

THE EFFECTS OF SCALE

Introduction

Have you ever wondered how much scale deposits in a steam boiler were costing you in terms of excess fuel costs?

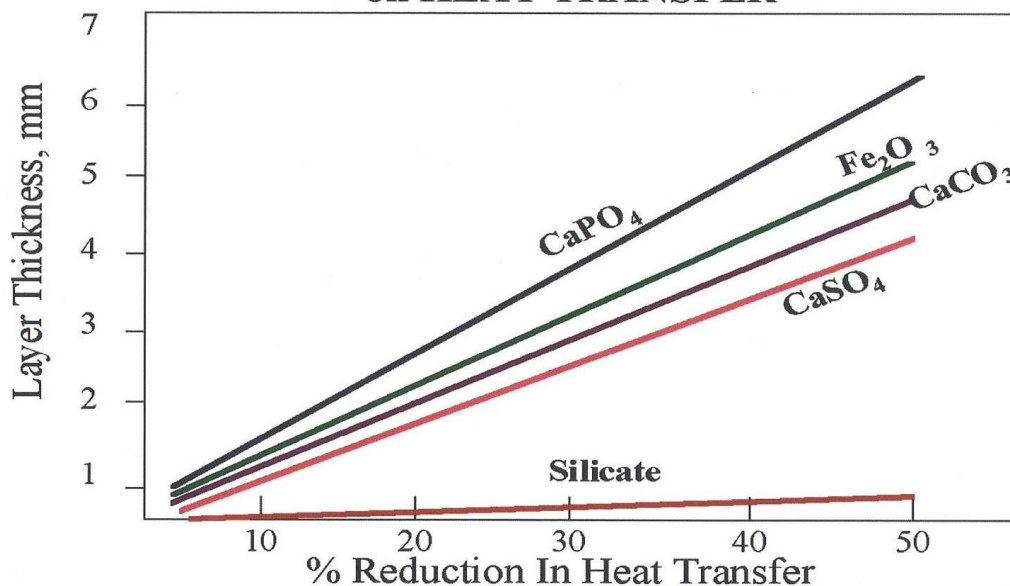
What you find may surprise you.

Impact of Scale on Heat Transfer Efficiency

In a boiler, fuel is burned to generate heat energy. From an efficiency standpoint, the objective is to transfer as much heat energy as possible from the hot combustion gases to the boiler water. Because scale deposits are insulating, they reduce how efficiently heat from the combustion gases is transferred through the metal boiler tubes to the water. This reduced heat transfer efficiency means that in a dirty boiler, more of the heat goes out the stack instead of being converted into steam. This reduced heat transfer efficiency also means that in a dirty boiler, more fuel must be burned to generate the required amount of steam versus a clean one.

As the "Impact of scale and deposits on heat transfer" graph shows, some deposits are more insulating than other. For example, 1mm of a silicate scale reduces heat transfer efficiency by 50%, while it takes 4mm thick layer of a calcium carbonate scale to reduce efficiency by the same figure. To accurately estimate the excess fuel costs associated with a scaled boiler, an estimate of the average deposit thickness and what it is made of is needed.

**IMPACT OF SCALE AND DEPOSITS
on HEAT TRANSFER**





The High Cost of Poor Scale Control

To fully appreciate the high cost of poor scale control, real cost data needs to be considered, not just percentages.

As the table below shows, the excess energy cost associated with a scaled boiler is phenomenal. Quite often the payback in terms of reduced fuel costs runs into the tens of thousands and even hundreds of thousands of dollars if your boiler is large. Thus doing a chemical cleaning job, installing better feed and control equipment, or an improving your boiler treatment program could pay for itself many times over. And with natural gas costs on the rise ([Article](#)) the payback on doing whatever is necessary to maintain a clean boiler has never been greater.

Table - High Cost of Scale Deposits in a Steam Boiler

| Boiler Load | Excess Annual Fuel Cost | | |
|--------------------|--------------------------------|------------------|------------------|
| | <i>0.4mm</i> | <i>0.8mm</i> | <i>1.6mm</i> |
| 250 HP | \$19,743 | \$40,294 | \$84,089 |
| 1000 HP | \$78,971 | \$161,177 | \$336,355 |