



+RESTEEL

Upscaling Reclaimed Steel Components
for Second-Life Applications



ORGANISATION PROFILE

LUT University and **Steel Structures** (Mechanical Engineering) Research Group is led by Dr. Antti Ahola (Assistant Professor, Tenure Track) and comprises approximately 15 researchers with an annual budget of around €1.5 million. Steel Structures conducts research on fatigue and structural integrity of welded structures, high-strength steels, computational weld mechanics of steel components. LUT University operates advanced experimental facilities for mechanical and fatigue testing at specifically at joint, component and structural levels, and has extensive experience in national and international collaborative R&D projects. Through its leadership of the HRO Design Forum, the group maintains a broad network of Finnish metal industry companies (+40 companies involved), enabling strong industrial engagement, technology transfer, and demonstration activities.



PROPOSAL INTRODUCTION (I)

Vision: +RESTEEL develops and validates an industrially scalable framework for recovering, qualifying, refurbishing, and redeploying **reclaimed steel** components into **high-value second-life applications**. The project will combine structural integrity and assessment, and digital pass for traceability to preserve embodied value, reduce emissions, and enable circular manufacturing of steel structures.

Motivation: **Steel production** remains one of the most **energy- and carbon-intensive** industrial activities (Currently, **7% of global CO2 emissions**). Growing volumes of steel are becoming available from decommissioned European assets, yet most is still *remelted* rather than *reused*. By **recovering**, qualifying, refurbishing, and **upcycling structural steel components** for second-life applications, their embodied energy, manufacturing value, and structural performance can be preserved, avoiding the significant energy demand associated with electric arc furnace processing and supporting the development of **European circular value chains**.

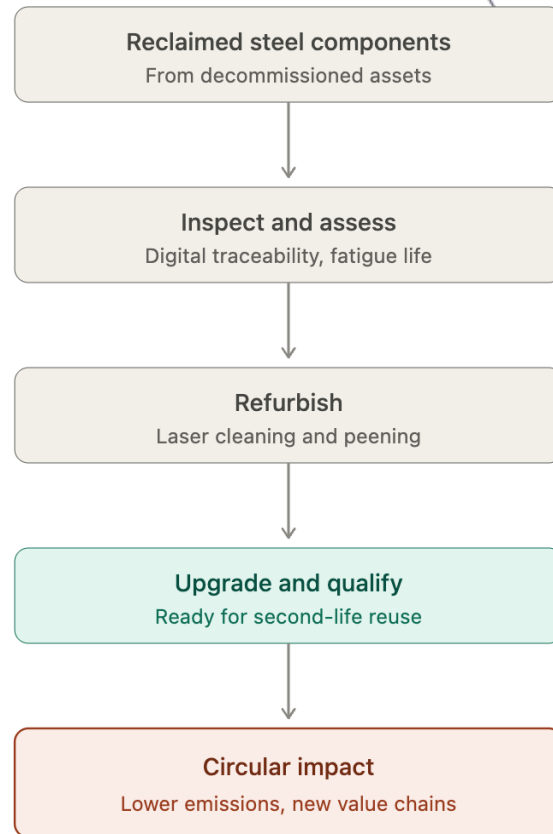
Content: **Technical developments** include digital inspection and traceability, structural and fatigue assessment, remaining-life prediction, advanced refurbishment technologies such as laser cleaning and peening, and qualification methodologies for reuse. Beyond the technical aspects, the project will establish a **digital steel passport**, quantify **environmental and economic benefits** through LCCs and LCAs, and develop business models and **value-chain concepts** to build viable European markets for reclaimed structural steel components.

PROPOSAL INTRODUCTION (II)

Expected outcome: +RESTEEL will develop and validate an integrated process for recovering, inspecting, refurbishing, qualifying and redeploying reclaimed steel components. The project will demonstrate digital component traceability, fatigue-based remaining useful lifetime (RUL) assessment, laser refurbishment and second-life design through industrial demonstrators, advancing the integrated solution towards TRL 7 and supporting future commercialisation.

Impacts: +RESTEEL will enable new industrial value chains for reclaimed steel components, reducing dependence on virgin steel and associated emissions while creating new business opportunities in recovery, refurbishment, qualification and second-life applications. The project will support scalable circular manufacturing, strengthen industrial competitiveness and accelerate market adoption of qualified reused steel components

Schedule: 1.1.2028 – 31.12.2030 (3 years), SMART label by 02 June 2027 after which national applications are prepared during autumn 2027.



PARTNERS

Current

LUT University, FI: Research Director Dr. Antero Kutvonen, Assist. Prof. (Tenure Track) Antti Ahola – **Structural integrity**
+ **Finnish company** for a demonstrator (second life applications)
University of Turku, FI: Assist. Prof. (Tenure Track) Mohsen Amraei – **Refurbishment and upscaling**
Ruhr University of Bochum, GER: Prof. Helen Bartsch – **Component reuse and standardization (EC3)**
+ **German SME company** for NDT and deconstruction of recycled components

Partner search – what we still need (at least)?

- LCA/LCC
- Digital pass developers
- Business model developers
- Something else, *please announce yourself!*

HRO – Finnish Steel Ecosystem



*for demonstrators

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