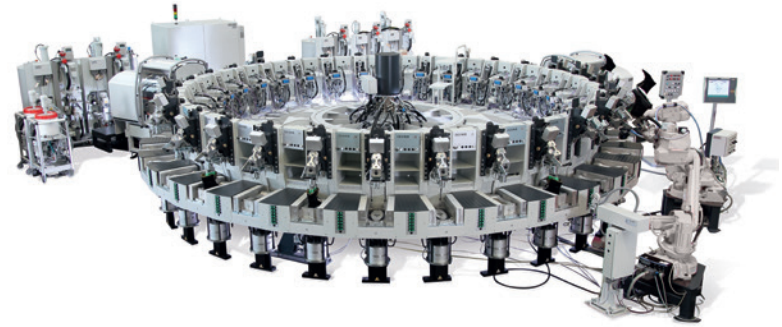
ReziProK
Resource-efficient Circular Economy – Innovative Product Cycles

LongLife

New business models for an extended use of technical systems based on a simple, decentralized condition assessment and prognosis of the remaining service life



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

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Components, such as bearings, springs e.g. in machines, are often replaced significantly before they reach the technically possible service life and are sent too early to material recycling or disposal. Using selected applications, the partners in the consortium want to show that a decentralised condition assessment with a prognosis of the remaining service life can lead to longer use and thus make a contribution to improved resource efficiency.

Application example: a high-speed roll-up door.

Sustainability instead of short-term effects

We have defined two Use-Cases for the project “LongLife”. On the one hand, the drive spindle of an injection unit from a shoe machine and on the other hand mechanical components of an industrial high-speed roll-up door. Components in technical systems, such as bearings, drive belts and springs are regularly replaced according to a maintenance schedule, although in some cases they could be kept in use much longer. One reason for this is often the uncertainty regarding the actual condition of the components and their expectable remaining service life, because such information cannot be obtained with existing means and data or because the cost-benefit ratio is unacceptable. A further barrier is that the business models of the involved companies are often not geared to such extended use of the components. For example, manufacturer´s main interest is usually to sell new products rather than supporting the re-use of used products, not least due to warranty issues and margins. As a result, this leads to unnecessary costs and burdens the environment through increased resource consumption.

Increased certainty regarding the remaining service life

The partners of the “LongLife” consortium want to remove barriers for a longer use of technical components and thus contribute to a significant saving of resources. This is to be achieved by combining technical and business management elements. On the one hand, methods and tools will be developed for the most reliable possible prognosis of the remaining service life of used technical components. On the other hand, innovative reference business models are to be developed that build on these results and provide tangible benefits for all partners that are involved in the extended use of the components.

The application partners´ motivation is to quickly obtain an assessment of the condition of the considered components when problems occur with the overall system. Based on this, it can then be decided whether the component has to be replaced or still can be used for a longer period of time so that, for example, an extra on-site service can be avoided, especially when technicians have to travel abroad. As an additional service, the users of the components should be provided with information regarding the options for emergency operation until the next regular service.

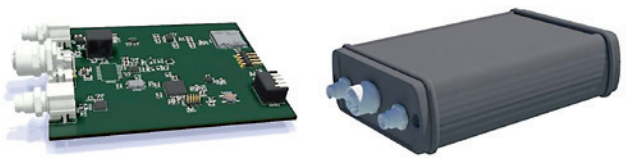
First results

In cooperation with Efaflex GmbH, the manufacturer of high-speed doors, the relevant components for a failure (tension spring, drive belt, strap) are closely examined.

For this purpose, a high-speed roll-up door was set up and put into operation for tests in a laboratory area of the University of Bremen. The control unit of the high-speed door was used to read out and visualize a wide range of parameters, such as motor temperature, speed, torque, etc. This provided initial information about the current state and operating conditions of the components. First findings on the state and operating conditions of the components have already been obtained. Additional sensor technology is currently tested to enable targeted time-discrete condition determination.

With regard to the drive spindle in the second use case, relevant sensor data were identified and supplemented via a test bed available at DESMA. The results were incorporated into the development and case-specific adaptation of the mobile test station. This contains standard sensors, can communicate with further sensors and establishes the connection to the “LongLife” platform.

In parallel, an AI model based on Bayesian networks are developed to predict the remaining service life. This model maps the typical wear patterns of the considered use cases and assigns characteristic features to these patterns that can be detected by sensors.



Design study of the mobile test equipment.

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In addition, initial building blocks of reference business models were defined, which can be used to configure business models that can include several partners in the value chain. In addition to the partner who provides the forecast system (system holder), these can be component manufacturers, plant builders, plant operators or maintenance service providers.

The innovation of the project approach

The innovative approach combines a decentralised collection of relevant data, an AI-based learning forecast via a dedicated platform and the possibility to configure business models. This motivates value chain partners to apply the forecast and provide the necessary data. As a result, longer use of technical components is promoted, in line with the objectives of the “ReziProK” funding measure.

The project “LongLife” 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
LongLife – New business models for an extended use of technical systems based on a simple, decentralized condition assessment and prognosis of the remaining service life

Project duration
01.07.2019 – 30.06.2022

Funding reference number
033R246A–E

Funding volume of the project
1.244.367 Euro

Internet
reziprok.produktkreislauf.de

Publisher and editorial office
Networking and transfer project “RessWInn”

Design
PM-GrafikDesign

Picture credits
P. 1: DESMA Schuhmaschinen GmbH
CoSynth GmbH & Co. KG
P. 2: BIK Universität Bremen

Status
March 2021

Cover-Picture: The project “Longlife” combines residual life testing on selected components.

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