TALKING POINTS

HOT-DIP GALVANIZED STEEL vs. PAINT LIFE-CYCLE ASSESSMENT CASE STUDY- PARKING STRUCTURES

Based on its maintenance-free durability for 75 years or more in most environments, hot-dip galvanized (HDG) steel has a lower economic cost and environmental impact than paint. It uses a healthy, abundant, and recyclable metal, zinc, to provide corrosion protection, therefore it should be considered the preferred construction material for architectural and industrial applications.

To measure the sustainability of hot-dip galvanized steel and provide a basis for future improvements in life-cycle performance of zinc products, the Institute for Environmental Protection Technology at the Technical University of Berlin, conducted life-cycle assessments (LCA) comparing a hot-dip galvanized parking structure to a painted parking structure.[1] The scope of the LCA is shown pictorially in *Figure 1* below.

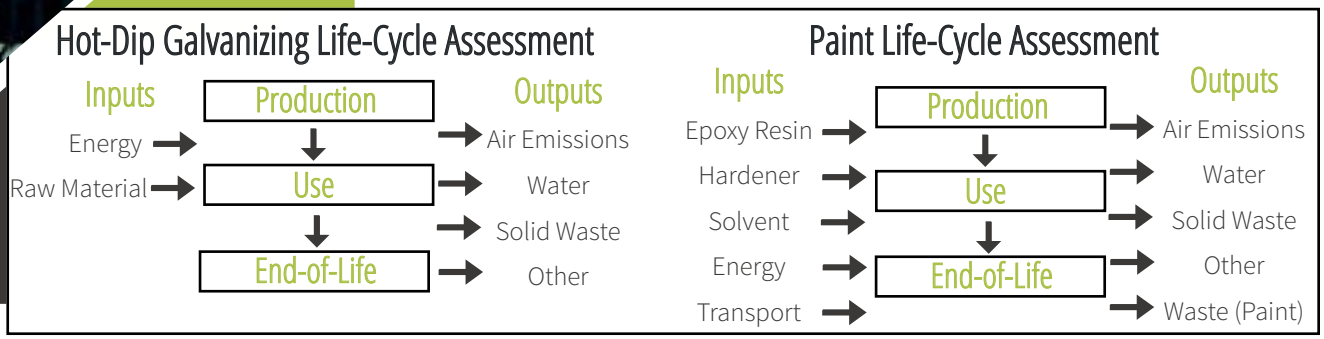

Figure 1

The environmental impact categories assessed were those most commonly applied in LCA studies and "green building" rating systems such as Leadership in Energy and Environmental Design (LEED®) – i.e. use of energy and natural resources and the impacts of emissions on global warming potential (GWP), acidification potential (AP), and photochemical ozone creation potential (POCP) i.e. smog.[2]

Case Study Parameters

- 60-year service life
- Galvanized coating corrosion rate of 1.0 micron per year (ISO 1461, C3 environment)
- 1 m2 steel part (20m2/metric ton)
- Paint system – 3-coat, 240 microns thick
- Maintenance painting year 20 and 40 (ISO 12944)[3]

CASE STUDY- PARKING STRUCTURES

Results

The contributory factors for the hot-dip galvanizing system are lower in all effect categories than for the paint system, primarily because the painted parking structure requires periodic maintenance. The total energy and resource consumption during the production, use, and end-of-life phases for the hot-dip galvanizing is just 32% of that required for the painted parking structure, and the GWP (CO_2 emission) is 38% of paint. Furthermore, the POCP (smog) for hot-dip galvanizing is 33% less than paint, and the AP is 15% less (*Figure 2*).

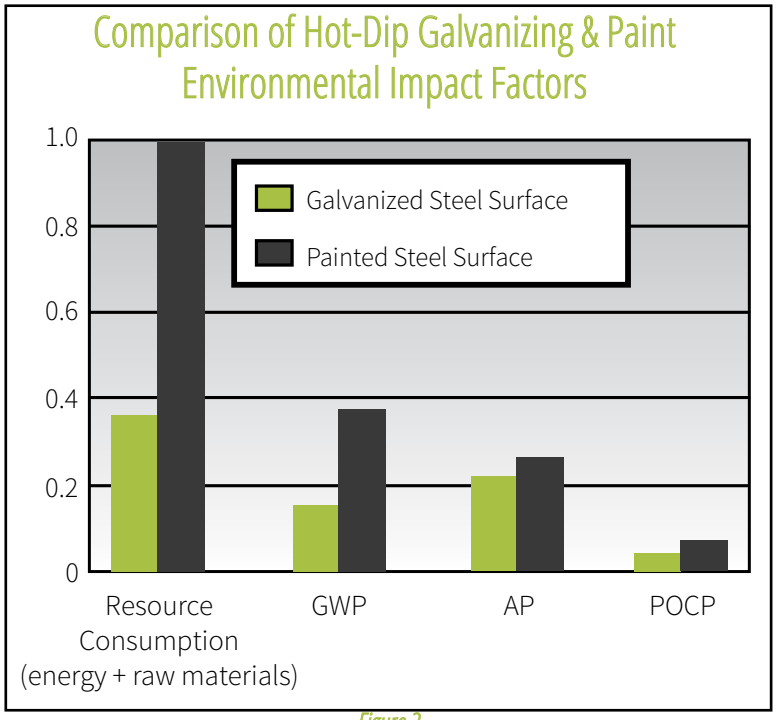

Figure 2

Conclusions

This study has quantified the principal environmental impacts for both a galvanized steel parking structure and a painted parking structure. For the contributory factors considered, the efficiency and durability of the galvanized parking structure provided for significantly lower life-cycle environmental indicators than the painted structure.

Hot-dip galvanized coatings make economical sense, too. The initial cost of a hot-dip galvanized coating is often less than or equal many paint systems utilized for corrosion protection of architectural and structural elements. Additionally, galvanizing's life-cycle cost is almost always far less. For an economic cost analysis example, see *Hot-Dip Galvanized Steel Costs Less, Lasts Longer.*

[1] Woolley, Tom B. Arch. PhD, Galvanizing and Sustainable Construction: A Specifiers' Guide, 2008

[2] The results were calculated using the recognized CML 2 baseline 2000 method.

[3] A number of assumptions were made, most notably; the maintenance painting of the structure has the same durability and environmental profile as the original paint application. This was a conservative assumption, but was necessary due to the lack of available environmental data on in-situ maintenance painting.