

Aquarius Technical Bulletin - No. 28

ORP Millivolts & Free Available Halogen Charts for Swimming pools and Cooling Towers

ORP millivolt levels vary with the pH value, and to a lesser extent with both temperature and T.D.S. or the ionic concentration and this can be confusing when trying to establish a millivolt set point to control a residual of Free Available Chlorine or Free Available Halogen.

Swimming pools need to have the pH controlled (for both water balance and for maximum disinfection efficiency) and usually is controlled between pH 7.4 and 7.6. Temperature does not vary by more than a few degrees and T.D.S. only increases very slowly over weeks or months. As the parameters vary only slightly the chart at bottom of page can be used to set ORP millivolts as automatic control of free chlorine levels on swimming pools. Typical values will be between 725 to 775 millivolts.

Cooling systems are allowed to concentrate up the make up water based mainly on the Calcium Hardness levels or sometimes the silica level. The resulting pH of the cooling systems (where acid dosing is not performed) will be a factor of the make up water and the level of concentrations. e.g. In Melbourne cooling towers will be at about pH 8.0, Adelaide, Perth, and Sydney (or Hong Kong) cooling towers will run about 8.5 and Brisbane at about 8.8 to 9.0 pH.

Most operators are familiar with a free halogen residual that they would like to maintain in their particular cooling system and the graphs on the following pages give millivolts settings and Free Available Halogen in ppm for

Bromicide, Dantobrom RW and Sodium Hypochlorite which should be helpful in selecting the correct millivolt level to obtain the desired FAH for the particular application.

Operating a cooling systems at 450 - 500 mV. will usually return HPC of about 10^3 or 10^4 cfu/ml and will provide this level of bacterial "kill" independent of the cooling system operating pH.

A direct relationship has been shown to exist between ORP (mV) and the kill time of microorganisms:

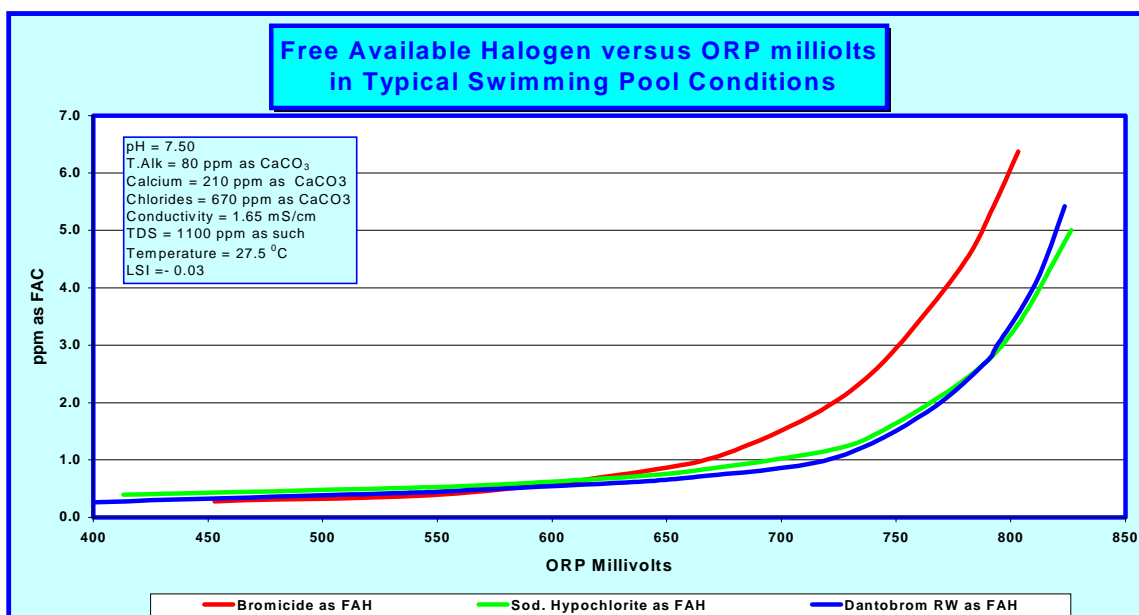
ORP (mV) KILL TIME for E. COLI

650 = 1 seconds
600 = 10 seconds
550 = 100 seconds
500 = 20 minutes
450 = 4 - 6 hours

Other organisms such as Listeria and Salmonella are also rapidly killed at 650 mV. However yeasts and molds may require ORP values greater than 750mV. for a rapid kill. The typical ORP in produce water disinfection is 650 mV.

Since ORP is the measure of disinfection, it does not matter what the oxidizer is, or what form of oxidizer is used. It may be chlorine, bromine, ozone, or others

For more information on ORP please refer to Aquarius Technical Bulletins No. 18 and No. 24.



ADVANCED TECHNOLOGY FOR THE NEW MILLENNIUM

