Research Fund for Coal and Steel

Friction stir welding for improving joinability of high-performance steels for automotive components to boost green road mobility

Summary of the work performed during the 1st reporting period (September 2021 - June 2023):

- The technical requirements and specifications of FSW and FSSW for some automotive applications were defined. Besides, the materials to be used in the three use cases of the project were selected and successfully manufactured and distributed among the project partners. Finally, the selection of the corrosion protection strategy was also carried out.

- The welding process was successfully developed and optimized for three different enhanced-machinability steels, as well as tool development for FSW of Steel and Al-St was carried out. In order to be able to evaluate the process data, online process monitoring was also designed for the essential welding parameters and integrated into existing welding systems.

- Process optimization of the refill FSSW process which relies on geometric details and expected performance of the demonstrators. The task also included designing and manufacturing appropriate weld specimens using refill FSSW to create single-spot joints, and using a sealant to protect against galvanic corrosion.

- The metallurgical characterization of the reference materials was divided in two different sections: the microstructural characterization and the main mechanical properties evaluation. The reference joints will be analysed as benchmarks for the FSW and refill FSSW processes.

- Definition and design of the three demonstrators to prove the applicability of FSW and refill FSSW technologies to automotive structures are ongoing.

- Simulation of the industrialisation process for assembly task regarding the B-Pillar (Case II) was completed, to demonstrate the industrialisation potential and feasibility of the technologies developed in Stir4Steel project.

- Assessment of the current environmental situation for reference demonstrators which includes existing conventional joints, materials etc. was done. This calculated data will be compared with the new processed demonstrators and its new techniques.

- Risks and mitigation actions are in place, while all the partners have contributed to communication and dissemination activities and main dissemination tools have been created.