SUSTAINABILITY OF AM

Our ambition is to bring the "Sustainability of Additive Manufacturing" into the spotlight. We build upon a generic Product Life Cycle (PLC) model and deepen that for a holistic sustainability analysis of the AM process. This approach enables us to quantify the correlation of the actual AM process with conventional alternatives in terms of Life Cycle Assessments and Costing (LCA and LCC). As a prerequisite, a gap-free and consistent database is required to both quantify the costs to ecological and economical side by side and quantify sustainability. The main contribution of the project lies in the identification of required attributes, the assessment of available data quality and detection of data gaps.

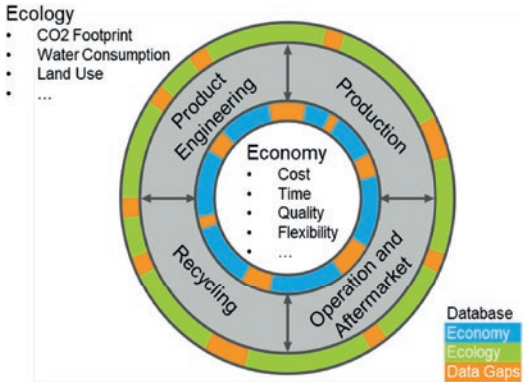

FIGURE 1: Dependencies on ecology and economy hinting at existing data gaps in phases of the product lifecycle

FIGURE 2: Focusing the analysis of sustainability on the core level of

PROJECT OVERVIEW

DURATION	04/2022 – 12/2022
PARTNER	DMRC
FUNDED BY	DMRC
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Motivation

Sustainable product development is becoming increasingly relevant, both due to its intrinsic value as well as the upcoming societal requirements. Additive manufacturing (AM) offers enormous potential to satisfy these needs: With lightweight design and energy efficiency it directly contributes to the reduction of ecological issues like CO2 emissions.

While the current research mainly focusses on the technological advancement of AM, our focus lies in the "Sustainability of AM". The scope will be tailored around the production process unique to additive manufacturing. The broader product's life cycle (PLC) perspective will be established to set the system boundary and enable clear differentiation of this project's focus: A transferable model and methodology, focused at first on SLS production process of polymer-based parts. Pre-existing tools like available Life Cycle Assessment (LCA) databases will be tested and transferred onto the specific qualities of AM. Data will be gathered and funneled to enable thorough quantification while revealing gaps in available data as depicted in Figure 1.

Aim

This project will enable a gap-free and consistent database to both quantify the costs to ecological and economical side by side and quantify sustainability. The main contribution of the project lies in the identification of required attributes, the assessment of available data quality and detection of data gaps. These results will be incorporated into an integrated LLC/LCA model validated by industrial sample parts.

The project is conducted by the Chair of Product Creation (Heinz Nixdorf Institute) of Prof. Dr.-Ing. Iris Gräßler and the research group c.i.k. of Prof. Dr.-Ing. Rainer Koch.