

## A STUDY OF BOILER WATERS IN HIGH PRESSURE PLANTS\*

BY

D. B. KEYES

*Chemical Engineering Division,  
University of Illinois, Urbana, Illinois*

### ABSTRACT

The occurrence of calcium sulfate scale in ordinary boiler operations, the common practice of treating the water in order to prevent the formation of this particular compound, and the conditions of its formation in the ordinary boiler operating at 250 pounds pressure is well known.

High pressure boilers up to 2,000 pounds pressure have been recently constructed in this country and abroad. The higher efficiency of operation has caused considerable interest in these particular plants. Unfortunately, no data are available on the solubility of calcium sulfate under the new conditions, the solubility of many other salts present in ordinary boiler waters, or the effect of one soluble salt on another. The problem of operation at these high temperatures and pressures becomes a serious one. Work was started in the Chemical Engineering Division at the University of Illinois some years ago in order to ascertain the solubility of all these salts under these new conditions, and the effect of one upon the other.

It is realized that scale formation under high temperature conditions is likely to materially retard heat transfer and cause a hot spot in the metal and the failure of the tube or drum due to the high pressure. Such failures are likely to be disastrous, not only from the standpoint of property damage but also from the standpoint of loss of life.

The preliminary results of these tests, as far as calcium sulfate scale is concerned, indicate that the use of a small amount of soda ash will prevent the formation of calcium sulfate scale at high temperatures and pressures, and at the same time sufficient sulfate ion can be maintained to prevent embrittlement of the boiler plate.

In conclusion, it may be said that solubility studies at high pressure and high temperature will not only be valuable from the standpoint of the power plant operator but should supply data which will be of real use to everyone who is attempting to remove salts from water solution and who can utilize both high pressure and high temperature.

\* This work was done by Professor F. G. Straub of the Chemical Engineering Division, Engineering Experiment Station, University of Illinois. The work has had the financial support of the Utilities Research Commission Incorporated, of Chicago, Illinois. Further details of the work have been published in the Transactions of the American Society of Mechanical Engineers, 54, (21) 223, Nov. 15, 1932.