

pH-Meter in Cleaning Processes

Cleansers must dissolve contaminants without affecting the surface material. Simultaneously the cleansers should be environmentally friendly. However, there is no "contamination". Cleanser and contaminant should work with each other (react) in both, physical and chemical ways to achieve the optimum cleaning results. If the contamination is removed, the cleanser should protect the surface from immediate contamination.

Besides the classic neutral and all-purpose cleansers in household there are also cleansers and corrosive fluids in acid and alkaline pH range, both in household and industry on the market.

pH working range of various cleansers

approx. pH 1: sanitary cleanser

approx. pH 2: rust remover

approx. pH 7: neutral cleanser

approx. pH 9: all-purpose cleanser

approx. pH 10: basic cleanser for linoleum, rubber and rubber flooring

approx. pH 11: basic cleanser for PVC

approx. pH 12: strong basic cleanser for PVC

approx. pH 13: soap, industrial cleaning products

approx. pH 14: pipe cleaning products, grill cleanser

The removal of deposits and debris from the surfaces is an important process step in industry. The matrix of the contamination determines what type of cleanser should be used. The cleaning effect is determined by the chemical composition, the pH, the temperature and the exposure to the cleanser. It is especially important to have an inline pH measurement in addition to temperature control in order to detect the pH shifts because of dilution and level of contamination.



Acidic surface cleaning pH <6

Acidic industrial cleaners, besides their acidifying ingredients, have got water-soluble organic LM, surface material active substances such as surfactants and inhibitors. You are able to remove mainly inorganic compounds (such as metal dust, metal oxides and pigments). But the good cleaning effect when it goes about oils and fats is not there. In an acidic cleanser the cleaning effect is based on addition of H⁺ ions to the contamination and to the surface of the material and on the consequent rejection of dirt from the surface. However, this rejection principle is much stronger developed in case of alkaline cleansers than it is in acidic cleansers. Rust removers, for example, are based on mineral acids (hydrochloric acids, especially phosphoric acids), which provide dissolving of rust and cover the surface in such a way, that it stops the formation of additional rust.

Alkaline surface cleaning pH > 8

The surface cleaning with alkaline cleaners is the most common cleaning processes in the metalworking industry. Metals are often protected here by coating before oxidation. In the further processing the cleaning steps are necessary to obtain a chemically clean metal surface. Here alkaline cleaners come into play. The cleaning effect of an alkaline cleanser is based on the addition of the negative hydroxide ions to the surface and their electrostatic repulsion (sealing during the cleaning process). Organic contaminants such as oils, fats and waxes are changed by a chemical hydrolysis reaction to such an extent that they obtain water-soluble properties and thus are removed. Similarly, inorganic deposits, such as metallic abrasion and dirt can be removed. Alkaline industrial cleaner based on alkali hydroxides and alkali carbonates in addition to their alkali properties, have also some other additives which support the cleaning effect and seal the surface. Here phosphates, borax

compounds, silicates, surfactants and emulsifiers come into play. By means of different combinations of the ingredients it is defined whether a cleanser gets corrosion removing (alkali hydroxides), degreasing (alkali carbonates, phosphates) or emulsifying (silicates) properties or whether a good cleaning effect is reached due to the special addition of additives, such as Borax, also in a low alkaline range.



No matter, either the alkaline and acidic cleansers are applied to the material as concentrates or in a diluted form locally – working protection is of special importance when it goes about dealing with these substances. Here, at every working stage it is required to know the pH value. Used bathroom cleansers should be disposed of or neutralized. The same also applies to cleaning baths in industry. In these cases, either a selective control or an in-line measurement of pH is necessary to monitor the cleaning process under control and to neutralize the resulting sewage of the cleaning and rinsing bath.

PCE Instruments offers multiple solutions for these applications regarding laboratory pH measurement, pH process control and remote maintenance.