PG Semester – IV

Elective course – 1b: Physical Chemistry Special

Unit – V (A): Corrosion

Cost of corrosion (contd.):

"Political" considerations are also a factor. We depend largely on foreign sources for some metals: 90 percent for chromium (the main alloying element for stainless steel) and 100 percent for columbium (niobium) used in high temperature alloys. Our sources could be shut off or the prices boosted. For example, during a recent crisis the price per pound of columbium jumped from $5 to $50.

Production of metals used for corrosion resistance and to replace corroded parts require large amounts of energy, thus compounding the nation's energy problems.

The most comprehensive study of the annual cost of metallic corrosion in the United States was conducted by the National Bureau of Standards (NBS) and Battelle Memorial Institute in response to a congressional directive. Results are published in a seven-part series. The first is, "NBS Battelle Cost of Corrosion Study ($70 Billion) Part 1-Introduction," by J. H. Payer, W. K. Boyd, D. B. Dippold, and W. H. Fisher of Battelle (Materials Performance, May 1980). The other six parts appeared in subsequent issues of Materials Performance (June-November 1980). The figure of $70 billion* covers corrosion (in 1975) of metals (nonmetallics not included) and are costs incurred if corrosion did not exist; this amount has no practical significance, but it does emphasize the magnitude of the problem. Unfortunately, $70 billion has been simply stated as the "cost of corrosion" in later literature and is misleading (implying that $70 billion could be saved) because nothing can be done economically to reduce most of these costs. It is somewhat like asking how much you could save on your food budget if you stopped eating. However, the report states that about $10 billion could be saved if best, and presently known,

practices to combat corrosion were applied. Chemical industry efforts involve high costs, but this industry is in the forefront with regard to utilizing corrosion control practices.

In fact, our economy would be drastically changed if there were no corrosion. For example, automobiles, ships, underground pipelines, and household appliances would not require coatings. The stainless-steel industry would essentially disappear and copper would be used only for electrical purposes. Most metallic plants, as well as consumer products, would be made of steel or cast iron.

Although corrosion is inevitable, its cost can be considerably reduced. For example, an inexpensive magnesium anode could double the life of a domestic hot water tank. Washing a car to remove road deicing salts is helpful. Proper selection of materials and good design reduce costs of corrosion. A good maintenance painting program pays for itself many times over. Here is where the corrosion engineer enters the picture and is effective his or her primary function is to combat corrosion.

Aside from its direct costs in dollars, corrosion is a serious problem because it definitely contributes to the depletion of our natural resources. For example, steel is made from iron ore, and our domestic supply of high grade directly smeltable iron ore has dwindled. Another important factor concerns the world's supply of metal resources. The rapid industrialization of many countries indicates that the competition for and the price of metal resources will increase. The United States is no longer the chief consumer of mineral resources.