PHORGOTTEN PHENOMENA

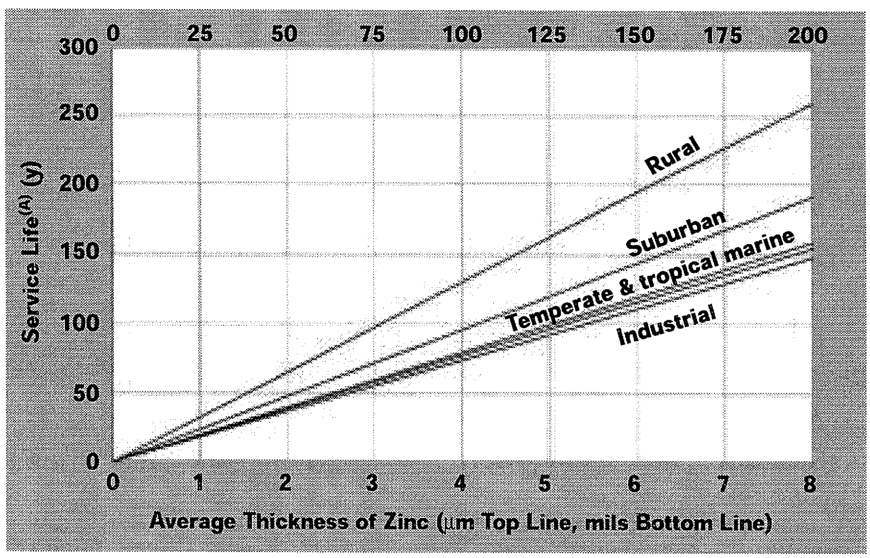
Hot-Dip Galvanized Steel in Pulp & Paper Plants

PHILIP G. RAHRIG, *American Galvanizers Association*

The pulp and paper industry is committed to operating with reduced emissions in the microenvironment of the production area. The air quality has improved in the macroenvironment of the surrounding community and cities to comply with complementary legislation and regulations. As a result of these actions, corrosion rates of Zn have decreased dramatically in pulp and paper plants during the last 20 years. Zn is the metal used in the hot-dip galvanizing process to protect steel columns, beams, stringers, girts, purlins, stairs, handrails, access grating, and checker plate from the corrosive attack of chlorides and sulfides in and around these plants.

A long-term study conducted by Noranda, Inc. (Toronto, Ontario), one of the world's largest Zn producers, documents the performance of hot-dip galvanized (HDG) steel in the microenvironment of several plants during the 1980s. Corrosion rates of Zn were found to be <0.1 mpy (2.5 µm/y). Having a minimum coating thickness of 3.4 mils (86.3 µm) of Zn (required to meet the hot-dip galvanizing specification ASTM A123[1]) provided several decades of corrosion protection of structural steel in the brown stock and thermal mechanical pulping (TMP) buildings

FIGURE 1



Service life chart for HDG coatings in various environments.

(A)Service life is defined as the time to 5% rusting of the steel surface.

Note: 1 oz/ft^2 ~ 1.8 mils

and in the black liquor recovery boiler area. This study, as well as data accumulated from many other microenvironment studies that were conducted from the 1930s to the 1980s, provided specifiers of corrosion protection systems with a very accurate means of predicting service life.

Air quality improved considerably from both micro- and macroenvironmental perspectives in the late 1980s and throughout the 1990s. During this period, industry curtailed its use of many of the compounds that increase the corrosion rate of the HDG steel Zn coating. Hence the service life of the steel was extended. Paper mill designers and specifiers of corrosion protection systems for the brown stock and TMP buildings, the black liquor boiler, utility bridges, and walkways could now look forward to nearly maintenance-free structures for upwards of 60 years.

Using statistical methods, neural network technology, and an extensive worldwide corrosion database, a model was developed to accurately predict either the corrosion rate of Zn or the service life of HDG steel in any environment.

The environmental data input required to estimate a corrosion rate includes temperature, airborne salinity, sulfur dioxide (SO_2) concentration, relative humidity, and amount of rainfall, and sheltering condition (indoor, rain-sheltered, or outdoor). By inputting data into the model for a number of locations in an array of environments, a chart can be produced that provides estimates of service life (Figure 1).

With the exception of the bleaching area, where HDG steel is painted to provide a duplex corrosion protection system, it is possible to economically achieve a virtually maintenance-free structure at a pulp and paper facility.

Reference

1. ASTM A123, "Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products" (West Conshohocken, PA: ASTM, 1997).

PHILIP G. RAHRIG is the Executive Director of the American Galvanizers Association, 6881 S. Holly Cir., Ste. 108, Centennial, CO 80112. He has managed market development programs and technical research to support the successful application of HDG steel in myriad markets, including pulp & paper, bridges and highways, stadiums, and utilities. MP