that although ECA as a hygiene technology is still relatively new in the commercial environment, it was developed in Russia during the 1970s for use in the mining industry. "After more than a decade of extensive research and development to ensure that the technology does not affect the taste, colour or appearance of treated products, Radical Waters introduced a series of novel and

patented ECA-based food and beverage applications into the market in early 2004. Since then we have manufactured, produced and installed ECA hygiene management systems for food and beverage plants in 21 countries on six continents. ECA technology is ideal for plants implementing HACCP, where the elimination and constant control of microbial contamination is vital."

Sectors using it

Fiford states that ECA technology is extremely effective at eliminating all pathogens and food spoilage microbes including spores, bacteria, fungi, viruses, yeasts and moulds in beverage, grain milling, meat, seafood, starch and sauce manufacturing environments.

• **Beverages.** She says that trial results of Radical Waters' ECA technology in cleaning-in-place (CIP) applications in beverage plants have shown:

- An increase in production time and overall operating efficiency due to shorter CIPs and downtime. Potential time savings of up to 70% can be achieved.

- Reduced CIP volumes result in a substantial reduction in the production of toxic effluent.

- Substituting conventional chemicals with ECA solutions can result in cost savings on chemicals of up to 90%.

- Water savings of up to 60% may be achieved due to shorter cleaning and disinfection cycles as well as the ability to reclaim CIP solutions for subsequent reuse. The two ECA solutions are compatible and do not require rinsing between and after applications.

- Substantial energy savings are achieved as all CIPs are performed at ambient temperature.

- **Grain milling.** In the busy milling environment, effective microbial control is imperative for the quality of the milled product. Without effective decontamination procedures in place, grain mills run the risk of producing

lower-grade products that can only be marketed at commodity prices.

Fiford says that employing ECA technology allows millers to effectively decontaminate raw grain at the conditioning stage, control fungal spores and other spoilage microbes, and to remove and control biofilm in-process. "Further advantages include no product taint or residue carry-over and a substantial shelf life extension of the final milled products."

- **Meat.** She explains that research has confirmed that foodborne outbreaks of listeria can be traced back to recontamination of meat products during peeling, slicing, repackaging or similar procedures. "Our ECA solutions have been shown to be repeatedly effective in reducing microbial counts by a minimum of 99%. Further studies confirm that the remaining microbial activity of ECA after application will also control general microbial build-up and limit the cross-contamination of further products."

Fiford therefore advises meat processors to use ECA products to ensure general food safety compliance, to disinfect working surfaces, decontaminate carcasses, and decontaminate offal and sausage casings - will result in extended shelf life of value-added products.

- **Seafood.** Shelf life limits and spoilage of seafood is an ongoing dilemma for processors. In the factory environment, sea water is often used as a vehicle for transporting fresh fish from one processing point to the next. This water tends to become progressively soiled during processing, creating an environment for micro-organisms to flourish and spoilage to occur.

Fiford says that ECA technology can be used to decontaminate the process sea water and thus increase product shelf life. It can also be added into flaking and packing ice to improve the shelf life of fresh

seafood for export purposes.

"The ECA solution eliminates and controls all pathogenic organisms, including Staphylococcus Aureus and E. coli (0157), substantially reducing the risk of cross-contamination. It also reduces the total volatile nitrogen on aged fish and is useful for environmental odour control."

- **Starch.** High quality products require a balance of low levels of microbial contamination and minimum levels of chemical residues used in the manipulation of the starch compounds. She explains that ECA benefits for starch processors include: integration for real time sanitation in place, improved assurance of pharmaceutical-grade starch production, reduction of noxious chemicals such as sulphur dioxide, and reduced plant downtime with extended production run time.

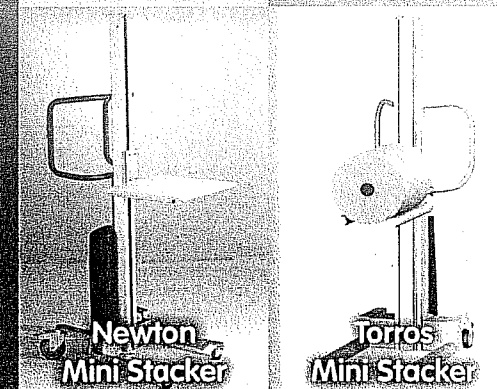
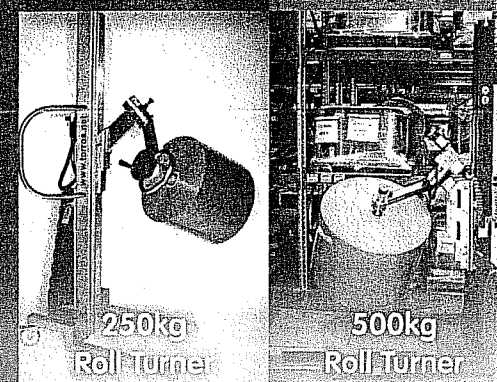
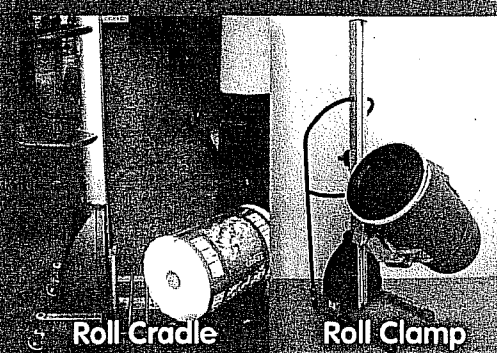
- **Sauces.** Water quality is of the utmost importance in a sauce plant, as it is one of the primary ingredients in the manufacturing process. Municipal water is typically not re-treated in such processes and can potentially create a microbial spoilage problem if unqualified water is used. Micro-organisms and biofilm are also ubiquitous in moist or damp environments.

In this case, Fiford emphasizes that ECA will decontaminate the process water and become a product ingredient that reduces the need for food preservatives or extend the shelf life of preservative-free products. It can also be used for general in-process surface disinfection.

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- Radical Waters Int has signed an agreement with Anasac, giving it exclusive distribution rights for Radical Waters' ECA technology in Argentina, Bolivia, Chile, Colombia, Ecuador, Peru, and Uruguay as well as in the beverage sector in Brazil.

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HOW ECA WORKS

Electro chemical activation (ECA) is a scientific process that mimics the body's natural process.

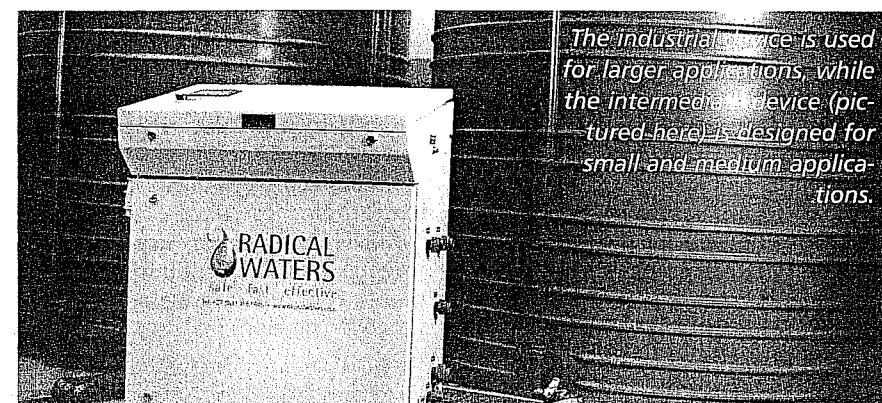
When the body comes under attack from invading bacteria and viruses, its immune system immediately responds by sending increased numbers of a specific white blood cell called Neutrophil to the invasion site. Once activated, these cells produce substantial quantities of a mixed oxidant solution called hypochlorous acid, which is highly effective in eliminating all invading microbes and pathogens, while remaining non-toxic to humans.

Radical Waters' ECA device generates hypochlorous acid (HOCl) under highly specific electrochemical conditions using a combination of water, salt and electricity. The ECA solutions are created by mixing readily available food grade salt with water, and then passing the brine solution through the patented reactors at the core of the ECA device. Once inside the reactor, the brine is activated by way of an electrical charge and two distinct solutions are produced:

1. Anolyte - a disinfectant
2. Catholyte - a detergent

Radical Waters says that both anolyte and catholyte - when used singularly or in tandem - have been shown to be effective in removing and controlling biofilm present on all liquid contact surfaces.

The company's ECA technology has US Food & Drug Administration and EU approval for use as an advanced disinfectant in the food and beverage processing industries. As well as accreditation for full profile safety and anti-microbial efficacy, the Radical Waters' devices are CE-certified to meet EU health, safety, and environmental requirements.



The industrial device is used for larger applications, while the intermediate device (pictured here) is designed for small and medium applications.