

AU.RO.R.RA: AUtonomous RObotic Repair of RAil switches

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**UNIVERSITY
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RAMLAB

Holland High Tech
Global Challenges, Smart Solutions

Rail Crossing Repair

- 300 crossings per year are planned for regular replacement in the Netherlands.
- disruption in normal transport flow.
- high maintenance, replacement, and monitoring costs.
- Each unforeseen replacement of a crossing may take several hours, or even up to several days.



Welding of Rails

- Rails are mostly welded with the thermite welding process or stick electrode process.
- All processes are manual, and require highly skilled operators.
- The welding processes are unhealthy for the workers.
- The working environment can be adverse; repairs done at low traffic periods (nights-winter).



Robotic welding

- MaxQ hardware & software: proprietary RAMLAB welding process monitoring and control system
- Techman Cobot arm: Friendly for Human-robot interaction
- Miller Electric Auto Continuum 350 power source: Capable of high welding at high currents; suitable for rail welding.



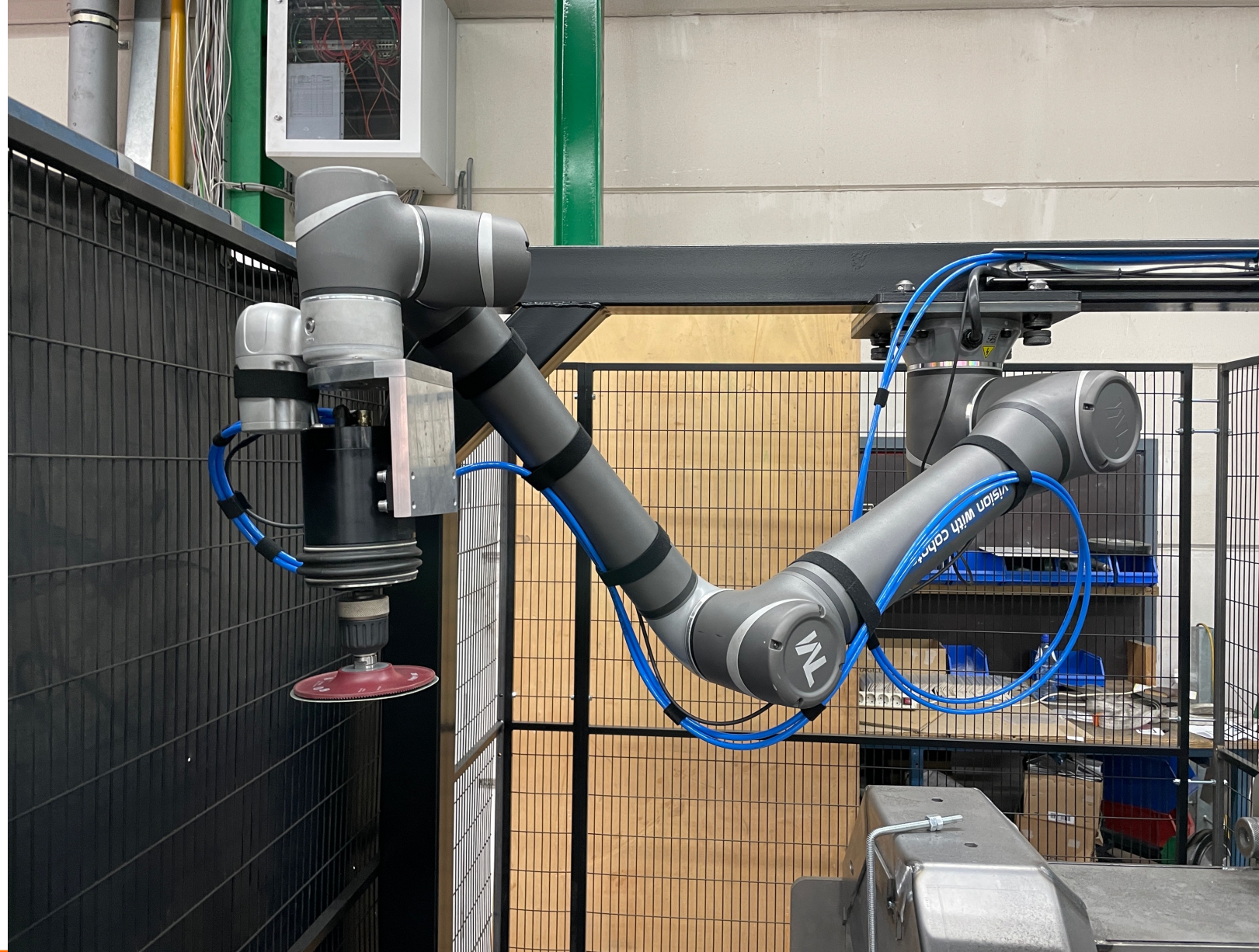
Robotic Welding

- The system is able to scan the rail surface and calculate weld toolpaths.
- The temperature during welding is monitored and correct interpass temperature is used.
- The surface is scanned at the end of welding to be used as input for grinding and surface finishing.
- Matching filler metals were selected from existing products.

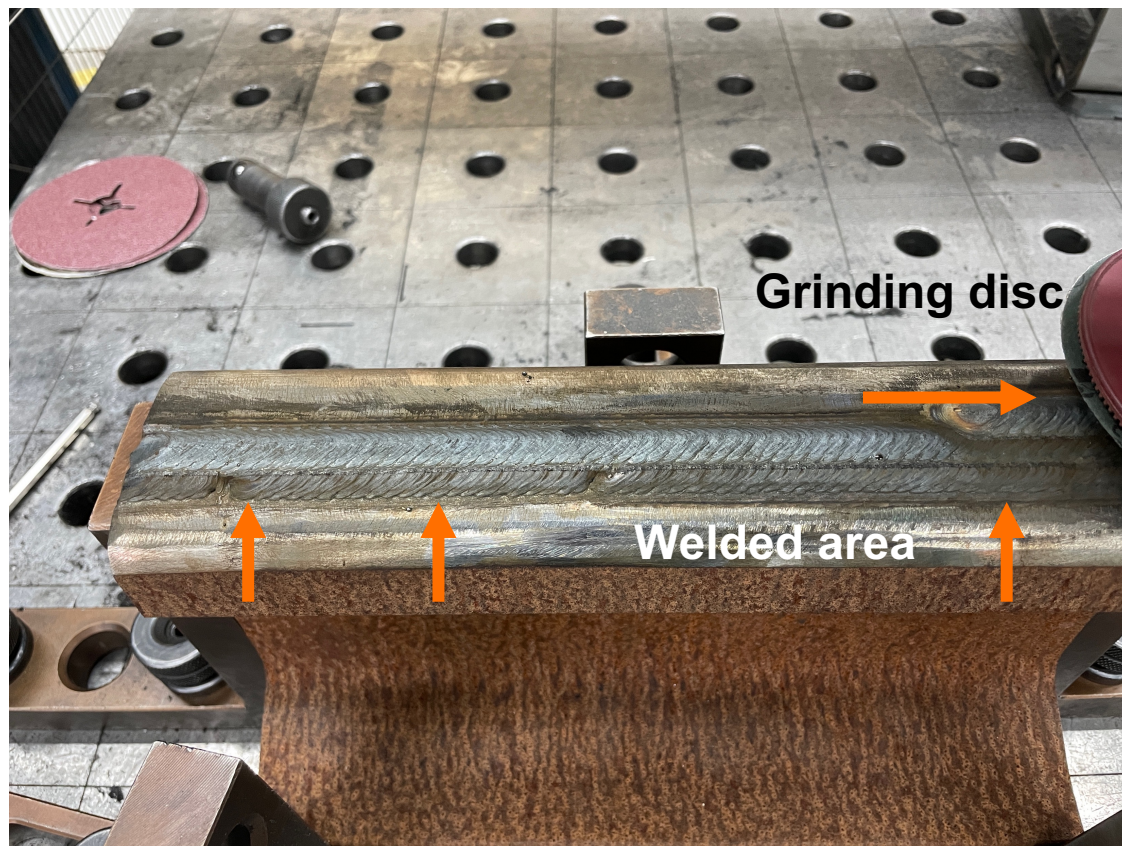


Robotic Grinding

- An additional Techman Cobot arm was developed and installed at RAMLAB to cooperate with the welding robot.
- A Schunk MFT 390 FRO grinding spindle was used.
- Surface information received from MaxQ system.
- Toolpaths for grinding designed with RAMLAB software.



Robotic Grinding



Key Findings

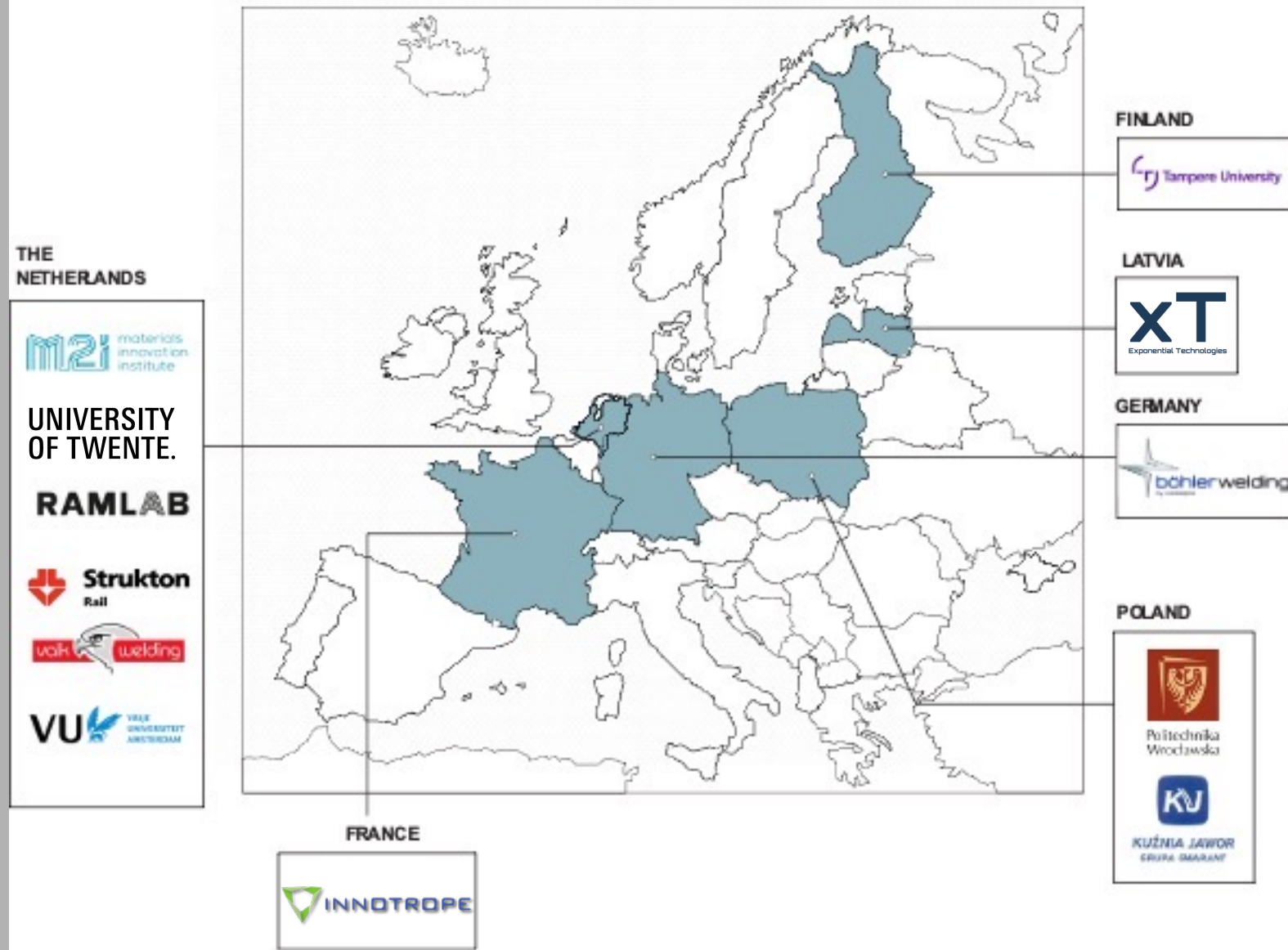
- The system has been validated at RAMLAB in static conditions.
- The welds performed fulfill the repair requirements for surface welds of rails.
- The grinding cobot is able to grind the surface at the desired surface finish.
- Current welding consumable range was evaluated and potential alloying improvements were identified.



What's next?

Scaling up

- Based on the findings of the AURORRA project, we have established a European consortium.
- We will submit a Horizon Europe proposal for developing the solution further and bring it to the market.
- The foreseen budget is € 9M.
- Call HORIZON-CL4-2022-DIGITAL-EMERGING-02-07.



Dank voor uw aandacht



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