

Chlorine Scrubber Sodium Hydroxide Control With Oxidation Reduction Potential

Powell Oxidation Reduction Potential Instrumentation is the best available technology for the indication and control of sodium hydroxide concentrations for chlorine scrubbers on the market today. Powell technology has been successfully applied to chlorine scrubbing for over 40 years. Chlor-alkali production plants such as Occidental Chemical and Olin Chemical in the United States, Sasol LTD in South Africa, Orica in Australia, Carbochloro in Brazil, Occidental in Chile and many other throughout the world use proprietary Powell Oxidation Potential Electrodes for this application.

When the correct electrode installation has been made using the Powell ORP electrodes, the silver/platinum electrode pair produce a millivoltage signal output according to the following formula:

$$E = E^{\circ} - \frac{0.0591}{2} \log \frac{(\text{OCl}) (\text{H}^+)^2}{\text{Cl}^-}$$

Where E° is the standard oxidation potential for the reaction.

Since the electrode potential is primarily a function of the hydrogen ion concentration, a sharp inflection is noted at the reaction end point similar to that obtained by pH measurements.

Experience has shown that typical millivoltages in a chlorine scrubber starting with a typical 21% sodium hydroxide and reacting with chlorine will produce the following approximate mVDC signals with respect to the remaining sodium hydroxide versus the weight percent sodium hypochlorite. Data is shown in Table 1.

Table 1

Remaining Sodium Hydroxide vs Weight Percent Sodium Hypochlorite		
Wt. % NaOH	Wt. % NaOCl	ORP mVDC*
21.34	0.00	0
19.90	1.12	288
18.47	2.31	311
16.93	3.45	330
15.49	3.50	345
14.22	5.54	358
12.88	6.81	372
11.44	8.01	384
9.90	8.88	396
8.49	10.25	410
7.00	11.27	424
5.38	12.67	441
3.95	13.59	460
2.31	15.13	488
1.48	15.58	507
0.81	15.99	535
0.42	16.44	561

*Millivoltage Direct Current



Using the above data, the Oxidation Reduction Potential Curve with the 21% by weight sodium hydroxide starting point can be represented as a graph, as shown in Figure 1. Using the proprietary Powell ORP electrodes any chlorine scrubber can be continuously or batch controlled at high sodium hydroxide levels as required by individual design of the scrubber.

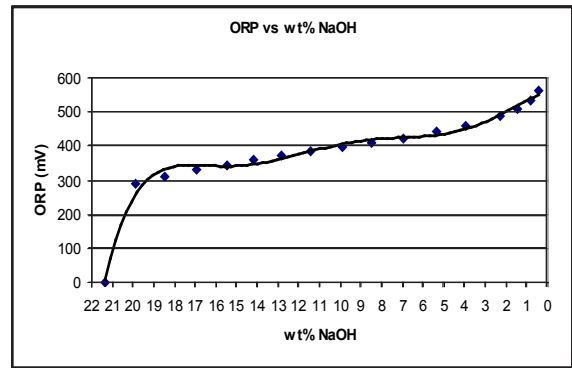
Powell's customers have successfully controlled by using continuous and automatic control sodium hydroxide levels at typical levels such as 12% by weight with excellent results. Many customers chose to operate the scrubbers at much lower levels of sodium hydroxide such as 1.5% using Powell ORP electrodes either by batch or continuous.

If the system is automated with the application of automatic sodium hydroxide supply valves in conjunction with the Powell ORP electrodes, process upsets can be easily and quickly managed.

On batch chlorine scrubbers, the Powell ORP electrodes are used to provide information and alarms to inform the operators when to change batch sodium hypochlorite tanks in the scrubbing operation.

Powell has Best ORP Technology Available

The Powell Oxidation Reduction Potential (ORP) Electrode utilizes platinum for the measuring electrode and silver for the reference electrode. The unit has proven itself in numerous years of service in chlorine scrubbing, sodium hypochlorite production, chlorine and bleach neutralization, and the ferric chloride industries and is suitable for use in any halogen chemical service including scrubbers, neutralization tanks, vent stacks, and batching tanks. Powell ORP Electrodes are available for 1" to 18" pipe sizes, and are known for their long service life. The Powell ORP Electrodes have been designed for simple installation and maintenance. They are easy to install and repair. There are many types of installation methods to chose depending on the design of the chlorine scrubber.



For More Information

Please contact Powell today and find out why companies such as Olin and Occidental can now operate their emergency chlorine scrubbers automatically and continuously with the confidence necessary in today's environmental standards. To obtain literature, test data, engineering drawings, and/or free Cd's, Fax 989.681.5013 or e-mail your request to info@powellfab.com.



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