

RODEO

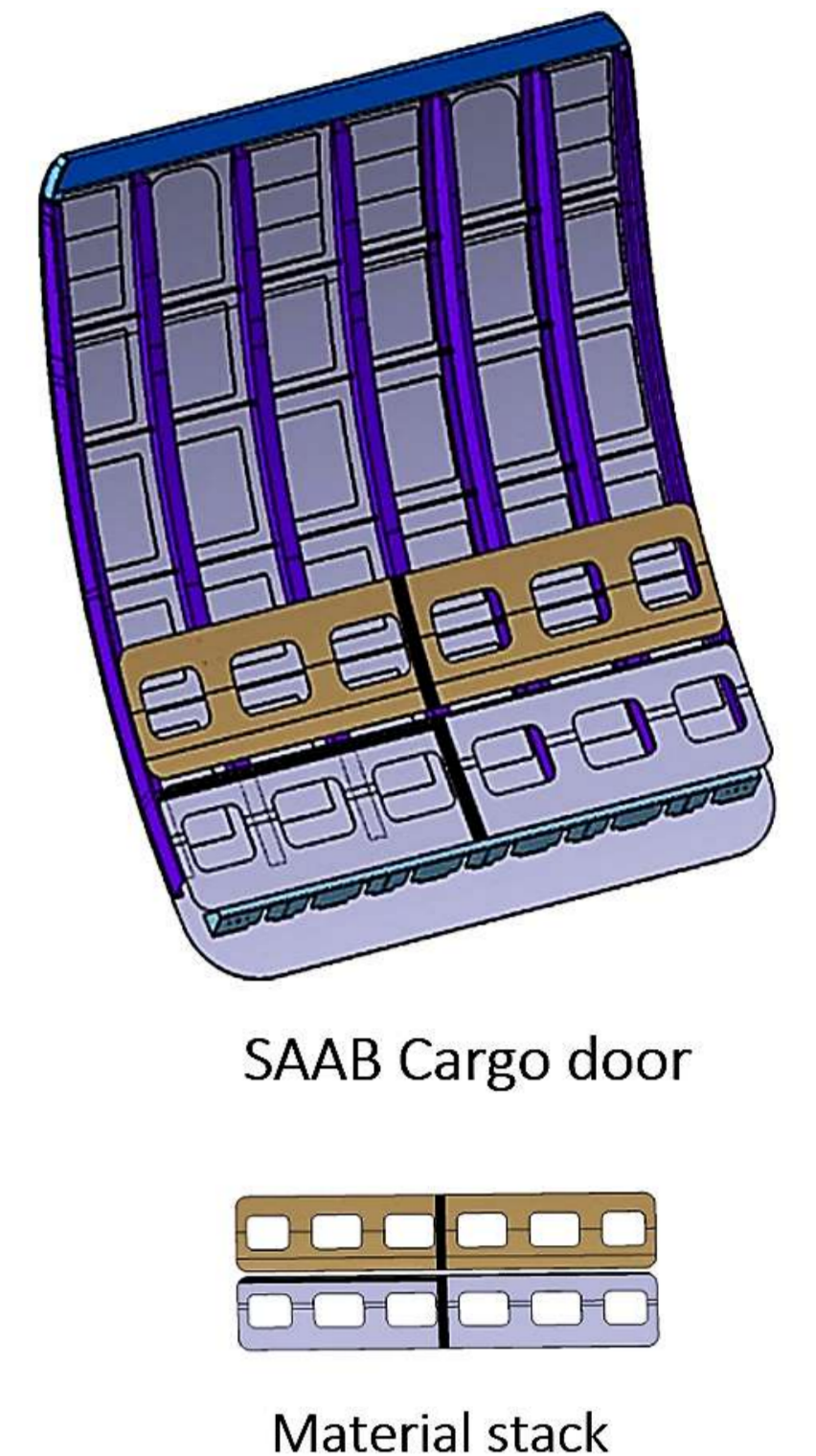
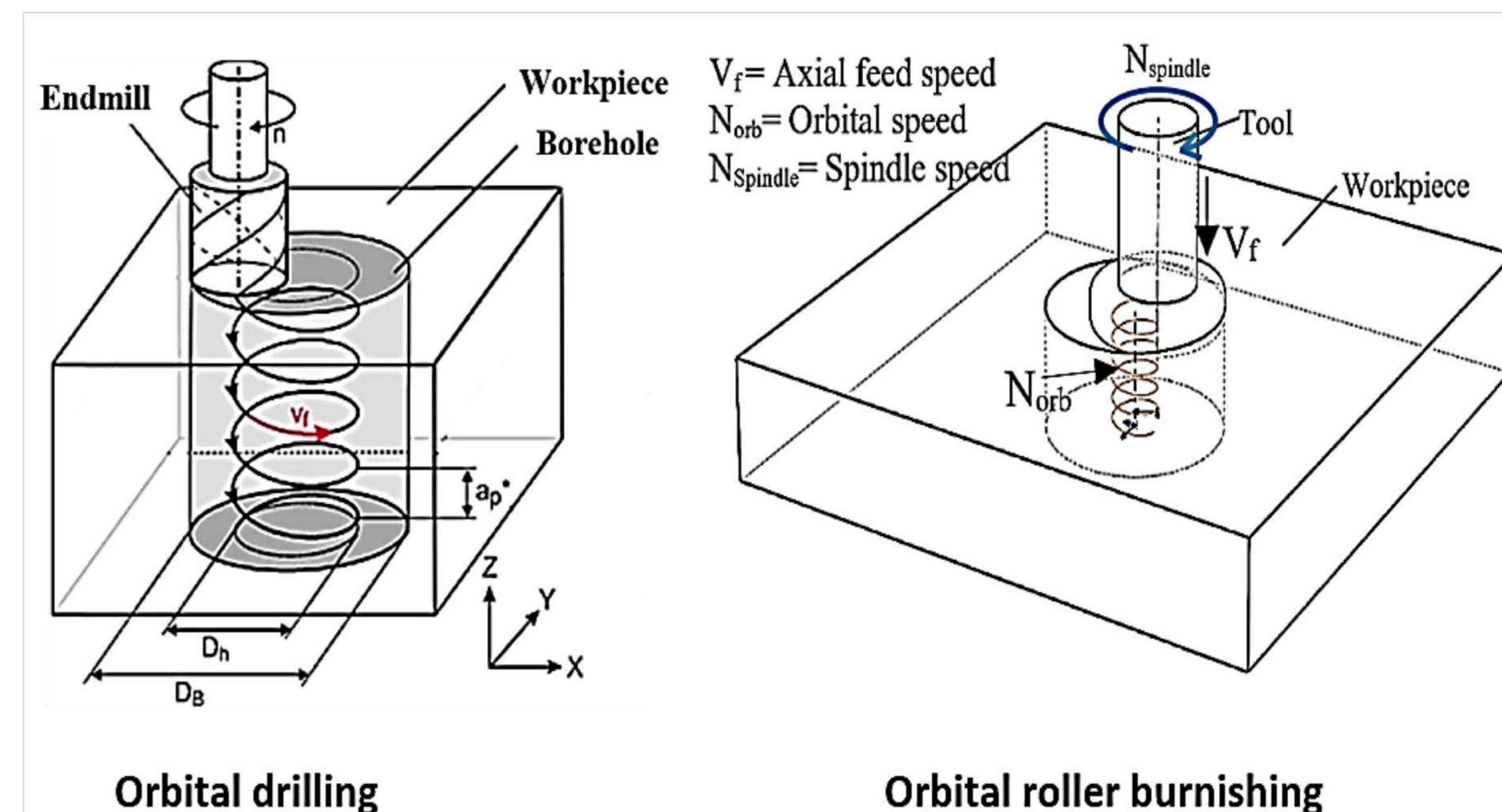
Robotized Orbital Drilling Equipment and Optimized residual stresses



Aim and objectives:

The main objective of the RODEO project is to propose a lightweight robotized orbital milling equipment as well as appropriate cutting tools and high-speed machining operating conditions, to enable drilling of tightly spaced small diameter holes in aluminum with the control of induced residual stresses.

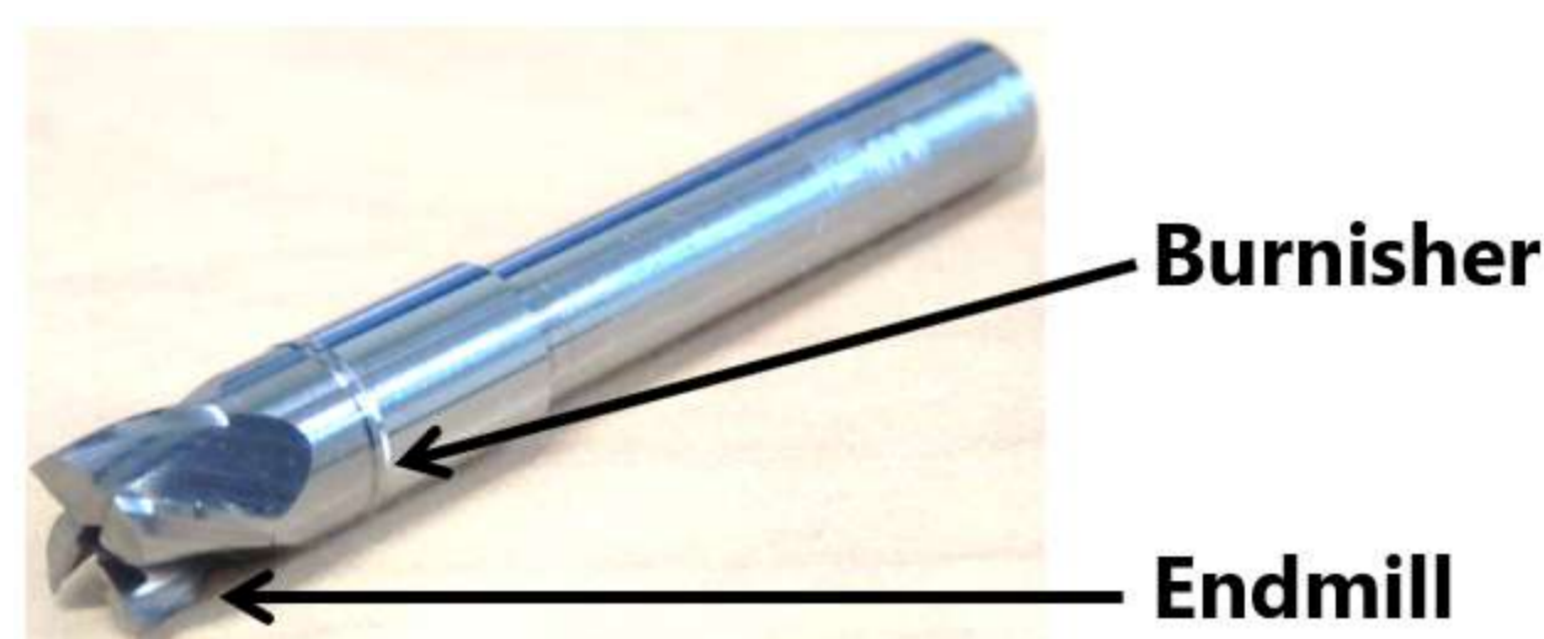
Its application shall be on Al/Al and CFRP/Al stacks; example in SAAB Aerospace cargo door components. The presented work has been conducted on Al2024.



Methodology:

1) Development of a combined orbital drilling and burnishing tool to attain required residual stresses

HAM Carbide tool



2) Development of a high-speed orbital drilling unit able to drive the tool in the prescribed conditions

ORBIBOT drilling unit by PRECISE:

Spindle rotation:

20000 – 60000 rpm

Orbital rotation:

500 – 2000 rpm

Axial feed:

10 – 2000 mm/min



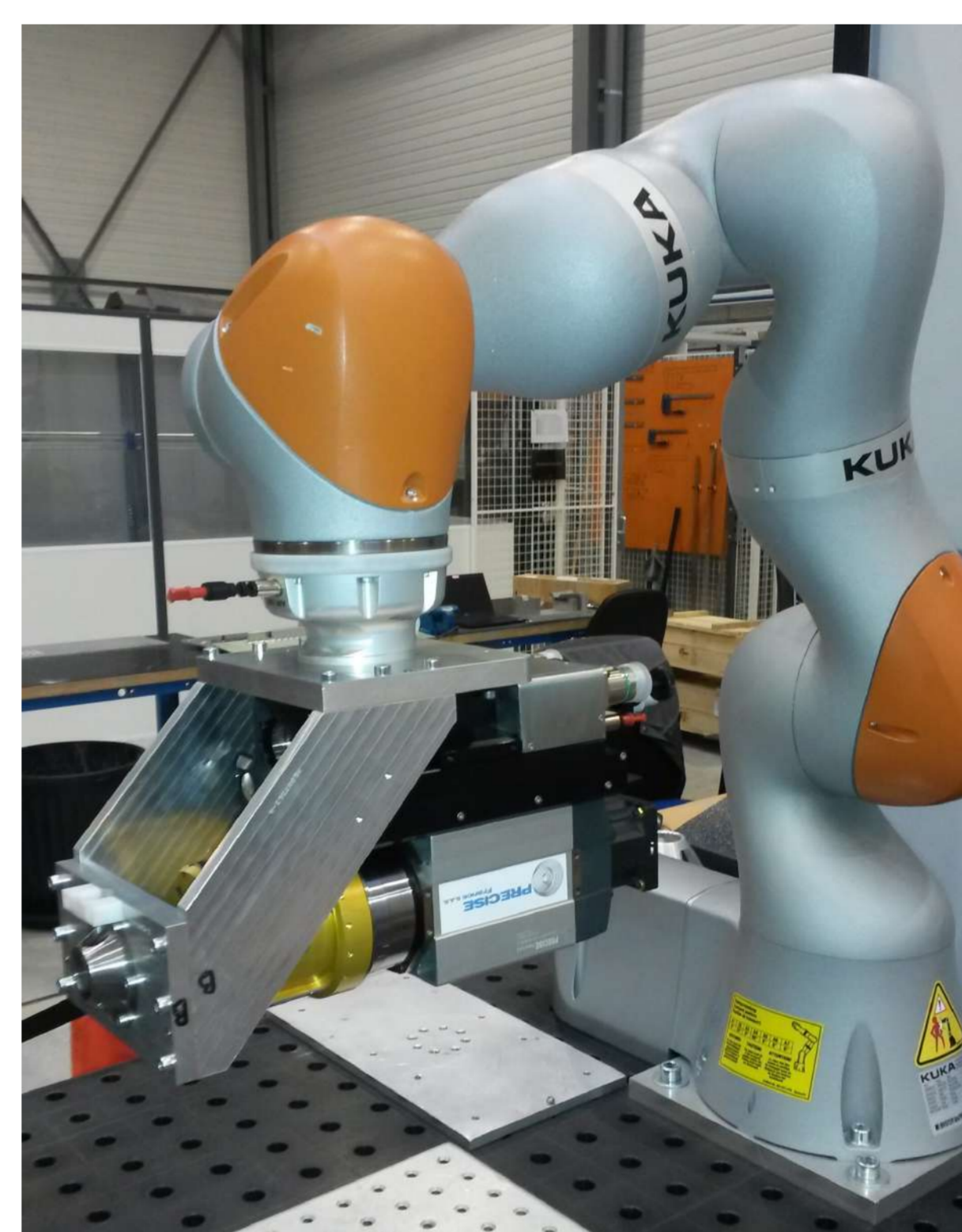
3) Integration of the developed orbital drilling unit on a lightweight industrial robot

KUKA Cobot LBR iiwa:

14kg - 0.8m

Pressure foot for higher accuracy

Vacuum system for chips



4) Determination of operating conditions of the lightweight robot to ensure the drilling operation

Tool-Material couple dedicated for orbital drilling → Optimized orbital drilling conditions

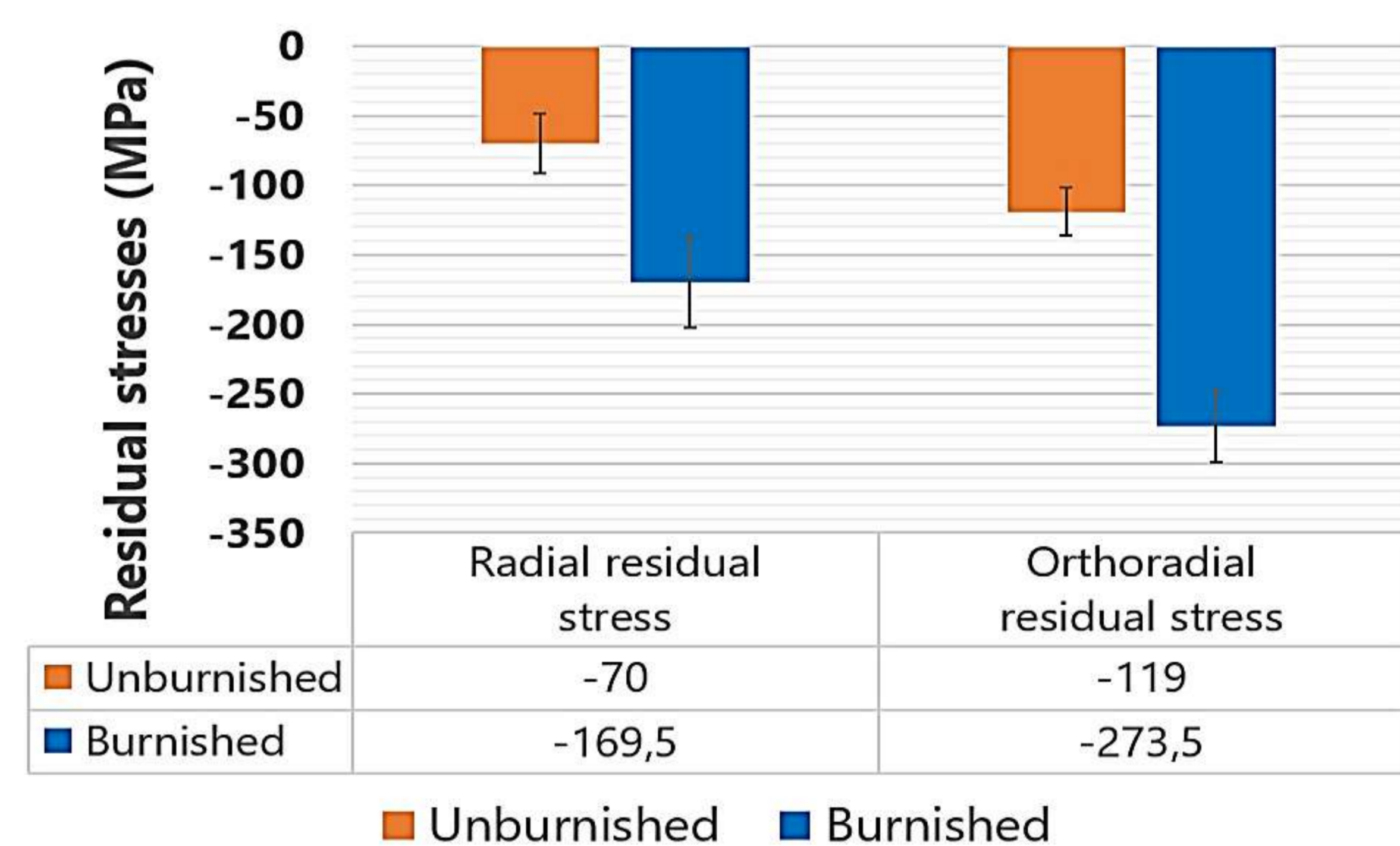
Operating conditions:

High-Speed Machining innovative orbital drilling device

- Spindle rotation: 40.000 rpm
- Orbital rotation: 1.500 rpm
- Burnishing depth: 20 μm

Residual stresses:

Impact of orbital burnishing on residual stresses



Fatigue tests:

Improved fatigue life compared to axial drilling (tests done on open-hole samples)

