ERA Convention 2011

“Growth Again”

Equipment End-of-Life Strategies

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Legislative framework

- **No specific European « End-of-Life » legislation for construction equipment like for vehicles**

- **Specific European directives related to the restriction of hazardous substances used within equipment, e.g.:**
  - **Directive 2005/69/EC restricting the use of Polycyclic Aromatic Hydrocarbons used in tyres as from 2010**
  - **Directive 2006/122/EC restricting substances like PerFluoroOctane Sulfonates and Borates sometimes used in coatings, corrosion inhibitors, etc… as from 2008**

    Etc..

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Legislative framework

- Machinery Directive 2006/42/EC covering the safety aspects of “End-Of-Life” in Annex I, 1,1,2. Principles of safety integration:

  “Machinery must be designed and constructed so that it is fitted for its function, and can be operated, adjusted and maintained without putting persons at risk when these operations are carried out under the conditions foreseen but also taking into account any reasonably foreseeable misuse thereof.

  The aim of measures taken must be to eliminate any risk throughout the foreseeable lifetime of the machinery including the phases of transport, assembly, dismantling, disabling and scrapping.”

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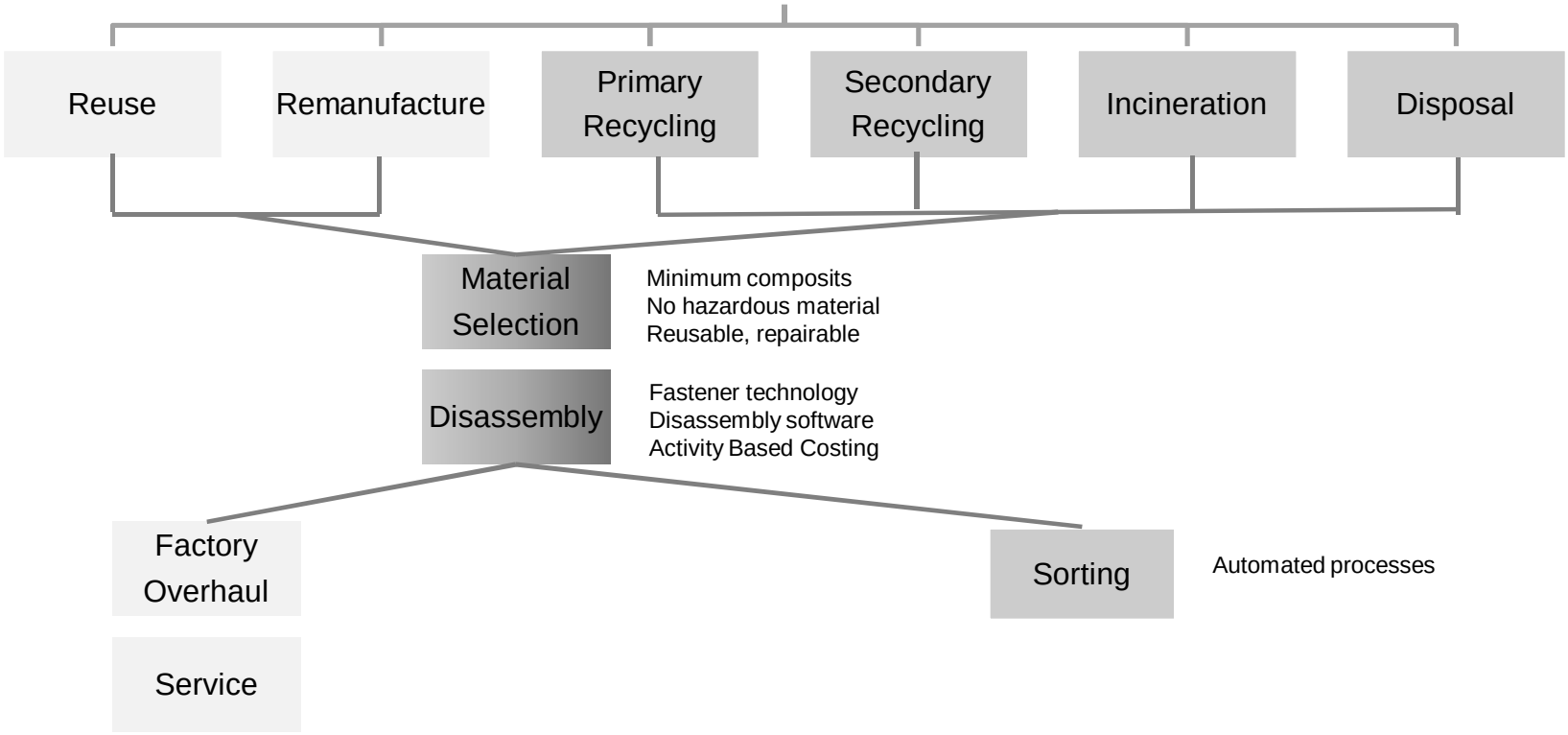
End of Life options



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Product Characteristics

Design Cycle	Length of time between successive generations of a product or the frequency that a design team redesigns the product or designs a new product that makes the original product obsolete
Technology Cycle	Length of time that the product will be on the leading edge of technology before new technology makes the original product obsolete or less desirable
Repurchase Cycle	Length of time that elapses before the average user decided to upgrade their product to one with increased functionality
Wear-Out Life	Length of time form product purchase until the product no longer meets the original functions
Reason for Obsolescence	Reason that the product is no longer able to perform its intended function; a product reaches its end-of-life because it is either worn-out or outmoded

* The End of Life Design Advisor (ELDA) is a web-based tool for evaluating and improving product end-of-life strategies, available at http://dfe.stanford.edu.

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Factors influencing End of Life strategies

High impact

- Number of parts
- Number of materials
- Level of cleanliness
- Design cycle
- Technology cycle
- Repurchase cycle

Less impact

- Machine size
- Number of modules
- Hazards
- Wear out life
- Reasons for obsolescence
- Functional complexity

http://www-mml.stanford.edu/publications/1999/1999.JEM.SPEC.Rose.pdf

L. Breiman, J. H. Friedman, R. A. Olshen, C. J. Stone. *Classification and Regression Trees*. Wadsworth, Belmont, CA, 1984.

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Examples, Years

	Mobile Phone *	Automobile *	Aircraft Engine *	Construction Machinery **
Design Cycle	1	4	7	8
Techn. Cycle	2	10	7	12
Wear-Out Life	5	20	20	20
Repurchase Cycle	2	5	7	8

* ELDA case study in: http://www-mml.stanford.edu/publications/1999/1999.JEM.SPEC.Rose.pdf
** Own assumtions

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Construction Equipment

Further improvements from elevated base level:

- High Wear-Out Life
- Long Repurchase Cycle
- Well established secondary markets
- Minimum composit material content
- Prepared for disassembly
- Use of high value base materials

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Construction Equipment

CECE continuously promotes and stimulates "Life Cycle Thinking" within the Construction Equipment Industry.

- The sustainable use of available natural resources, the restrictive use and complete ban of substances of recognised environmental concern.
- The reduction of waste by a high degree of reusability and recycling.

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Appendix

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Voluntary approach

Standards have been developed:

- ISO/DIS 10987 - Earth-moving machinery - Sustainability - Terminology, sustainability factors and reporting
- ISO 16714 - Earth-moving machinery - Recyclability and recoverability - Terminology and calculation method

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Voluntary approach

ISO 16714

The calculation of the recyclability and recoverability rates is carried out through the determination of the mass for 4 steps

1. Pretreatment
2. Dismantling
3. Metals separation
4. Non-metalic residue treatment

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Voluntary approach

ISO 16714

Pretreatment step:

Takes into account machine components parts/ materials like: all fluids, batteries, oil filters, tyres, drums, bucket, etc.

Dismantling step:

Takes into account the accessibility, fastening technology and proven dismantling technologies

Takes into account machine components parts/ materials like: engine, hydraulic circuits, cab, boom, counterweight, etc.

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Voluntary approach

ISO 16714

Metals separation step:

Takes into account all metals, both ferrous and non-ferrous, that have not been accounted for the previous steps.

Non-metallic residue treatment step:

Takes into account all other materials remaining that can be recycled or potentially used for energy recovery (e.g. energy recovering of polymers and elastomers).

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Voluntary approach

The recyclability rate:

The sum of the mass of the pretreatment + dismantling + metals separation + non-metalic residue to be recycled divided by the shipping mass of the machine.

The recoverability rate:

The sum of the mass of the pretreatment + dismantling + metals separation + non-metalic residue to be recycled + remaining mass that can be potentially used for energy recovery divided by the shipping mass of the machine.