Measurement of Variables Critical to Controlling Processes – Conductivity

Your Objectives:

At the end of this lesson, "Measurement of variables critical to controlling processes – Conductivity" you will be able to appraise the conductivity variable.

Definition of electrical conductivity

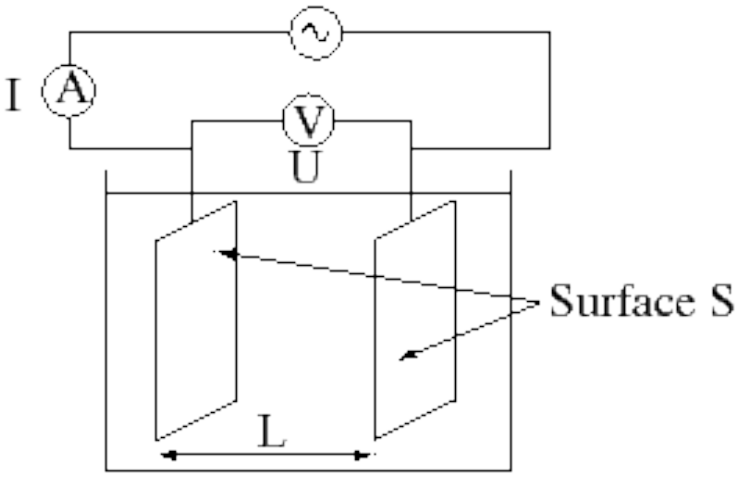
Electrical conductivity, or specific conductance, is the reciprocal of [ ] resistivity (see below). It represents a material's ability to conduct electric [ ] . It is commonly represented by the Greek letter σ, while κ (especially in electrical engineering) and γ are sometimes also used. The SI [ ] of electrical conductivity is siemens per [ ] (S/m).

Electrical resistivity (also called specific electrical resistance or volume resistivity) and its inverse, electrical conductivity, is a fundamental property of a [ ] that quantifies how strongly it either resists or conducts electric current. A [ ] resistivity indicates a material that readily allows electric current. Resistivity is commonly represented by the [ ] letter ρ. The [ ] unit of electrical resistivity is the ohm-meter (Ω·m). For example, if a 1 m × 1 m × 1 m solid [ ] of material has sheet contacts on two opposite faces, and the resistance between these contacts is 1 Ω, thereby the resistivity ofthe material is 1 Ω·m.

Measurement

The [ ] conductivity of a solution of an electrolyte is [ ] by determining the resistance of the solution between two flat or cylindrical electrodes separated by a fixed [ ]. An alternating voltage is used in order to avoid electrolysis. The resistance is measured by a conductivity meter.

A wide variety of instrumentation is commercially available. There are [ ] types of cells, the classical type with flat or cylindrical electrodes and a [ ] type based on induction. Many commercial systems offer automatic [ ] correction.



Here is perhaps a good explanatory video of that:
https://www.youtube.com/watch?v=sVcG65dMZfk

In the highly regulated biotech and [ ] industries, effective analytical measurement is critical for ensuring high production quality and operational efficiency whilst meeting [ ] standards. One key [ ] application is conductivity analysis during clean-in-place (CIP) processes, though it is also used for several other [ ] . Conductivity measurement is so integral to the pharmaceutical manufacturing process that it is easy to take it for granted. However, understanding some basics of its operation and correct application can make a significant [ ] in the effectiveness and efficiency of CIP.

Conductivity in CIP (Cleaning in Place)

The CIP process ensures that equipment is cleaned and maintained to minimise any possible cross-contamination and improve [ ] and product quality. Conductivity analysis is a measure of how well a solution conducts electricity. [ ] solutions are more conductive than water used for flushing the system, thus conductivity measurement enables plants to monitor cleaning steps and final rinsing to ensure completeness.

Optimally, a CIP process will maximise safety while preventing cross-contamination. Hence, increase CIP time and you will minimize production downtime while optimizing thermal efficiency, reduce energy requirements, and avoid excessive heat loss.

The multi-step CIP process includes initial and final drain, pre-rinse, sodium [ ] wash, and post-rinse. Some processes may also include a sanitizing cycle so as to reduce [ ] contamination, by using strong oxidants such as hydrogen peroxide, [ ] , chlorine dioxide, or other chlorine-containing compounds. It is critical that processing plants ensure that these chemicals are thoroughly removed [ ] only to avoid cross-contamination but also to prevent corrosion of [ ] .

Effective cleaning is determined by detergent strength, cleaning time, and _____ . Conductivity measurement is used throughout the _____ process to ensure the right detergent concentration and to monitor the completion of each step. By measuring the conductivity of the returning acid and caustic solutions, plants can confirm that the detergent is the right strength, with the correct concentration of acid and caustic, for each CIP _____ . These conductivity measurements are proportional to the concentration or solution strength and are recorded for _____ . During the CIP _____ , since it is common for fluids to be only partially neutralised, conductivity analyses will indicate when additional concentrate should be added.

By measuring conductivity, plants can determine the interface between _____ solutions and rinse water. When the conductivity drops to the value of rinse _____ , it indicates that the next _____ in the cycle may begin. This procedure minimises CIP _____ while following (standard) regulatory compliance. Conductivity is also an effective way to detect the interface _____ the cleaning solutions and the product so that valves can be switched at the right time so as to prevent both cross-contamination _____ product wear and tear.

Aufgabe Lückentext:

Folgende Wörter bitte in den Lückentext einfüllen.
Jedes Wort kommt einmal vor.
Bitte Gross- und Kleinbuchstaben beachten.

and, bacterial, between, current, CIP, Cleaning, cleaning, circuit, cube, distance, difference, equipment, electrical, electrical, Greek, hygienic, hydroxide, low, material, metre, measured, measurement, not, ozone, unit, pharmaceutical, processes, process, safety, step, SI, second, two, temperature, temperature, time, validation, water