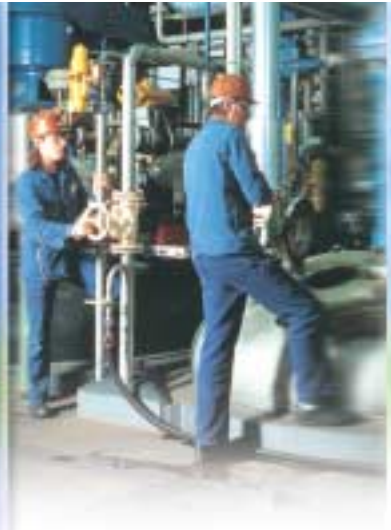
Conductivity
for Concentration Control



Notes

Inductive conductivity for chemical concentration control.

Process Analytics
Application

Background

In many processes chemicals of a certain concentration are used as reagents. For economical reasons these chemical are usually delivered and stored in much higher concentrations than needed in the process, to save transportation cost and valuable storage space. Often the same chemical is used in different concentrations depending on the process at hand. Before these storage strength chemicals can be used in the plant, they have to be diluted. For this dilution a control strategy is needed. Conductivity in a broad number of cases is a function of concentration, and can therefore be used to control the makeup system.

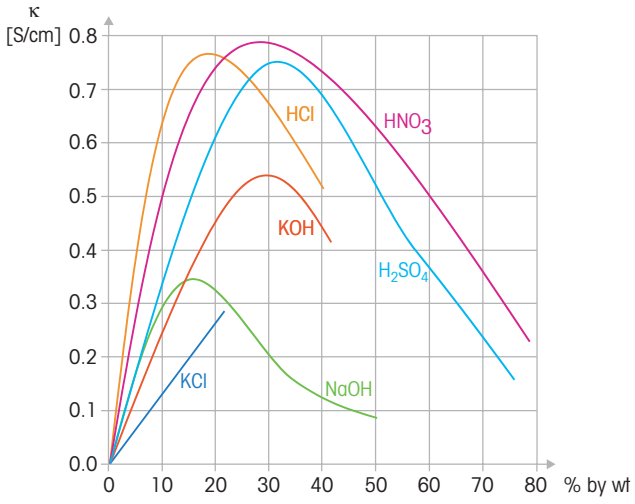


Figure 1:
Conductivity of concentrated solutions.

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Process

First of all it has to be determined whether conductivity is a function of concentration for the chemical in question. That is usually the case for any acid, alkaline, or salt. Sometimes marker ions are used with non-conductive chemicals, in order to make concentration conductivity dependent, because it is a very easy and reliable measurement. Secondly the conductivity vs. concentration curve for the particular chemical has to be taken into consideration. Mainly for two different reasons:

a) Is the working range fully left or right of the peak to allow for an unambiguous measurement? Because only if the peak is not enclosed in the working range, can conductivity unambiguously be related to the concentration.

b) Is the slope within the working range sufficiently steep to get the desired accuracy? The accuracy of the conductivity system can be expressed in µS/cm, for example. The slope tells us what change in concentration we get per µS/cm. The accuracy in µS/cm times, the slope then gives the accuracy in concentration that is theoretically possible.

Tight concentration control means using the correct concentration in the process. Wasting valuable chemicals by using concentrations that are to high means wasting money. Concentrations not higher than desired also means there will be fewer burdens on recovery and/or wastewater treatment systems. Using concentrations that are not too low on the other hand assure efficiency of the process. Working with a tightly controlled concentration overall enhances repeatability and therefore quality.

Mettler-Toledo Solution

The best solution for this application is an inductive conductivity sensor.

Modern inductive systems have the sensitivity to detect very small changes in conductivity, important for an accurate measurement.

Inductive conductivity sensor InPro 7200 series

PEEK is a very good sensor material, with very good chemical and mechanical resistance. However, material compatibility should be checked for each individual application.

Conductivity transmitter Cond Ind 7100 e

As far as the transmitter is concerned, the Cond Ind 7100 e is the best choice. Simple operation, precise and reliable measurements as well as low cost of ownership reduce effort and expense.

With its unique user interface (pictographs) and continuous transmitter and sensor diagnostics, this transmitter unit can be employed in all process applications.

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