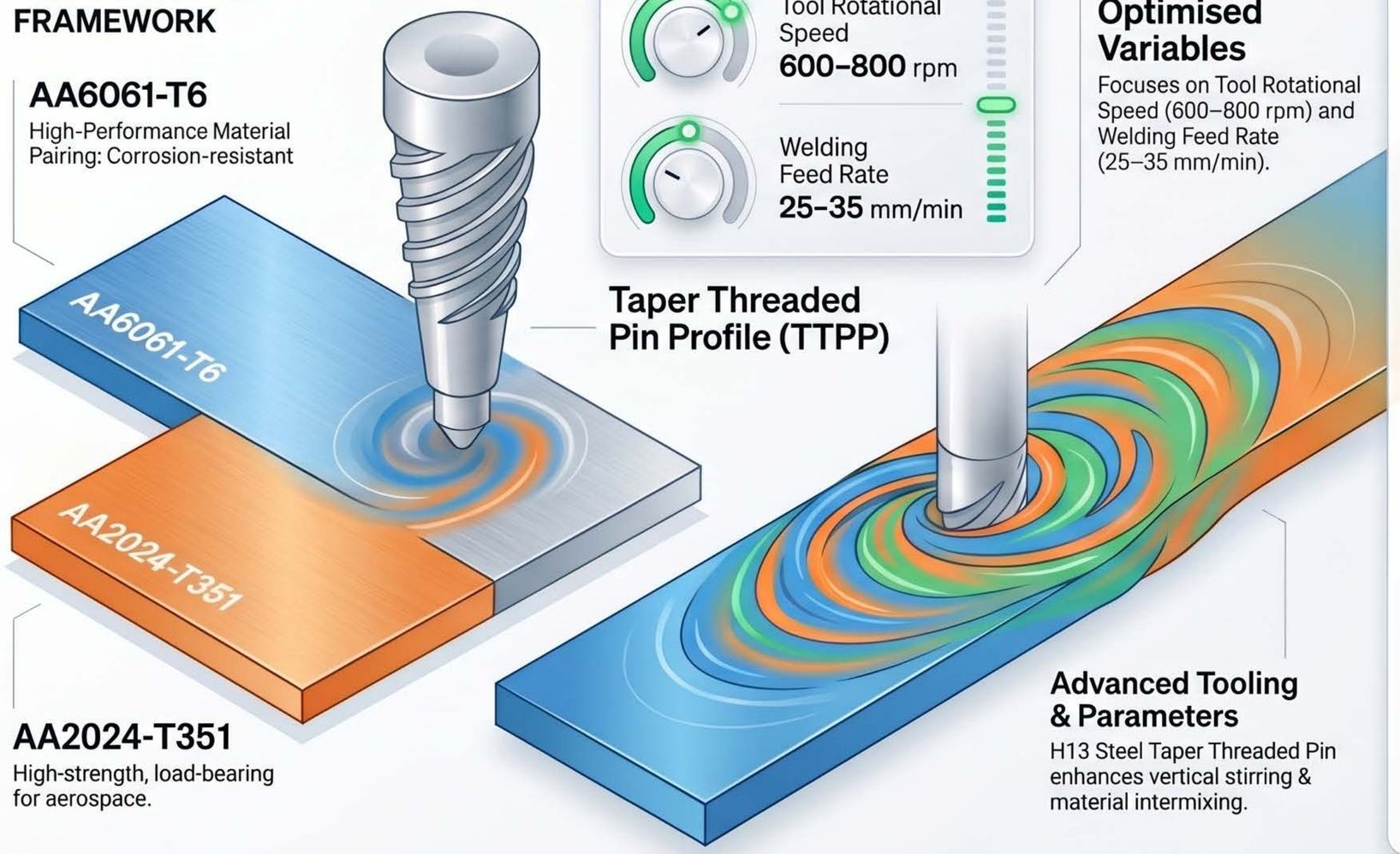
Optimising Dissimilar Friction Stir Welding: AA6061-T6 vs AA2024-T351

How Tool Rotational Speed and Welding Feed Rate Influence Mechanical Performance and Microstructure.

THE EXPERIMENTAL FRAMEWORK

AA6061-T6

High-Performance Material Pairing: Corrosion-resistant



AA2024-T351

High-strength, load-bearing for aerospace.

Optimised Variables

Focuses on Tool Rotational Speed (600–800 rpm) and Welding Feed Rate (25–35 mm/min).

Taper Threaded Pin Profile (TTPP)

Advanced Tooling & Parameters

H13 Steel Taper Threaded Pin enhances vertical stirring & material intermixing.

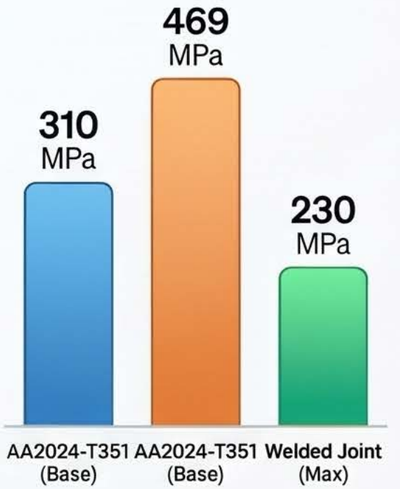
PERFORMANCE & OPTIMISATION RESULTS

Critical Driver:

ANOVA reveals tool speed contributes ~74% to tensile strength & ~75.5% to hardness.

Peak Tensile Strength Achieved

At 800 rpm & 35 mm/min feed rate.



Fully Ductile Fracture Mode

High-heat trials (800 rpm) produced deep, large dimples, indicating excellent material ductility & bonding.