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Life Cycle Assessment of Aluminium Recycling: Case of Electric cables

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Goals of the Study

- Use Life Cycle Analysis (LCA) to compare aluminium production.
- Validate environmental benefits of mechanical recycling facing traditional melting recycling.
- Identify possible improvements for MTB recycling processes.

Product Description

- Mechanical recycling process,developed by MTB, can recycle all types of cables such as old or new scraps
- Only dry and mechanical processes are used by MTB
- The purity of MTB recycled aluminium overtake 99,5%
- Secondary aluminium used traditional melting method for recycling
- The purity of secondary aluminium is around 97%

Functional Unit

The impacts have been calculated according to the following reference :

"Produce one ton of aluminium, with purity above 97% in Europe, for end-user applications."

Life Cycle Steps

The characterization of the compared systems is based on the life cycle steps presented on the Fig 1 below.

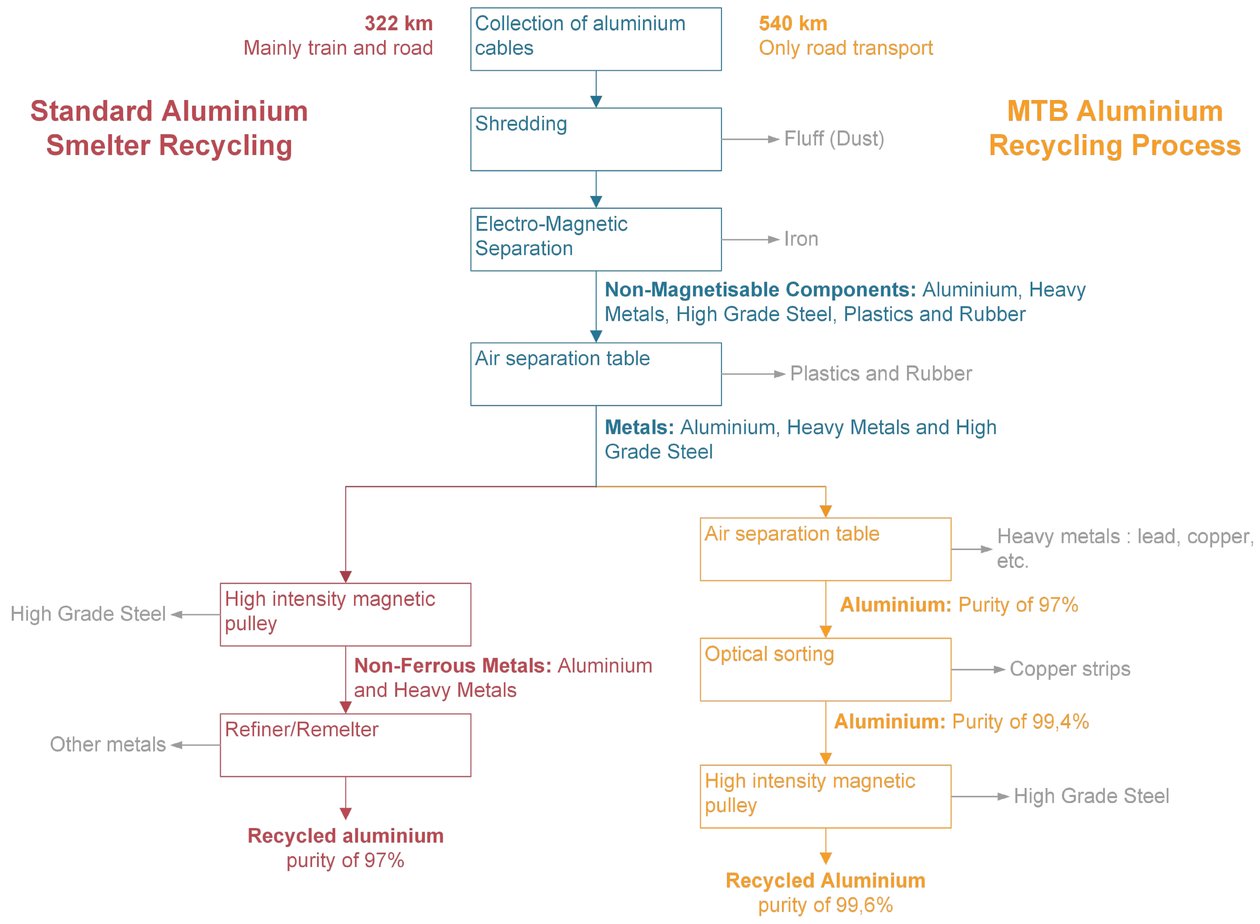
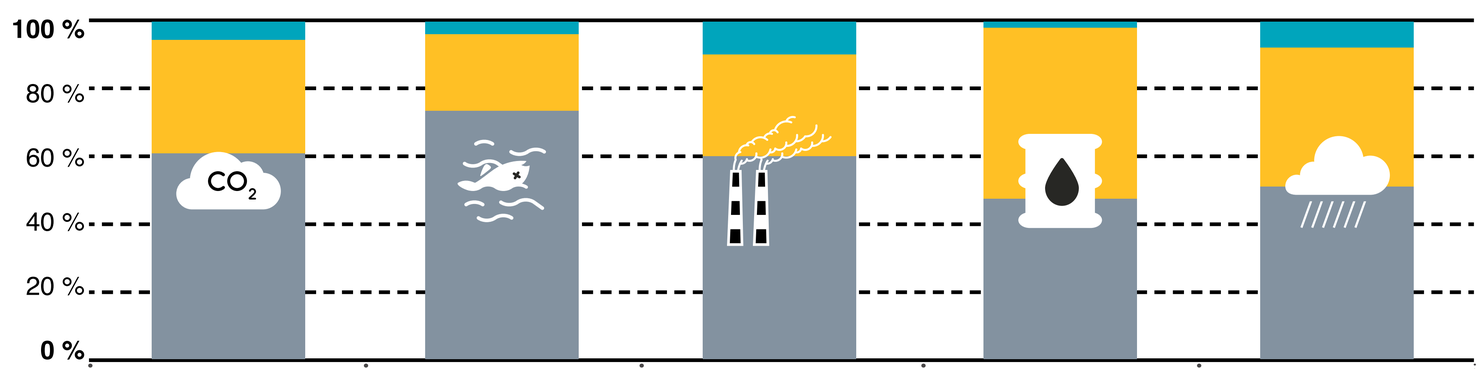


Fig 1 Life Cycle steps of the 2 recycling scenarios of the study

Recycled Aluminium Comparison

	Climate change	Water ecotoxicity	Photochemical oxidation	Resources depletion	Acidification
1 ton of MTB Aluminum	33 [%] 225 [kg CO_2 eq]	40 [%] 401 [CTUe]	30 [%] 0,742 [kg NMVOC eq]	21 [%] 0,0218 [kg Sb eq]	11 [%] 0,0887 [mol H^+ eq]
1 ton of secondary aluminum Data from Ecoinvent 3.1	100 [%] 700 [kg CO_2 eq]	100 [%] 1054 [CTUe]	100 [%] 2,60 [kg NMVOC eq]	100 [%] 0,106 [kg Sb eq]	100 [%] 8,66 [mol H^+ eq]

MTB Aluminium Characterization



	Climate change	Water ecotoxicity	Photochemical oxydation	Resources depletion	Acidification
Waste management	5,3 [%] 8,2 [kg CO_2 eq]	3,7 [%] 14,0 [CTUe]	9,7 [%] 0,07 [kg NMVOC eq]	1,7 [%] 0,0004 [kg Sb eq]	7,7 [%] 0,066 [mol H^+ eq]
Production	33,6 [%] 51,8 [kg CO_2 eq]	23,2 [%] 88,5 [CTUe]	30,6 [%] 0,21 [kg NMVOC eq]	51,4 [%] 0,0112 [kg Sb eq]	41,3 [%] 0,356 [mol H^+ eq]
Upstream logistic	61,1 [%] 94,3 [kg CO_2 eq]	73,1 [%] 279,2 [CTUe]	59,7 [%] 0,42 [kg NMVOC eq]	46,9 [%] 0,0102 [kg Sb eq]	51,0 [%] 0,439 [mol H^+ eq]
Total	154 [kg CO_2 eq]	382 [CTUe]	0,70 [kg NMVOC eq]	0,022 [kg Sb eq]	0,860 [mol H^+ eq]

Interpretations

- Upstream logistic is the main contributor in MTB system with an average impact of 35%[(2)].
- Compared to traditional melting methods the environmental benefit of MTB technologies for aluminium recycling is around 60%[(2)].
- Compared to aluminium from mining, MTB aluminium recycling allows impact reduction of 96%[(2)].

[(2)] Average on the 11 indicators set without weighting.

References

Environmental assessment of aluminum recycling by MTB cold refining processes, published in March 2015.

ISO 14025: Environmental labels and declarations — Type III environmental declarations, 2010.

LCI data from database Ecoinvent v3.1 and indicators from ILCD 2011 MidPoint+ v1.05/EU27 method.

Software data aggregation on SimaPro™ v8.0.4.30 Analyst.

Acknowledgment

This work was performed within the financial support from French Agency for Environment and Energy Efficiency (ADEME).

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