PREPARATION OF CAUSTIC SODA AND PERACETIC ACID SOLUTIONS FOR THE CIP (Cleaning in place of bottling plant)

How to dilute pure powder form caustic soda to bring it to 2 % solution to use in CIP systems

To dilute pure powder caustic soda (sodium hydroxide) to a **2% solution** for CIP (Clean-In-Place) systems, use a ratio of **20 grams of powder per 1 litre of water**.

1. Calculation Guide

For most CIP applications, a "weight by volume" (w/v) concentration is used.

- **For 10 Litres of solution:** Mix 200g of caustic soda powder with 10L of water.
- **For 100 Litres of solution:** Mix 2kg of caustic soda powder with 100L of water.

2. Critical Safety Steps

Mixing caustic soda is an **exothermic reaction**, meaning it generates significant heat and can cause violent eruptions if handled incorrectly.

- **The Golden Rule:** Always add caustic soda to water, never water to caustic soda.
- **Water Temperature:** Use **lukewarm or cold water**. Never start with hot water, as the reaction will raise the temperature further, potentially leading to boiling and dangerous mists.
- **Stirring:** Add the powder slowly and stir constantly with a non-metallic (plastic or wooden) tool to prevent the powder from clumping at the bottom, which can create "hot spots".

3. Usage in CIP Systems

- **Temperature:** Once diluted, the solution is typically heated to **60°C–85°C** (140°F–185°F) during the CIP cycle to effectively dissolve organic residues like fats and proteins.
- **Contact Time:** A standard caustic wash usually circulates for **20 to 45 minutes**.
- **PPE Requirements:** Always wear chemical-resistant gloves, a face shield or goggles, and protective clothing. Work in a well-ventilated area to avoid inhaling fumes.

Warning: Do not use caustic soda on **aluminium, zinc, or galvanised surfaces**, as it will corrode and damage them.

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information on neutralising the solution after use.

Safety and Neutralization Information

Caustic soda (sodium hydroxide) is a strong base that is highly corrosive. When handling this substance, it is essential to use appropriate personal protective equipment (PPE), including chemical-resistant gloves, safety goggles, and face shields.

Neutralization and Disposal:

After use in a CIP (Clean-in-Place) system, the solution will have a high pH level. Neutralizing a strong base with an acid is a chemical reaction that generates significant heat and can be dangerous if performed incorrectly.

1. **Consult Local Regulations:** Municipalities have specific codes regarding the disposal of industrial or high-pH waste. It is necessary to check with local wastewater treatment authorities before disposing of any spent solution.
2. **Professional Guidance:** For industrial or large-scale applications, neutralization should be performed according to established safety protocols and often requires specialized equipment to monitor pH and temperature safely.
3. **Safety First:** If the solution comes into contact with skin or eyes, immediately flush the area with large amounts of water for at least 15 minutes and seek medical attention. Do not attempt to apply neutralizing acids to the skin.

Sterilisation of CIP (Cleaning In Place) with a solution of Peracetic acid

To prepare a peracetic acid (PAA) solution for CIP (Clean-In-Place) sterilisation of bottling equipment, you must first determine the concentration of your concentrate—typically **5% or 15%**—and then dilute it to the target level, usually between **100 ppm and 250/ 500 ppm** **(parts per million)** for no-rinse food contact surfaces.

1. Dilution Ratios for 2% CIP Sterilisation

For effective sterilisation in a bottling line, aim for a concentration of **100–250 ppm**. Below are the common mixing ratios based on standard 5% PAA concentrate:

Target Concentration	Per 10 Litres of Water	Per 100 Litres of Water
125 ppm	25 ml	250 ml
200 ppm	40 ml	400 ml
250 ppm	50 ml	500 ml
500 ppm	80 ml	800 ml

*Note: If using a **15% concentrate**, divide the required amount by 3 (e.g., ~8 ml per 10L for 125 ppm).*

2. Preparation Steps

1. **Safety First:** Wear chemical-resistant gloves, safety goggles, and a face shield. PAA is highly corrosive and has a pungent, vinegar-like odour that can irritate the respiratory tract.
2. **Water Selection:** Use clean, cold, or ambient temperature water. Avoid using hot water, as PAA is an unstable oxidising agent that decomposes faster at higher temperatures.
3. **Mixing:** Always add the **PAA concentrate to the water**, never the other way around, to prevent splashing of the concentrated acid.
4. **Circulation:** In your CIP system, circulate the solution for **10 to 30 minutes** to ensure all internal surfaces and bottling heads are fully sanitised.

3. Critical Considerations for Bottling Equipment

- **Material Compatibility:** Diluted PAA is generally safe for **304 and 316 stainless steel**. However, avoid use on soft metals like **copper, brass, or galvanised steel**, as it will cause rapid corrosion.
- **No-Rinse Limit:** In many regions (including the USA and UK), solutions below **200 ppm** do not require a final water rinse, as PAA naturally breaks down into water, oxygen, and acetic acid (vinegar).
- **Pre-Cleaning:** PAA is a ***sanitiser***, not a detergent. **Ensure all organic soils and "caustic" residues from the previous cleaning step are thoroughly rinsed out** before introducing the PAA, as remaining soil can neutralise the acid's effectiveness.

4. Recommended Products for CIP

Pro-Dis CIP Peracetic Acid (15%)

: A high-performance, food-safe disinfectant specifically designed for breweries and dairies to remove yeast deposits and biofilms.

https://www.astralhygiene.co.uk/products/product/prodis-cip--peracetic-acid

- Peradox Peracetic Acid-Based Disinfectant: A fast-acting, Defra-approved terminal disinfectant suitable for all water types in food processing.

https://www.quillproductions.co.uk/products/peradox?variant=46731615043

These documents outline PAA dilution ratios for bottling equipment CIP and offer critical safety data.