KLORTAB NaDCC EFFRVESCENT CLEANING / DISINFECTION TABLETS

TECHNICAL AND COMPETENCY DATA SHEET

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Beverage and Food Processing Plants

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How NaDCC works – What is the difference from Bleach?

The active ingredient of Klortab NaDCC Effervescent Cleaning and Disinfection Tablets is sodium dichloroisocyanurate, known as NaDCC, but the active ingredient of bleach is sodium hypochlorite.

When both NaDCC and bleach dissolved in the water, they produce hypochlorous acid (HOCl), a highly effective disinfecting agent. The difference between the two chemicals due to HOCl is that NaDCC is an organic molecule, while Sodium Hydroxide (NaOH), which is more commonly known as caustic, is obtained in bleaches.

When NaDCC is mixed with water, it is an organic chlorine donor in the form of a moderately acidic use solution with a neutral pH of 5,5 – 6,5. Bleaches and other hypochlorites are highly alkaline solutions, and when dissolved in water, the pH level is around 11 - 12. (pH is logarithmic scale and if pH is started with 13 and diluted in a ratio of 10: 1; depending on the water quality, the pH decreases by approximately 1). If you want to show it as a chemical reaction, the result is:

NaDCC

$C_3Cl_2N_3NaO_3 + H_2O \longrightarrow C_3ClHN_3NaO_4 + HOCl$

Bleach

$NaOCl + H_2O \longrightarrow NaOH + HOCl$

Caustic is highly corrosive and poses serious health risks, both in direct contact (especially eyes and mucous membranes) and inhalation of dry powder of bleach. There are many serious studies show the relationship between bleaches and occupational asthma in healthcare workers. On the other hand, NaDCC is non-caustic and has confirmed that its use as a disinfectant in drinking water, both and lifelong, does not cause any observable health problems. OSHA has identified health effects such as ulceration, eye, skin and respiratory irritation in the nasal passages as caustic causes, even at the Permissible Exposure Limit level of only 2mg /m^3 in air. It is important to pay attention to the stoichiometric caustic ratio (one to one) in the HOCL. For every hypochlorous acid molecule produced, a caustic molecule is produced. Therefore, making a stronger disinfection solution with bleach inevitably means exposure to more caustic.

NaDCC does not contain caustic and ready-to-use solution can cause moderate eye irritation when applied directly to the eyes. Thus, while the HMIS (The Hazardous Materials Identification System) ratio of the product is 1/0/0, it is 3/0/0 in bleaches.

Why pH is important?

The biologically active substance of both bleach and NaDCC is HOCl, and HOCl dissociates in water as follows:

$HOCl \longleftarrow OCl^- + H^+$ (note: this is a reversible reaction)

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Studies show that non-dissociated HOCl has four times more antimicrobial killing power than dissociated hypochlorite ions (OCl^-). In reality, HOCl is very similar to the structure of water and is electrically neutral, so it can easily pass through cell membranes as if entering water. The ratio of HOCl to OCl^- in solution is determined by the solution pH. A more acidic solution contains more HOCl, while a more alkaline solution has more hypochlorite ions (OCl^-). A NaDCC solution with a pH of 5,5 to 6,5 is an 80-90% active disinfectant in the form of HOCL, while bleach with a pH of 11 to 12 is less than 10% active disinfectant in the form of HOCl. It means that NaDCC is a much more effective disinfectant than bleach even at very low concentrations.

Solution stability

When NaDCC is mixed with water, it produces hypochlorous acid (HOCl) and a slightly acidic monochloroisocyanurate in the use solution. These two components are fixed at a ratio of 50-50 in the usage solution, so when free chlorine is used during the disinfection process (due to the reaction of bacteria, organic matter, etc.), a part of the bound chlorine is released and the 50:50 ratio is restored again. This is the MOST IMPORTANT FEATURE of the NaDCC that should be noted because unlike bleach and other hypochlorites, NaDCC maintains its killing power even after contact with organic dirt. *Bleach releases all of the HOCl it contains, and when it comes into contact with organic soils, it does not leave any active ingredients for rapid killing.*

Sodium hypochlorite solutions are not inherently stabile. When the lid of the package is opened, the HOCl present in the solution is highly evaporated, significantly reducing the free chlorine concentration. On the other hand, NaDCC in solution has much less loss rate. This degradation in HOCL occurs when it comes into contact with acids, sunlight, certain metals and gases as in bleach. Because it is not stabile and when it used for disinfection, preparing daily. In contrast, NaDCC is stabile and has 3 days shelf life in closed container. In order to increase the stability of bleach, a number of manufacturers producing ready-to-use wipes and diluted bleach have increased the pH by adding extra caustic. Increasing the pH can make the product more stable, but while increasing the abrasive properties of the product, it causes the biocidal activity of HOCl to decrease further.

Due to the inherent stability of NaDCC and its higher HOCl content, lower concentrations are sufficient for an effective killing. Longer shelf life significantly reduces waste and costs. Tests on metal surfaces show that NaDCC is 50% less corrosive than bleach and does not harm vinyl and plastics.

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EPA Legislation

US EPA has registered a NaDCC-based product as a sporicidal disinfectant with many bleach-based products for use on hard surfaces.

Product	Contcentration	Exposure time
NaDCC	**1076ppm**	**10 minutes**
Bleach	**5500ppm**	**10 minutes**
NaDCC	**4306ppm**	**4 minutes**
Bleach	**9000ppm**	**5 minutes**

As seen in the EPA registration document, NaDCC is more effective than bleach even at a lower concentration. Low-concentration disinfectants significantly reduce potential health hazards to workers and damage to equipment and product cost.

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