

RESOURCE  
ACQUISITION

MANUFACTURE

PACKAGING AND  
TRANSPORTATION

USE

END-OF-LIFE



Round Table Discussion:

“From lab specimen to pilot production: Scaling Up!”



*Discussion Co-ordinator:*  
Anna Widheden, IVL



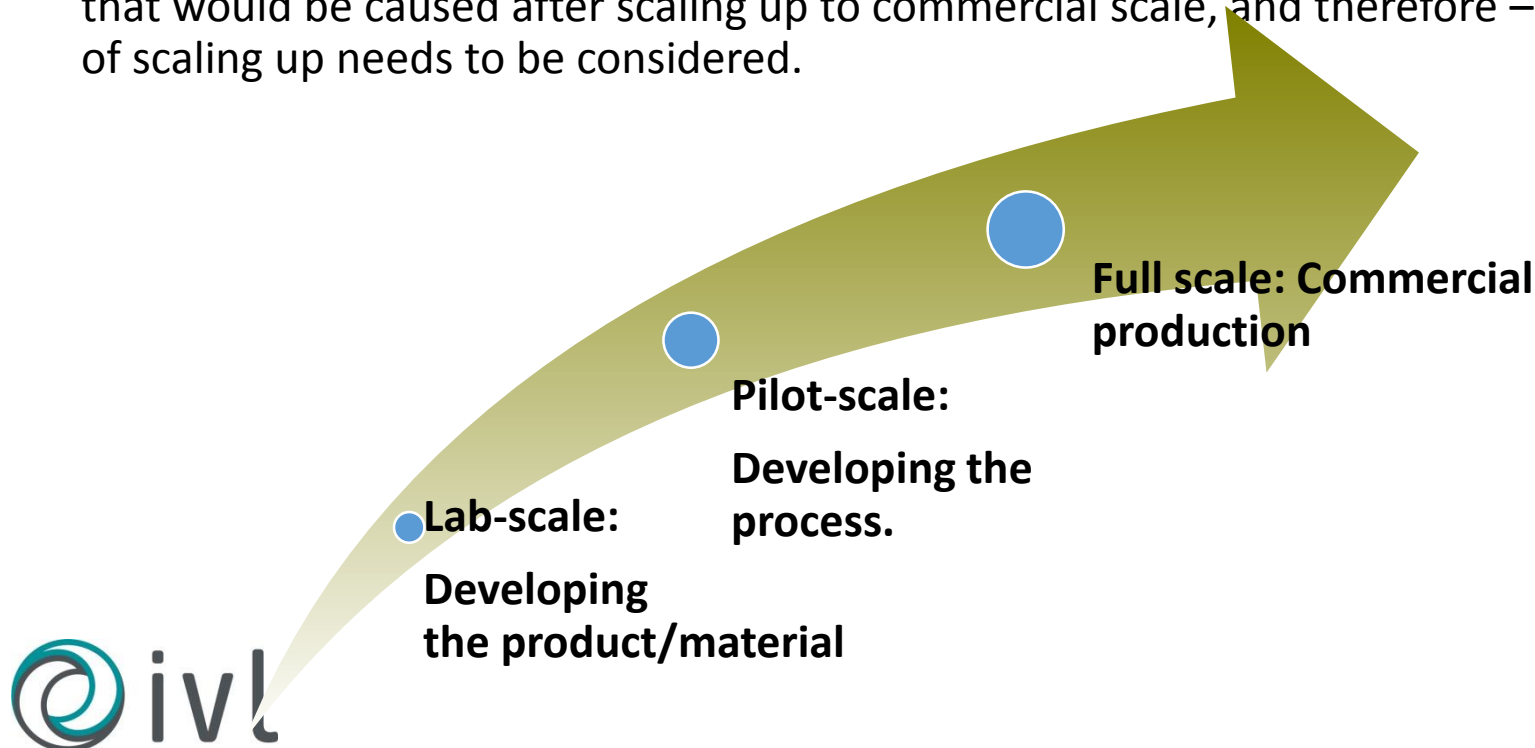
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## Description of problem

When going from small (pilot) scale to full scale, the production will (ideally) be more efficient: Empirical studies have demonstrated that there is a correlation between the cost of manufacturing an item and the cumulative quantity of the item produced.

LCA-results of lab-scale processes do not necessarily present the environmental burden that would be caused after scaling up to commercial scale, and therefore – the effects of scaling up needs to be considered.



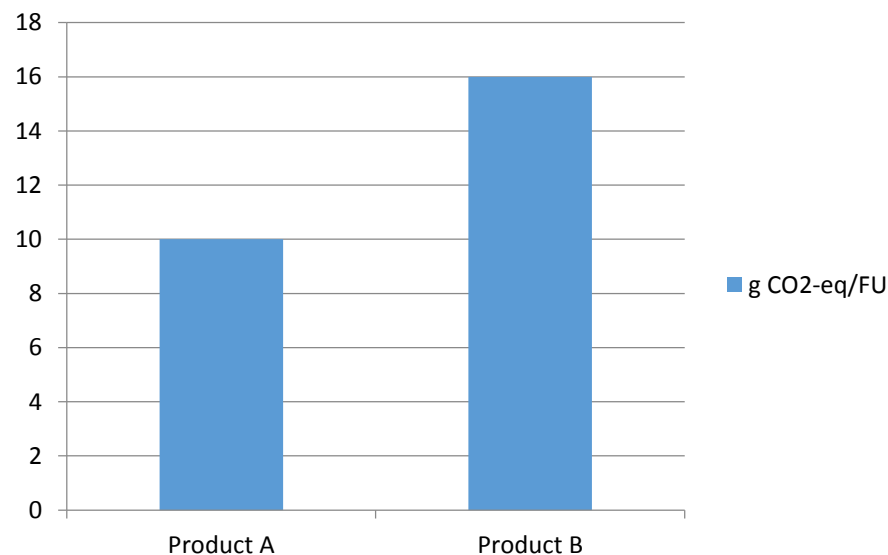


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## When is it extra important to consider the effects of scaling up?

- Especially in comparative LCA-studies, the effects of scaling up must be considered.
- When delivering data to a common LCA-database (since the data might be used for comparative analyses).
- Other situations?





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## Which effects are relevant?

1. Effects on processes themselves
2. Effects by process synergies
3. Optimization and production capacity
4. Other...?



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## 1. Effects on processes themselves

- Change of yield
- Change of energy efficiency
- Change of energy supply
- Change of type and amount of waste
- Emission levels
- .....



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## Change in yield

A yield change can be expressed in LCA-relevant data by changes of e.g.

- Required amount of materials per FU
- Amount of waste per FU
- Energy requirements per FU
- Emissions per FU





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## Emissions

For a production plant, measures might have to be taken into account to reduce the emissions in order to comply with legislation, e.g.

- filter systems
- off-gas cleaning systems





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## Waste - or material for recycling?

Residues from production can either be handled as waste or as recyclable material.

Recycling of residues from pilot plants might, due to their small amount, not be profitable and are instead treated as waste.







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## Energy efficiency

For economic reasons, manufacturers are motivated to improve the energy efficiency of production processes continuously.

More relevant to work with energy efficiency in full scale production





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## 2. Process synergy

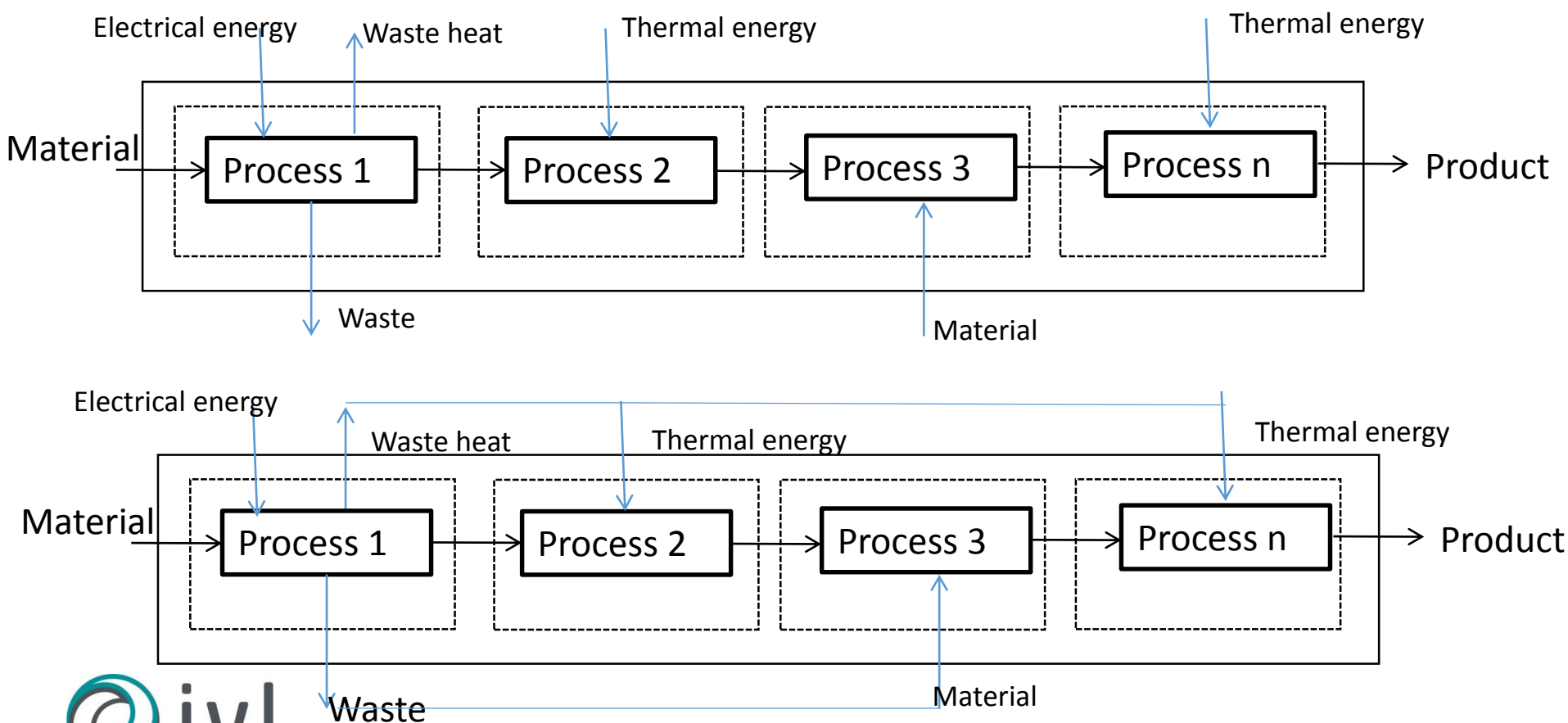
Synergy effects will ideally be implemented in production processes due to their economic advantages.

Eg.

- Use of waste heat from one process as input of thermal energy to another process within the same production plant.
- Use of waste from one process as input material into another process



## 2. Process synergy





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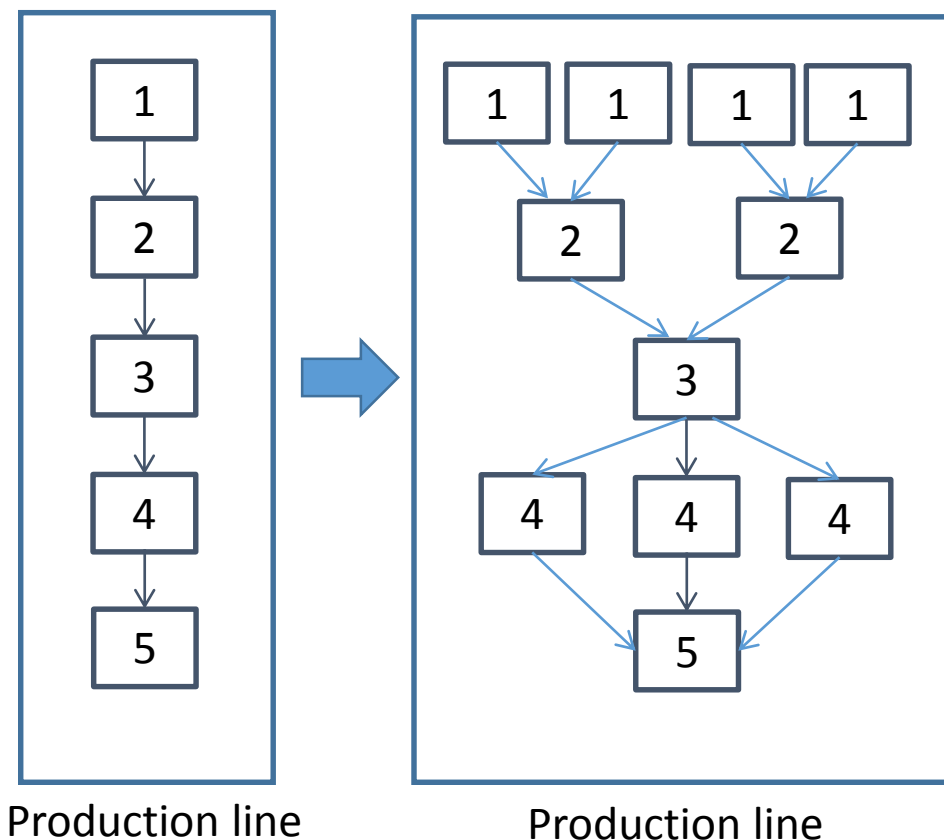


## 3. Production capacity

In a pilot plant, the production capacity is necessarily not used fully.

However, a commercial plant is organized to use the production capacity more efficiently.

Depending on the targeted total production capacity, the amount of required processes in a production plant can differ





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## Round Table discussion

1. What different up-scaling situations do you have in your projects?
2. How are you going to handle them?
  - How will you perform the up-scaling
  - How will you treat the un-certainty that this means?





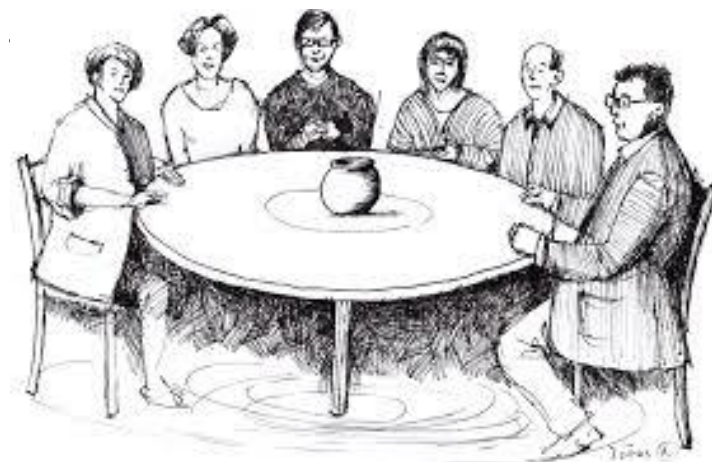
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## Round Table discussion

From Matthias (EELICON) – the challenges are:

- How to get to an industrial process, i.e. production capacities, production periphery (hall, additional processes, logistics, fulfillment of regulations/laws, etc.)
- Define the complete life-cycle (production of-Life)





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## One solution..

.. is to design the full-scale process  
(on paper/the LCA-tool) from theoretical  
descriptions (e.g. handbook data for unit  
operation performance).

Other solutions?

