Decision Making in Car Dismantling and Recycling

Cascade Use
Research Group at Oldenburg University

Alexandra Pehlken, Matthias Kalverkamp

Presentation at the
IARC, Vienna, March 15th 2018
Please see also ICM media

https://icm.ch/press-article-iarc

For all press releases related to IARC 2018
What we do

✓ ‘Cascade Use’ supports the ambition of societal actors towards a reduced resource use and minimizing CO$_2$ emissions in the long-term.

✓ We develop and test a key assessment tool for decision making on the environmental performance on car parts reuse or recycling.

✓ The target is to keep resources within the economic cycle as long as possible in order to reduce or even avoid the use and processing of primary raw materials.
What do we want?

- By 2030, achieve the sustainable management and efficient use of natural resources
- By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse
- By 2030, ensure that people everywhere have the relevant information and awareness for sustainable development and lifestyles in harmony with nature
Our Case study: The car and its life cycle(s)

Processing of Raw Materials (e.g. car manufacturing)

- Dismantling
- Sale as Second-hand Car
- Export Worldwide
- Secondary Raw Materials through Recycling Processes
- Remanufacturing of Selected Car Parts
- Sale of Used Car Parts
- Raw Material Processing

Use of Remanufactured Car Parts

Trade-in as Second-hand Car

Picture references:
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© fotomek – Fotolia.com
And own sources
Green Car seen in Oldenburg, Germany
The Cascade

Kalverkamp, Matthias; Pehlken, Alexandra; Wuest, Thorsten (2017): Cascade Use and the Management of Product Lifecycles.
In: Sustainability 9 (9), S. 1540. DOI: 10.3390/su9091540
The Cascade in automotive aftermarket

**CLSC Example**: OEM-controlled product flows through closed-loop supply chains; loops end after a number of reuse cycles and leakage occurs; or products are actively steered into recycling and recovery.

**‘Cambio Volante’ Case**: Used-car converters utilize export supply chains from Japan to establish new additional lifecycles from both formerly closed-loop supply chains (see example above) or from classic forward supply chains.

Challenges for corresponding supply chains:
- Unavailable or extremely expensive spare parts
- Limited access to used parts from LHD countries

**Recycling issues**:
- Recycling landscape is very limited in the region (Chile, Bolivia, Paraguay)
- Extended use of vehicles counterproductive for the environment at some point

**Direct-recycling issue**: In this particular case, if directly recycling, environmentally preferable reuse precluded.
Increasing Reuse Opportunities: Potential Development for Trade with Reused Parts

Our Decision Tool „RAUPE“

Raupe: Recycling of Automotive Units and Parts Evaluator
Based on user generated content
Lichtmaschine

Elektrik > Anlasser, Lichtmaschine

Lichtmaschine (gebraucht)

Produktinformation

- Ersatzteil: Lichtmaschine 1, Golf 6N / 6KV ab 95, Classic / 028903023E
- Leistung: 5km
- Originalteilnummer: 028903023H
- Baujahr: 1995
- Preis:
  - gebraucht: 58,25 EUR
  - neu: 91,59 EUR
  - +7,00 EUR Versand inkl. MedSt.
  - +10,00 EUR Versand inkl. MedSt.

Mach mit!
Jetzt als Partner die Seite bearbeiten und Informationen teilen.

Fragen zu diesem Bauteil?
Partner anschreiben und in den Direktkontakt treten.

gebraucht 58,25 EUR
64 % Preissparnis

Einsparpotential für das ausgewählte Bauteil

- CO2-Ersparnis: 45% (0-100)
- Material-Ersparnis: 80% (0-100)

Einsparpotential insgesamt

- CO2-Ersparnis: +18% (0-100)
- Material-Ersparnis in kg: +87%

Bestandteile & Materialien

<table>
<thead>
<tr>
<th>Part</th>
<th>Material</th>
<th>Weight (kg)</th>
<th>Replacement probability (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strator</td>
<td>Steel</td>
<td>0.773</td>
<td>20</td>
</tr>
<tr>
<td>Rotor coil</td>
<td>Copper</td>
<td>0.550</td>
<td>22</td>
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<tr>
<td>Rotor</td>
<td>Iron cast</td>
<td>1.094</td>
<td>19</td>
</tr>
<tr>
<td>Drive shaft</td>
<td>Steel</td>
<td>0.262</td>
<td>10</td>
</tr>
<tr>
<td>Belt fitting</td>
<td>Steel</td>
<td>0.519</td>
<td>10</td>
</tr>
<tr>
<td>Fan</td>
<td>Steel</td>
<td>0.138</td>
<td>10</td>
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<tr>
<td>Spacer</td>
<td>Aluminium</td>
<td>0.003</td>
<td>50</td>
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<tr>
<td>Bearings</td>
<td>Rolled steel</td>
<td>0.099</td>
<td>50</td>
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<tr>
<td>Slip ring N</td>
<td>Copper</td>
<td>0.033</td>
<td>100</td>
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<td>Slip ring S</td>
<td>Copper</td>
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<tr>
<td>Housing</td>
<td>Iron cast</td>
<td>2.527</td>
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</tbody>
</table>
Lichtmaschine

Elektrik > Anlasser, Lichtmaschine

Lichtmaschine (gebraucht)

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- Baujahr: 1995
- Preis:
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Einsparpotenzial für das ausgewählte Bauteil
- 45% CO₂-Ersparnis
- 80% Material-Ersparnis

Einsparpotenzial gesamt
- +18% CO₂-Ersparnis
- +87% Material-Ersparnis in kg

Bestandteile & Materialien

Folgende Elemente sind in diesem Bauteil enthalten

Mach mit!
Jetzt als Partner die Seite bearbeiten und Informationen teilen.

Fragen zu diesem Bauteil?
Partner anschreiben und in den Direktkontakt treten.
Based on the history of sold car parts

Drive: 56,478 Products
Lighting: 29,834 Products
Brake: 15,053 Products
Electrical: 58,910 Products
Undercarriage: 25,312 Products
Windows and panes: 2,814 Products
Interior: 25,552 Products
Body parts: 64,605 Products
Comfort equipment: 15,926 Products
Complete Packages: 18 Products
Steering: 1,655 Products
Other: 14,906 Products
Making information available

Critical elements periodic table in development on the CCU website including the new information of the EU 2017 criticality assessment

https://tempro.uni-oldenburg.de/elemente
Platinum (78)

solid, primordial, metal, transition metal

Criticality status: critical

Supply concentration: 4.460 HHI (high) *

Supply risk: 2.2 *

Weighted country risk: 0.07 GLR (moderate) *

Economic importance: 4.9 *

Primary production:
- South Africa (71%)
- Rusia (16%)
- Zimbabwe (6%)

Legend
- Critical
- Candidate
Training the young generation: 
Scrappy Bird saves the planet 
Android Version available on playstore
Conclusion

• High Potential for recycling of raw materials with improving material efficiency through consumer education and training.

• Without cascading materials, shortage of raw materials in 2050 very likely. Therefore, material efficiency through recycling must be improved.

• Circular economy also addresses open-loops without the engagement of OEMs (compare to closed-loop). These actors need more support since they are important players in efficiency.
Contact Us

Dr.-Ing. Alexandra Pehlken
alexandra.pehlken@uni-oldenburg.de

Research Group Leader: Cascade Use
Oldenburg University, Germany
www.uni-oldenburg.de/cascadeuse

Research Focuses:
• Remanufacturing supply chains and marketing systems
• Supply Chain Management and Product Lifecycle Management

Matthias Kalverkamp, M.Sc.
Market Analysis
matthias.kalverkamp@uni-oldenburg.de
Join us for ICCCE 2018

International Conference of Cascade-use and Circular Economy
Come to the Northwestern part of Germany: to Oldenburg (Lower Saxony)
September 24th and 25th, 2018

https://iccce2018.com/
Thank you for your attention!

Dr.-Ing. Alexandra Pehlken
alexandra.pehlken@uni-oldenburg.de

Leader of Research Group Cascade Use, Oldenburg University, Germany
References:


