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Analysis of recycling methods for contaminated metal chip considering approaches to eco-efficiency and eco-effectiveness

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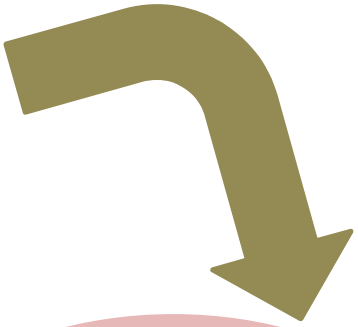
Introduction

Generation of waste has become a challenge for management companies



Loss of input and organic matter

High costs and environmental impact associated with the environmentally friendly disposal

Is there any alternative?

Common practices found in the metal-mechanic sector is concerned with the remediation, recycling, and treatment during/after the waste is generated

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Eco-efficiency

CP approach

Eco-effectiveness

=

Developing technology to improve the production process, avoid generating waste, streamline processes and improve the utilization of *raw materials* and *energy*

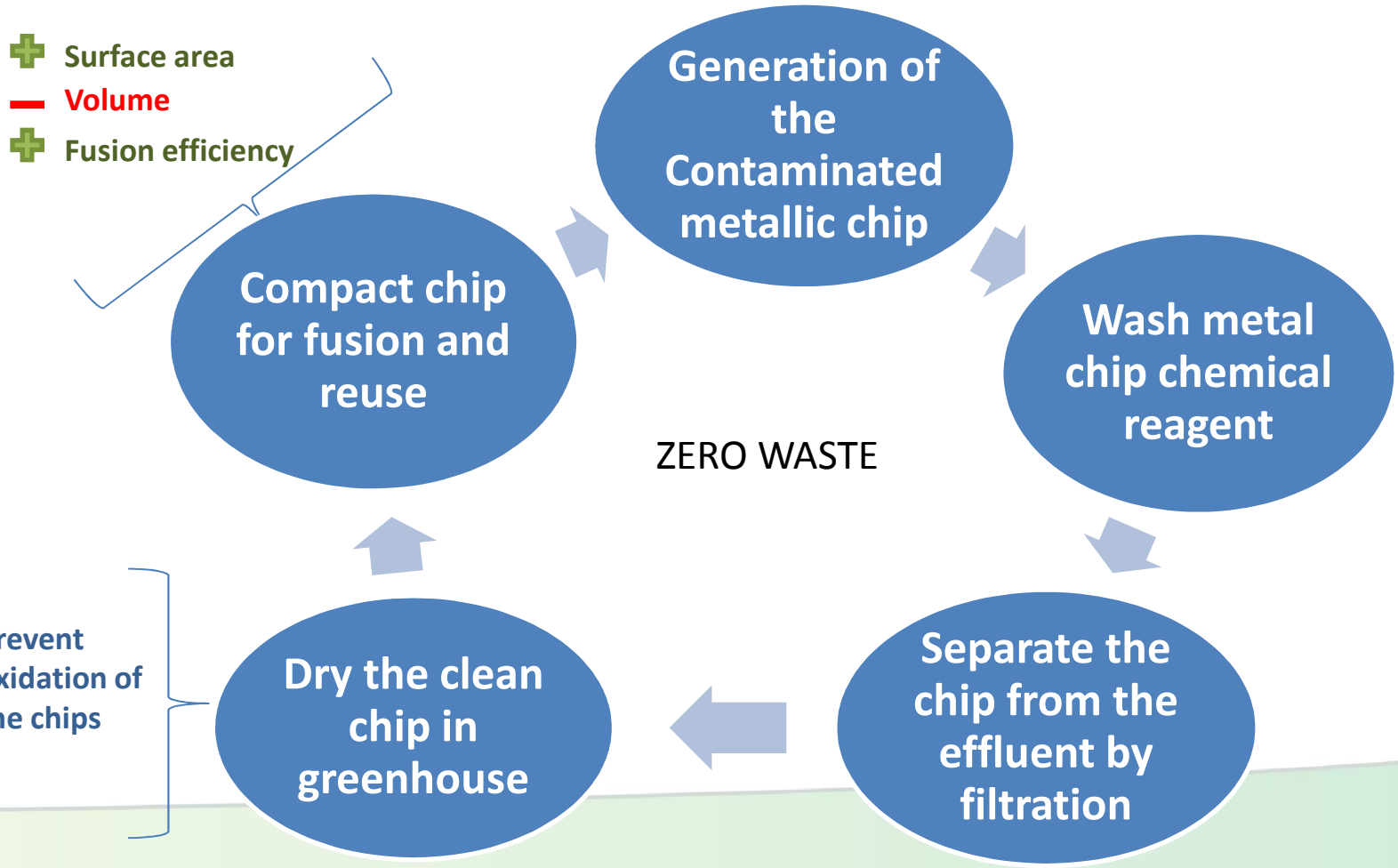
Braungart and McDonough (2007, 2009).

Eco-efficiency and Eco-effectiveness

	ECO-EFFICIENT	ECO-EFFECTIVE
ORIENTATION	Tends to promote actions with short-term results	Tends to promote actions with long-term results
PARADIGM	Reduction and minimization (cradle to grave)	Waste = nutrient (cradle to cradle)
ASSUMPTION	Linear flow materials	Cyclic flow materials
INOVATION	Tends to be incremental	Tends to be radical
BUSINESS VISION	Increases the product use longevity (repair, reuse, remanufacturing, recycling)	Sale of performance attributes and utility instead of just selling the product; new business models

Table 1 – Features of eco-efficiency and eco-effectiveness. Table source: Adapted from Lutkemeyer (2014).

Reuse Method – eco-effective approach (patent deposit - INPI)



100%

Total oil removal from chip;

High-grade reagent cleaning by destillation;

Aluminum machinability remelted > without generation of slag and soot > very close to the commercial alloys.

(DUTRA et. al, 2007)

Main Objective

- Evaluate the eco-efficiency and eco-effectiveness of the methods used in the cleaning of metallic chips contaminated with cutting fluid metallurgical enterprises.

Methodology

Analysis of waste reuse methods of metal chips > choose the method considered more eco-effective to be used as control > chosen method designed and executed by Dutra et al [9];

↓

Diagnosis of reuse in loco aluminum chip waste into three companies located in Porto Alegre - RS, the metal-mechanic industry that have the same type of waste for comparison of the methods employed > qualitative approach to Environmental Management System of the companies studied (A, B, C);

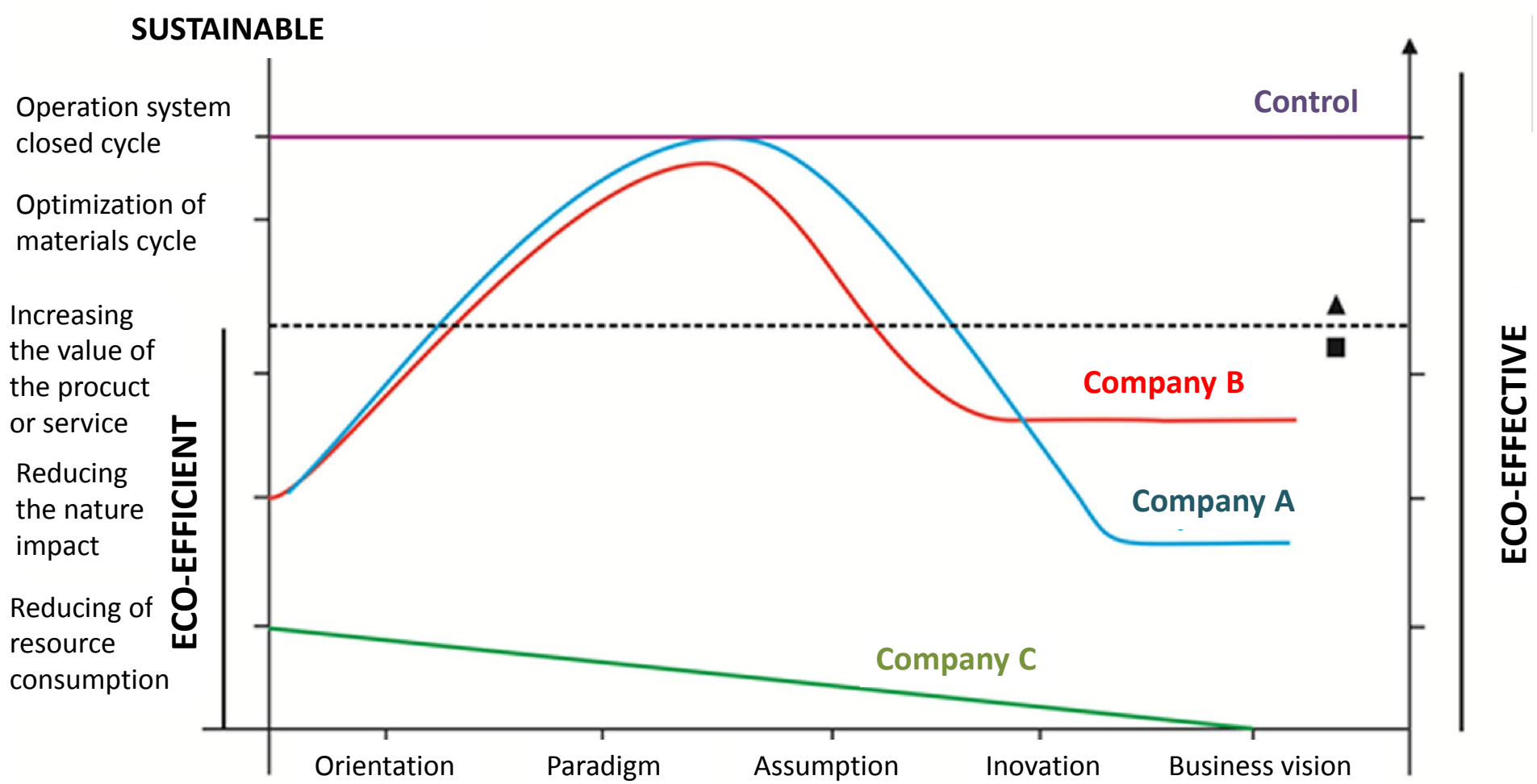
↓

Analysis of the different practices presented by companies "A", "B" and "C“ > identification of eco-effective and eco-efficient approaches in each method > evaluation and comparison of the methods in the control method.

Results and Discussions

COMPANY	GENERATION (TON/MONTH)	DESTINATION	TREATMENT BY GENERATION COMPANY	ENVIRONMENTAL IMPACT
COMPANY A	55	Sell waste for metallurgy that will remelt of chips	There is not	Significant
COMPANY B	19	Sell waste to smaller company in order to gather more quantity and sell for metallurgy that will remelt the chips	Oil flow in bucket in order to sell the cleanest metallic chip (previous treatment before remelting	Significant
COMPANY C	02	Pay for third party collect the residue, making the necessary treatment and disposal in landfills	There is not	Significant

Table 2 – Data collection in the companies interviewed. Table source: The Autors (2015).



	EXPECTED	OBSERVED		
COMPARATIVE	Dutra et al. (2007)	Company A	Company B	Company C
ORIENTATION	Eco-effective	Eco-efficient	Eco-efficient	Eco-efficient
PARADIGM	Eco-effective	Eco-effective	Eco-effective	Eco-efficient
ASSUMPTION	Eco-effective	Eco-effective	Eco-effective	Eco-efficient
INOVATION	Eco-effective	Eco-efficient	Eco-efficient	Eco-efficient
BUSINESS VIEW	Eco-effective	Eco-efficient	Eco-efficient	Eco-efficient

Figure 1 – Comparision between the control method and the observed methods.

Conclusion

Eco-effective practices in the industry:

- positive results for the development of sustainability;
- environmental improvements (leaving extracting raw material and avoiding pollution);
- reduction of costs (waste disposal);
- economic increase (leaving buying and producing the raw material itself).

- But this approach is not yet fully deployed in companies since only the control process has all stages of the metal chip recycling process as *eco-effective*;

The methodology was effective = was possible to identify the methods analized eco-efficient and eco-effectiveness approaches

- Practices and concepts of eco-effectiveness approaches must be addressed by literature and adopted by the companies, since in the long run, bring environmental and economic benefits.

Still processes with eco-efficient practices are better compared to processes that do not have any sustainable practice.

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THANK YOU!

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