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Future Remanufacturing Loop Data Driven Innovations for Growing Manufacturing Business (FREIMAN)

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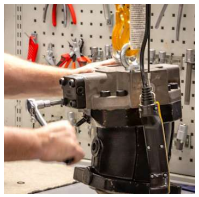
Project

- BF Co-innovation
- 2026-2027
- Budget 5 Meur

Project is part of SIX Smart Manufacturing Roadmap 2035 implementation



Remanufacturing challenge and opportunity

- Existing remanufacturing businesses (physical products come back for remanufacturing – return loop) are small but profitable.
- Customer demand and regulation drives towards circular economy, but currently supply does not meet the demand due to unpredictability, low efficiency and low transparency (low digitalisation) of return loop.
- Data and AI can provide control to return loop in totally new level allowing remanufacturing business growth for OEMs and SMEs.

Examples of remanufacturing

1. The whole machine is shipped for remanufacturing

2. Machine core parts are shipped for remanufacturing or refurbishing

Hydraulic pump

Tyres

DEUTZ 2011 (Tier 2, 3, & 4i)

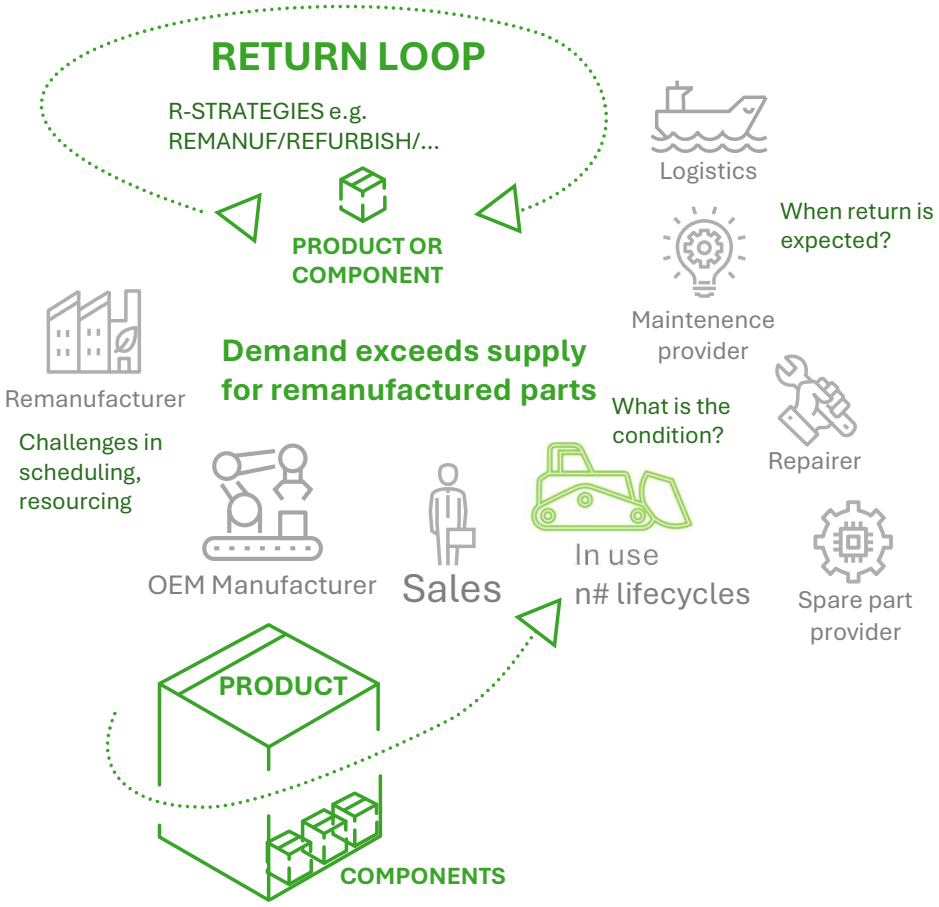
Engine

Gear box

Ref: Saidani et al., Heavy vehicles on the road to circular economy, Resources, Conservation and Recycling, Vol. 135, August 2018

Finnish company challenges

- Unefficient loop, non-coordinated manual operations, very low level of digitalisation.
- Unknown condition of used products / parts and when they are expected or when they should return.
- Shortage of remanufactured core components in the market limits business growth.
- Product design, data and IT-systems are created for linear economy, not for circular nor multiparty data sharing.
- Unknown opportunities, technologies, regulation demands and business potential of remanufacturing future markets.

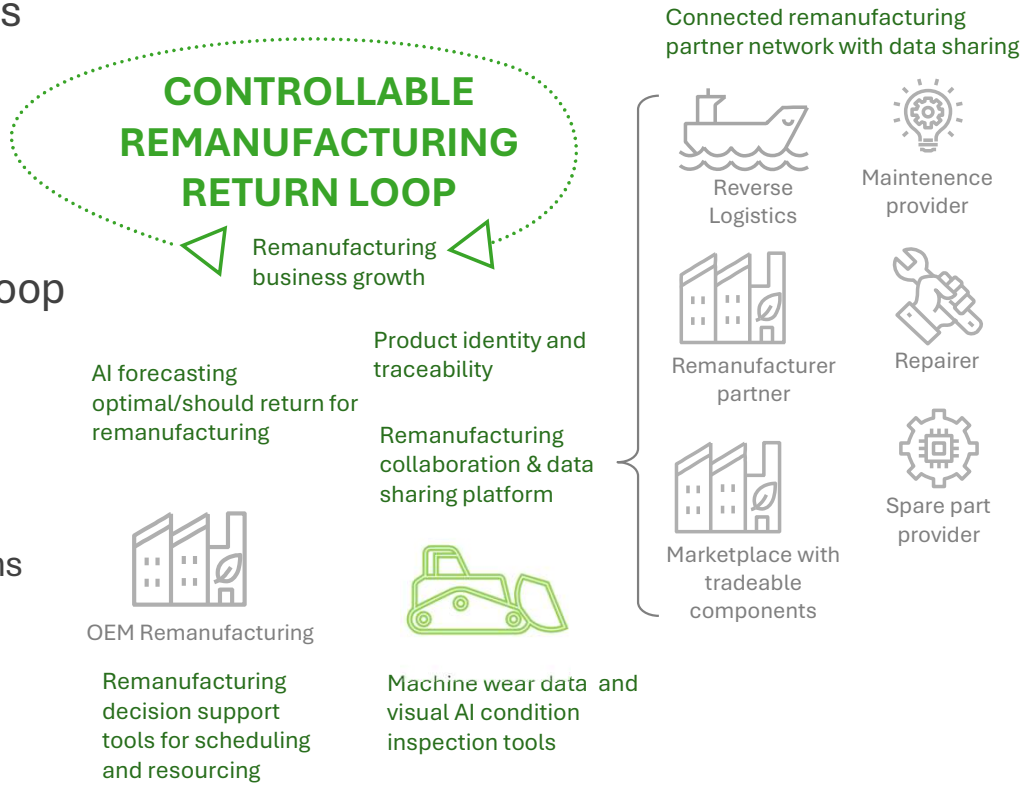


Research questions

- RQ1: How return loop business can be grown substantially with new business models, market openings and data driven services?
- RQ2: How can improved access to data-based decision making and AI based forecasting improve profitability, transparency and control to remanufacturing return loop?
- RQ3: How should product design and utilization of variety of as-made and as-used data be developed for remanufacturing?

Vision of Data and AI driven Return Loop 2035

- New potential for remanufacturing business growth
  - New level of supply for remanufactured parts
  - New possibilities through product design
- Gaining control to remanufacturing return loop
  - AI forecasting of return time and condition
  - Utilisation of decision support tools
- Increasing efficiency of return loop actions
  - Alignment OEM and partner remanufacturing actions and schedules for lower lead times
  - Anticipatory and accurate production scheduling, warehouse utilisation and spare parts



Objectives and Work Packages

1. Develop understanding of business potential in case of remanufacturing return loop with multi-partner data sharing.
2. Develop tools and AI models that enable higher transparency and control to return loop
3. Develop higher utilisation of data for remanufacturing oriented product design, management of remanufacturing network and decision making.

Work Packages

Collaboration and roles

JOINT DEMONSTRATIONS

PONSSE

KALTIOT

masino KONAFLEX

nokian TYRES

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AI MODEL
DATA MAPPING
PRODUCT LENSE APPROACH

DECISION SUPPORT
BUSINESS OPPORTUNITY
PRODUCT DESIGN

MULTIPARNER RETURN LOOP
COLLABORATION PLATFORM
DIGITALISED TOOLS

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AI AND MULTIPARTY DATA
MANAGEMENT PLATFORM

KALTIOT

CUSTOMER FEEDBACK

Motoajo Oy

REMANUFACTURING LOOP
AND MACHINE CORE PART
CONDITION DATA &
SERVICES

masino KONAFLEX

nokian TYRES

PONSSE

Project use cases

- Forecasting supply of return channel
- Advanced multiparty sensor data condition monitoring
- Future business based on data and AI driven return loop

Results and next steps

- Publications (2 submitted)
- Return Loop Value Stream Data Mapping (done)
- State-of-the-art and market studies (soon to be finished)

Next targets

- Joint FREIMAN dataset and platform
- AI forecasting development
- Demonstrations

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Questions?

Your experiences on remanufacturing?

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