

GENERAL DISCUSSION

MR. JOHN W. WOOD.¹—Mr. Blaser made the comment, slightly shocking to me, that there was little effect, if any, on the rate of corrosion by changes in pH. I would like to ask a couple of questions in connection with this.

First, I should like to ask whether or not this observation referred to tests made with some particular corrosion inhibitor in addition to pH control, and second, whether there was any note made of changes in the type of corrosion that occurred with changing pH.

MR. D. M. WROUGHTON (*author*).—The tests I spoke of, which attempted to isolate the effects of pH, were run with no additions other than the reagent used to control the pH.

I think Mr. Blaser might well answer the second part of the question, but I will make a pass at it, and if he objects, he can speak up.

I do not believe there was any profound difference between neutral pH and high pH as far as the character of the corrosion is concerned.

MR. R. U. BLASER (*author*).—Regarding Mr. Wood's comment, there appears to be a greater effect of pH in reducing corrosion of carbon steel than for stainless materials or intermediate alloys. The effect is sufficient to justify the use of some kind of pH control if it is compatible with other system requirements. However, as long as a pH of 10 or more is maintained, variations above this level or in the chemical additions used to obtain pH control caused little change in the corrosion of carbon steel at 600 F.

Whether carbon steel is ultimately used in equipment for nuclear power plants, with or without water treatment of some kind, will probably depend upon many other characteristics of the system considered. In turn, these characteristics are ultimately related to the nuclear aspects which are not fully discussed in this symposium.

MR. O. M. ELLIOTT.²—This is a comment on the excellent papers presented at this Symposium. You have seen that the problem of constructing a nuclear reactor heat transfer system is an economic one, in which, when you try to use low-cost standard metals, you run into corrosion problems that can be solved by the use of high-cost materials.

Perhaps the solution is to use a combination of the two metals, in some sort of cladding arrangement. But clad materials do not stand temperature shocks very well. However, there is a new process that is now in commercial operation for the chromium diffusion coating of ordinary mild steel, and a small plant for carrying out this process is in operation in Philadelphia, Pa.³

I have made some tests on the product. The chromium coating is about 0.01 in. thick and is attached very well by a diffusion of the chromium into the steel crystals. There is also a replacement of surface iron by chromium so that there is no appreciable dimensional change. The surface is much denser than for electroplating.

The process at the present time is

¹ E. F. Drew & Co., Power Chemicals Division, Boonton, N. J.

² Sun Oil Co., Philadelphia, Pa.

³ Alloy Surfaces, Inc., 1115 N. 38th St., Philadelphia, Pa.

applicable to steel tubes about 12 ft long, inside and outside, and other shapes. It is carried out in a manner similar to case hardening, where the metal is packed in a powder and heated to a fairly high temperature in a furnace for a period of about one day. Under the reducing conditions in the powder, the chromium diffuses into the steel and also replaces some of the steel surface. Thus the inside of pipes as well as the outside can be clad.

MR. FRANK E. CLARKE.⁴—I should like to review briefly where we came from and where we are heading. When the first A-bomb was dropped, it did such terrible damage that no one guessed atomic power might be harnessed with anything so commonplace as mild steel. Super alloys were the logical choice, and unfortunately mild steel was not even included in the early experiment for reference purposes.

We have just heard several papers on

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the effects of high-purity water on the super alloys and mild steel. They give the impression that the program is drifting slowly toward mild steel systems, but they do not say so outright nor do they indicate serious deficiencies in the super alloy systems. Actually we may be rushing toward mild steel. If this is so, we should admit it. Otherwise, the metallurgist will continue trying all sorts of means for protecting the vulnerable stainless steel, and the chemist will continue working on almost impossible micro tests for chloride and dissolved oxygen which cannot exist together in such systems.

A scientist owes it to his contemporaries to admit when he has made a mistake. This is particularly important if failure to do so will cost money and time. In other words, why not let the newcomers profit by all of our experience and tell them the real reason behind the sudden interest in mild steel. Such frankness may pay dividends in the progress of atomic power.