



Aalto University

CHEM-E5145

Recycling Challenge

Workshop 5
7.2.2019

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Workshop timetable

- 8.30-9.30 Task 2 pitch
- 9.30-10 Vesborg posters
- 10-10.15 Sum-up the posters

Break 15 min.



Workshop atmosphere 2016

- 10.30-11.00 Recycling challenge
- 11- 11.45 Peer-review of Flip reports + videos preparation + Task 3 details

Intendent learning outcomes

Workshop V

Justify material selection
with scientific argumentation
(Task 2)

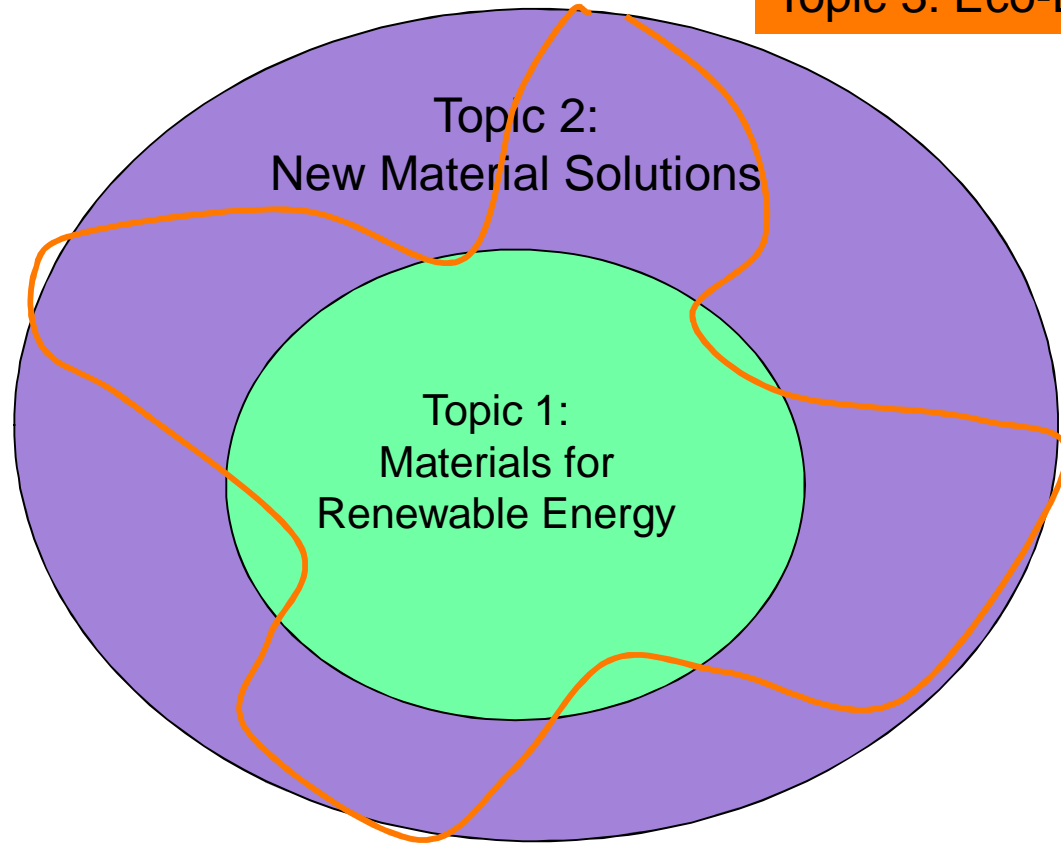
Share the expertise of
ones field in a
heterogenius team

Recognition of the
challenge in recycling

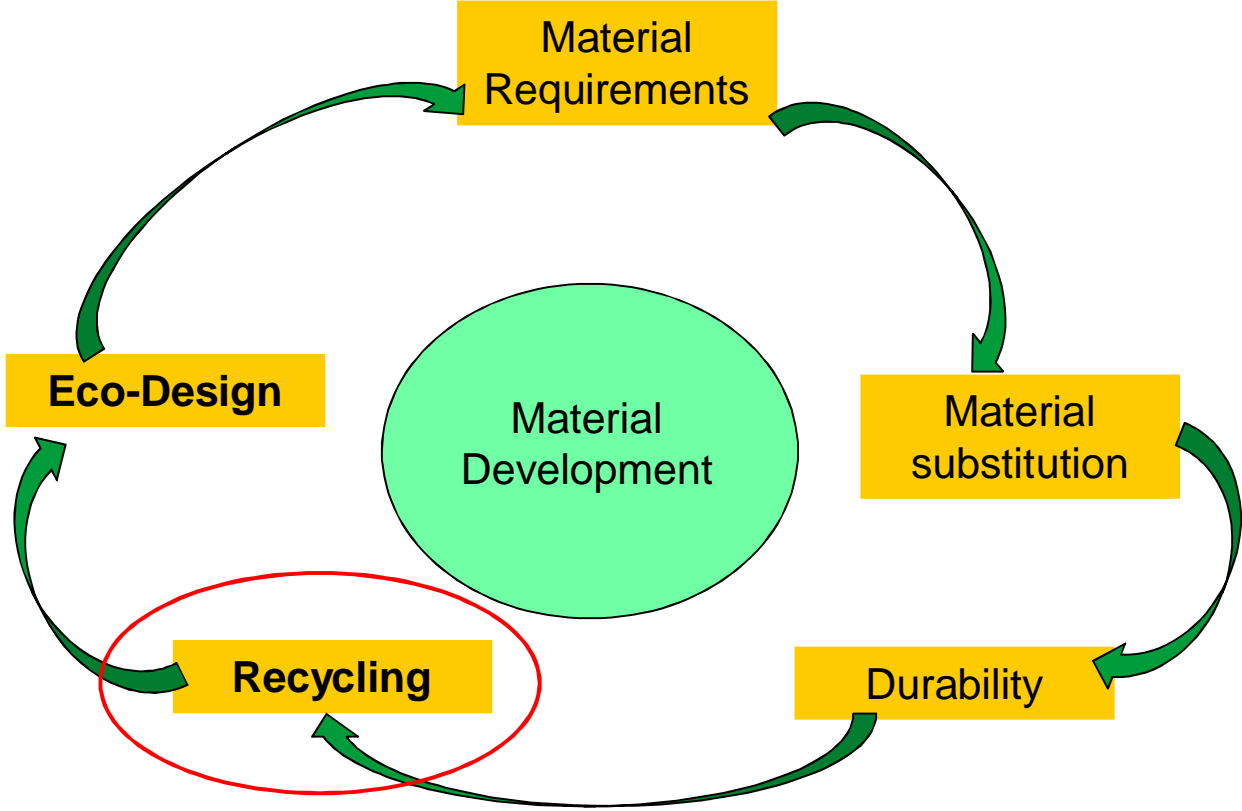


Develop new material
solutions and eco-designs

Topic 3: Eco-Design



Topic 3 – Eco-Design



Task 2 – Pitch at 1.2.2018

Max. 3 min. -> Practice

New material solution

Slides (max. 4-5 slides):

- 1) Shortly your application
- 2) A material issue you are addressing
- 3) New material solution
- 4) Why should your idea be funded?

+

Slide with references (this does not need to be part of the pitch but is part of the submission)

Task 2 – Evaluation

New material solution

Innovation potential max .8 p.

Credibility and the need for this solution max. 7 p.

Delivering the message max. 5 p.

Total 20 p.

The slide must have reference slide in the end, indicating what this idea is based on.

Groups and Topics: Task 3

Off-Shore Wind

- Villa Sai
- Verna
- Riina
- Karim

Thermal Storage

- Moriam
- Julia
- Erfan
- Hamidreza
- Irina

Flow Battery

- Neea
- Tuulia
- Konsta
- Marko
- Reima

Solar PV

- Frej
- Judit
- Vera Kouhi
- Jacobo
- Lucas

Solid Oxide Fuel Cell

- Jarkko
- Jyrki
- Anna
- Ella
- Sandesh

Concentrated Solar Power

- Lillian
- Nikhil
- Aino
- Karri
- Henna-Liisa

Marine

- Alexandra
- Veera Hellgren
- Tomi
- Katriina
- Henri

Workshop V - Poster

The poster should include:

According to *Vesborg* – How abundant are your elements?
Indicate with different post it colours, the raw materials!

Visualization –
to support understanding

Break 15 min.

Sum up from the poster's

Vesborg –diagram

- > How abundant are the raw materials in these applications?
- > Which application has most challenge with scalability?
 - > Which does not have any?

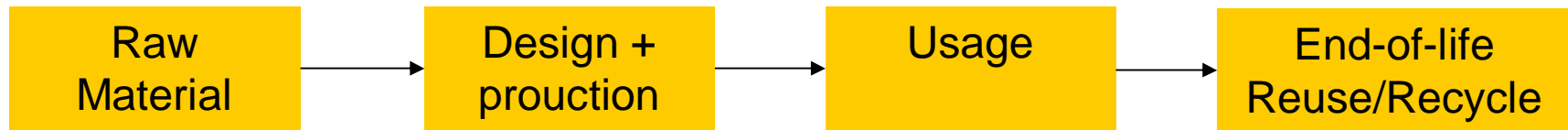


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Recycling Challenge

First we ensure the durability – then come's the recyclability...

Linear economy



Circular economy

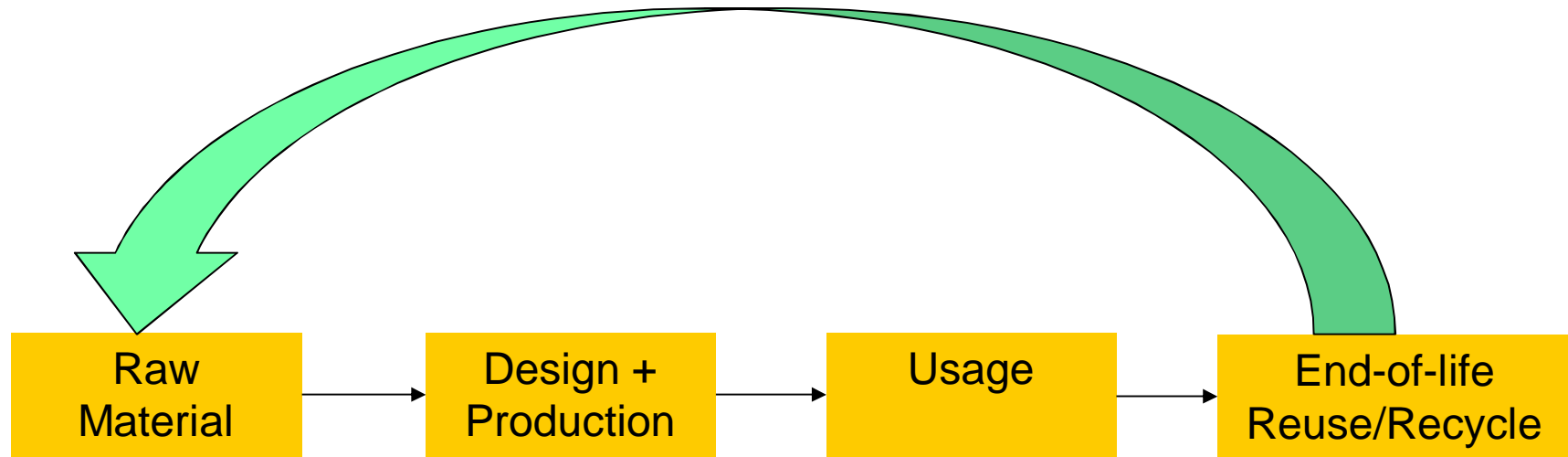


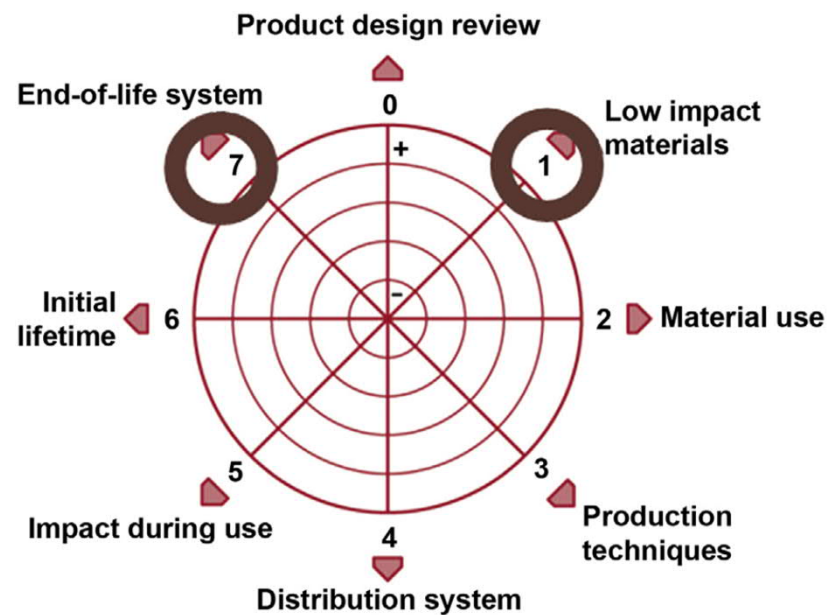


Image: European Parliament

Where does energy play important role?

Eco-design

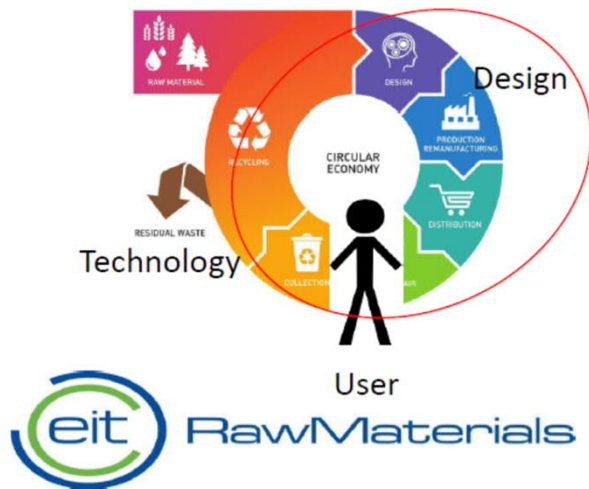
- Eco-design (currently) is a design that take into consideration more ecological design at any part of the product life:



CHEM-E6215 Circular Economy Design Forum

- How to design for recycling: products/processes/services
- Multidisciplinary platform for innovation and added value business
- Entrepreneurial mind-set in Circular Economy context
- Period IV, register open at Oodi

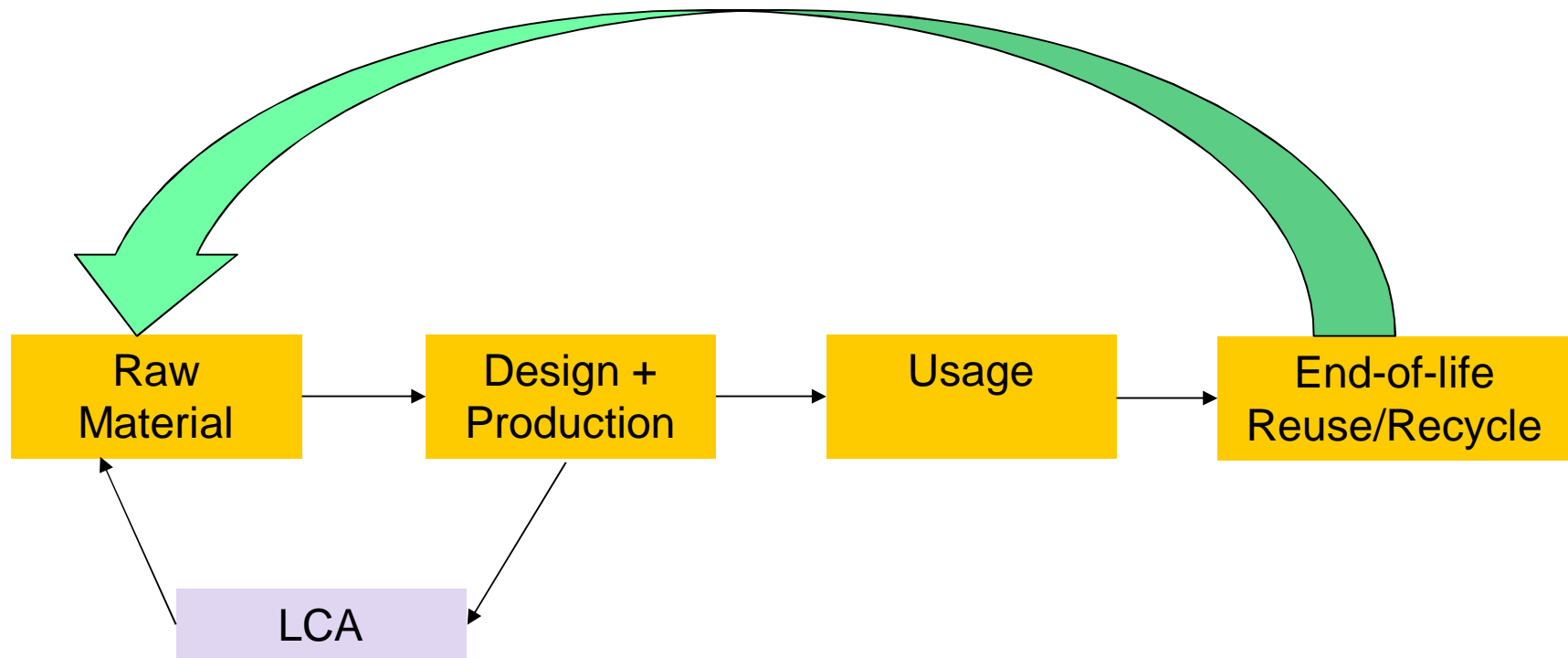
OPPORTUNITY 1: Leasing service



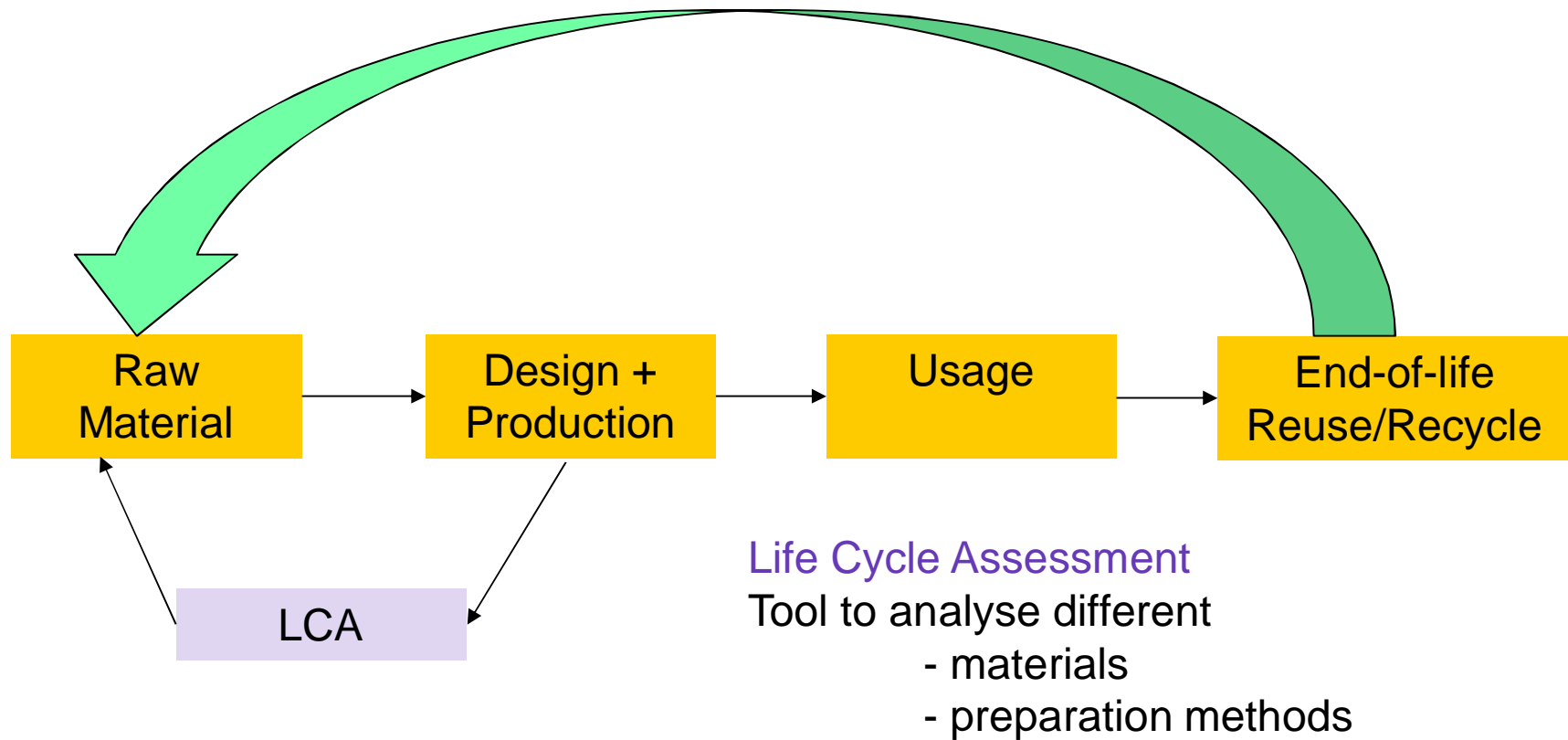
CE expert's



Circular economy



Circular economy

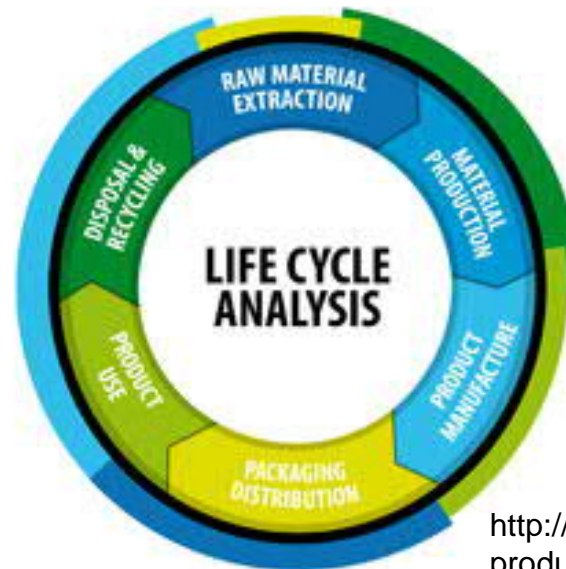


Life cycle assessment

Objective

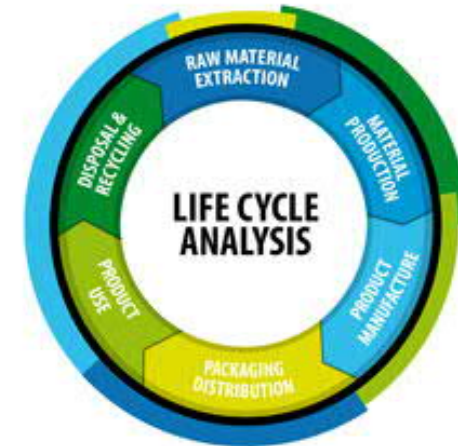
“to understand the environmental impact of a product over its lifetime”

ISO14040 guidelines



<http://www.nibe.org/en/services-and-products/research/LifeCycleAssessment>

Life cycle assessment



<http://www.nibe.org/en/services-and-products/research/LifeCycleAssessment>

Can reveal:

What is the largest energy sink

Where does the largest impact to environment come from?

Which material production method has lowest consumption energy/smallest footprint to environment?

What is the effect on packaging/transport

Product use

Disposal and recycling

Life cycle assessment

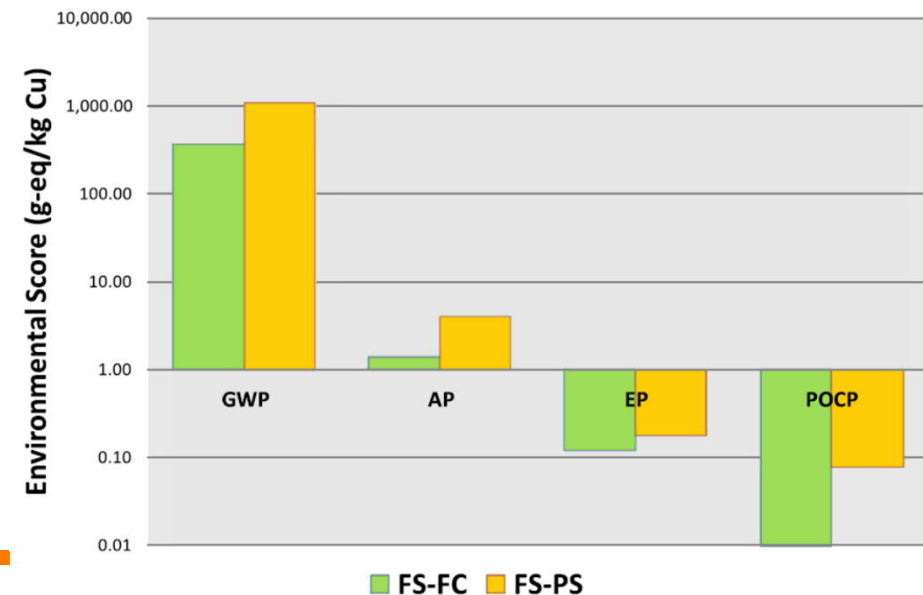
Answer can be

Comparison of different index

- Energy consumption
- Global Warm Potential (GWP) [CO₂ emissions]
- Acidification Potential (AP)
- Human toxicity (cancer)
- Eutrication potential (EP)
- Photochemical ozone creation potential (POCP)

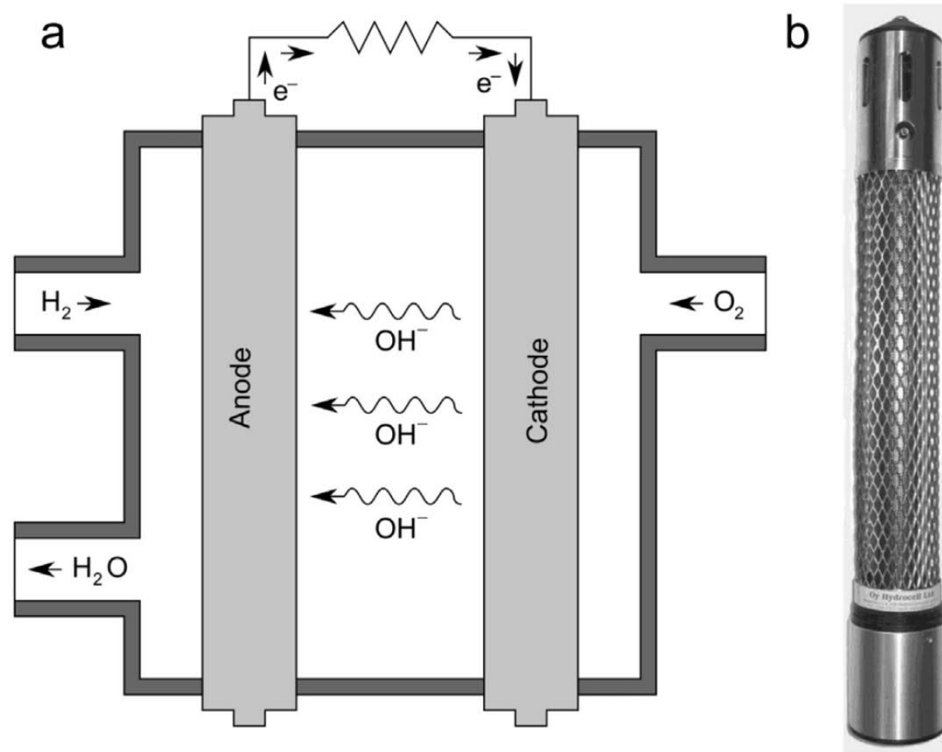


<http://www.nibe.org/en/services-and-products/research/LifeCycleAssessment>



Life Cycle Assessment

Case: Alkaline Fuel Cell



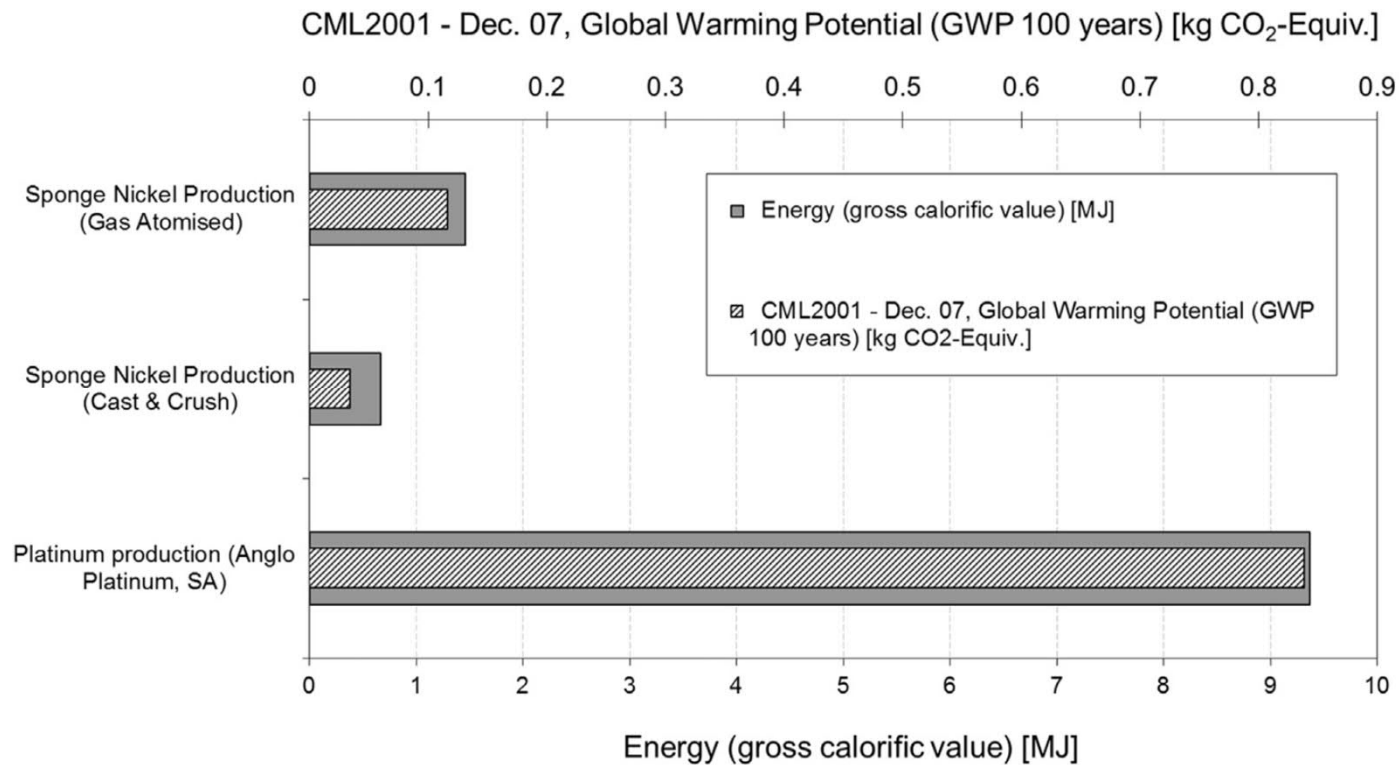
Catalyst options for anode:

- Pt
- Raney Ni
(Gas atomized)
- Raney Ni
(Cast & Crush)

Which has the largest effect
on environment?

Life Cycle Assessment

Case: Alkaline Fuel Cell



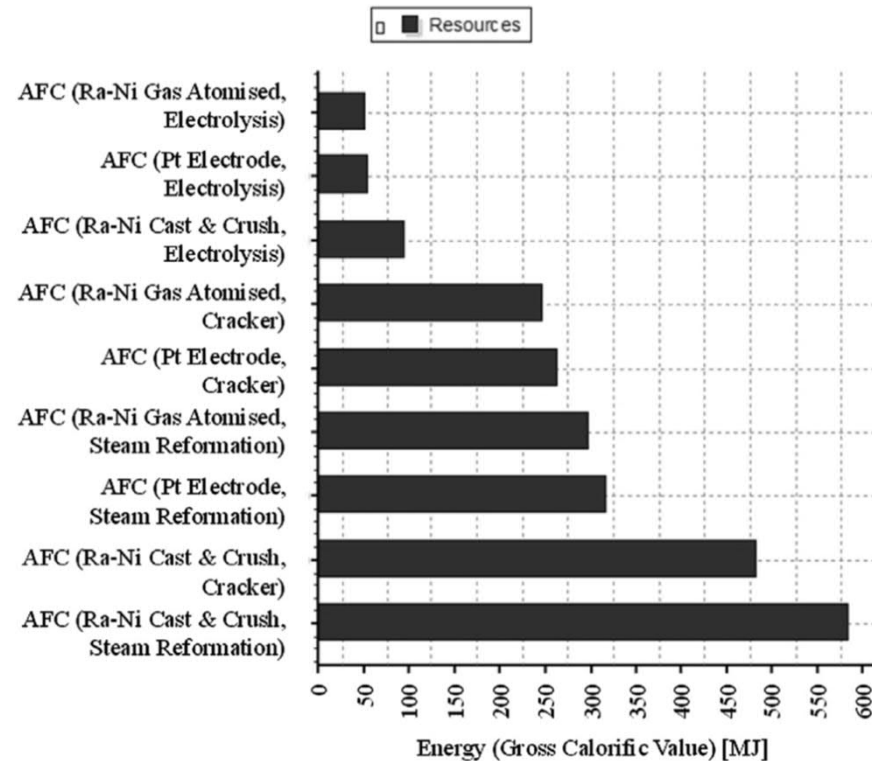
Life Cycle Assessment Case: Alkaline Fuel Cell

Overall energy required during the whole lifetime of AFC

Effect on the hydrogen production?

- Electrolysis
- Hydrocarbon cracking
- Steam reforming

Which has the lowest effect on environment?



Note:

- Gas atomised Ra-Ni had higher durability in AFM lifetime!
-> decreases energy required

Life Cycle Assessment

Case: Polymers

Polymer components are used almost in all applications

- PLA (polylactide), biobased polymer

- PP (polypropylene), oil based polymer



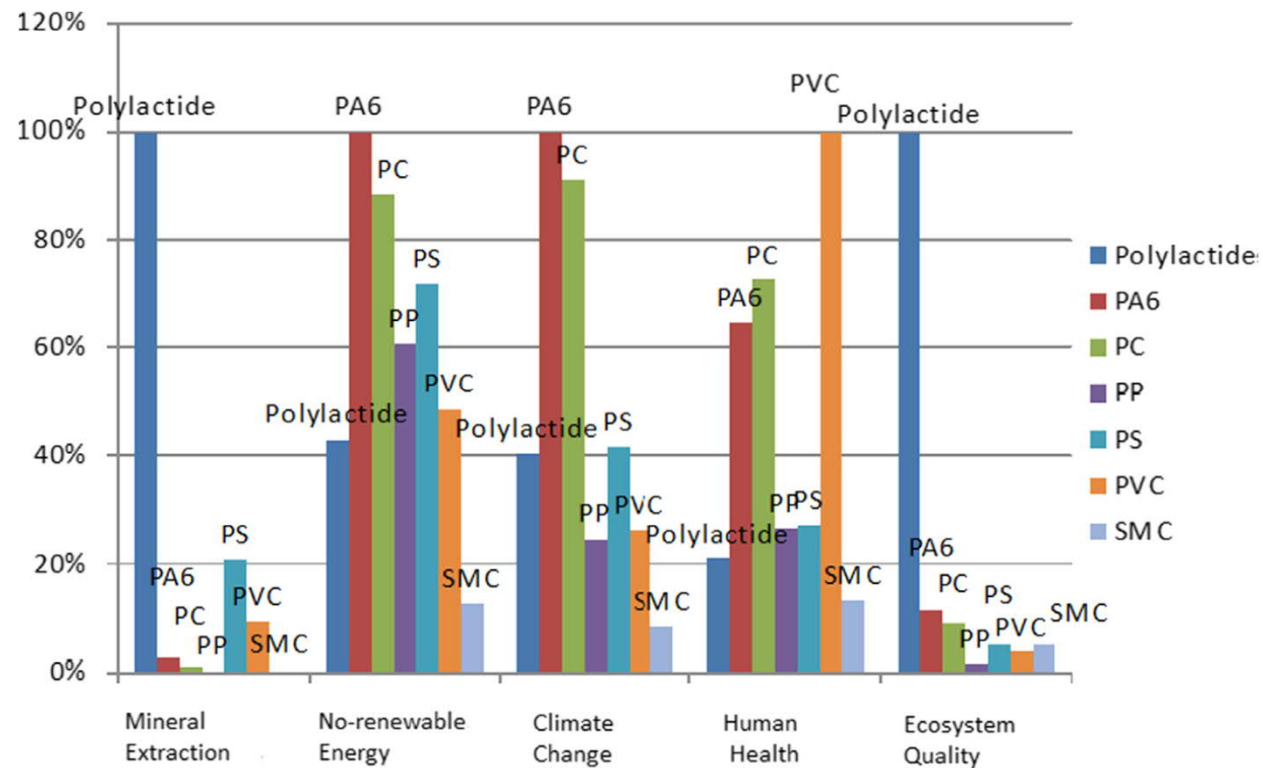
www.technologystudent.com

www.corporatevending.com

Which one has the lowest effect on environment?

Life Cycle Assessment

Case: Polymers



Recycling Challenge – Case: Computer



Reflection



1. What was most interesting today?
2. I would have wanted to hear more on?



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Next workshop VI

Next workshop VI

- Poster session (Life Cycle Assessment)
- Biobased materials – thermal storage (Roza Yazdani, post doctoral reseracher)
- Theory: Eco-Design and how to take that into account
In your design of Task 3
- Brainstorming and preparing for the Task 3

Flip report V:

1) E. Worrell and M.A. Reuter, *Handbook of recycling*
Part 3: Chapter 27 “From Recycling to Eco-Design”
[Part 1: Chapters 1-3 (strongly recommended to read)]
MyCourses – Materials

2) News paper clip: “Recycling”

Preferable in your application (if not found any on course topic)
(any country, any language)

3) Journal Paper: Life Cycle Assessment on your application

If various option, divide in the group
If you can't find, contact Annukka

VTT Excursion at 14.2

Location: -> Biologinkuja 5A (Behind Abloc)

Two groups 13-14 and 14-15 (MyCourses questioner)

You **need to have ID** with you

- For Finns
 - Driver's license
 - Official ID card with image
- For non Finnish citizen it needs to be
 - **Passport** (preferable), they will be photographed
 - European Union ID -card

Excursion report

- DL 25.2.2019 submit to MyCourses and
- Peer reviewed online (You will get also points by preparing the peer review). Peer review timetable next week

Reflective report

- Write report on energy system research at VTT:
 - What was new to you?
- What topics (discussed at the course) were presented?

Max. 1 page



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Task 3 Instructions

Task 3 – Eco-design

Presented at examination week: 28.2 14-17

- Eco-design is material design taking into account the recyclability of the application at end-of-life
- This can be new material solution, new design, reselection of materials
- But also ... new concept, new business opportunities

- You need to first know the current status of your application
- Select a topic that is already in consumer use

Task 3: Eco-Design

- You prepare a Eco-Design for your application
 - Can be various ideas/solutions for different stages of the product lifetime
 - Presentation of **max. 10 min.** including:
 - Life cycle of the product
 - Current challenges in recycling
 - Eco-Design improvements (1-3 solutions at different parts of the value chain)
 - Scientific argumentation (why?)
 - 5 min. for questions
-

Task 3 Grading (25 p.)

- Entire life cycle of the application and it's bottlenecks 6 p.
 - Innovation potential of the solution/(s) 6 p.
 - How this help commercialization of the product 4 p.
 - Scientific justification 4 p.
 - Clarity of the presentation and answering to questions 5 p.
- 25 p.

Flip reports – peer review

- Student number to your task
 - Select one flip that is from other topic than your own
 - Read and evaluate the report (15 min.)
 - Write at least 2 sentence of feedback
 - What was good/interesting or/and what could be improved
 - Grade
 - 3 p. Excellent work
 - 2 p. Good work
 - 1 p. Some parts missing/ Unclear text
 - 0 p. No submission
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