

Design for Remanufacturing and Reverse Logistics

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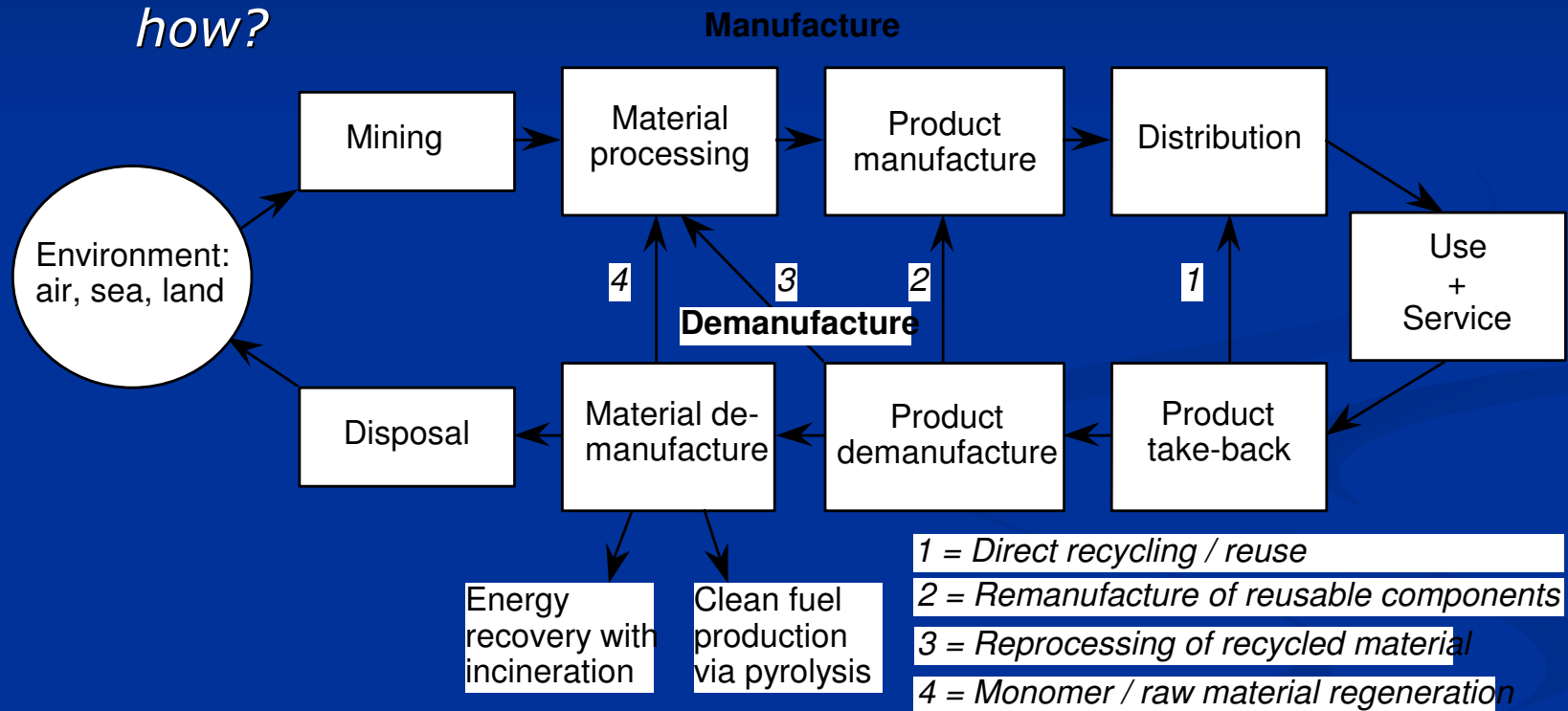
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Outline

- Definition
- Reverse Logistics Management
- Designing Products for Remanufacturing

A Product's Life Cycle – From Cradle

- Basic questions you need to ask and keep in mind when designing: *What do we want to do, why, and how?*



The phrase “demanufacture” is used to characterize the process opposite to manufacturing involved in recycling materials and products.

Recycle and Re-Use

- Recycle:
 - A series of activities, including collection, separation, and processing, by which products or other materials are recovered from or otherwise diverted from the solid waste stream for use in the form of raw materials in the manufacture of new products.
 - *Materials which are diverted for use as an energy source should be documented separately under the category of energy recovery*

- Re-Use:
 - The series of activities, including collection, separation, and in some cases processing, by which products are recovered from the waste stream for use in their original intended manner.
 - *Remanufactured components fall under the classification of re-use.*
 - *(Germans refer to this as "product recycling".)*

- Note: Both definitions include collection as a first step.
- Reverse logistics and reverse logistics management (RLM) are a (design) concern.

Reverse Logistics Management

What is the Objective of RLM?

- What is the RLM for?
 - Product service for customer/owner?
 - Product reuse "as-is" for new customer?
 - Product remanufacture for new customer(s)?
 - Recycling of product's material?
 - Disposal of product?
 - Or all of the above for selected sub-assemblies of the product?
 - Other?
- The RLM intent will drive to a large extent the "design for RLM" effort.
 - Material recycling allows for destruction of the product. The issue of transport damage is almost irrelevant. Design for Disassembly requirements for mechanical separation are different than for manual separation.
 - Product reuse/remanufacture relies on a high residual value. Transport damage is to be avoided or limited by proper logistics product and logistics design.

Who is doing the RLM and Life Extension?

- Who is driving/controlling the RLM?
 - The Original Equipment Manufacturer (OEM)?
 - A third party contracted by the OEM?
 - An independent friendly or “hostile” entrepreneur
- Associated big issue: who “controls” the product design and what influence do life-cycle participants have over the design?
- One of the most critical issues for independent remanufacturer is how and where to get the replacement parts.

Designing Products for Remanufacture & Re-Use

Product Life Extension

- Products become obsolete because of
 - technical obsolescence
 - fashion obsolescence
 - degrade performance or structural fatigue caused by normal wear over repeated uses
 - environmental or chemical degradation
 - damage caused by accident or inappropriate use
- To achieve life-extension and multiple profit cycles, these issues have to be countered.
- Critical Issue: The “openness” of the product design strongly affects RLM and associated life extension processes
 - Upgradable products allow for a larger percentage to be salvaged
 - Use of technology that is proprietary or difficult to reverse engineer will block/limit the number of independent entrepreneurs