Automated Temperature controlled FSW
Robotic application

Ana C. F. Silva

PhD Student in Production Technology

Supervisors:

Gunnar Bolmsjö

Jeroen De Backer

26 May 2015

Trollhättan, Sweden

Objective

- Precise and fast temperature acquisition during welding
- Perform FSW optimization
  - Parameters development time reduction
  - Weld quality improvement
- Upgrade the ContRoStir software (J. De Backer) to a more user friendly software – to be used by non-experts
- Application on complex weld geometries, different materials and/or FSW variants

Research Questions

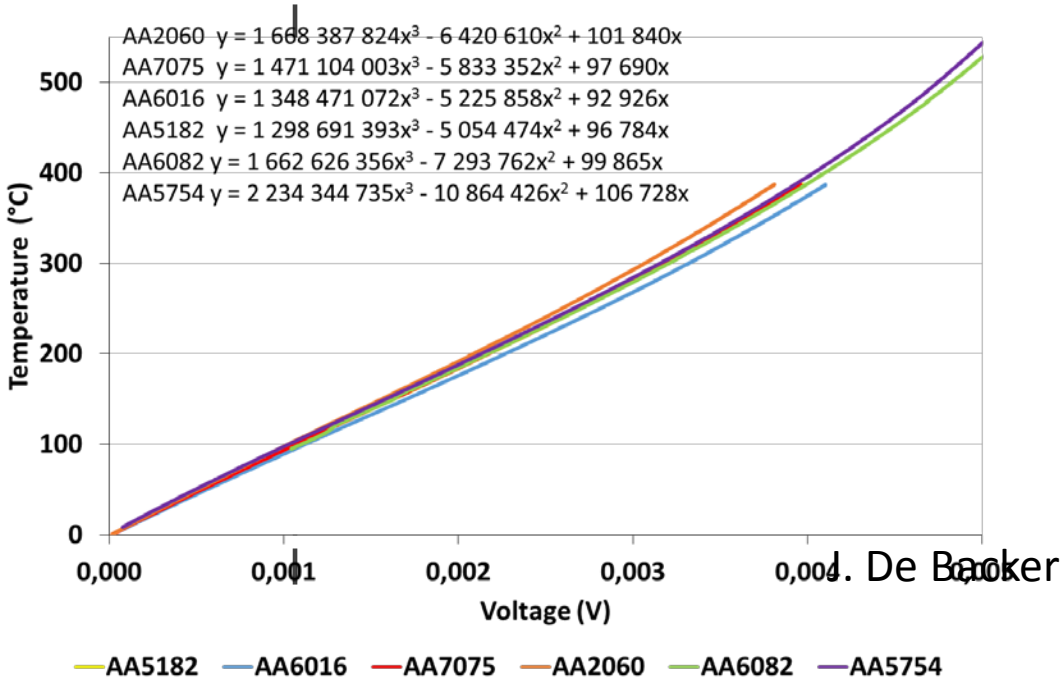
- How to achieve high quality welds using temperature controlled FSW?
  1. Selection of temperature measurement method.
  2. Effects of temperature control on the final joint quality.

- Can the FSW be optimized automatically using temperature as control parameter?
  3. Plunge optimization.
  4. Automated weld optimization.
  5. Application to complex geometries and FSW variants (SSFSW, BTFSW).

WP 1 – Temperature measurements

Better temperature measurement method selection

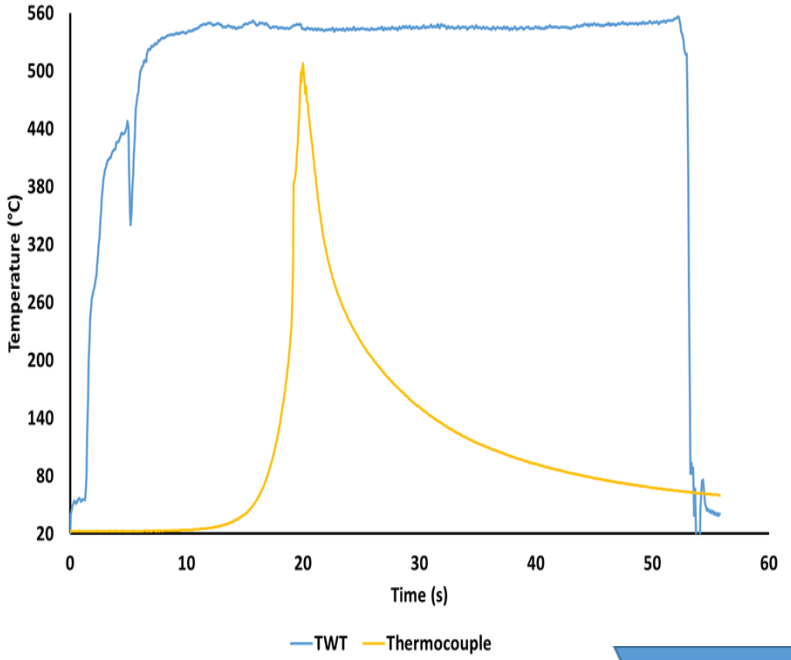
- TWT vs other temperature measurement methods.
- Identification of parameters that can influence the measurements – how to avoid them.
- Calibration – How to acquired more accurate temperature data.

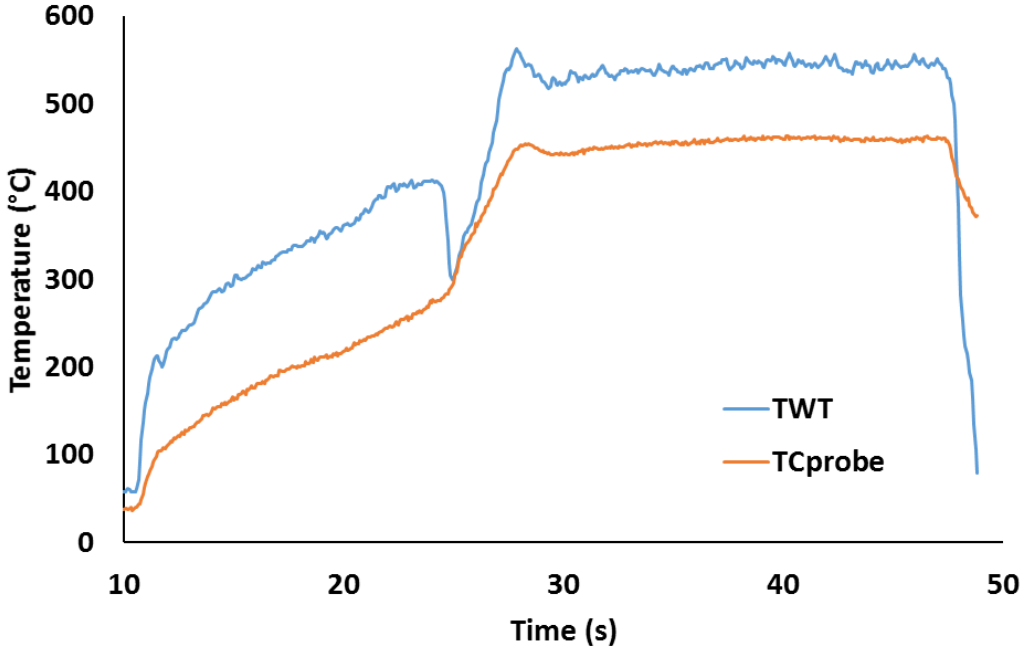


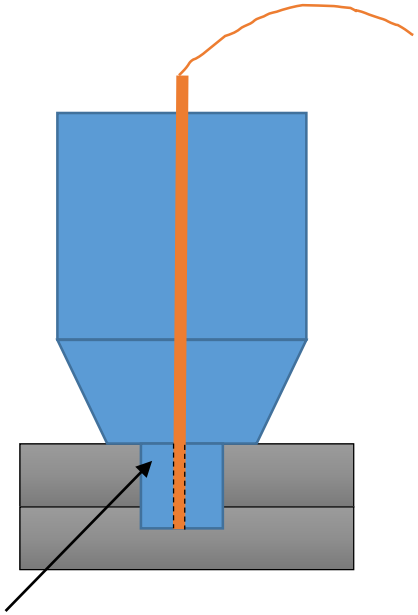
J. De Backer

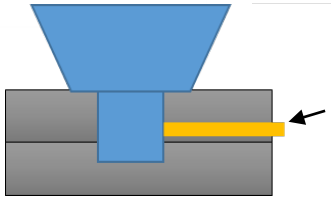
Temperature data acquisition

- FSWP2015 conference - TWT method for temperature measurement during FSW process









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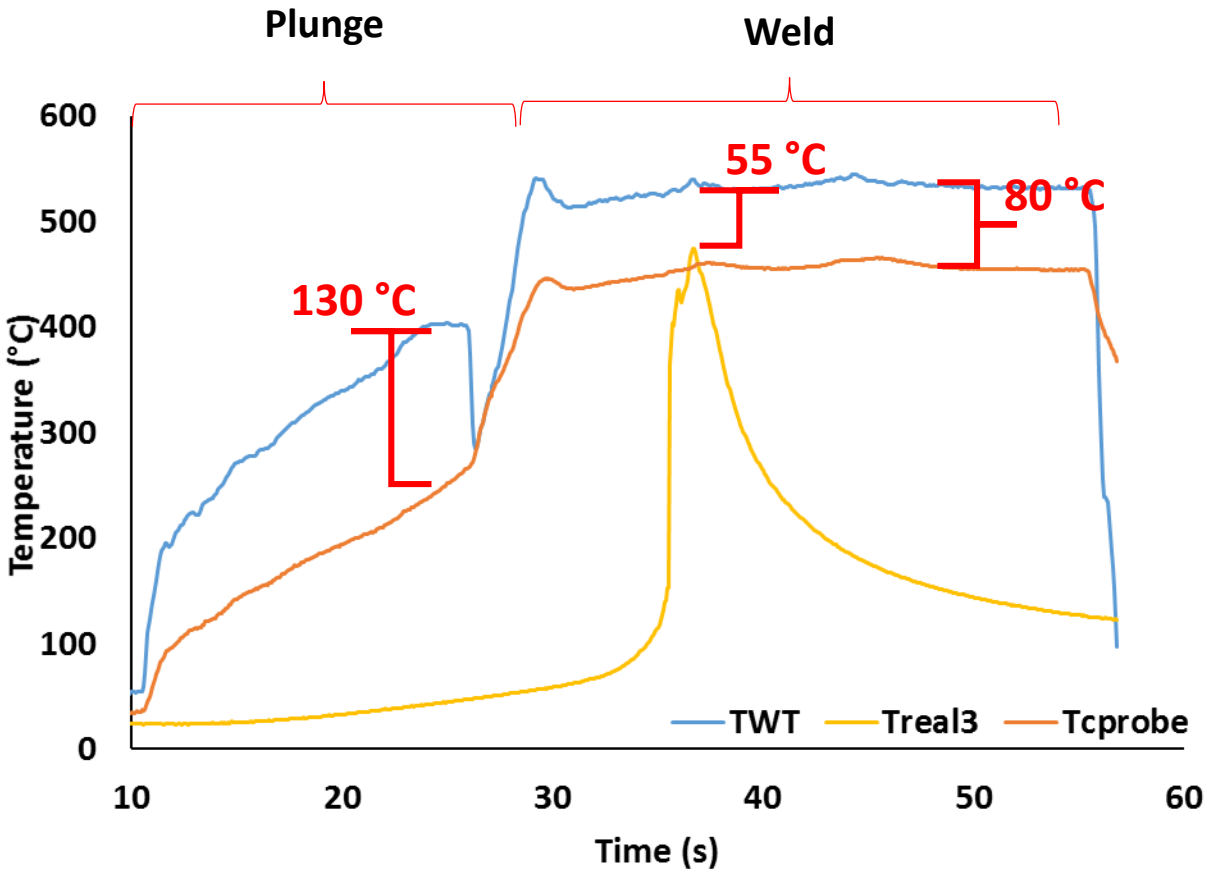
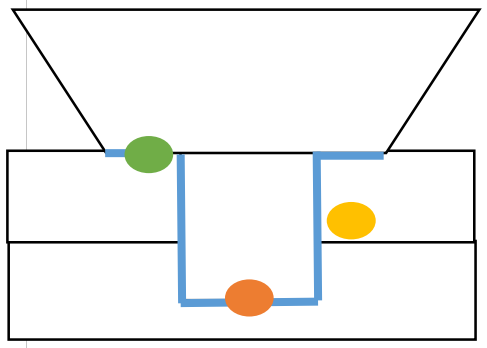
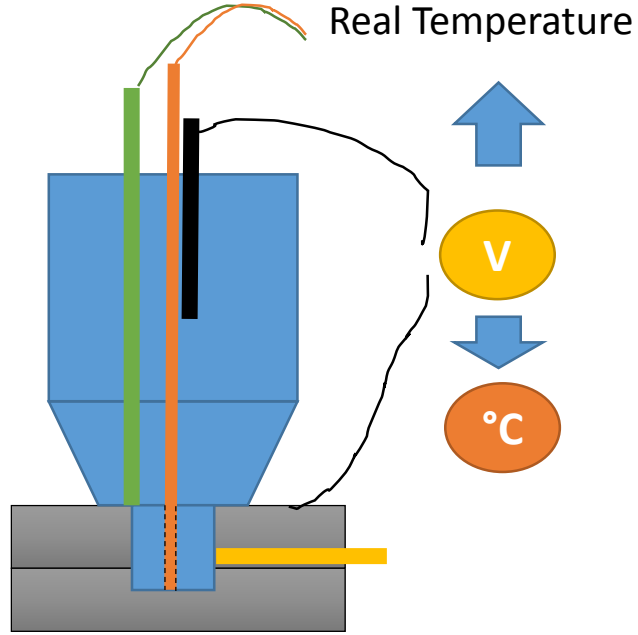






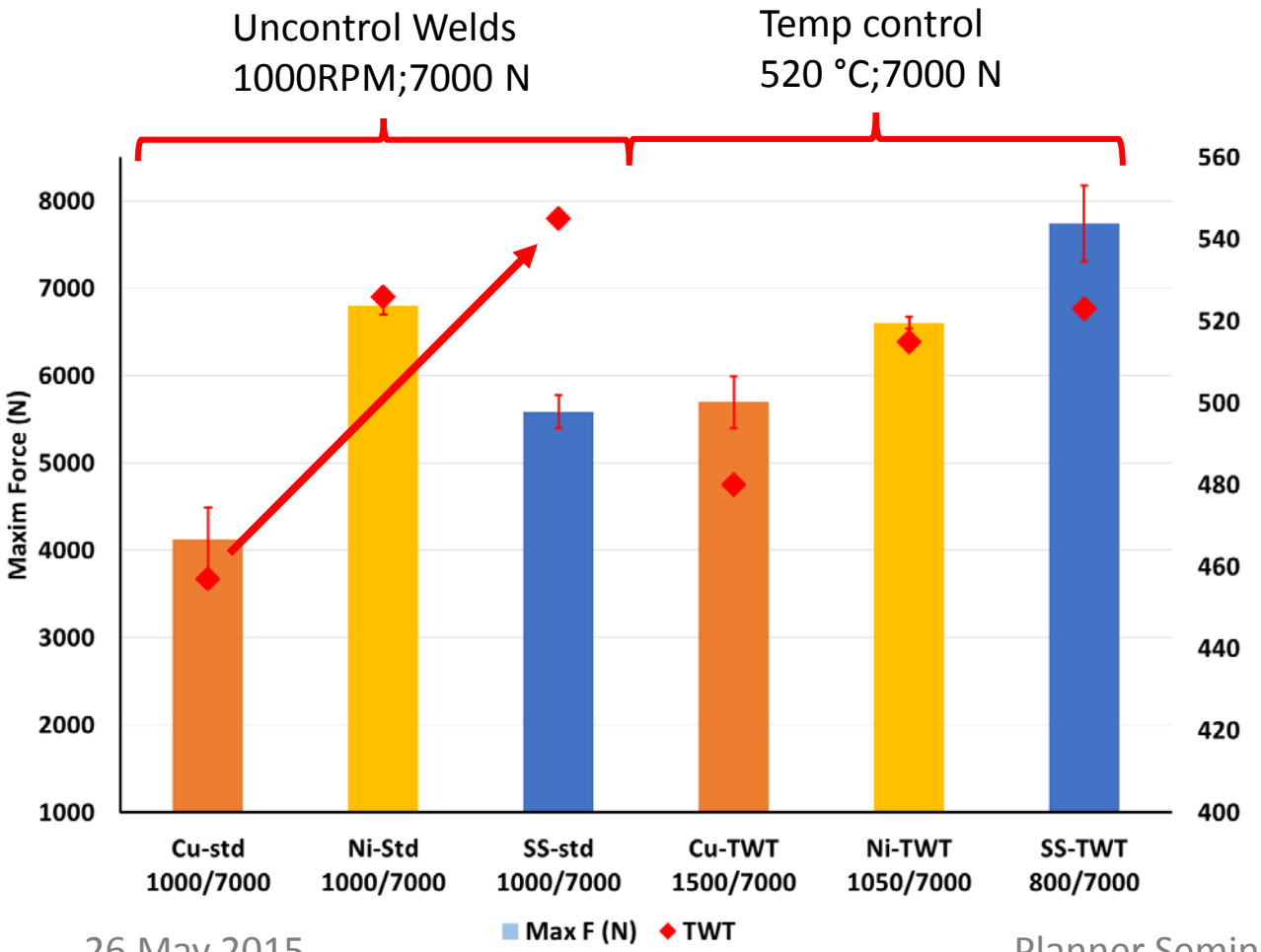
WP 2 – Temperature controlled FSW

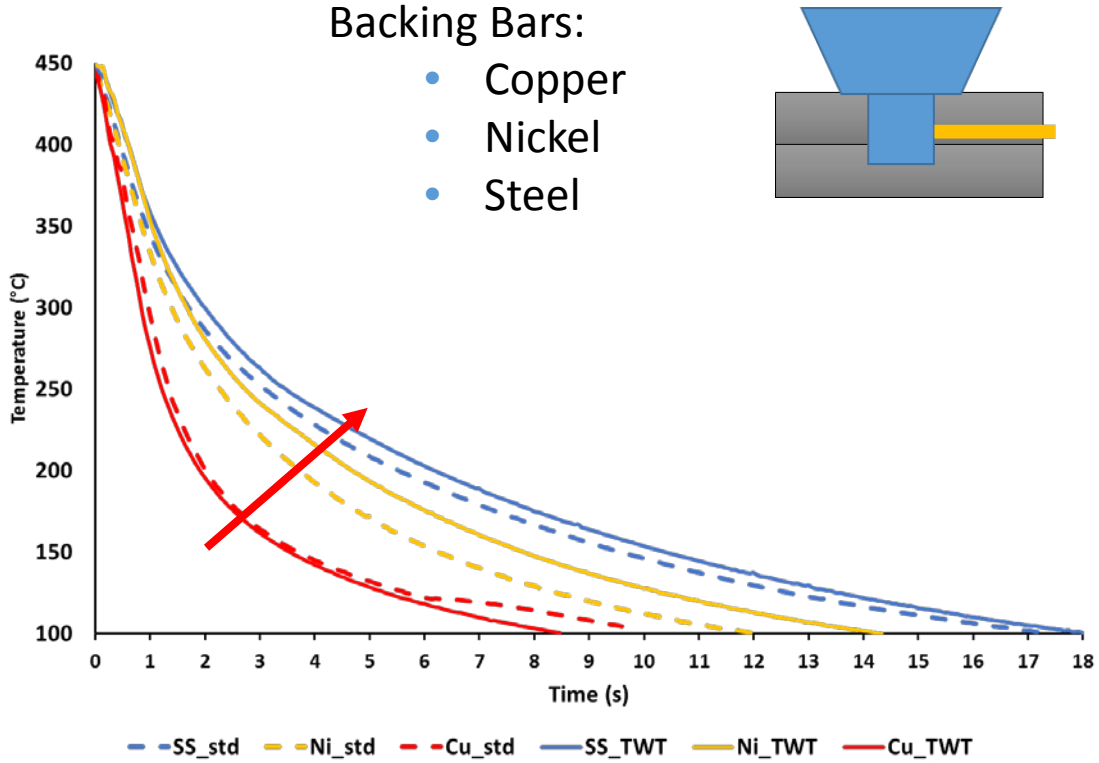
Effects of temperature controlled FSW on the final joint quality

- Study of the welding parameters effect on the weld quality.
- Welding parameters limits.
- Study of temperature to achieved high quality welds.
- Experiment on different alloys and thickness

Backing Bar Effect

- IIW2015 conference - Cooling rate effect on temperature controlled FSW process





Backing Bar Effect

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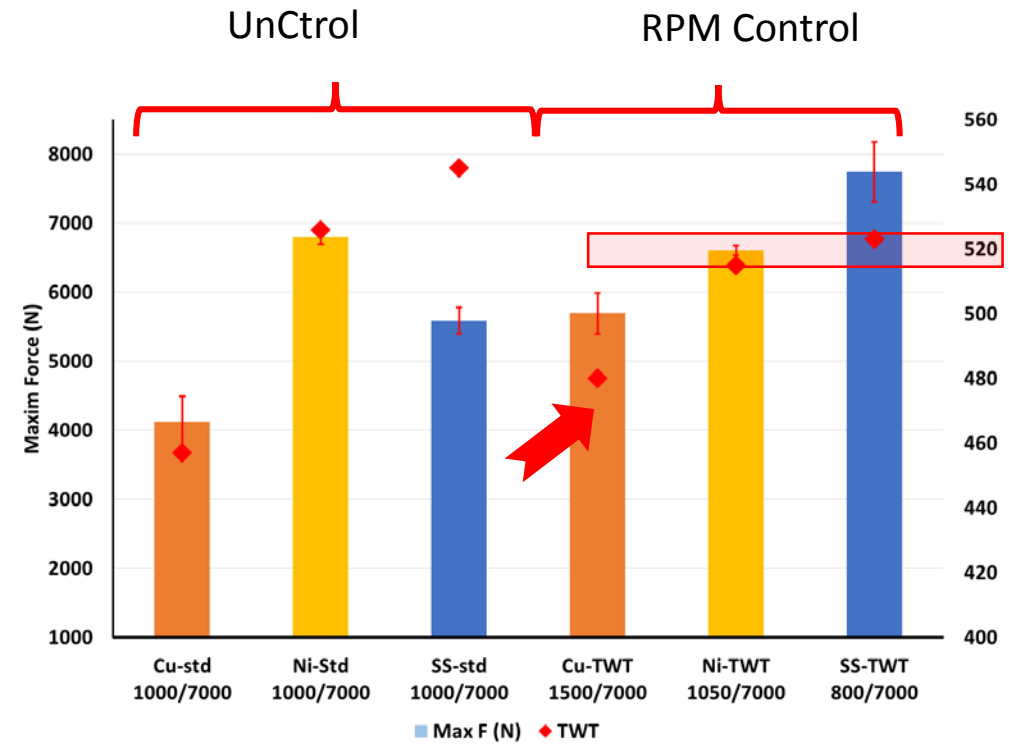
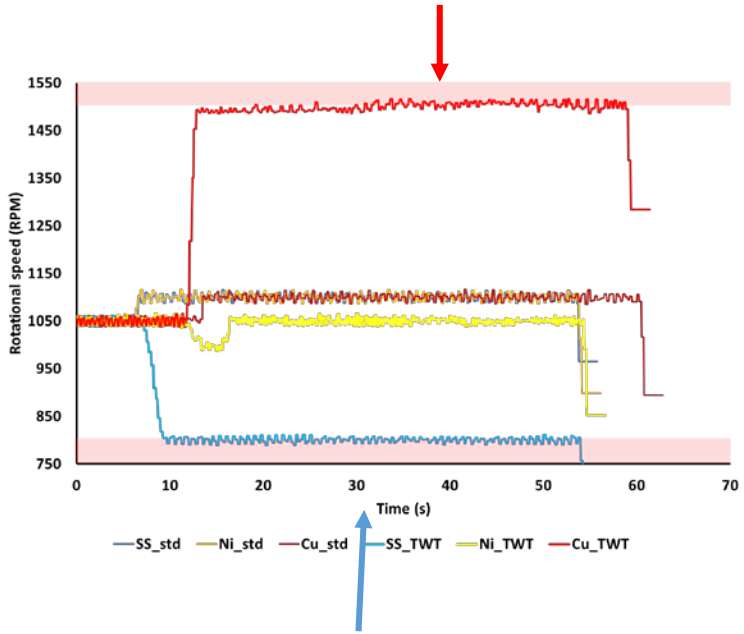
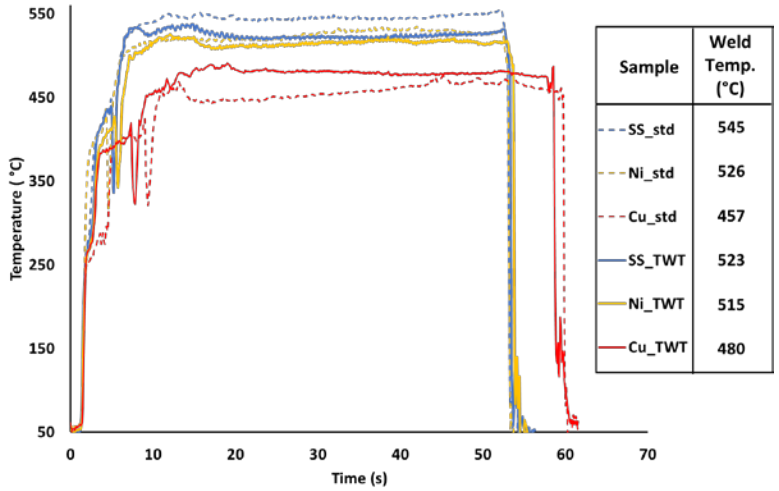


Copper: RPM limit at 1500RPM

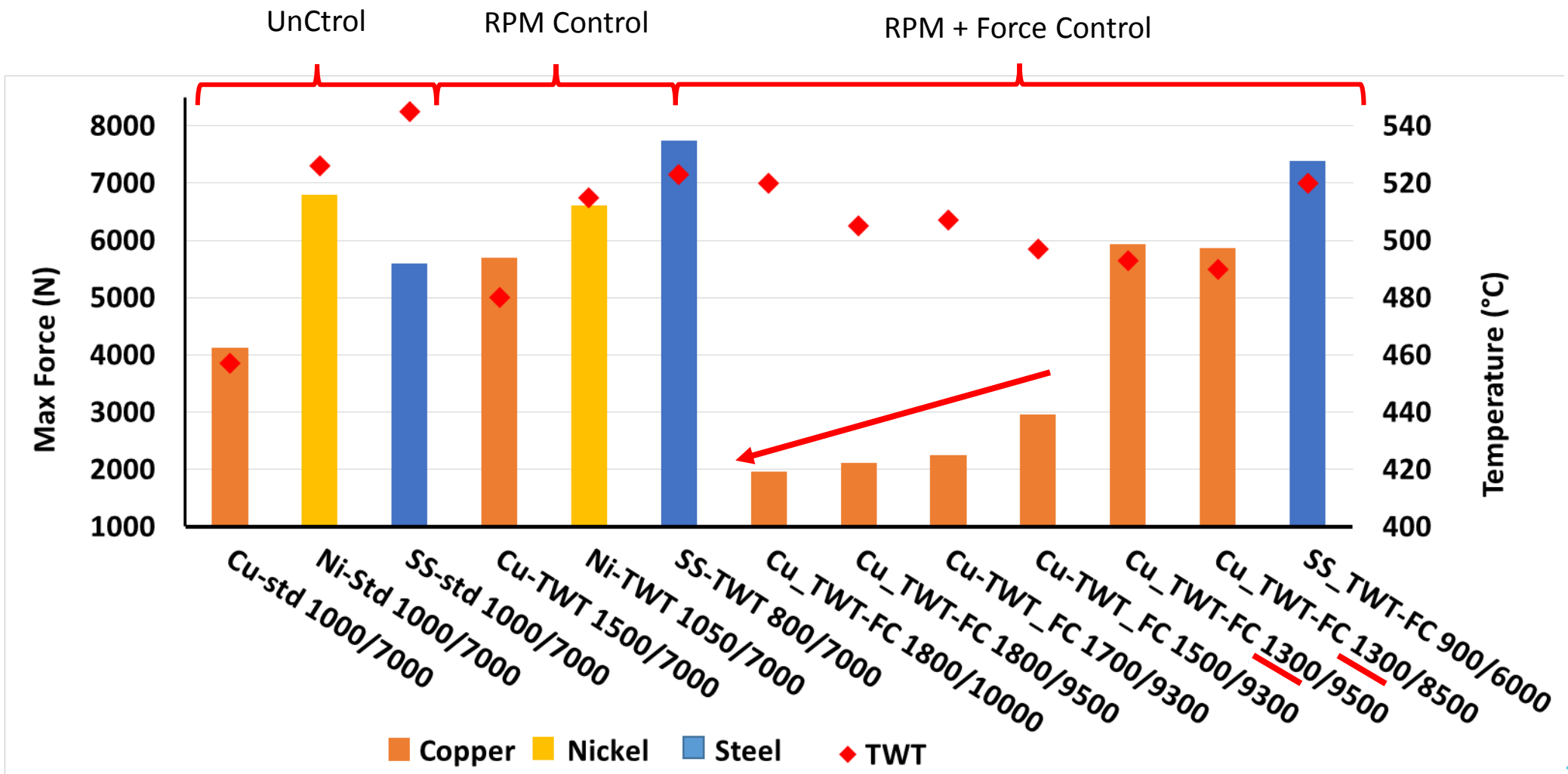




Sample	Weld Temp. (°C)
SS_std	545
Ni_std	526
Cu_std	457
SS_TWT	523
Ni_TWT	515
Cu_TWT	480

Steel: RPM limit at 800 RPM

Backing Bar Effect



Questions?

ana.silva@hv.se

Motivation – Friction stir welding

- FSW have a high interest by industry due to its advantages.
- Friction stir welding fast development:
  - Lack of expertise on FSW.
  - New and demanding industrial challenges.
- Feedback control of FSW
  - Temperature