ReziProK
Resource-efficient Circular Economy – Innovative Product Cycles

LifeCycling²

Reconfigurable design concepts and services for resource-efficient (re-)use of e-cargobikes

Resource-efficient Circular Economy – Innovative Product Cycles (ReziProK)

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E-bikes and e-cargobikes are already an integral part of our mobility. The strong spread of electrically assisted bikes is accompanied by the question of resource-efficient recycling after initial use. In the joint project "LifeCyling²", solutions for further use and recycling of complete wheels and individual components are being developed and tested. This also includes the development of services and recycling measures.

Persona characteristics and user stories

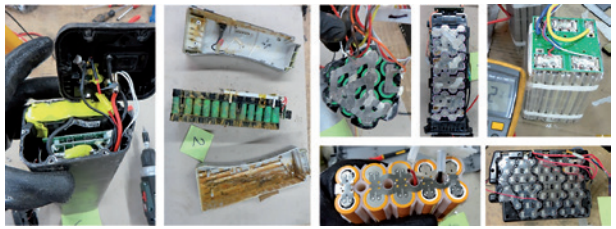
Resource-efficient mobility

The volume of traffic for individual mobility and transportation of goods is increasing worldwide. E-bikes and e-cargobikes are suitable for lower-emission mobility, especially in innercity areas. However, the lower use of resources during the use phase of e-bikes and e-cargobikes is currently countered by a lack of solutions for the continued use of resource-intensive components such as batteries and the recycling of the complete bicycle.

Since e-bikes and e-cargobikes will be considered electronic scrap in the future, concepts must be developed to recycle individual components in a targeted manner or to transfer them to secondary uses. In order to increase the resource efficiency of e-cargobikes beyond their first use, the partners in the joint project "LifeCyling²" are researching and testing solutions for the targeted further use and upgrading of products and components and for material recycling. Effectiveness and innovations will result from interdisciplinary cooperation and the strong linking of services and products.

Controlling life cycle options

The project LifeCyling² aims at improving the life cycle-spanning resource efficiency against the background of the increasing spread of e-cargobikes. Technical concepts are to be developed to extend the service life by means of product updates and upgrades and to optimise the intensity of use through sharing solutions. In addition, measures for the life cycle-oriented design of e-cargobikes and methods for the definition of life cycle strategies will be developed and organizational measures for the targeted recycling of electronic components will be investigated. The design concepts developed for hardware and software systems will be implemented and tested in practice in the form of demonstrators for pilot projects. In addition, technical solutions and services will be developed and tested as software-based



Battery systems of various producers have been analysed.

services to improve usage behaviour and resource efficiency during initial use by means of upgrades to enable resource-efficient reuse of the entire bike or individual components. In LifeCycling², four fields have been identified:

- Product: upgrading, residual value assessment and secondary use of e-cargobikes.
- Components: Recycling and conversion of accumulators and drive components.
- Material: separation and recycling of materials.
- Information and control: Collection and provision of information to increase the Resource efficiency.

First results

Several use cases for e-cargobikes and personas have been derived within Design Thinking workshops. The use cases are the central element within the development of the e-cargo, the battery, the business model, information services and recycling processes. A distinction is made between commercial use for the transport of goods and private use for the transport of goods and people (and other living beings). As for business models, both leasing and sharing have been identified. Initial sets of requirements were collected with the help of structured influencing factors.

In another strand, an analysis of commercial battery systems and cells for e-bike drives has been carried out. The recycler was able to collect and provide old batteries and battery systems from various manufacturers. By analysing them, it could be determined that there are no standards regarding the cell designs used (cylindrical cells, prismatic cells, pouch cells) as well as the mechanical and electrical system design (e.g. housing, sensory system).

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Solutions in pilot projects

The approaches are being developed in an interdisciplinary way in a network of two university institutes and four industrial partners and tested in pilot projects. From the pilot projects and findings, generally valid recommendations for action, strategies and technical measures as well as processes for the development and implementation of product, component and material cycles for e-bikes and e-cargobikes will be derived. Researchers from product and software development and accompanying social research are involved in the joint project. The industrial partners contribute expertise in the fields of recycling, safety of accumulators, leasing and service solutions for e-bikes and e-cargobikes as well as data acquisition, evaluation and visualisation.

During the project, associations, citizens, bicycle manufacturers and mobility providers will be involved in the collection of requirements and evaluation of future application scenarios for e-cargobikes.

The project "LifeCycling²" is funded within the funding measure "Resource-efficient Circular Economy – Innovative Product Cycles (ReziProK)".

"ReziProK" is part of the research concept "Resource-efficient Circular Economy" of the Federal Ministry of Education and Research (BMBF) as part of the FONA Field of action 6: "The circular economy – efficient use of raw materials, avoiding waste" and supports projects that develop business models, design concepts or digital technologies for closed product cycles.

Funding measure
Resource-efficient Circular Economy – Innovative Product Cycles (ReziProK)

As part of the FONA Field of action 6:
The circular economy – efficient use of raw materials, avoiding waste.

Project title
LifeCycling² – Reconfigurable design concepts and services for resource-efficient (re-)use of e-cargobikes

Project duration
01.08.2019 – 31.07.2022

Funding reference number
033R232A–F

Funding volume of the project
1.498.994 Euro

Internet
reziprok.produktkreislauf.de

Publisher and editorial office
Networking and transfer project "RessWInn"

Design
PM-GrafikDesign

Picture credits
NFF/Massel; TU Braunschweig/Cudok

Status
March 2021

Cover-Picture: "LifeCycling²" explores solutions for sustainable mobility.

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