ipp
IRISH POWER & PROCESS
The Brennan & Co Group

YOKOGAWA

APPLICATION NOTE

MEASURING CONDUCTIVITY CORRECTLY IN CLEAN-IN-PLACE (CIP) SYSTEM

Industry: Pharmaceutical, Chemical, Food & Beverage
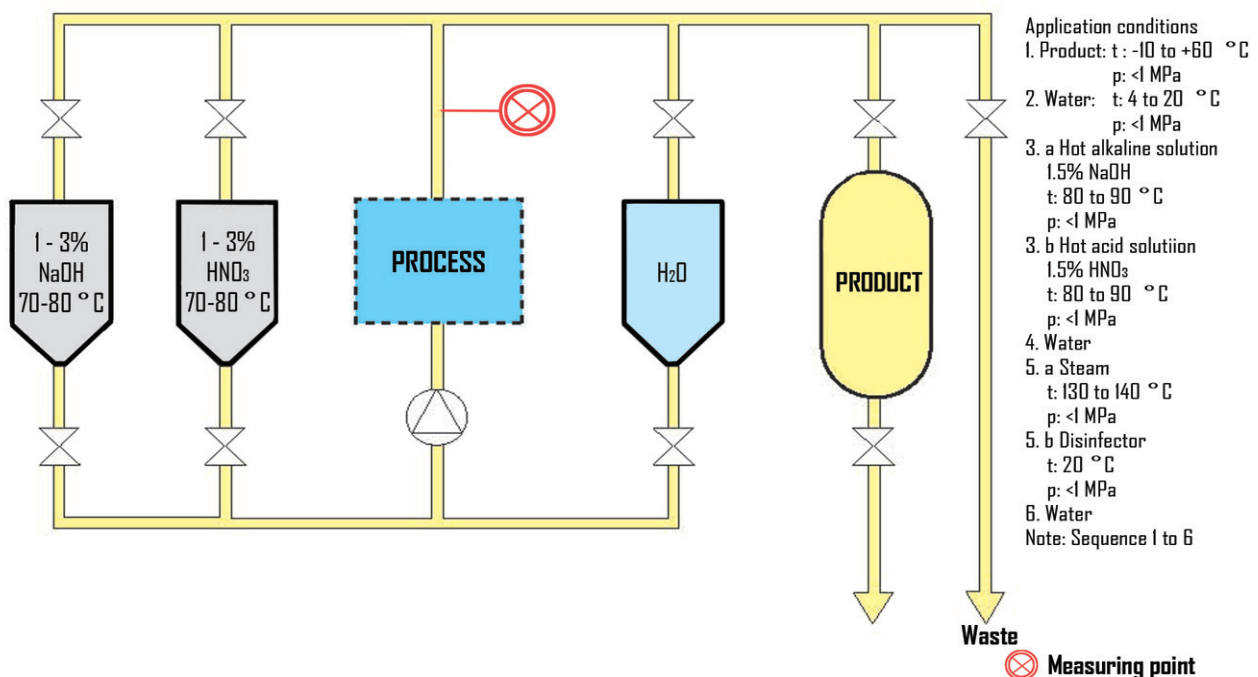**Product: Inductive conductivity analysers**

In the manufacturing process of Pharmaceutical, Chemical and Food & Beverage industries, the cleaning and sterilization of tanks and piping are done with various cleaning solutions, fresh or hot water and steam after manufacturing products. Clean-In-Place (CIP) is the system designed for automatic cleaning and disinfecting. The recovery of cleaning solutions contributes significantly to reduce chemical costs and wastewater processing costs.

Yokogawa FLXA21 inductive conductivity transmitter has earned a reputation in the recovery of cleaning solutions because it can take measurements with good boundary surface precision over a wide range.

Expected Benefits

- Optimizes cleaning and sterilizing application for tanks and piping by use of CIP
- Reduces operating costs - save up to 10% of your chemical use for CIP

Application conditions
1. Product: t : -10 to +60 °C
   p: <1 MPa
2. Water: t 4 to 20 °C
   p: <1 MPa
3. a Hot alkaline solution
   1.5% NaOH
   t: 80 to 90 °C
   p: <1 MPa
3. b Hot acid solutiion
   1.5% HNO₃
   t: 80 to 90 °C
   p: <1 MPa
4. Water
5. a Steam
   t: 130 to 140 °C
   p: <1 MPa
5. b Disinfector
   t: 20 °C
   p: <1 MPa
6. Water
Note: Sequence 1 to 6

1 - 3% NaOH 70-80 °C

1 - 3% HNO₃ 70-80 °C

PROCESS

H₂O

PRODUCT

Waste
⊗ **Measuring point**

Process Overview

CIP systems depend on the process differentiations of Pharmaceutical, Chemical and Food & Beverage. In addition, the cleaning solutions and chemicals are different. The chemicals that are generally used are hypochlorous acid, caustic soda, and nitrous acid. In a cleaning solution recovery system, the process lines and piping are cleaned with an initial cleaning solution. After that, the cleaning solution is cleaned with fresh water. The cleaning solution is recovered at that point, but since it gradually becomes diluted with fresh water, recovery is discontinued and the solution is discharged through a drainage line when the concentration of the cleaning solution drops below the standard value. The cleaning with different solutions or fresh water, the recovery of the cleaning solution, and the discharge of waste solution are repeatedly carried out. In addition, sterilization with steam or cleaning with distilled water or de-ionized water is performed as a final step in some cases.

1. Process conditions

	Concentration (%)	Temperature (°C)	Pressure MPa
Water	—	4 to 20	0 to 1
NaOH solution	1 to 5	80 to 90	0 to 1
HNO_3 solution	1 to 5	80 to 90	0 to 1
Steam	—	below 130	0 to 1

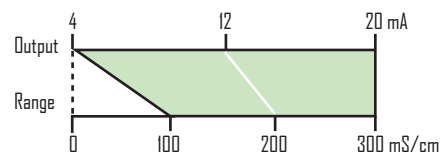## 2. Features of ISC Inductive Conductivity Analyser used in a CIP Process

(1) Improved precision in boundary surface measurement.

    (a) Equipped with a zero-suppression function according to output signal

*Zero suppression
Example: Output 4 to 20 mA DC
                 ↑   ↑
Range: 100 to 300 mS/cm

    (b) One sensor can handle a minimum span of 100 μS/cm and a maximum span of 1999 mS/cm.

(2) Steam sterilization capability

Measurements can be performed at process solution temperatures of -10 to 130°C and pressures no greater than 2 MPa.