



GUIDELINES FOR BOILER BLOWDOWN AND CYCLES OF CONCENTRATION

The ASME (American Society of Mechanical Engineers) several years ago established water quality guidelines for boiler feedwater and boiler water. For boilers operating at pressures up to 1000 psig, these specifications are summarized below:

BOILER FEEDWATER				BOILER WATER		
Drum Pressure (psig)	Iron (as Fe) ppm	Copper (as Cu) ppm	Total Hardness ppm (as CaCO ₃)	Silica (as SiO ₂) ppm	Total Alkalinity** ppm (as CaCO ₃)	Specific Conductance (umhos/cm)
0-300	0.100	0.050	0.300	150	700*	7000
301-450	0.050	0.025	0.300	90	600*	6000
451-600	0.030	0.020	0.200	40	500*	5000
601-750	0.025	0.020	0.200	30	400*	4000
751-900	0.020	0.015	0.100	20	300*	3000
901-1000	0.020	0.015	0.050	8	200*	2000

*Total Alkalinity not to exceed 10% specific conductance.
 **Minimum level of Hydroxide (OH) alkalinity in boilers operating below 1000 psig must be individually specified with regard to silica solubility and other components of internal treatment.

The above specifications, although set for very good reasons, must be considered as good guidelines and not strictly applicable for all situations. Exceptions may be taken depending on operating conditions and the treatment programs employed. Examples are boiler water alkalinities and silica. In some lower pressure systems employing softened, high alkalinity makeup water, total alkalinities may be allowed as high as 1200 ppm when utilizing a specific boiler water antifoam and conducting a recommended embrittlement study. Similarly, silica concentrations can be allowed above those indicated where steam is not superheated or used in critical turbines and where effective dispersant programs are used.

The calculation for cycles of concentration is:

$$\text{Cycles} = \frac{\text{Concentration of dissolved solids in the boiler water}}{\text{Concentration of solids in the boiler feedwater}}$$

The above calculation assumes that all dissolved (ionized) solids in the feedwater remain dissolved in the boiler water. This is not normally possible due to the solubilities of the minerals in the feedwater being exceeded in the boiler water and thus precipitating out of solution as solids. The prime purpose of the boiler water treatment program is to prevent deposition of these solids as an insulating scale on the heating surfaces.