



Optimization of equipment reuse: creating standards for environmental impact assessment and operational requirements

A standardized framework is essential for optimizing performance, ensuring clear communication, and supporting informed decision-making across industries, enhancing the efficacy of equipment reuse in a circular economy.

Standardization Needs

ALICIA discovered that diverse terminologies and guidelines among companies result in a fragmented communication landscape, hindering effective evaluation of reused equipment and suitability. This can be remedied by standardizing terms, definitions, and calculations for performance metrics.

Furthermore, existing Life Cycle Assessment (LCA) methods should also be reworked to adequately address the environmental implications of second-hand equipment, especially regarding the remaining lifetime and necessary data.

ISO 59020, ISO 14040, ISO 14044, ISO 18828-4, ISO 22400 series, IEC 62890, ITU-T L.1023

are existing standards in context of assessing the environmental impacts of second-hand equipment

Requirements for a new standard on the assessment of environmental impacts of second-hand equipment

- Similar Steps as Traditional LCA (e.g., ISO 14040) with additional sections specified to second-hand equipment assessments
- Methodology for LCA of Second-Hand Equipment
- Circularity Key Performance Indicators (KPIs)
- Hotspots identification in Reuse Processes
- Calculating the energy consumption and CO₂ emissions

Requirements for a new standard on the reuse of production equipment

- Cost effectiveness and viability of equipment reuse
- General applications of integrating reused equipment not only into existing production lines but also in various scenarios
- Evaluating reliability, maintainability, availability, and efficiency
- Challenges and compliance in repurposing production equipment

ISO 14051, ISO 14052, ISO/TS 14074, IEC 60300-3-3, IEC 61124, IEC 62309, IEC/TS 63428, CWA 18038

are existing standards in context of the reuse of production equipment

ALICIA Results



- ALICIA LCA framework specifically tailored to used manufacturing equipment
- Sustainability KPI definitions to measure and compare the environmental sustainability of different second-hand machines
- ALICIA Digital Twin / Digital Twin framework including a two-phase decision-support framework integrating AI-Matchmaking, Digital Shadow (DS), and Digital Twin (DT) technologies



More information available in „European Research project ALICIA: Recommendations for Standards on the Reuse of Production Resources“ accessible on the [ALICIA website](#)

Project coordinator TUM; contact DIN: sarah.koehler@din.de; ALICIA GA: 101091577

