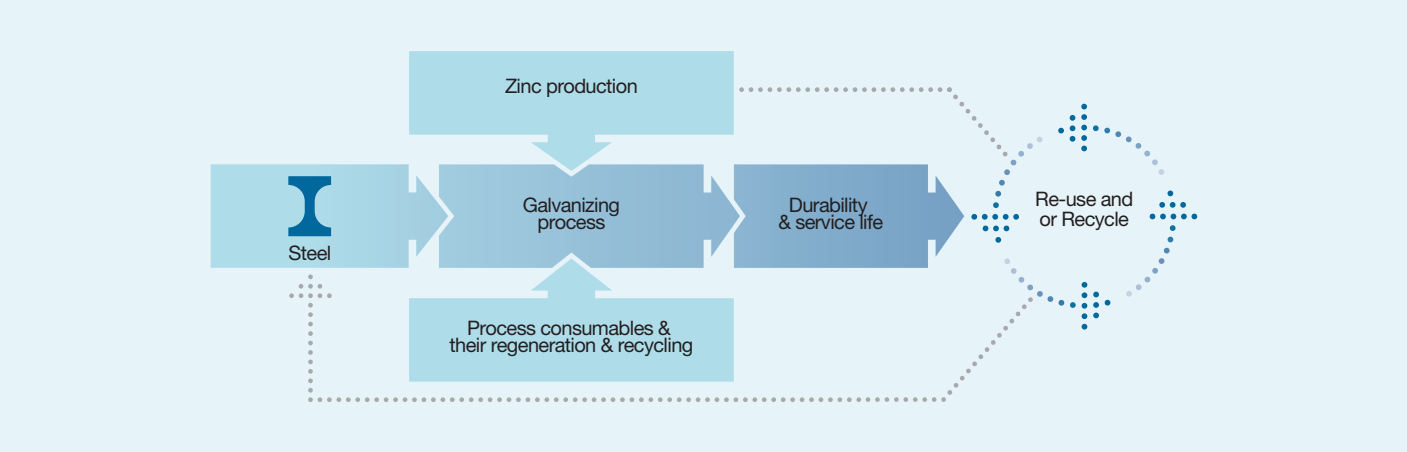
ENVIRONMENTAL PRODUCT DECLARATION

HOT DIP GALVANIZING

INTRODUCTION

The European galvanizing industry has recognised the need to publish reliable environmental information for the hot dip galvanizing process.

The data in this Environmental Product Declaration shows that the benefits of long-term durability of steel products can be achieved at a relatively low additional environmental burden.

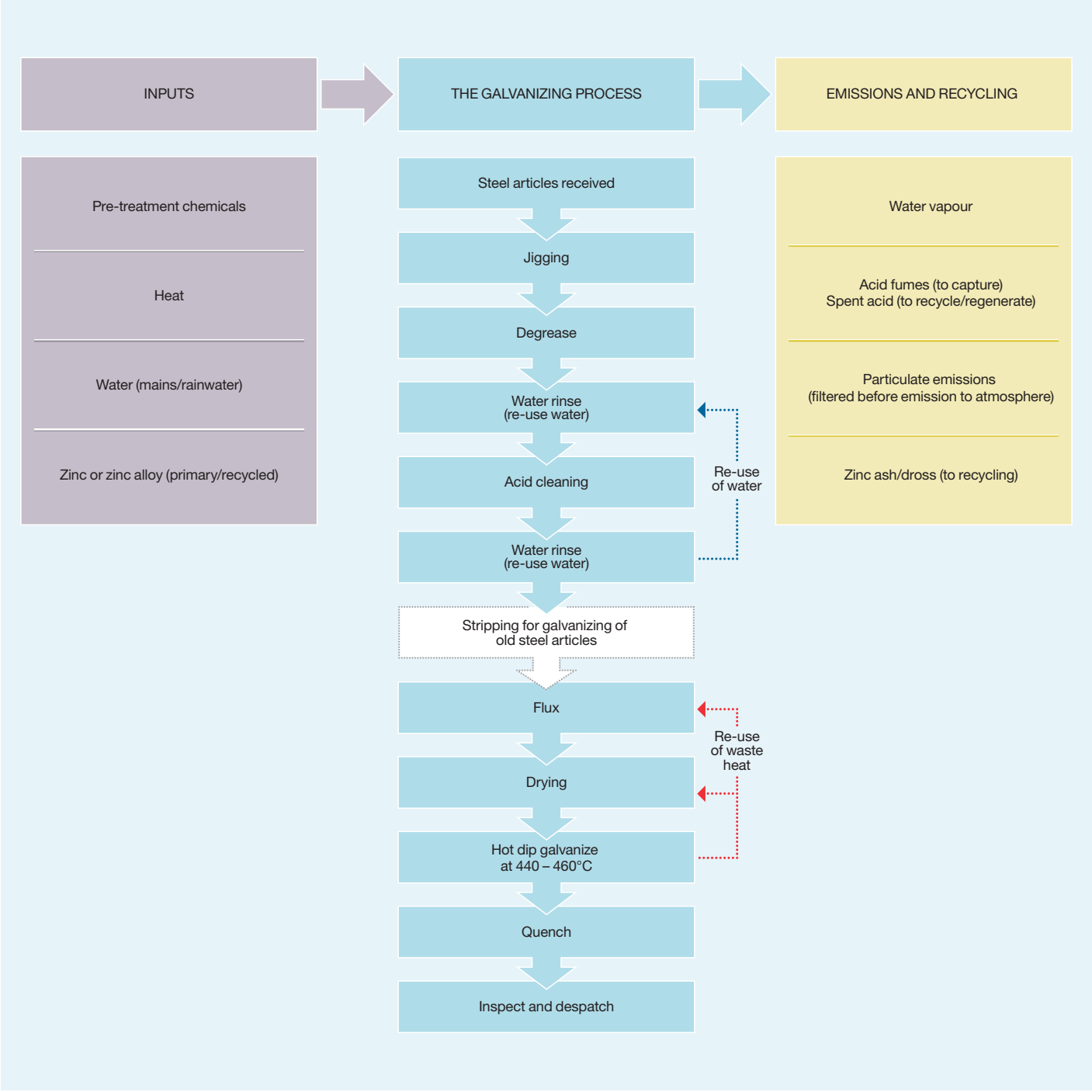


The life cycle of hot dip galvanized steel.

THE GALVANIZING PROCESS

Hot dip galvanizing is increasingly used to provide long-term corrosion protection for an ever-wider range of steel products and structures.

Steel articles are immersed into molten zinc to apply a thick, tough galvanized coating that will often protect the steel for the lifetime of the product or structure.



THE GALVANIZING PROCESS:

Inputs, emissions and recycling flows.

METHODOLOGY

In 2005, a major project was undertaken to collect environmental performance data from 46 typical European galvanizing plants. The result was the first ever 'Pan European Life Cycle Inventory (LCI) for Batch Galvanized Steel'.

LCI data is a vital tool for the detailed study of the life cycle environmental impacts of products and services. However, LCI data is not easy for product users to interpret and it is now increasingly common to communicate environmental performance through the simpler format of an environmental product declaration (EPD).

Hot dip galvanizing is a service of corrosion protection that may be supplied from a variety of operators that will not be identifiable at the specification stage in, for example, construction projects. A strictly 'corporate' EPD may therefore be less useful for this type of corrosion protection service.

Against this background, the European General Galvanizers Association (EGGA) appointed the Italian consultancy, Life Cycle Engineering, to generate a 'sectoral' EPD for the hot dip galvanizing of steel products using EGGA's existing LCI data for hot dip galvanizing and published data for steel products. The EPD was developed using the methodology of the International EPD® System first established by the Swedish Environmental Management Council.

This EPD has been established according to the Product Category Rules (PCR) for *'Corrosion Protection for fabricated steel products PCR 2006:1'*. In line with the PCR, the basis shown in Table 1 was used.

TABLE 1

Substrate	Steel plate of dimensions 1m x 1m x 5mm and weight of 39kg
Galvanized coating thickness	80 microns
Exposure environment	Category C3 (as defined in EN ISO 14713) with a zinc corrosion rate of 1.35 microns/year
Predicted maintenance-free coating life	Minimum of 59 years
Units (results)	Burdens per year of protection

The choice of environmental impact categories included in this EPD is also defined by the PCR and is shown in Table 2.

These are the most important aspects of interest to product users. In addition, information is presented on energy consumption and waste generation.

For information on the methodology used in this Environmental Product Declaration, including the Product Category Rules that have been applied, visit: www.environdec.com

TABLE 2

Global Warming Potential	The increase of global temperatures due to emissions of greenhouse gases.
Acidification Potential	The damage caused to trees and life in rivers and lakes due to change in pH arising from release of acidifying gases to the air.
Photochemical Ozone Creation Potential	Emissions of volatile organic compounds and nitrogen oxides can interact to cause smog that can be harmful to human health and the environment.
Eutrophication Potential	A form of water pollution that can result in acceleration of natural oxygen depletion in waters which damages aquatic ecosystems.
Ozone Depletion Potential	Emissions of CFC and other gases decrease ozone concentration in the upper atmosphere. This damages the ozone layer that protects life on earth from harmful ultraviolet radiation.

RESULTS

Results are shown in Tables 3 to 5. These results show that the benefits of long-term corrosion protection can be achieved at a relatively low additional environmental burden.

Although these results are simply expressed, there are two important points to remember when looking at the data:

1. To allow comparison with other materials, the environmental burdens of the steel substrate are also included in the results – but the results for the galvanizing alone have been shown separately. It can be seen that the investment in long-term corrosion protection has a very low environmental burden when seen as part of the whole product system.

2. The data are presented without applying a 'recycling credit' to either the steel or its zinc coating. A credit is normally applied in a life cycle analysis (LCA) for steel products but has been omitted in this EPD because the precise level of recycling has been difficult to determine in a sectoral EPD that is not specific to a certain product. In reality, both steel and zinc are subject to a high level of recycling from end-of-life steel products and structures. This EPD will be updated to include a recycling credit when this data has been identified.

The results given in Tables 3 to 5 are stated according to the functional unit required by the PCR – i.e., burdens per 'year of protection'. The results can be converted to burdens per 'kilogramme of steel galvanized' by multiplying by 1.51 (this factor takes account of the weight of the plate and the predicted maintenance-free life).

TABLE 3: Resource consumption

		Total (steel + galvanizing)	**Galvanizing**
Resources with energy content (MJ/year of protection)	Total renewable	0.3	0.1
	Total non renewable	18.0	1.7
	TOTAL	**18.3**	**1.8**
	Direct electricity (galvanizing process)	**0.05**	
Resources without energy content (g/year of protection)	Total renewable	76	3.8
	Total non renewable	1166	28.5
	TOTAL	**1242**	**32.3**
	Water	12000	423

TABLE 4: Environmental impact indicators

Indicator	**Units** (per year of protection)	**Total** (steel + galvanizing)	**Galvanizing**
Global warming potential (GWP100)	kg CO_2 eq.	1.55	0.11
Acidification potential	g SO_2 eq.	4.02	1.08
Photochemical ozone creation potential	g C_2H_4 eq.	0.31	0.04
Eutrophication potential	g PO_4^{3-} eq.	0.34	0.06
Ozone depletion potential	g CFC11 eq.	0.00	0.00

TABLE 5: Waste Generation

Indicator	**Units** (per year of protection)	**Total** (steel + galvanizing)	**Galvanizing**
Non-dangerous waste	kg	1.2	0.2
Dangerous waste	kg	0.00	0.00

EUROPEAN INITIATIVE FOR GALVANIZING IN SUSTAINABLE CONSTRUCTION

The European general galvanizing industry's response to the challenge of sustainable construction.

This includes a number of initiatives to generate relevant environmental data and explore the use of galvanizing in achieving more sustainable buildings and structures.

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FURTHER INFORMATION

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Further information on all aspects of sustainability and hot dip galvanizing can be found in 'Galvanizing and Sustainable Construction: A Specifiers' Guide' (2008). This book is edited by Professor Tom Woolley (Centre for Alternative Technology, UK) and has been published in English, German, Dutch, Spanish, Italian, French, Czech and Swedish.
Copies are available from national galvanizers associations.

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