

TrainERGY project

Case Study - Template

Submission Date:	25-11-16
Place:	Sheffield

Sector Analysed:	Metal production
Product Analysed:	Aluminium foil

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1 Introduction

The application of circular economy to reduce waste.

2 Overview

2.1 Firm description

Alumil S.A. is the largest privately-owned aluminium extrusion group in South-East Europe, in terms of **production, distribution network and range of aluminium profile systems**. It is among the top suppliers of branded aluminium systems for architectural use in Europe.

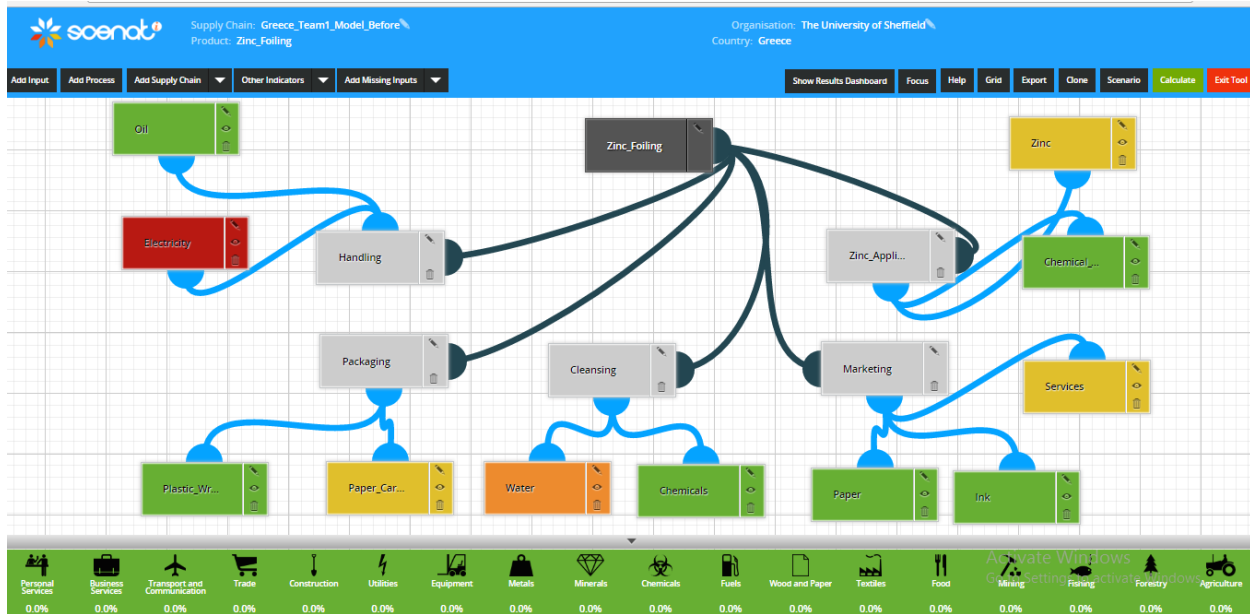
With 30 years of experience, Alumil is one of the most advanced companies globally in the **design and production** of aluminium extrusion products with **state – of – the art production lines** in all its factories.

Alumil produces aluminium systems which are designed and developed in the Group's Research & Development Department and then tested and certified by internationally accredited certification institutes and laboratories, such as Ift **Rosenheim** (Germany), **A.A.M.A** (USA), **Instituto Jordano** (Italy), **EKANAL** (Greece), etc.

2.2 Product description

The product is one square meter of aluminium foil that result as an automated production line and sold by batch.

2.3 Supply chain of the product



3 Main Analysis

3.1 Process approach

- Cutting of gross metal plates
- Cleaning zinc application
- Plastic foil packaging
- Waste management
- Marketing

3.1.1 Resources and materials, energy usage, package, water, waste, transport

Overall Process & Measurement Unit	Main processes	Inputs
	Handling Equipment	<ul style="list-style-type: none"> • Electricity (10KWH) • Oil (0.05 L)

Product/Process: Zinc Foiling of Plain Metal Surfaces Process (unit=1 Metal Surface)	Zinc application	<ul style="list-style-type: none"> • Zinc (0.250 KG) • Chemical adhesive (0.05 KG)
	Cleansing	<ul style="list-style-type: none"> • Water (12 L) • Chemicals (0.100 L)
	Packaging	<ul style="list-style-type: none"> • Plastic wrapping (0.100 KG) • Paper cartons
	Marketing	<ul style="list-style-type: none"> • Paper (0.200 KG) • Ink (0.002 KG) • Services (0.05 FTE)

3.2 Scenat analysis

3.2.1 SC Carbon Map

The Supply Chain Environmental Analysis Tool (SCEnAT) was used to model the Zinc Foiling Supply Chain of The University of Sheffield in order to evaluate the total lifecycle carbon emissions, identify carbon-hotspots and suggest possible low carbon intervention measures to address the hot-spots.

The results of lifecycle assessment (LCA) undertaken using the Hybrid LCA methodology are based on the environmental impacts due to global warming potential of the Zinc Foiling Supply Chain. The total lifecycle carbon emissions was estimated to be 42.83 kg CO₂-eq/m². This can further be divided into two main categories: process LCA impacts and indirect impacts. The process LCA impacts contributed 100.00 % of the total lifecycle impacts of the Zinc_Foiling Supply Chain. Indirect impacts associated with the supply chain were estimated to be 0.00 %. These indirect impacts arise from emissions associated with indirect inputs from the industries aggregated across 18 sectors namely: Agriculture, Forestry, Mining, Food, Textiles, Wood & Paper, Fuels, Chemicals, Minerals, Metals, Equipment, Utilities, Construction, Trade, Transport & Communication, Business services, Personal Services.

The use of the robust Hybrid LCA ensures that the those inputs that might otherwise be missed in the process LCA system, such as such as construction of commercial buildings (to account for construction of plants and related buildings), service related inputs (such as administration and business related activities), and other special purpose machineries for instance are captured.

The Lifecycle Emissions of the Zinc_Foiling Supply Chain are presented below in a bar chart.

It consists of all direct and indirect inputs into the LCA system, classified into different input categories.

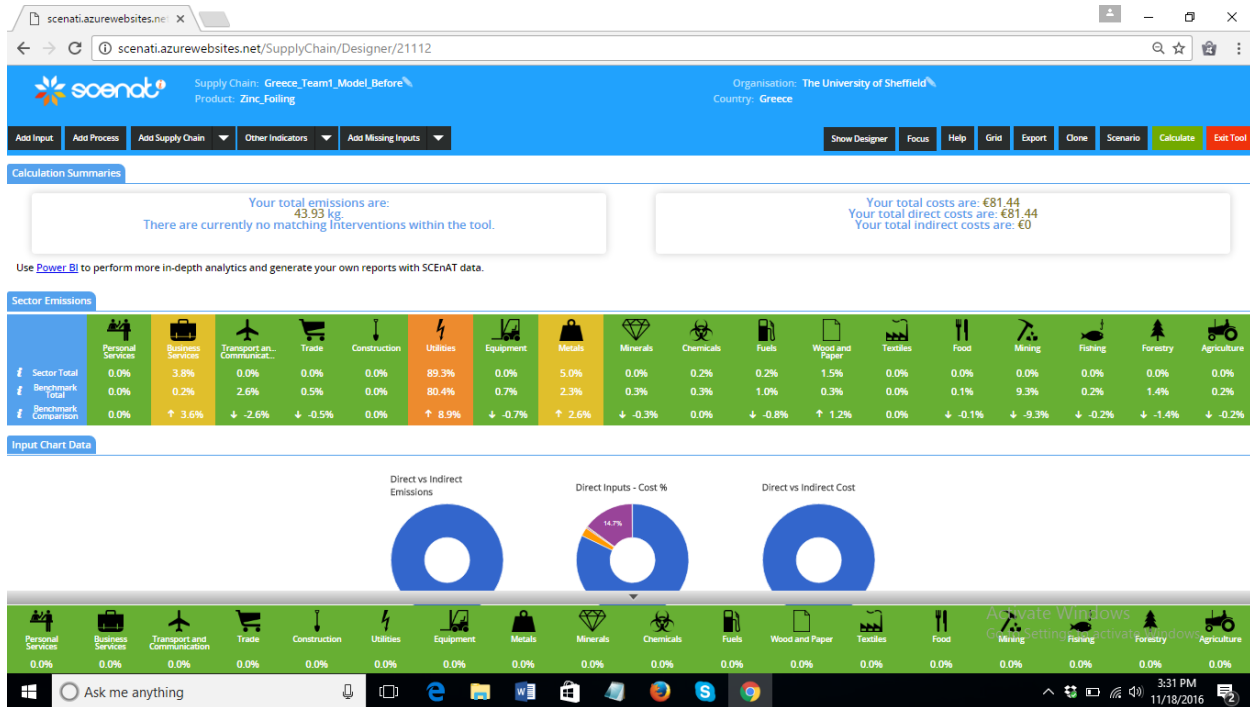
Full Supply Chain Data

Input Name	Amount	Avg. Unit Cost	Emission Intensity	Carbon Emissions	Emission %
Electricity	162.00kWh	\$0.39	0.2300	37.2600	87.0%
Zinc	1.78kg	\$1.12	1.2300	2.1894	5.1%



Services	1.00kWh	\$12.00	1.6700	1.6700	3.9%
Water	2.50litre	\$0.02	0.3400	0.8500	2.0%
Paper_Carton	0.90kg	\$0.23	0.6600	0.5940	1.4%
Oil	0.12litre	\$0.55	0.7800	0.0936	0.2%
Plastic_Wrapping	0.22kg	\$0.12	0.3400	0.0748	0.2%
Paper	0.20kg	\$0.05	0.3400	0.0680	0.2%
Ink	0.02litre	\$0.02	0.6700	0.0134	0.0%
Chemicals	0.10litre	\$0.08	0.1000	0.0100	0.0%
Chemical_Adhesive	0.02kg	\$0.05	0.1200	0.0024	0.0%
Personal Services (Indirect)	N/A	N/A	N/A	0.0000	0.0%
Business Services (Indirect)	N/A	N/A	N/A	0.0000	0.0%
Transport and Communication (Indirect)	N/A	N/A	N/A	0.0000	0.0%
Trade (Indirect)	N/A	N/A	N/A	0.0000	0.0%
Construction (Indirect)	N/A	N/A	N/A	0.0000	0.0%
Utilities (Indirect)	N/A	N/A	N/A	0.0000	0.0%
Equipment (Indirect)	N/A	N/A	N/A	0.0000	0.0%
Metals (Indirect)	N/A	N/A	N/A	0.0000	0.0%
Minerals (Indirect)	N/A	N/A	N/A	0.0000	0.0%
Chemicals (Indirect)	N/A	N/A	N/A	0.0000	0.0%
Fuels (Indirect)	N/A	N/A	N/A	0.0000	0.0%
Wood and Paper (Indirect)	N/A	N/A	N/A	0.0000	0.0%
Textiles (Indirect)	N/A	N/A	N/A	0.0000	0.0%
Food (Indirect)	N/A	N/A	N/A	0.0000	0.0%
Mining (Indirect)	N/A	N/A	N/A	0.0000	0.0%
Fishing (Indirect)	N/A	N/A	N/A	0.0000	0.0%
Forestry (Indirect)	N/A	N/A	N/A	0.0000	0.0%
Agriculture (Indirect)	N/A	N/A	N/A	0.0000	0.0%
Final Product	N/A	N/A	N/A	0.0000	0.0%

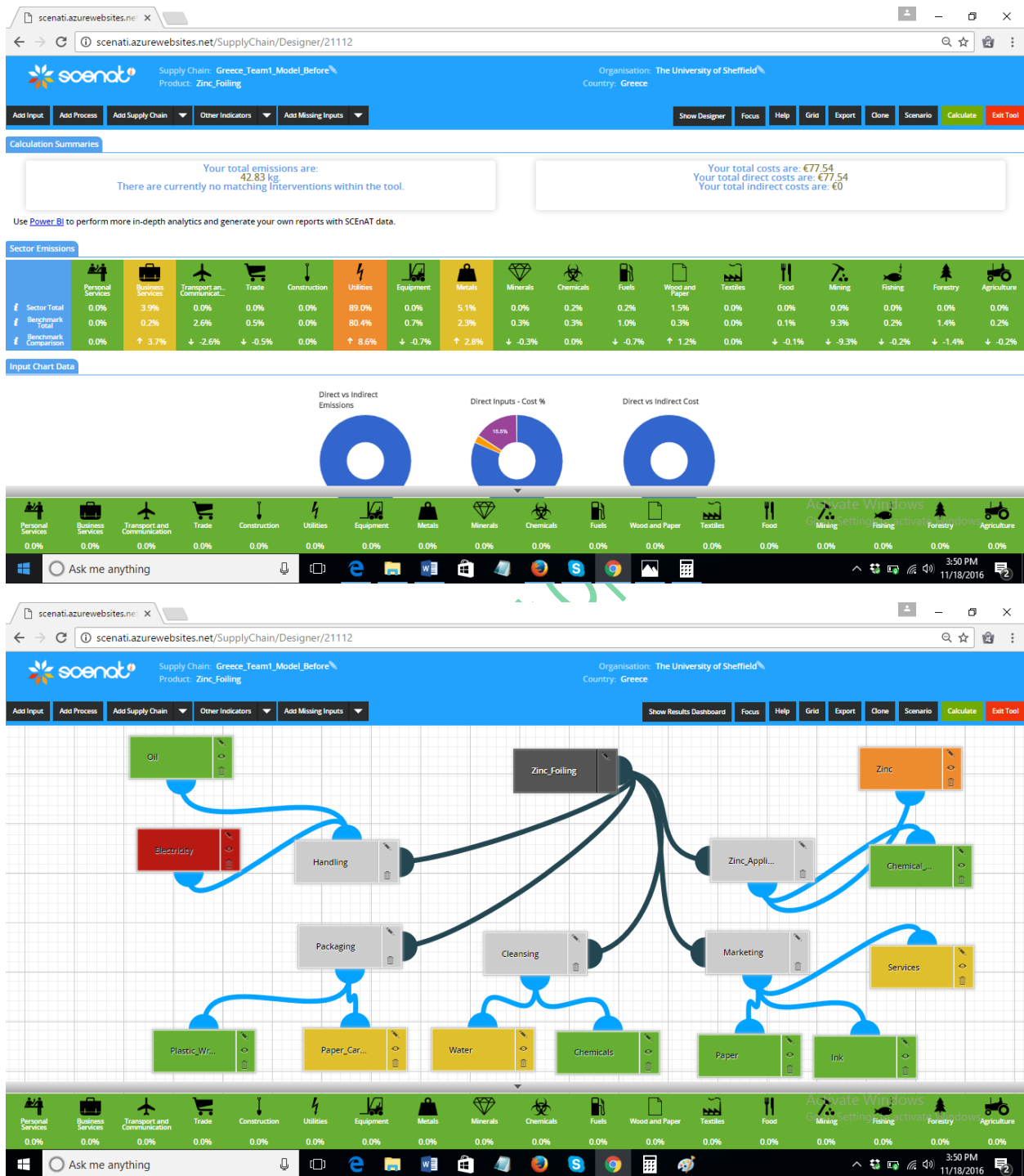
3.3 Results



4 Possible improvements

4.1 Scenario 1

- Apply circular economy for the water collection processes and re-circulation.
This process involved:
 - Deprecation rate of water use of 30% (thus 70% of the water is recycled)
 - Increased electricity cost to support this system (10KWH on average)
 - Increased business cost (operational) by 5%
 - Decrease of waste management cost by 35%
 - Results:
 - Total emissions cut per unit from 43.93 to 42.83
 - Total cost cut per unit from: 81.44 EUR to 77.54 EUR
- Initial estimated investment (operational change + hardware): 4580 EUR. Cost mitigation after 1174 Zinc Foil sales.



5 Final conclusions

This process showed that if circular economy is applied, cost and emissions could be indeed reduced. However, an initial investment is definitely required to support these processes and this will generate return on investment only in about 6 months to 1 year.

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