energy transition in the Benelux

Were do we stand and how to get to net zero

Contents

1 What falls within this presentation?

The scope covers direct consumption within scope 1 and 2, more specific the consumption of energy on site. With the exception of external transport.

- Oil
- Diesel
- Gas
- Electricity

2 What falls within witch scope ?

Scope 1 Direct CO2 emissions caused by own sources within the organisation. This refers to emissions from its own construction, transport and production-related activities. Examples include:

Gas consumption

Fuel consumption of everything leased or owned

Scope 2 This includes indirect emissions of CO2. These are emissions that arise from the generation of electricity, heat and cooling and steam in facilities that are not part of our own operations, but are used by the organisation.

Electricity consumption

Fuel consumption hired transport

Scope 3 These are emissions that arise as a result of the organisation's activities, but from sources not owned and operated by the organisation. These are emissions over which the organisation has no direct control.

emissions from transport or production that is outsourced or waste processing

emissions from business air travel

emissions from business travel by private transport

emissions from production or consumption of goods or semi-finished products.

3 Where is the CO2 caused?

Scope 1

What is the (typical) scope 1 consumption of a galvanising line? 1990 > 2000 > 2010 > 2020 > 2030

Energy consumption per ton of galvanised steel	Oil > GAS > ELECTRIC =scope 2
Pre-treatment + offices	Oil > GAS > ELECTRIC=scope 2
Drying chamber	Oil > GAS > ELECTRIC=scope 2
Forklift (diesel)	FUEL > ELECTRIC=scope 2
Material transport (if own truck)	FUEL > ELECTRIC=scope 2
Company cars (owned or leased)	FUEL > ELECTRIC=scope 2

3 Where is the CO2 caused?

example scope 1 savings from 1990 to 2030

- better ovens through better insulation
- smarter burner systems for furnaces
- ceramic coating of furnace walls
- better covers for off production time
- furnace heat recovery for dryer
- furnace heat recovery for hot water
- more production on less galvanizing lines
- less idling time (pure waste)
- better production volume per line
- transport from fuel to (green) electric
- heat pumps for hot water

3 Where is the CO2 caused?

What is the (typical) scope 2 consumption of a galvanising line?

E-consumption when producing 2 shifts	ELECTRIC > GREEN
E-consumption when idling	ELECTRIC > GREEN
Everything moved from scope 1 to electric	ELECTRIC > GREEN
Material transport (if you order the transport)	FUEL > ELECTRIC > GREEN
Energy from other companies (such as district heat)	FUEL > ELECTRIC > GREEN

3 Where is the CO2 caused?

All benefits in the supply chain are scope 2 savings

Convert power plants from coal, lignite to gas

wind power

nuclear power

solar energy

e.g. absolute scope 2 savings from 1990 to 2030

- All use electricity transformed to green power
- LED lighting
- Variable speed drives on screw compressors
- Solar energy (local)

3 Where is the CO2 caused?

Scope 3

What is the (typical) scope 3 consumption of a galvanising line?

- Transport or outsourced production or waste processing
- Business air travel
- Business travel by private transport
- From production or consumption of goods or semi-finished products

This last item includes zinc

In zinc, we have two major savings

1st You can buy "green" zinc, this is a big part because we use a lot of zinc, and extracting zinc takes a lot of energy.

2nd The use of zinc has become less due to better control of bath chemistry (hard zinc and ash) and thinner layers especially on thick materials by alloying the zinc.

4 from theory to practice

Usage in 1990 based on the total volume of Zink Info Benelux members, and the quantity of lines from 1990

1990	Netherlands	205,000 tons	23 lines
	Belgium	171,000 tons	17 lines
		376,000 tons	40 Lines
2020	Netherlands	295,000 tons	15 lines
	Belgium	196,000 tons	12 lines
		491,000 tons	27 Lines

5 calculation of CO_2

Energy consumption per tonne of galvanised steel

There were more small lines with less volume. the use cannot be specified exactly.

In the presentations of previous EGGA Intergalva assemblies, we found a usage of 480-950 kWh/tonne, with the high range being spinning lines.

Our calculation assumed an average of 580 kWh/tonne.

(At that time, the averaged was less than 10,000 tonnes per line)

20% of the lines ran on heavy oil (the rest on gas)

5 calculation of CO_2

Scope 1

furnace

GAS USE 376,000 tonnes * 80% *580 kW/ton = 174,464 MWh	35,505 Tons of CO2
OIL USES 376,000 tonnes * 20% *580 kW/ton = 43,616 MWh	11,662 Tons of CO2

pre-treatment + offices 15% of the gas or oil . 40% on oil and 60% on gas

GAS USE 376,000 tonnes*15% * 60% *580 kW/ton = 19,627 MWh	3,994 Tons of CO2
OIL USES 376,000 tonnes *15% * 40% *580 kW/ton = 13,084 MWh	3,616 Tons of CO2

drying chamber, 10% of total gas or oil.

GAS USES 376,000 tonnes *10%* 80% *580 kW/ton = 17,446 MWh	3,550 Tons of CO2
OIL USE 376,000 tonnes *10% * 20% *580 kW/ton = 4,361 MWh	1,166 Tons of CO2

5 calculation of CO_2

forklift (diesel)

To move 376,000 tonnes with a forklift truck, we estimated the number of movements and the time required to do so.

We need 5 movements to get one parcel across the line. One parcel is estimated at 1,000kg

1 movement takes 10 minutes (the trucks and yard were usually very different from today).

In total, we have 313,333 hours of forklift transport.

fuel consumption 313,333 h*4.8kg/h*11.86 kW/kg= 17,837 MWh 4,762 Tons of CO_2

Material transport (if own truck)?

Company cars (owned or leased)?

5 calculation of CO2

Scope 2

- Use of grey electricity
- Use of energy in production 200 kWh
- Use of energy in idling 40 kWh
- CO2 from grey energy in 1990 was 798 kg CO2/MWh (coal-fired plant)
- Most plants worked in two shifts

Use on production 3724 h * 200kWh * 40 production lines = 29,792 MWh	23,774 tons of CO2
Use when idling 5036 h * 40kWh * 40 production lines = 8,057 MWh	6,430 tons of CO2

5 calculation of CO_2

Scope 3

Zinc (still under development)

The problem here is that we have no information about the use of energy in 1990 to melt zinc out of zincore

5 calculation of CO_2

Calculations so far

Total 89,697 tonnes of CO_2 for the 376,000 tonnes of production in 1990

40% of 89,697 = 35,878 tonnes CO_2 and is the max total amount of CO_2 in 2030

In 2020, the Benelux volume has increased by 30.6% to 491,000 tonnes per year.

This means that (on average) the total amount of CO_2 per tonne is 35,878 tonnes of CO_2 / 491,000 tonnes of steel = 73 kg CO_2 per tonne of steel

6 opportunities and threats

For scope 1&2

If you can make all forklifts electric

If you are able to produce or buy all your electricity green

The max of 72 kg CO_2 per tonne of steel allows you to use gas for the furnace or dryer up to the use of 354 kW/tonne (36.2 m3 /tonne). For the total plant

Quick calculation

If you galvanise 850-900 tonnes of steel or more per m2 of bath area, there are opportunities to stay on gas and still meet the absolute 40% CO_2 of 1990.

(based on volume and growth of Benelux members)

Threats

Not enough electric power supply available

Not enough (electric) green power available

Price balance between 1 kWh gas and 1 kWh Electric

7 formulas

.....m3 gas * 9.769 kWh/m3= .....kWh /1000 * 203.51 kg CO2/MWh = ...kg CO2

.....kg diesel * 11.86 kWh/kg= .....kWh /1000 * 267.4 kg CO2/MWh = ...kg CO2

.....kWh (grey) /1000 * 523 kg CO2/MWh = ...kg CO2

.....Total kg CO2 / .....Ton of steel = ... kg CO2/ton steel

8 Conclusions

There are possibilities to get to 40% absolute CO2 in 2030 and still use gas for the furnace (as the first step)

By this we have the chance to wait for the (necessary) infra structure to make the next move to net zero

- Power supply (big enough for our furnaces)
- Green hydrogen gas
- ?????

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