AWK'23

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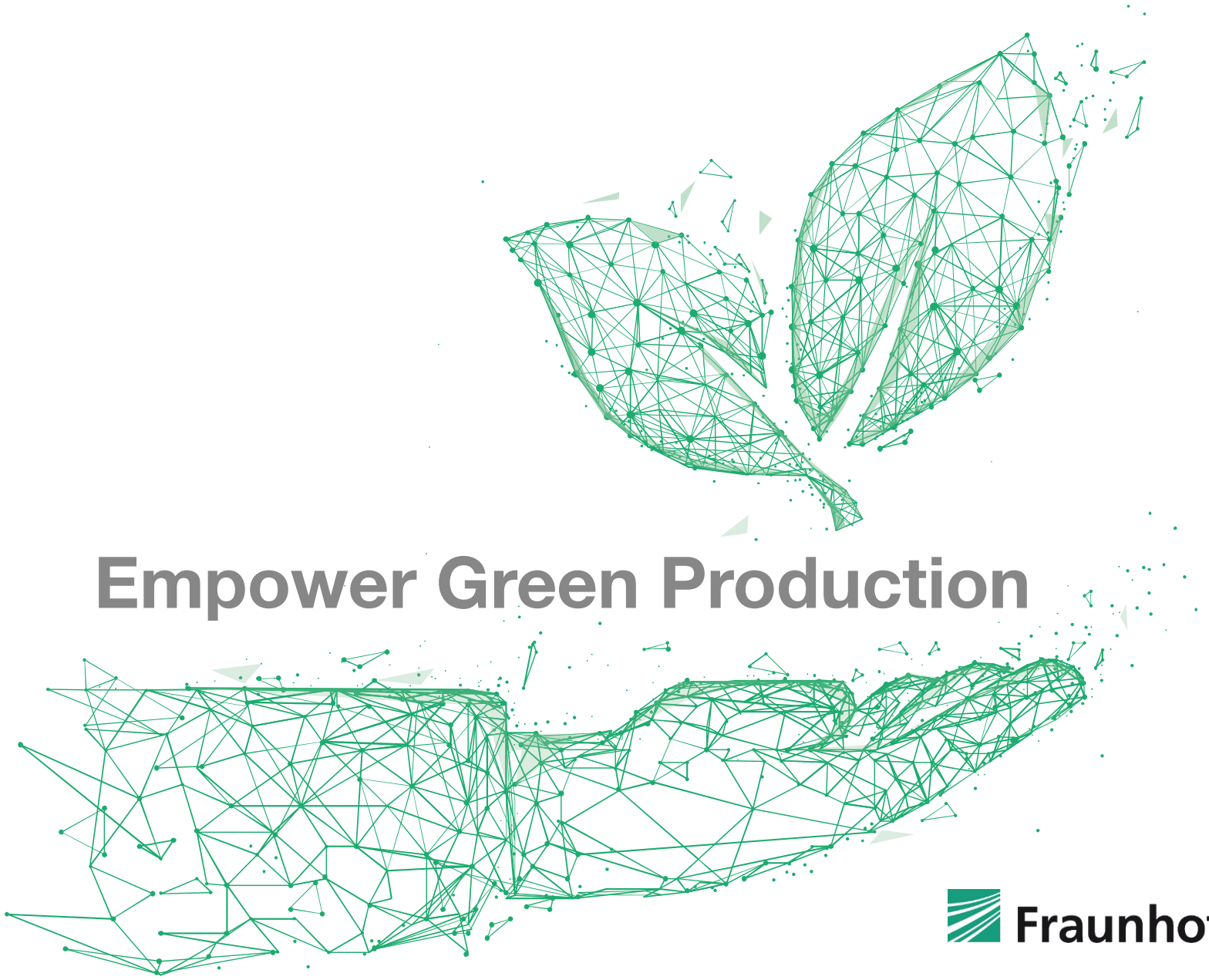
Green Upgrade Re-Assembly Factory

Expert presentation – Session 4
Wilhelm Mauß
Dr. Till Potente



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Sustainable Production

*"If we could build an economy that would **use things rather than use them up**, we could build a future."*

ELLEN MACARTHUR,
Sailor and founder of the Ellen MacArthur Foundation

Ecologically sensible

Politically demanded

Consumer-friendly

… **profitable possible**

…not only … sondern …

Functional expansion and value enhancement are...

Predictive Maintenance

Preserve functions

Sell second hand

…not only … but …

Life-prolonging measures are...

Sustainable Production is…

…not only … but …

Circular Economy is…

Saving Energy

Reduce scrap

Increase Efficiency

…not only … but …

Increase recycling

Secure raw materials

Separate waste

- **Climate change,** scarcity of resources
- **Instabilities** in material supply
- **Rising costs** for resources and materials

There is a need for...

Green Upgrade Re-Assembly Factory

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high total value

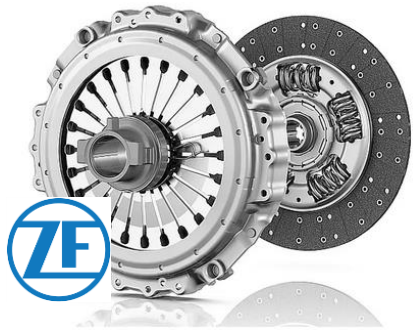
Economical through

industrialised processes

approx. 29€

Digital domestic water meter

- approx. 500,000 units/year
- Margin approx. 2-3 x as high as for new products



Clutch systems and torque converters

- Processing of approx. 10,000t of used parts/year at 1 of 25 remanufacturing locations
- Up to 90% material savings compared to new production, only 10% energy consumption

< 400€

Conservation of resources with simultaneous increase in value and function is not only successful for special machines but also with products in high quantities and lower material cost proportions.

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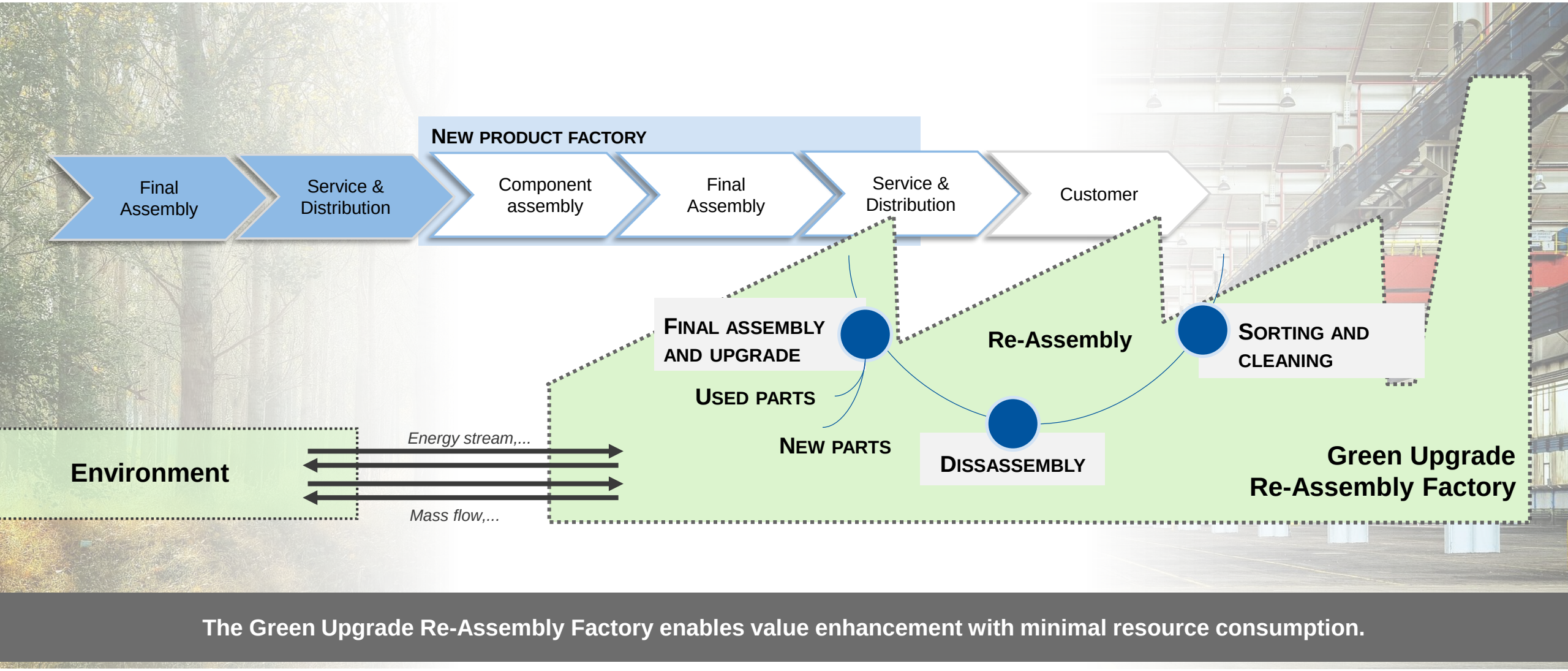
Sustainable production no longer takes place linearly, but circularly in the **Green Upgrade Re-Assembly Factory**



The Green Upgrade Re-Assembly Factory enables value enhancement with minimal resource consumption.

Adapted products as well as business models enable circularity and **increase margins at the same time**

Product As A Service

Ideal business model: cooperations and controlled return options in the B2B sector

Customer

Battery capacity > 2x calibration period

Higher **material quality**

Inspection

Process for Circularity

Creative and innovative technologies for disassembly enable short cycle times

Sorting

Disassembly

…

Design for Circularity

Oversizing: Higher product quality possible by distributing production costs over several utilisation cycles possible

Enabler

(See other presentations)

Uncertainties hinder industrialisation, as the **separation of planning and execution** cannot take place sufficiently

INDUSTRIALISED PROCESSES

- High utilisation thanks to high quantities makes **automation economical in steady-state condition**
- Reduction of investment costs through **dual use of equipment** for both new production and reprocessing, e.g. for inspection and calibration

ONLY SHORT-TERM PLANABILITY

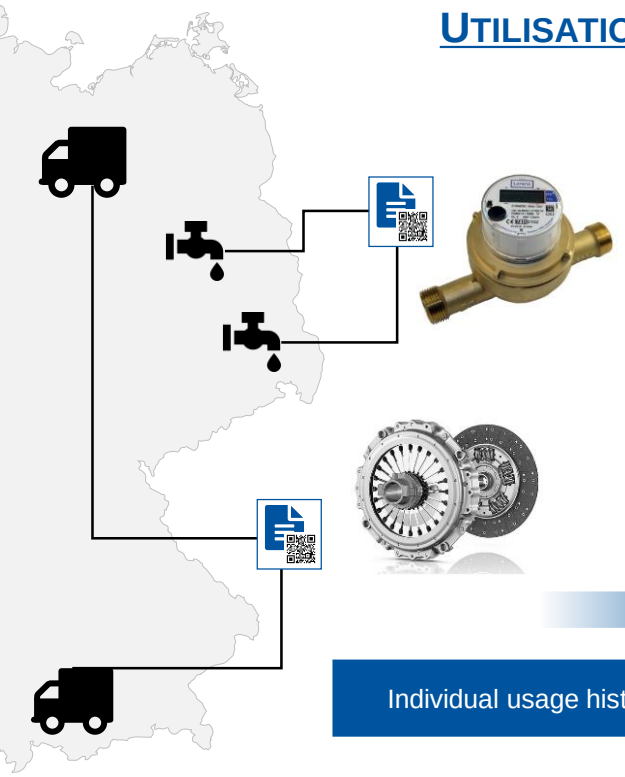
- **Planning only possible after diagnosis**
- **Disposition** with a high proportion of empirical **knowledge** and assumptions
- High **stock levels** necessary to compensate for delivery times of spare parts

No sufficient **separation of execution and planning**

The **reduction of information asymmetries** between producers, users and downstream users must be resolved in order to prevent loss of value and at the same time enable higher industrialisation.

The **digital product file** enables the reduction of information asymmetries and empowers industrialised reassembly processes.

UTILISATION CYCLE

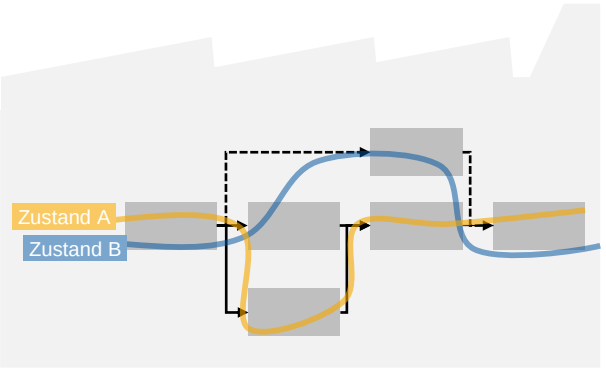


Individual usage history

*One-to-one **identification and tracking***

GreenToken by SAP | SAP Business Network Material Traceability

RE-ASSEMBLY

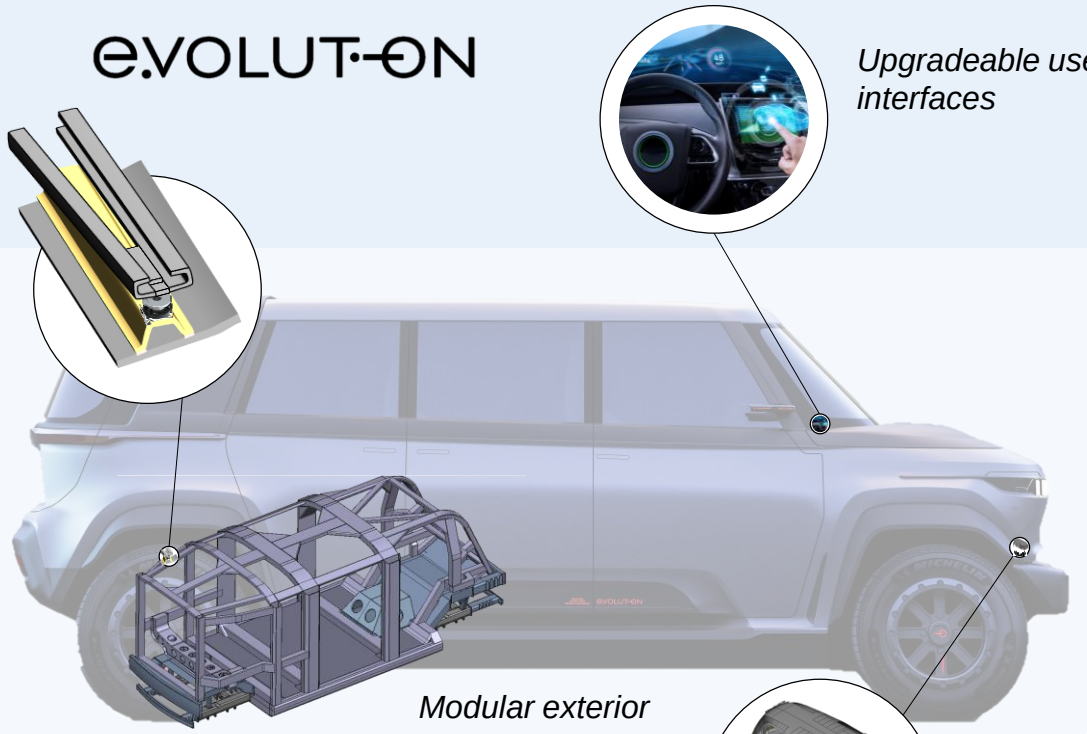


Individual work plans depending on condition

- Recording of relevant **usage and abrasion information** in the usage phase
- **Value retention** possible through actual description of product condition

- Derivation of **product and component-specific** condition information and thus **utilisation options** (re-use, recycling, re-assembly, ...)
- **Individual division into work plan groups** prevents overprocessing

In the **Re-Assembly Factory**, in addition to the remanufacturing, an **upgrade** of the product is realised



Experience live in theme tour 9:
"**Enablers for Sustainable Production Systems**"

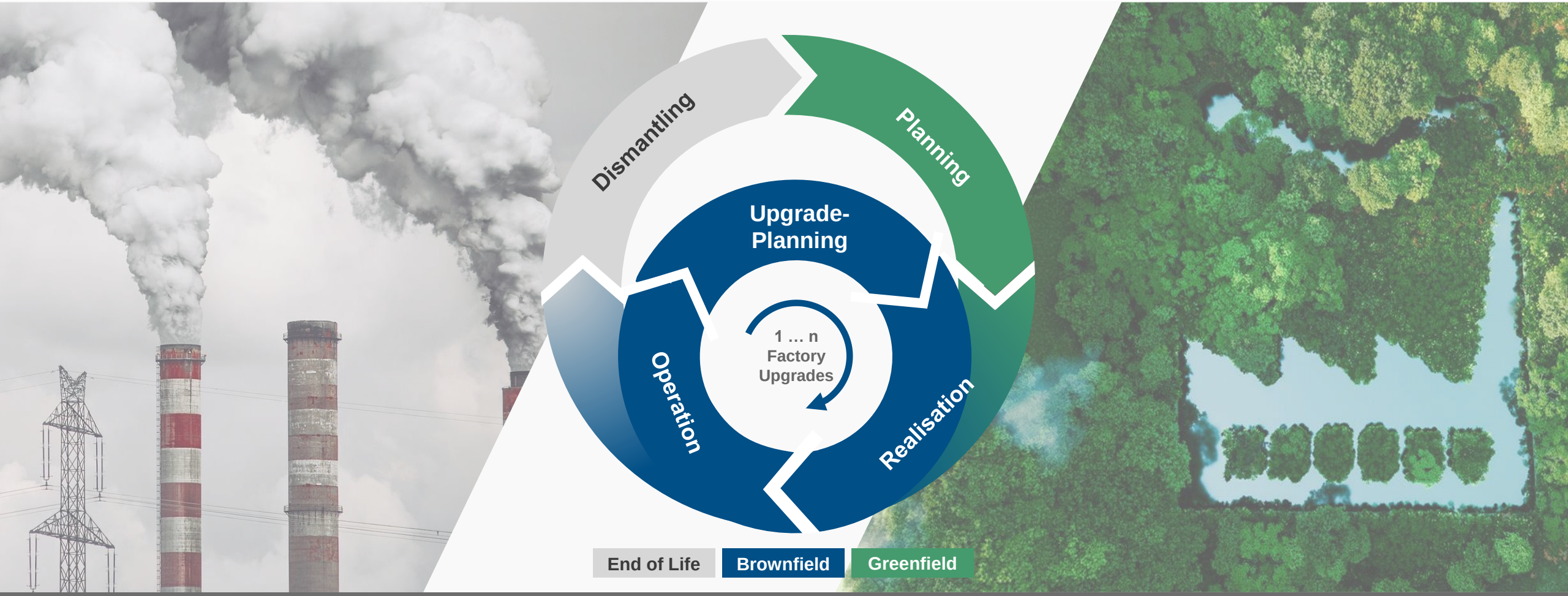
Old covering of the product from 2-4 years ago

Due to the **upgrade** of the **clutch facings**, the latest production variant can be manufactured

New covering of the current product, which is also used in series production. **Higher quality and performance data** than the predecessor product

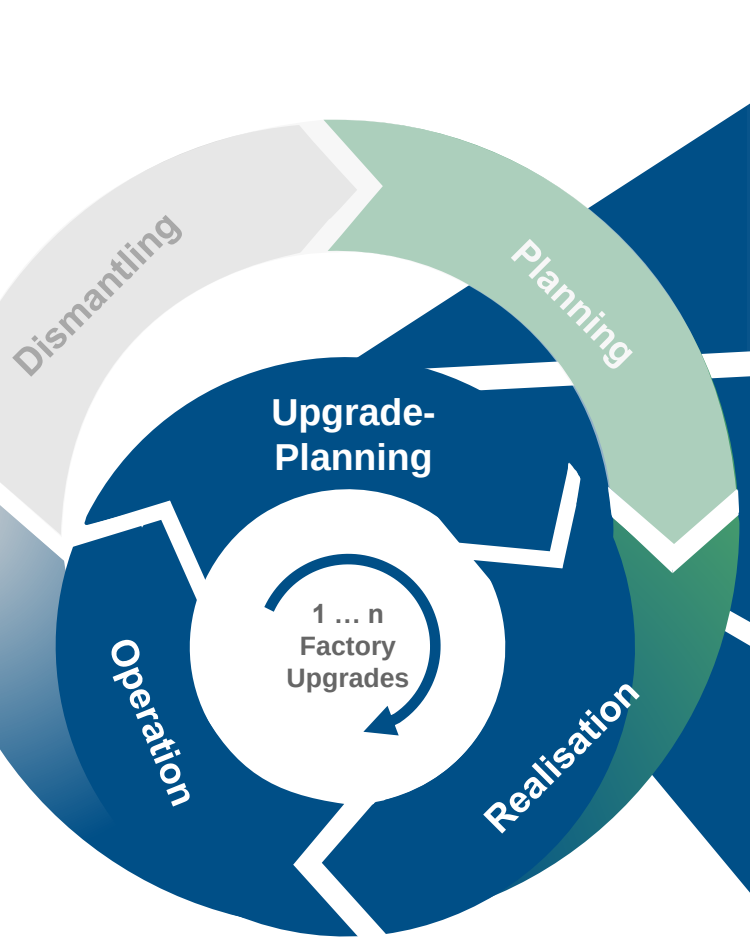
Only through a technical upgrade in the Re-Assembly Factory is a **real life extension and increase in value** possible.

Conventional brownfield factories can be transformed into green factories in the upgrade planning



Long and resource-efficiently operated green factories are made possible through frequent upgrades during the inner brownfield factory lifecycle. In greenfield planning, the foundations for this can be established early on.

Transformation measures within the scope of **upgrade planning** affect all areas of factory building and production



Upgrades to supply the production site

- For example, replace combined heat and power plants with **heat pumps** in combination with **ice storages**

➢ Enables Phoenix Contact to **decarbonise** by 2027
➢ Fundamentally **limits** price fluctuation **risks**
➢ **Reduces** operating **costs** in the long term

Upgrades to generate own electricity

- For example, expand **photovoltaic systems**

➢ **Redundancy** to the electricity grid is created and **surplus energy** can be sold
➢ **Local energy supply** minimises **transport losses**
➢ **Generating own electricity** can **save 70-90%** of a site's energy supply **costs**

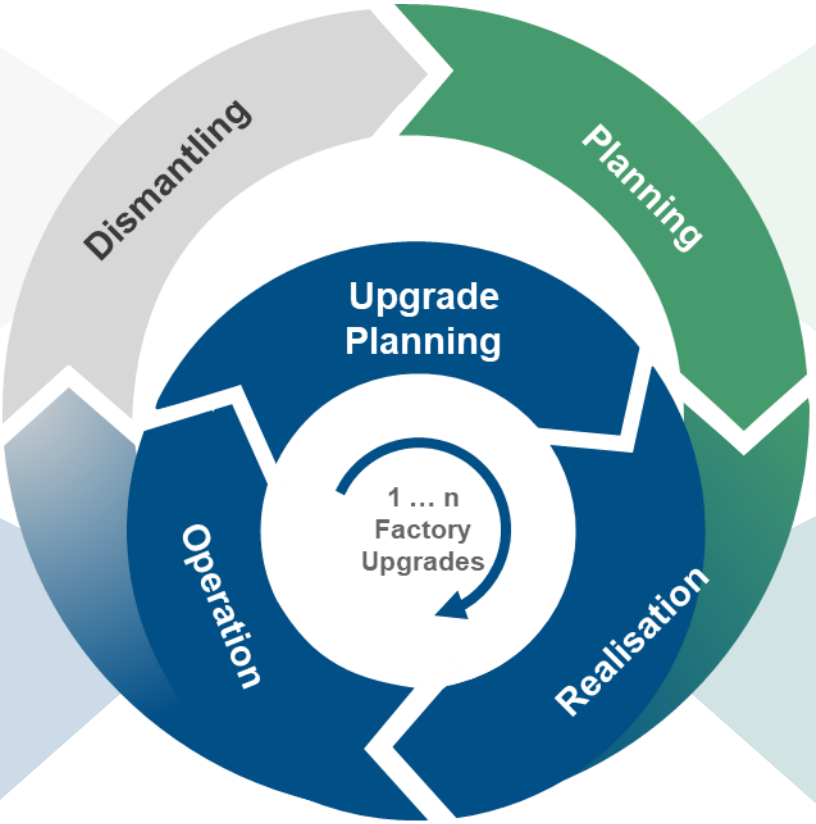
Upgrades of production technology

- For example, **automate** post-processing and cleaning of parts
- For example, use water blasters instead of sandblasting

➢ **Increases** process **efficiency**
➢ **Ensures** the **future** of production
➢ **Enables sustainable** production

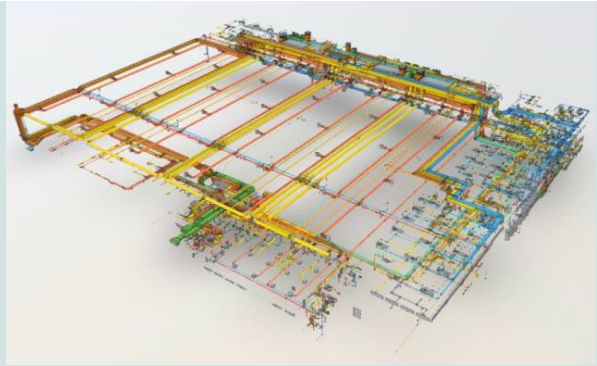
Green factories only become holistic when the focus shifts to the phases upstream and downstream of upgrade planning

"Cradle to Cradle" enables the recycling of building components



Modular greenfield planning enables subsequent upgrade planning

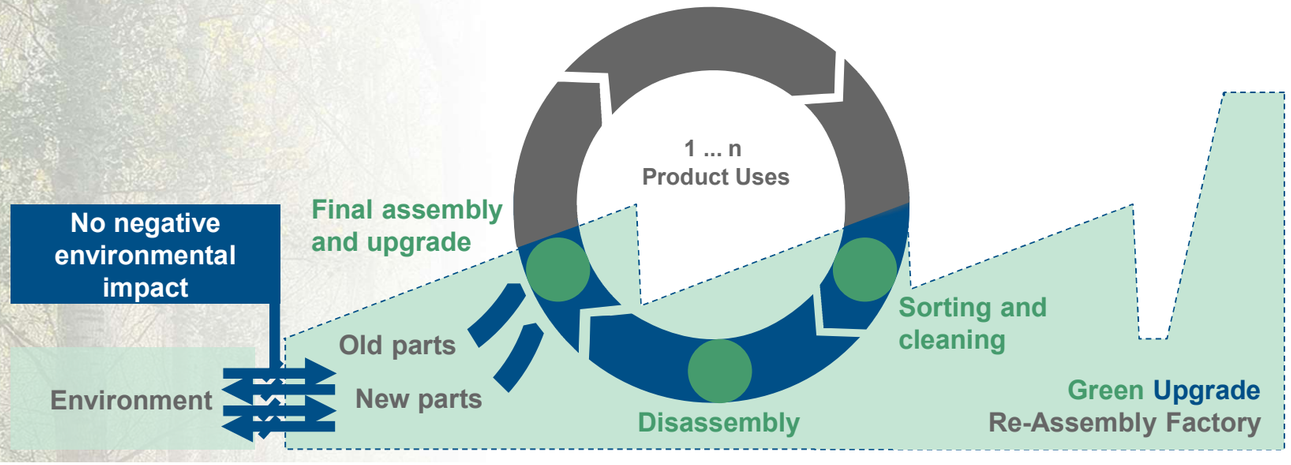
Smart building approaches allow operational optimisation through increased transparency

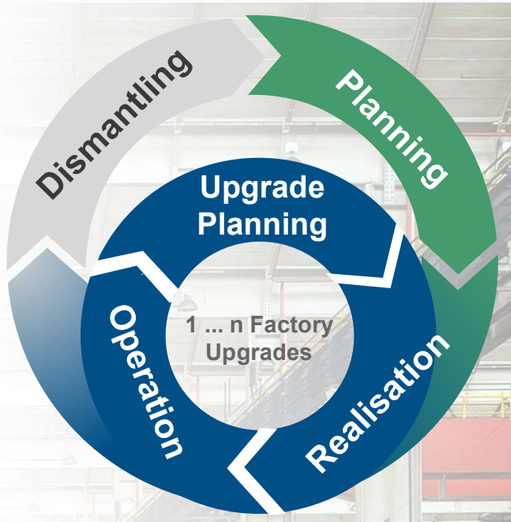


BIM use increases resource efficiency in construction

Only by considering levers in all phases of the life cycle of the Green Upgrade Re-Assembly Factory is the full sustainability potential exploited.

Sustainable production is already economically possible today in the Green Upgrade Re-Assembly Factory

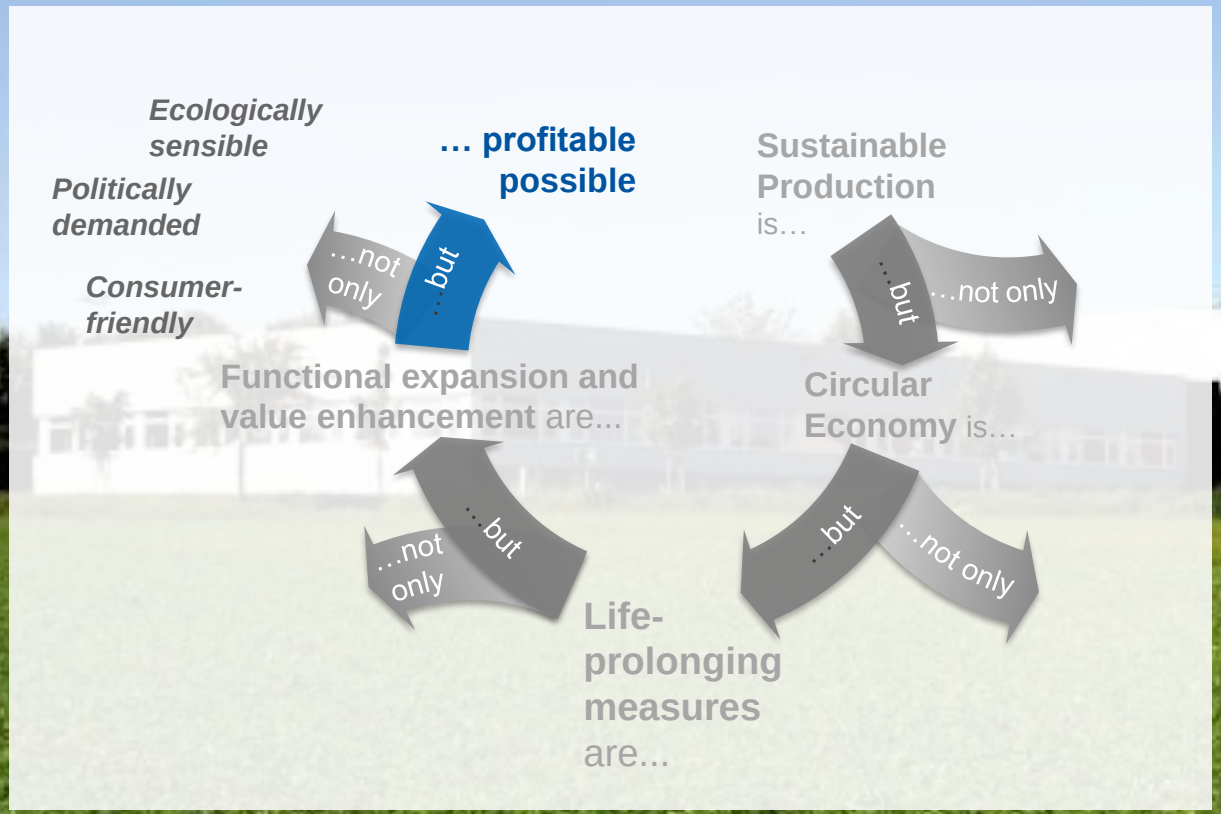




- **Cross-lifecycle data use** minimises the inherent uncertainties of reassembly and enables industrialization
- In many scenarios, re-assembly and related remanufacturing processes with **innovative** and **creative** solutions are already possible and **economical today**
- At the same time, **resilience** and the **share of skilled labour increases**

- Most of the planning is done in existing buildings. Therefore, the transformation to **green** factories is particularly relevant in the **brownfield**..
- New planning variables and optimisation requirements **increase complexity**. **Digitalisation** is necessary to **cope** with this.
- The operating **costs** of a **net-zero factory** are **lower** than those of conventional factories, and **resilience** and **reliability** also increase.

The Green Upgrade Re-Assembly Factory already enables economic functional and value enhancement with minimal resource consumption. minimal consumption of resources. It therefore lays the foundation for sustainable production.



- *Circularity was necessary for **the survival of the Lorenz company***
- *ZF only carries out remanufacturing processes if there is a **direct cost advantage***
- *Phoenix Contact makes **conversion to Net Zero factory profitable***

Sustainable production in a Green Upgrade Re-Assembly Factory is already possible today.

In the future, the profitability of investments in sustainable production is expected to increase further through government incentive programmes.

Thank you very much for you attention!