**Task**

As well as responding to environmental concerns, the recycling of steel scrap for reuse in steel production has taken on a new, economic significance due to the growing scarcity of natural resources and the rising cost of raw materials. The better we are able to characterize the chemical composition of steel scrap, the greater the value of the recovered fraction. Conventional fractionation processes (magnet extraction, density analysis, etc.) only cover a limited number of characteristics, and are generally not sufficiently selective with respect to the elements that can play a critical role in recycling. The defined task is to develop and verify the suitability of a measuring technique for the on-site characterization of steel scrap streams on conveyor belts with belt speeds of up to 3 m/s.

**Results and Applications**

In the first phase of the project, the researchers identified laser parameters that also permit the laser to remove coatings and layers of dirt in order to allow elemental analysis of the bulk material. A demonstrator setup featuring an optics module, a spectrometer module and a control module was designed and constructed. The optics module contains various components including the laser light section sensor for geometry measurement, the LIBS laser and the scanner. In an on-site field campaign at a recycling plant, the demonstrator setup was put into action in a shredder facility with a belt speed of roughly 1 m/s.

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**Method**

Laser-induced breakdown spectroscopy (LIBS) was chosen as the method for element-selective characterization. A short laser pulse forms a plasma on the surface of the scrap steel. The light emitted by this plasma contains information on the elemental content and is analyzed by a spectrometer. The geometry of the pieces of scrap is determined using a laser light section sensor and the analysis laser is quickly deflected by a scanner. Further development of this laser process is required to enable a reliable average elemental content of a scrap fraction to be determined.

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