

THE PROBLEM OF CORROSION

AN ABSTRACT

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Man's struggle against corrosion dates from his earliest uses of metals and has continued right up to the present. In the intervening years man's knowledge of wise usage of metals has increased tremendously and this increase is related, in no small measure, to the discovery of the nature of corrosion processes and subsequent means of controlling them. Our knowledge of corrosion is now considerable and it seems safe to say that an understanding of corrosion is completely dependent on the prior understanding of chemical and physical processes, especially electrochemical processes. The more we study corrosion, the more we realize that basically, corrosion reactions are natural processes that occur whenever a difference in the electrical potential exists between metals. This may involve two kinds of metals in contact with an electrolyte (galvanic action), or it may involve a potential difference, caused by the environment, between separate points on a single metal surface (concentration cells). Potential differences also exist due to peculiarities of metallic crystalline structure itself. These differences may be responsible for intergranular corrosion, stress corrosion cracking and leaching. As we study corrosion we also, therefore, realize that it

can frequently be controlled or avoided if we understand the conditions that cause corrosion currents to flow.

When we understand both the nature of corrosion and the conditions under which it operates, we can know what action to take to prevent or minimize the corrosion. We can, for example, choose the right materials for a given environment; that is, metals that do not develop differences in potential which are large enough to initiate a corrosion reaction.

Sometimes, we can adjust the environment to prolong the life of equipment that already exists such as by the addition of a chemical inhibitor to automobile radiators to prevent rusting. Inhibitors render the environment non-reactive or provide one that forms protective films.

We can apply an electric current to counteract the natural corrosion currents, a remedy called cathodic protection. We can give the metal a protective coating of paint, fabric, or some other more corrosion resistant metal. We can develop new alloys to meet a given situation. We can design and construct equipment free from built-in opportunities for corrosion currents to flow, as by avoiding crevices.

Many new and promising methods of combatting and dealing with corrosion are now appearing. It is reasonable to expect that we will be able to bring corrosion problems more and more under our control as time passes. But as our technology advances, new problems will arise and, therefore, we must continue to strive for more complete understanding of corrosion

problems. Through understanding we can often control, and when we control corrosion, we are helping to save millions of dollars every year in damaged machinery. We are helping to conserve our natural resources by making metals last longer and we are even helping to save human lives by reducing accidents due to failure of corroded parts.