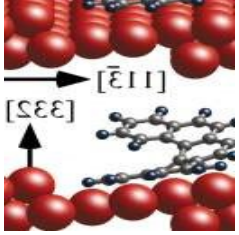


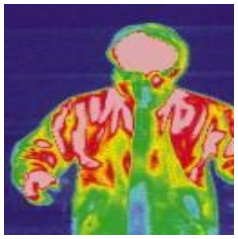
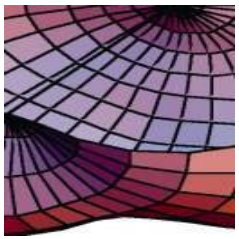

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From laboratory to industrial scale

scale-up calculations of chemical processes for LCA

Fabiano Piccinno[1,2]
Roland Hischier[1], Stefan Seeger[2], Claudia Som[1]

[1]Empa, Technology and Society Lab, St. Gallen, Switzerland
[2]University of Zurich, Department of Chemistry, Zurich, Switzerland

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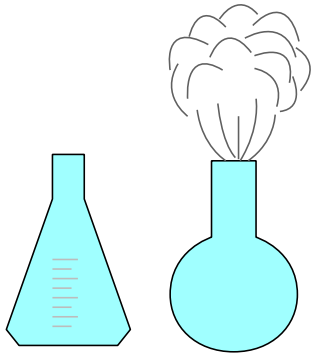
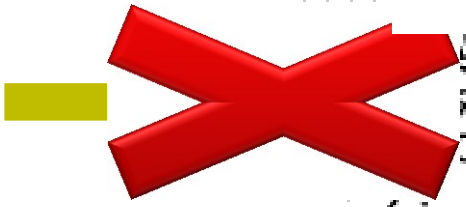
Outline

- Scale-up framework
- Case study: NanoCelluComp

Scale-up of chemical processes





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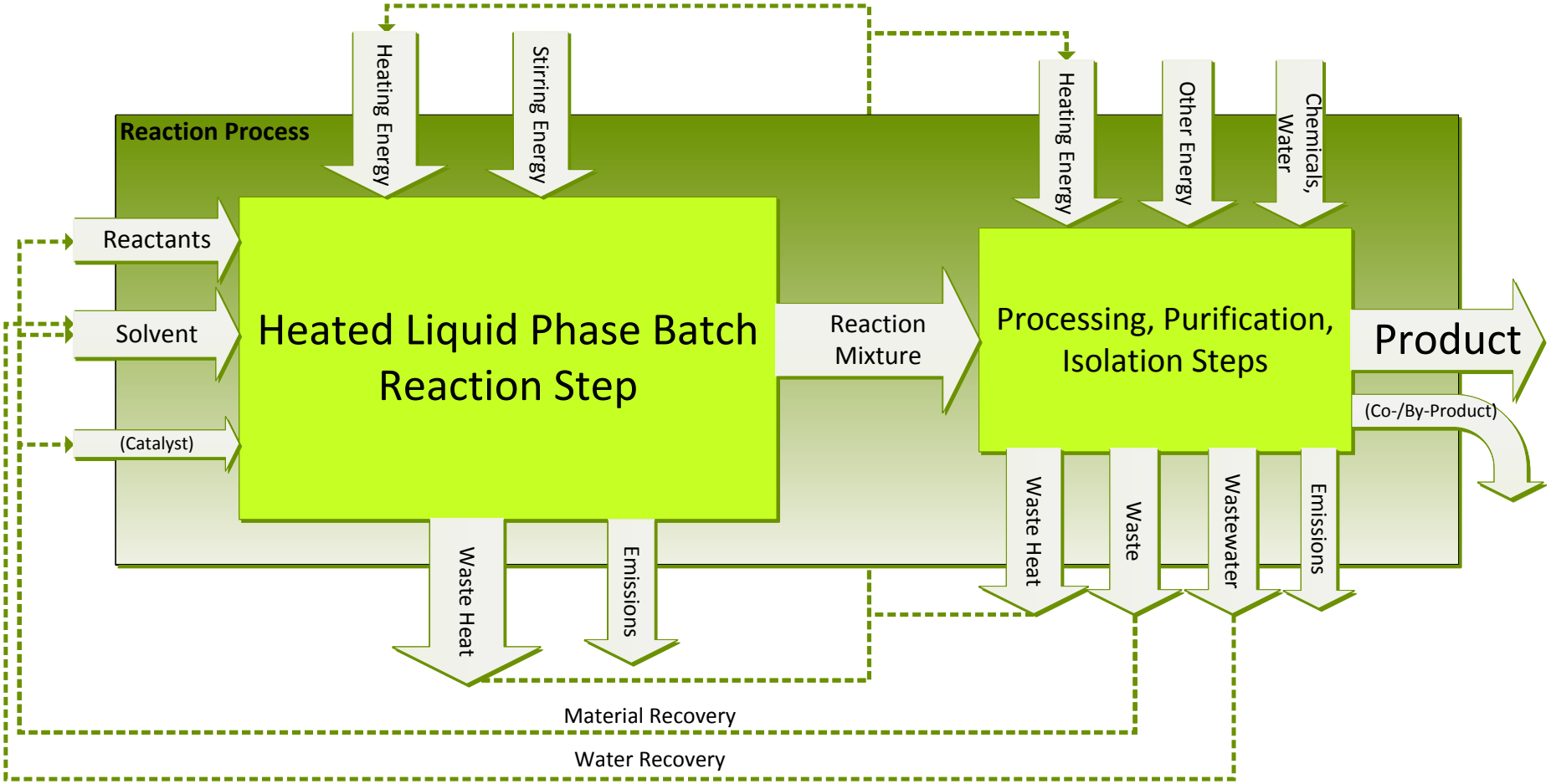
Scale-up framework

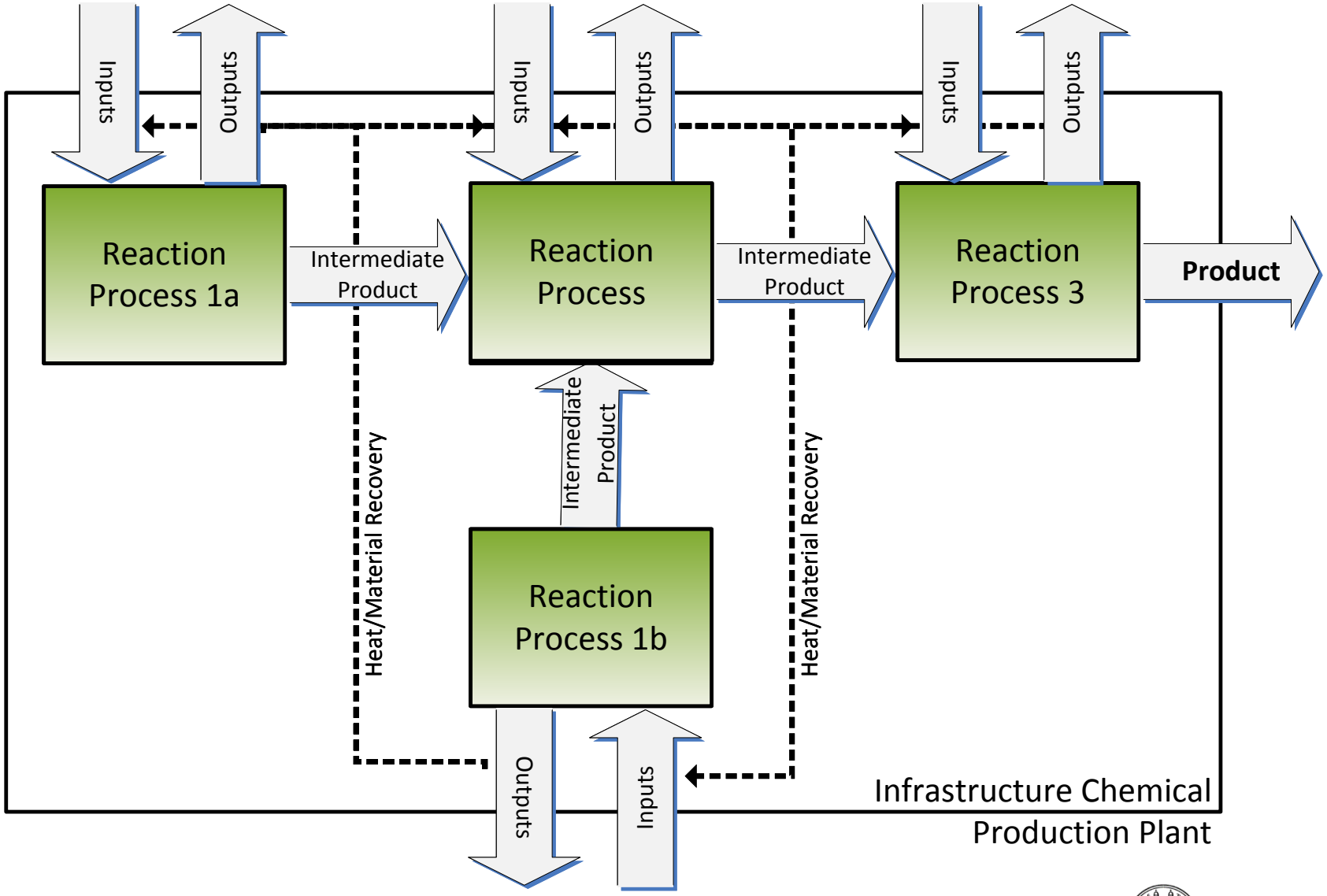
Scale-up procedure

Material and energy in- and output of a reaction process

- Focus on liquid phase batch reactor processes



Production plant with multiple reaction processes



Case study

NanoCelluComp

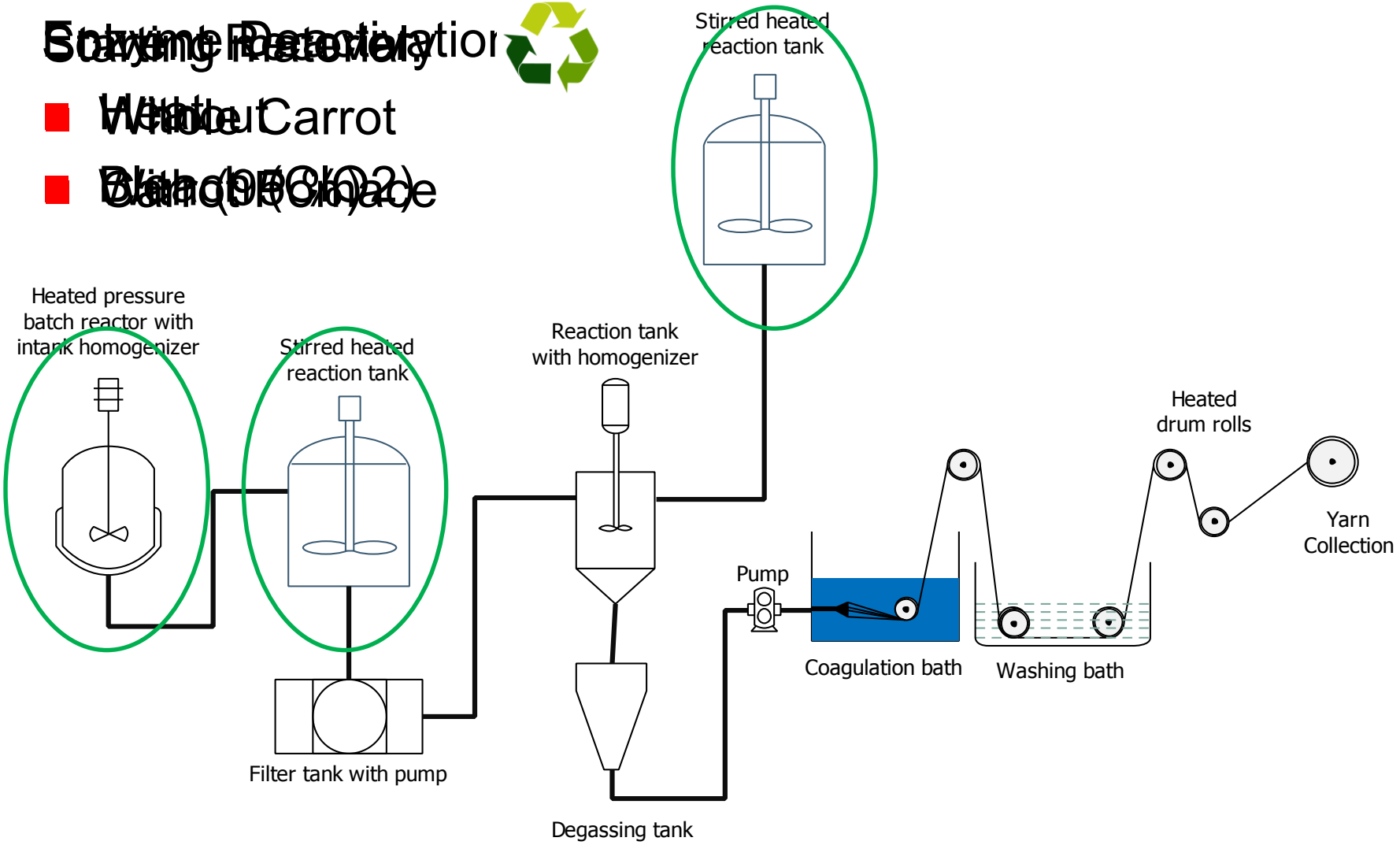
Lab production and plant flow chart

Carrot Waste

Production of 94 kg per batch ➔ ~ 700 t/a

Scenario Analyses

- Solvent Recovery
- Without Carrot
- With Carrot

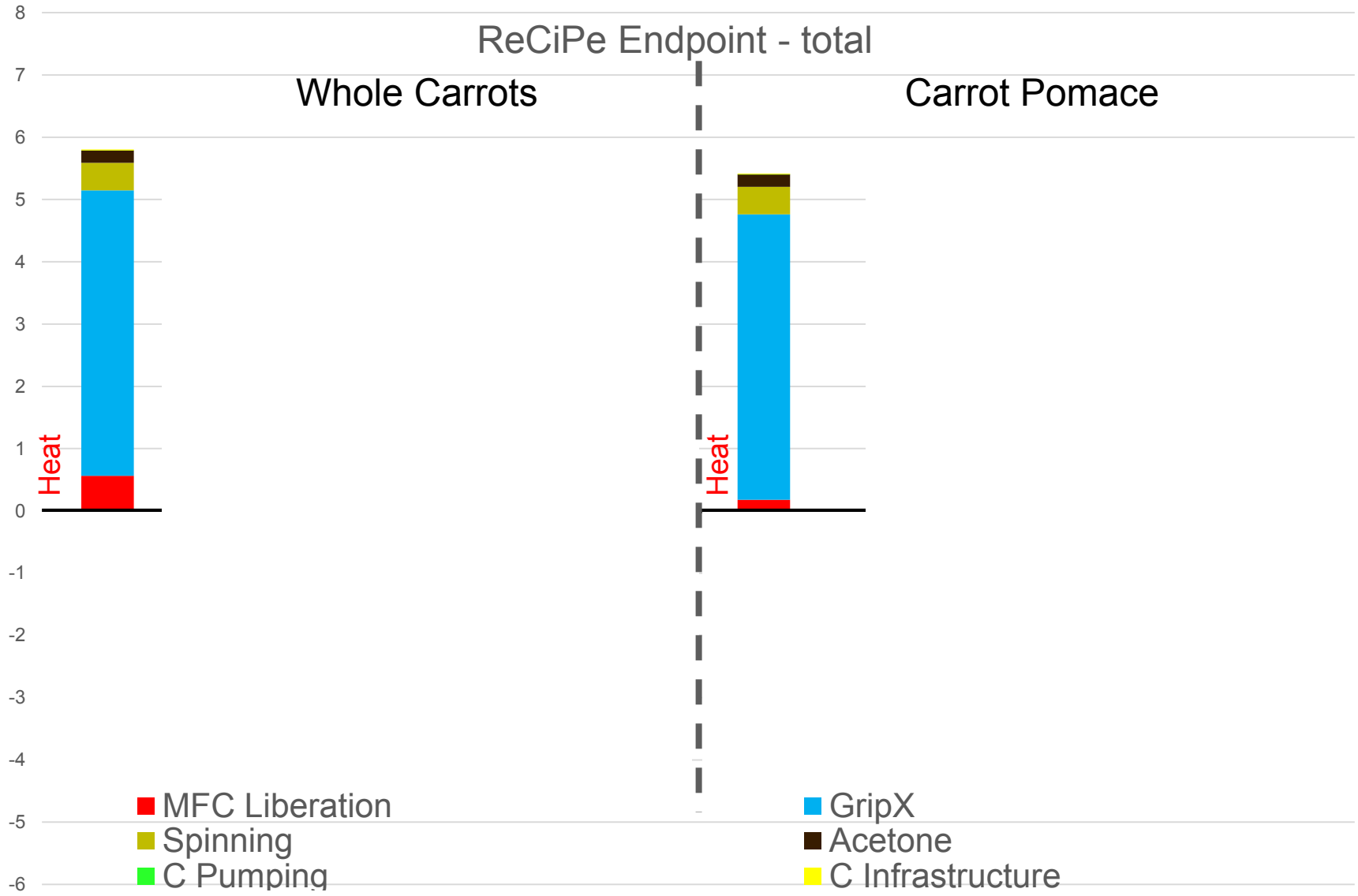


Scenario Analyses

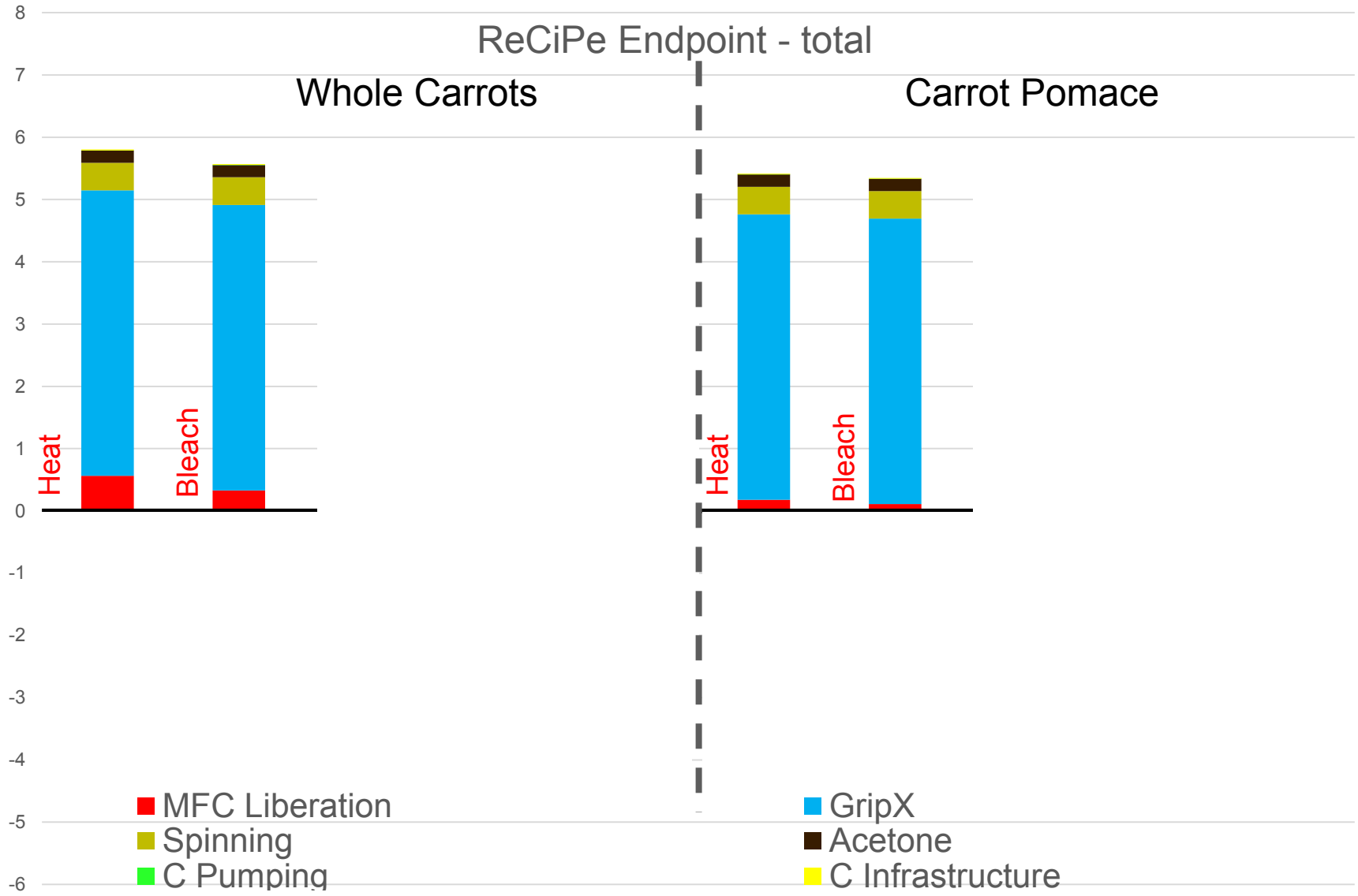
Heat Recovery

Preheat inlet stream with waste heat

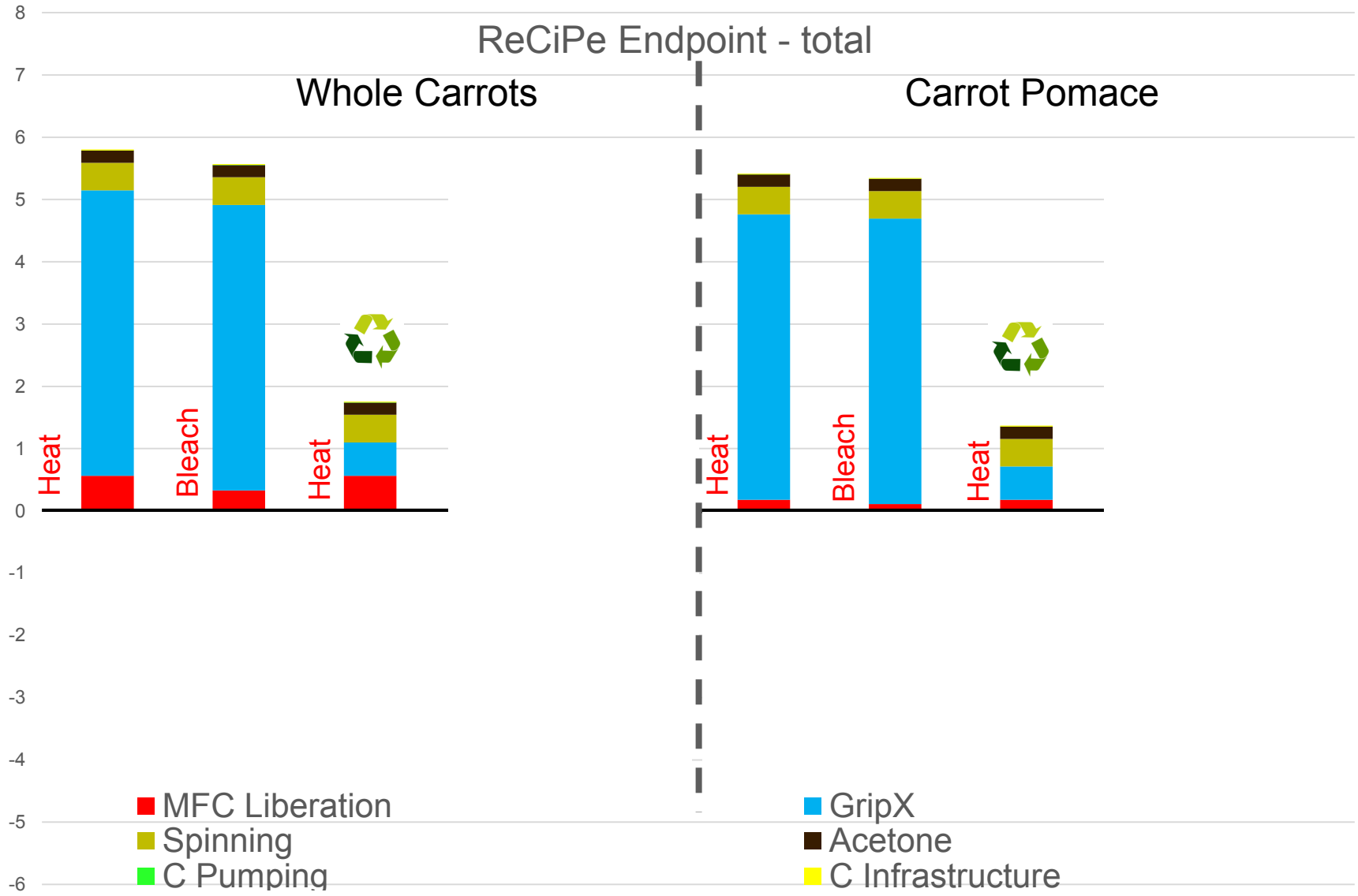
LCIA – production of 1 kg spun yarn



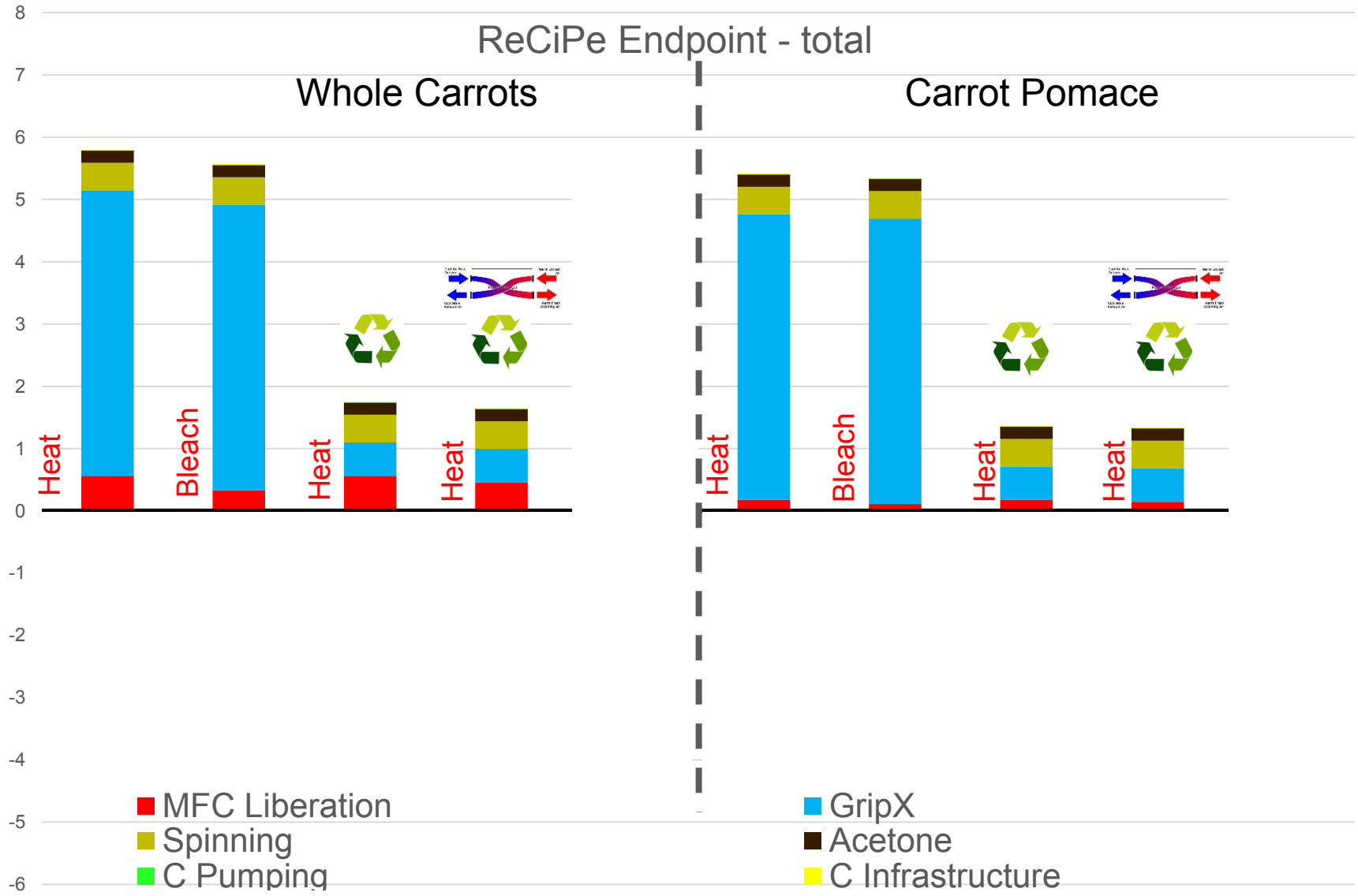
LCIA – production of 1 kg spun yarn



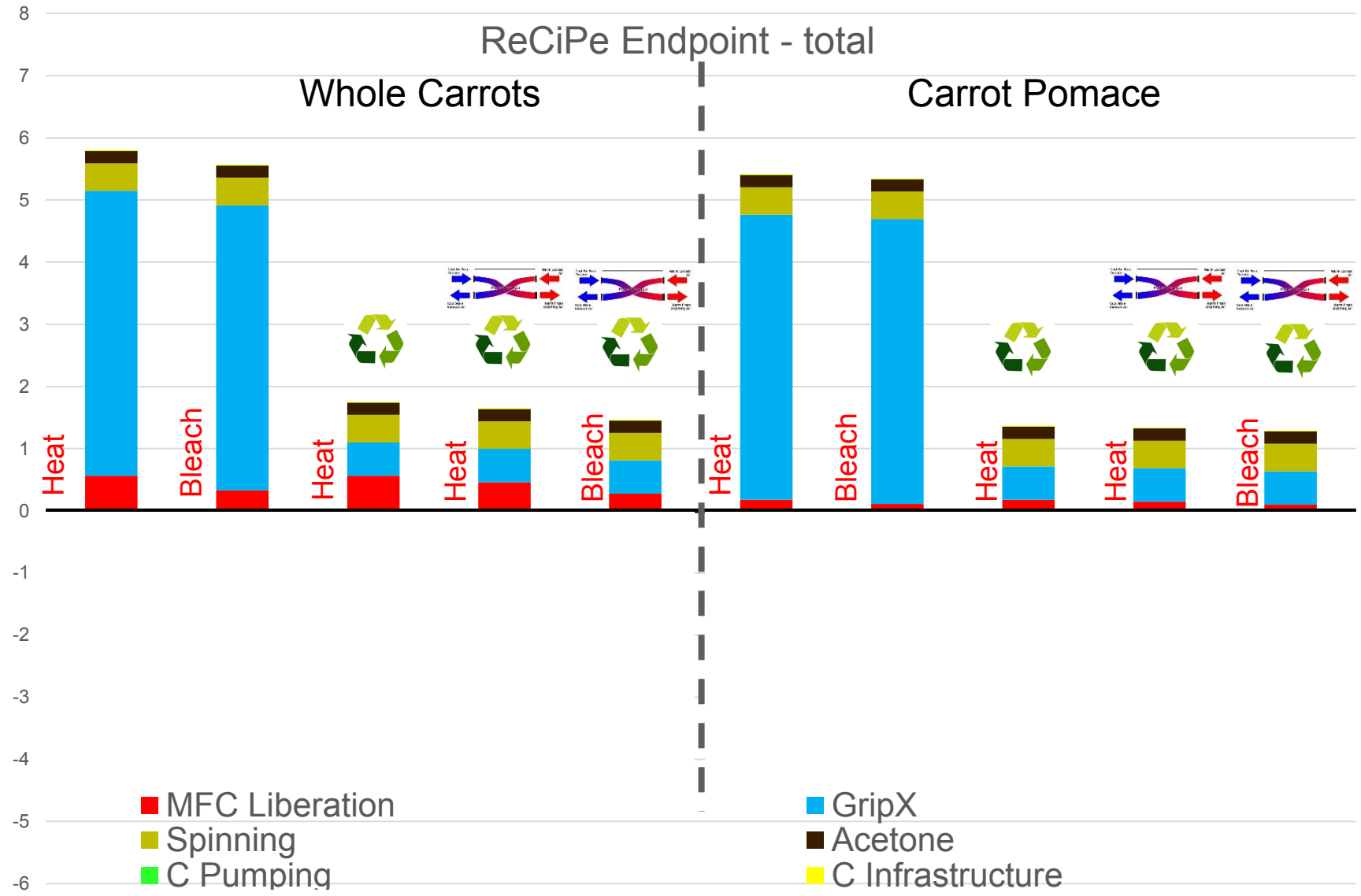
LCIA – production of 1 kg spun yarn



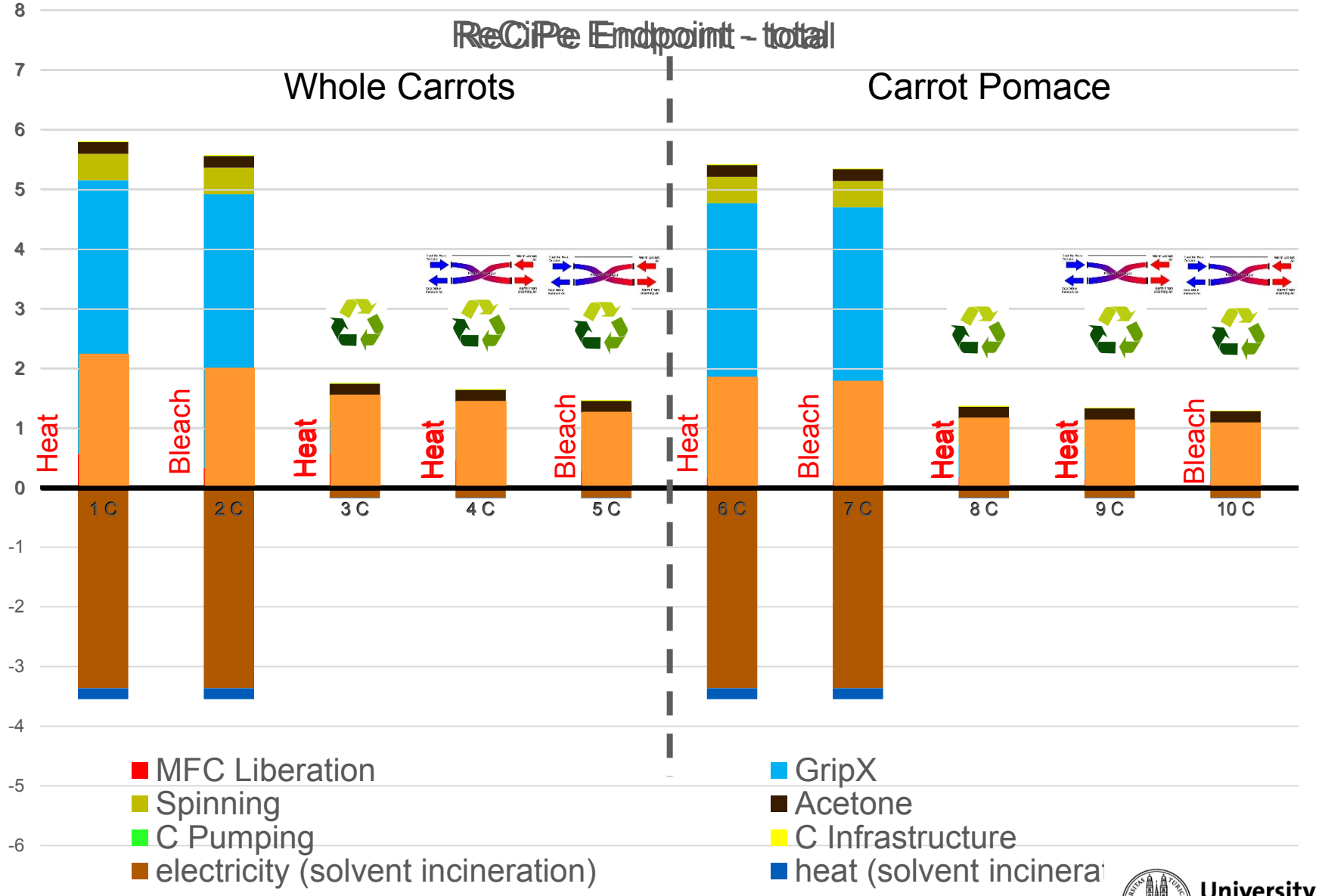
LCIA – production of 1 kg spun yarn



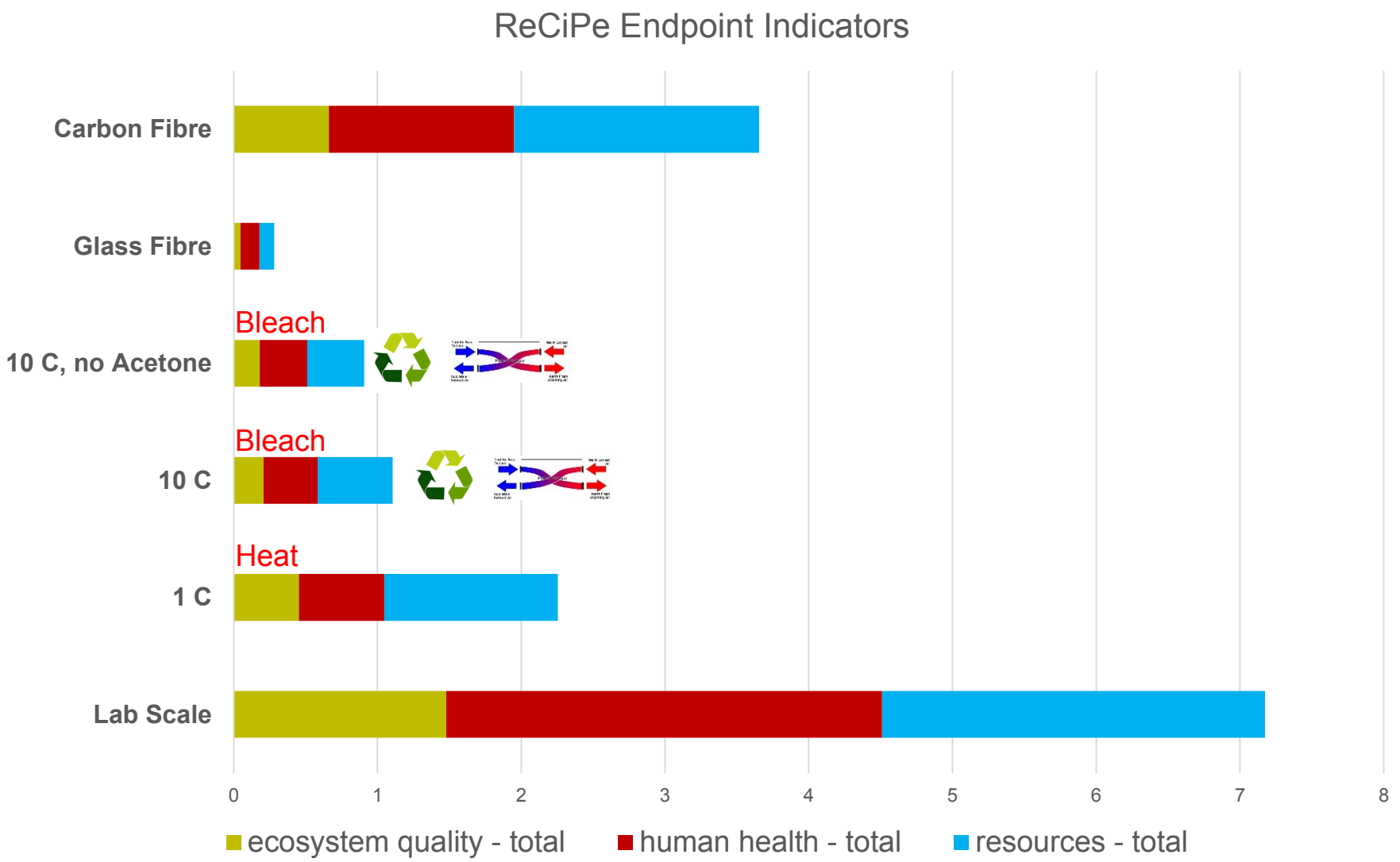
LCIA – production of 1 kg spun yarn



LCIA – production of 1 kg spun yarn



LCIA – Comparison with Lab Scale and Competing Fibres



Conclusions

- Framework helpful in predicting LCA
- Scenario analyses for understanding
- Treat results with caution
- LCA results help to focus on key contributors and optimize process

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Acknowledgement:

NanoCelluComp

Contact:

Fabiano Piccinno

fabiano.piccinno@uzh.ch

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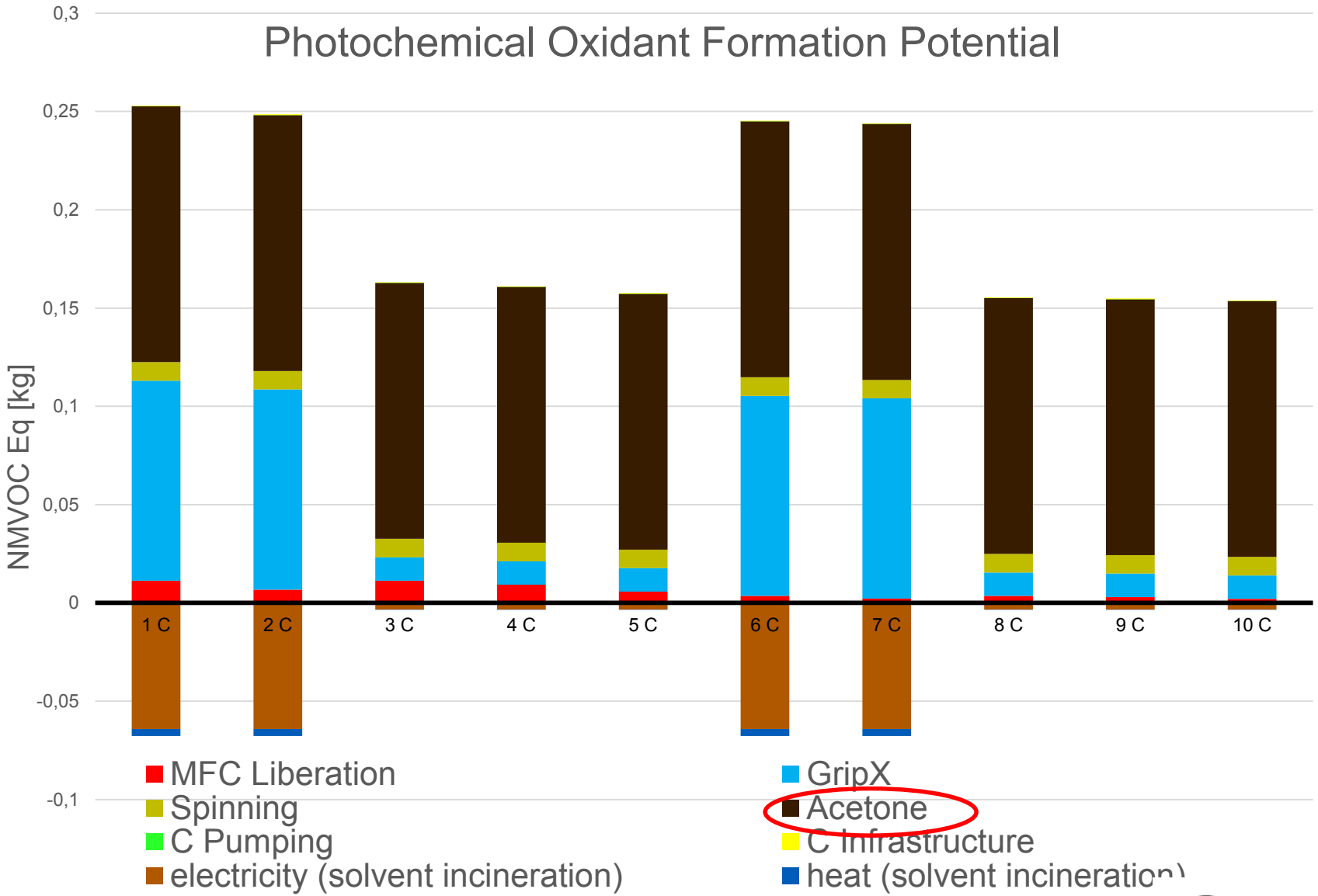
LCIA – production of 1 kg spun yarn



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Application – Motorhome Example

- **System 10 C (lowest impact) used for Cellulose**
- Functional Unit: 1 Motohome
- Transports not included

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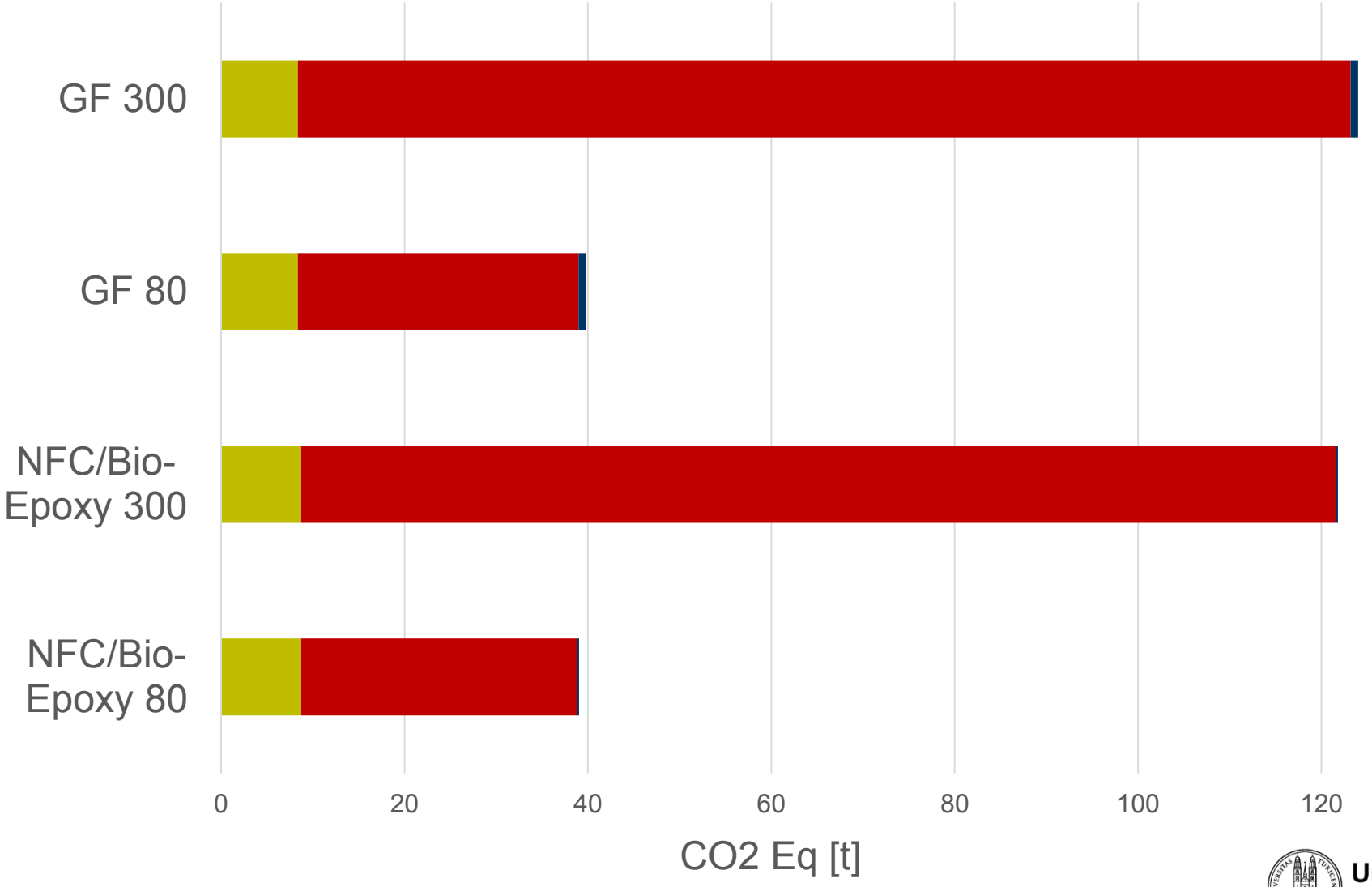
Global Warming Potential



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