

Ground water - Do we treat correctly ?

Throughout the country there are lot of garment factories which have been working from mid-eighties. Most of these have low pressure boilers working below 10 bars and gives about 500 kg/steam per day. Also there are larger boilers in Sri Lanka operating at higher pressures and capable of giving high capacity.

The quality of the water used for such systems can be defined by following major parameters.

- a) Alkalinity
- b) Hardness
- c) Total Dissolved Solids (TDS)
- d) Silica

Though there are some other important parameters involves in defining water quality this research revolves around hardness and TDS which are premier concerns in industrial water usage.

A sample of feed water obtained from one of the boiler at Koggala EPZ gave the following test results.

- pH 8.0 at 28.9 C
- TDS 720 mg/L
- Total hardness as CaCO 280 mg/L
- Total alkalinity as CaCO 374 mg/L

This water supply is from ground water and samples taken from other areas including Kalutara, Matara and Hambantota showed some what lower result values but not very different. But the water taken from the general distribution systems (pipe borne) showed much lower test result values. For those systems total hardness was around 50 and TDS around 200 mg/L.

Analyzing above results we can see that ground water in this areas not very suitable to use as boiler feed water or for cooling systems.

The normal methods adopted by the around these areas are use of chemical treatment to convert the hardness in to soft sludge, finally removed by blow down and use of Sodium form Cation exchangers. On the occasions where we have to use well water of this quality as industrial supply, this treatment methods are not seems to be ideal.

Though the total hardness can be removed by the above methods successfully the Total Dissolved Solids can not be decreased upto required levels. The normal recommended value of TDS should be less than 2500 mg/L for a low pressure boiler. High pressure boilers demand much lower TDS values. It is easily seen that non TDS removing methods can lead to exceed the recommended values creating lot of problems for the systems.

Basically Total Dissolved Solids includes inorganic salts which have a particle size of diameter less than 10^{-6} millimeters. High TDS levels cause several disastrous problems. It improve formation of scales inside the boilers and cooling systems. These scales as we know mainly contains Calcium and Magnesium Carbonates reduce heat transfer causing over heating of heating elements. Higher levels of TDS also cause foaming and results boiler ^{water} to be carried with steam. The final end result will be depositions in steam lines and user points and erosion. The mechanical devices such as steam purifiers and separates are used for preventing carry over. These are not employed with some low pressure boilers. With high carry over these apparatus can also get clogged even when they are used.

The carrying over was clearly evident in the garment factories on which basically the research concentrated. Some scales had come out from metal joints of steam irons indicating that there may be scales inside the irons and there is a high carry over. These scales reacted with diluted acid giving a gaseous product giving an indication that it may be a Carbonate of Ca^{2+} or Mg.

According to the above finding outs it is seen that for treatment of well water in Sri Lanka (Mainly in coastal areas) demineralizers are the most suited method. Strongly acidic cation exchanger (H^+ form) will serve this purpose.

By using H^+ form ion exchangers where Ca^{+2}, Mg^{+2}, Na^+ and other cations of metals can be exchanged for H^+ . This will not increase the TDS simultaneously will remove the hardness. By using this type of ion exchangers (H^+) pure steam can be obtained and lesser problems will occur in boiler systems. Though the initial cost for the demineralizers is high energy saving and protection of heating elements will compensate for the initial cost. Moreover the water want be a culprit that creates deep concerns in you.