PURITY IMPROVEMENT OF SCRAP METAL

Project information

Start date: 01.01.2023
Duration: 42 months
Type: Innovation Action

Call: HORIZON-CL4-2022-TWIN-TRANSITION-01
**Coordinator:** SWERIM AB
**Contact:** info@purescrap.eu

Motivation

In 2020, 80 Mt of post-consumer scrap were generated in Europe and will increase in the future. Tramp elements, such as copper, tin, chromium, nickel or molybdenum prevent the recycling, they may influence material product properties and metallurgical processes. This surplus of low-quality scrap within the EU results in enormous scrap exports. In 2019, these amounted to 21.8 Mt. On the contrary, scrap of higher quality has to be imported to the EU to fulfil the scrap demand for steel production. This situation creates a large potential for improved scrap treatment. The PURESCRAP project is taking an ambitious, major step toward reducing impurities in post-consumer scrap prior to melting by applying highly efficient sensor stations in conjunction with improved scrap processing. The project thereby provides a contribution to the Strategic Research and Innovation Agenda (SRIA) of the Clean Steel Partnership (CSP) and to the achievement of the European Green Steel goals regarding circular economy as well as to the reduction of CO_2 emissions.

Objectives

The project aims to increase the use of low-quality scrap grades (post-consumer scrap) by deploying and applying best available technologies to reduce impurities. The figure below illustrates the preliminary concept of the PURESCRAP project, the framed boxes highlight the project activities. During the project, sensor stations will be integrated in the two separate processing chains for heavy (cut) and shredded scrap to improve the impurity removal and enable a more efficient scrap processing. For heavy scrap the PURESCRAP project will apply extended sensor stations for scrap quality monitoring, preferably as intermediate process step (see upper part of the figure). For shredded scrap, there are several downstream processing methods already used, such as sieves, fans/cyclone, magnet (ferrous), density (stainless + copper), eddy current (stainless). For this scrap type, the downstream sensor-based monitoring will induce an efficient removal of impurities and enable a more efficient scrap processing.
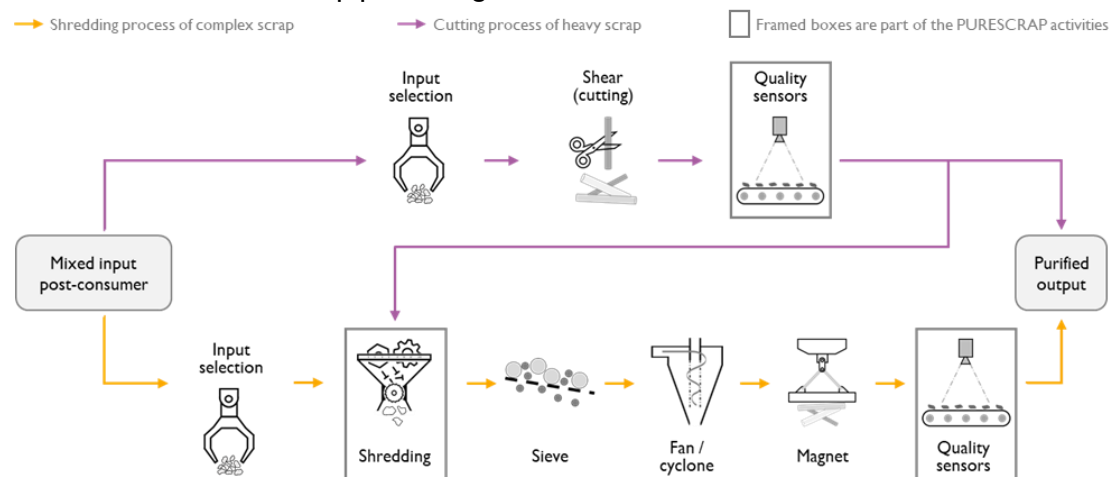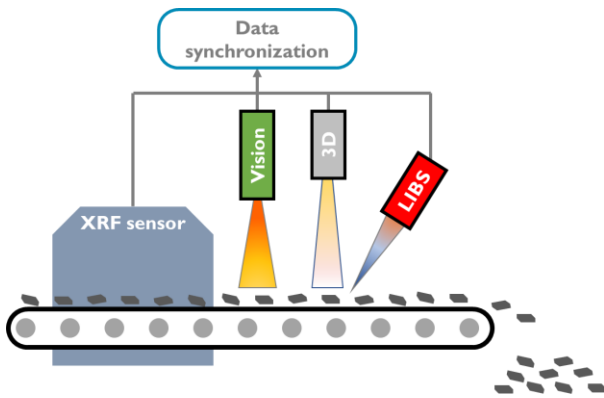
Preliminary concept for the analysis of shredded scrap using combined an synchronized sensors

Optical sensors for visual recognition are combined with chemical sensors and they are applied in a modular fashion so each sensor can work as a stand-alone to eliminate the risk of having a too complex system. The large amount of data has to be transferred, synchronised and merged. Existing software framework system will be further developed by enhancement and adaption to handle the data and aims at executing and controlling scrap operations. The upgraded post-consumer scrap will be used for steel production and the qualities charged during the melting processes consider final steel properties and cleanness level. Verification of hardenability and physical properties in the final product supports the quantification of scrap quality and the determination of the maximum possible rate of improved post-consumer scrap for high quality steel production.

Expected results

- Reducing impurities in low-quality scrap through spectroscopy and vision systems
- Enhancing the uptake of post-consumer scrap to produce high-quality steel grades
- Improving the scrap characterization through image detection and processing models using Deep Learning solutions
- Reducing CO_2 emissions by 10-30 % for scrap melting due to an increased input of upgraded post-consumer scrap compared to a reference basic oxygen furnace or electric arc furnace operation

Consortium

The consortium includes companies from research institutions and metallurgical industry as well as research institutions and consists of:

- Scrap recycling (Stena Recycling AB)
- End user (voestalpine Stahl Donawitz GmbH, SSAB EMEA AB)
- Sensor technology (BT-Wolfgang Binder GmbH, SPECTRAL Industries BV)
- Process control (DANIELI AUTOMATION SPA)
- Research organisation (SWERIM AB, K1-MET GmbH, ESTEP)
- University (Scula Superiore Sant'Anna, Luleå tekniska universitet, TU Dortmund)

Kick-off meeting

The first project meeting took place in Sweden at the beginning of February. All partners had the opportunity to visit SWERIM, STENA and SSAB to get an overview of the analysis, scrap sorting and steel production. Taking this into consideration, each member gained an enhanced understanding of the topic and acquired a clearer impression of the intended locations for the sensor stations. In addition to interesting and valuable insights, first decisions for the project were made and the way forward was agreed upon. After the productive work, the opportunity to socialize with colleagues over delicious meals and a few drinks provided an enjoyable and valuable experience.

Upcoming events

Here you will find upcoming events where you will have the opportunity to meet team members of the PURESCRAP project and get more information.