



phosphate hideout

"Phosphate hideout" and "chemical hideout" are terms used to describe the loss of boiler water phosphate residual that accompanies this solid phase formation problem.

The phosphate hideout phenomenon can pose a significant chemistry control problem in high pressure boilers that experience load variations.

Typically, phosphate tends to "disappear" as load (steaming rate load) is increased towards maximum. The pH will also vary, usually in an upward direction, although one would expect that the change in pH would be consistent with the change in Na:PO₄ ratio of the solution.

The upward trend in pH may be explained by an interaction between phosphate and magnetite that is also known to exist. Just as phosphate disappears with increasing load, so does it reappear with decreasing load, with concurrent impact on the system pH. Dissolution of the solid phase occurs as load is reduced.

Historically, "hide-out" had been regarded as an operating nuisance, which continually needed additions of tri-, di-, and mono-sodium phosphates to keep the boiler water in the CPT control range. However, it has been recognized recently that serious corrosion (termed "acid phosphate corrosion") can result when these chemicals are added to boilers where "hide-out" and deposition are occurring.

The acid phosphate corrosion also prompted Babcock & Wilcox to issue a service bulletin warning all utility customers of a potential chemistry control problem when using mono-sodium phosphate that could lead to serious furnace tube corrosion.

Phosphate "hide-out" is characterized by the retention of phosphate in the boiler during conditions of high load, and its subsequent release when the load is reduced. Various studies of the pure sodium phosphate water phase diagram suggest that "hide-out" is caused by the precipitation of sodium phosphate phases at local hot spots and under deposits.

Very high concentrations of phosphate accompanied by extreme pH excursions, may arise from incongruent precipitation reactions at local sites when "hide-out" takes place.

The periods associated with severe pH depressions often correspond to times when the applied strain is the highest for corrosion fatigue at various locations throughout the boiler.

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