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innovatie - ontwikkeling - masterproef

2012

Energy & Environment

Exergy based Sustainability Assessment of Batch versus Continuous pharmaceutical Tablet Production

Finite supply of fossil resources, resource efficiency, carbon footprint. All of them are *megatrends* within international production environments. But how to **measure environmental sustainability**? What is the **environmental impact** of your **Supply Chain**?

Innovative production technologies require cutting edge resource consumption assessment methods, e.g. based on thermodynamics.

→ **Exergy Analysis*** **(EA)** at process (α) and plant (β) level

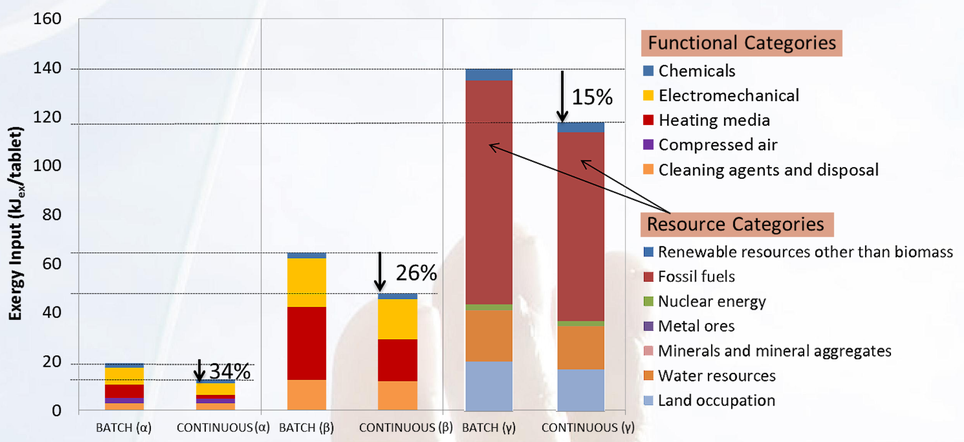
→ **Exergetic Life Cycle Analysis (ELCA)** at overall industrial level (γ)

*Exergy: quantity and quality of both energetic and material resources. One single resource-based indicator → pro-active

→ Continuous process optimisation through analysis of thermodynamic imperfections

Results:

- **34%, 26% and 15% resource consumption reduction** at process (α), plant (β) and industrial (γ) level respectively by implementing continuous manufacturing line
- Resource footprint: **65% fossil resources**, 15% water resources, **15% land occupation and biomass production**, 5% renewable resources



Resource-based environmental sustainability assessment and LCA enables quantifying and eventually controlling your environmental impact through process improvements. In contrast to traditionally emission-based studies, a direct correlation between avoided resource consumption and cost reduction is likely to be present. The obtained eco indicators are a powerful instrument in stakeholder communications.

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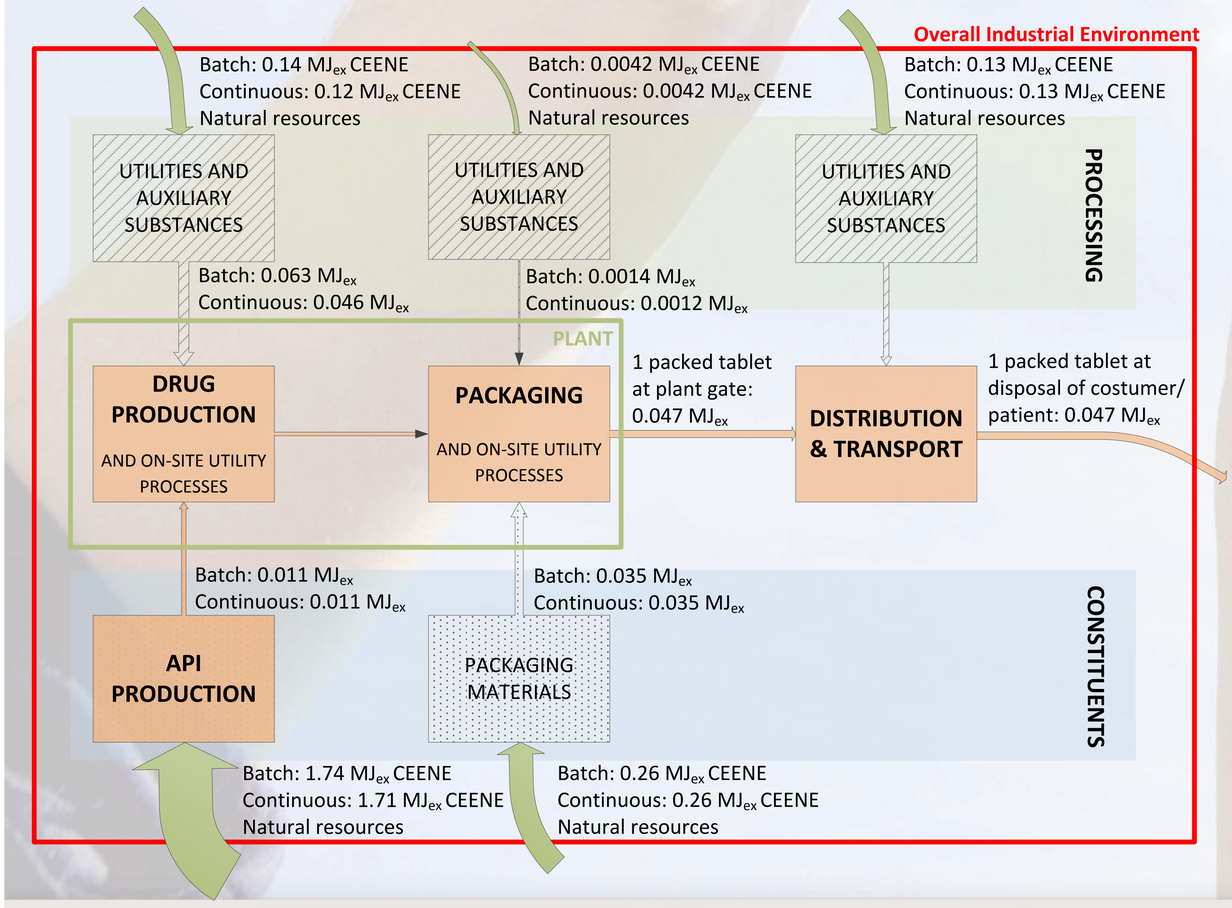

Results:

- **API dose** (Active Pharmaceutical Ingredient) most sensitive parameter (10% reduction API dose → 7% resource consumption reduction)
- Process improvements through valorisation of treated wastewater (e.g. cooling media) and exhaust air heat recuperation → **33% reduction of exergy losses**

Economic point of view:

- **Direct cost reduction** (26% resource consumption reduction) → Lean Manufacturing
- **C**orporate **S**ustainability **R**eporting
- **Marketing**, communications
- Meeting (European) legislations and voluntary initiatives

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