Heavy melting scrap verification with AI-driven sensor technology

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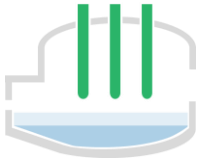
The project at a glance

Aim: Development of an user-friendly digital platform for networked production based on novel & soft sensors and related approaches and models → three use cases / three segments of the steel value chain.

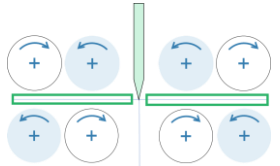
Use cases

Use Case 1:
Heavy melting scrap verification

Use Case 2:
Energy efficiency for EAF



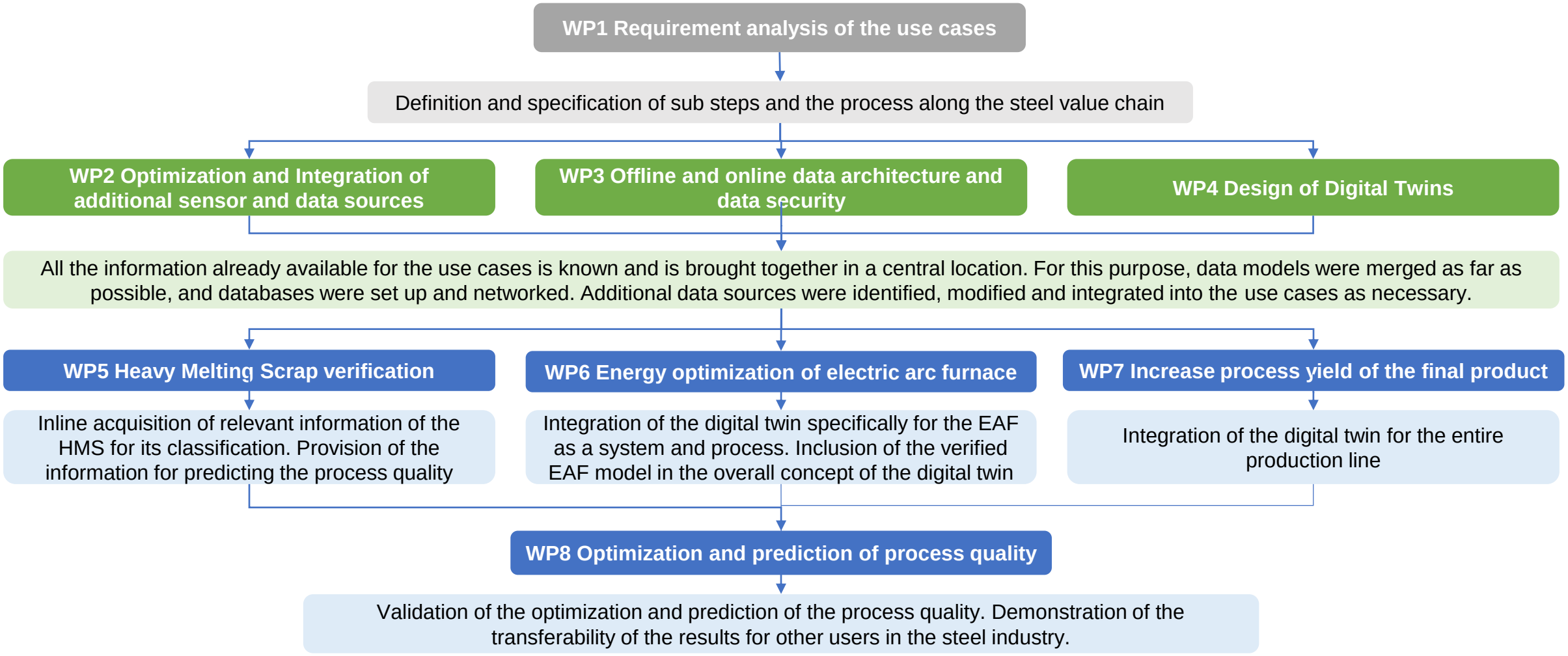
Use Case 3:
Final product quality



Consortium: 10 Partners / 6 EU countries

Duration: 01.11.2024 – 30.04.2028

Implementation



WP9 Project Management RP1

WP10 Project Management RP2

WP11 Project Management RP3

Heavy melting scrap verification

Current Situation

- **HMS scrap: ~ 25 tonnes / truck**
- visual inspection by experienced employees
- **random sample spectroscopic** analysis with handheld X-Ray fluorescence

NEED: An **improved and reliable scrap characterisation** to allow operator-friendly sorting and better separation to reduce impurities in the targeted steel heat.

Heavy melting scrap verification

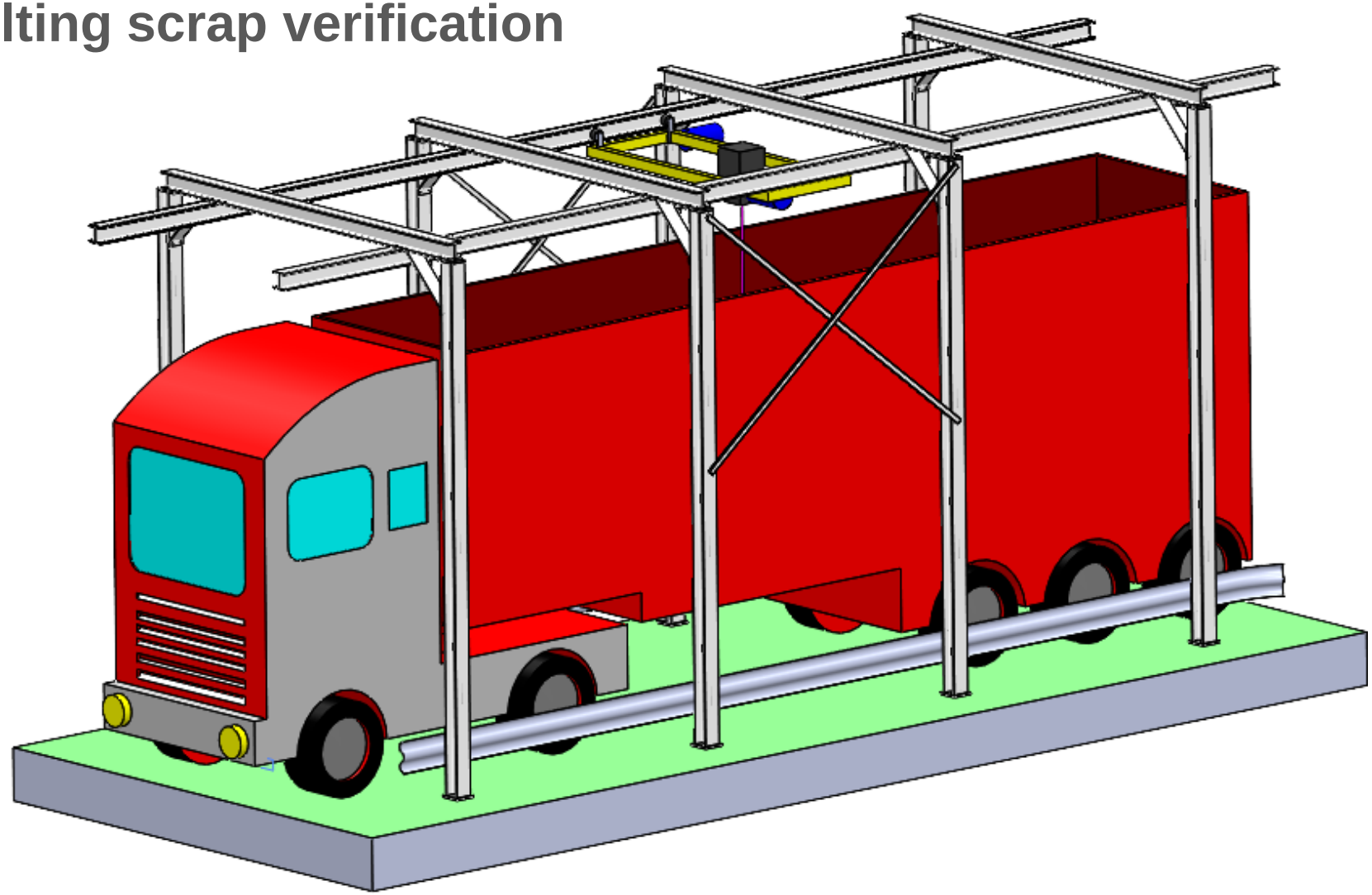
Solution:

LIBS portal for scanning truckload

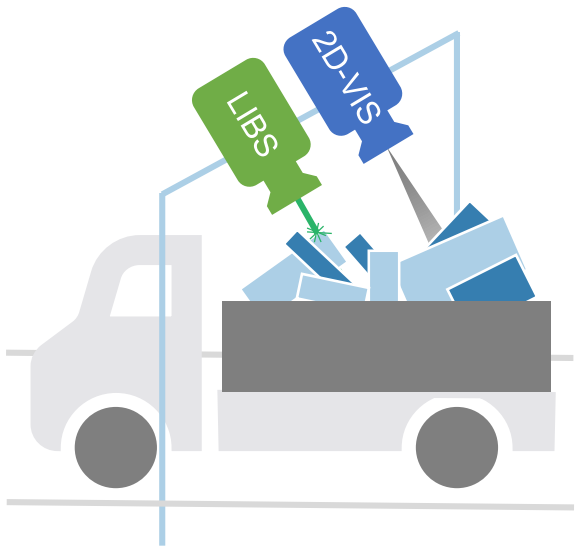
<u>Additional measurements:</u>

Height profile

Camera



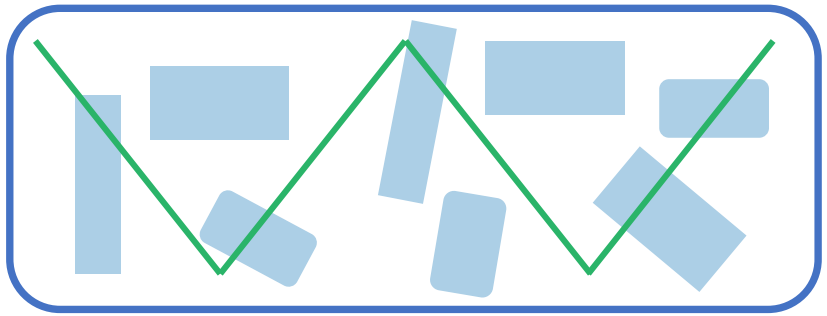
Heavy melting scrap verification – Image analysis (IA)



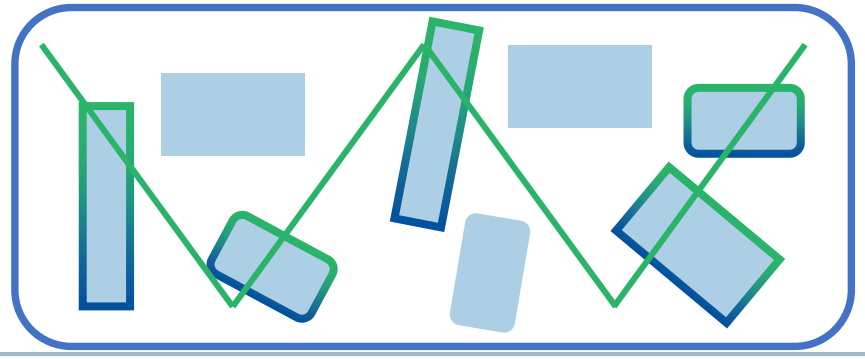
Camera image

LIBS analysis

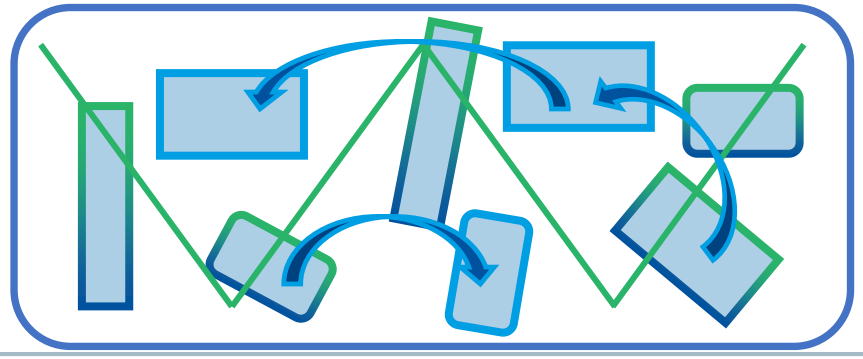
1st step IA: Create combined image



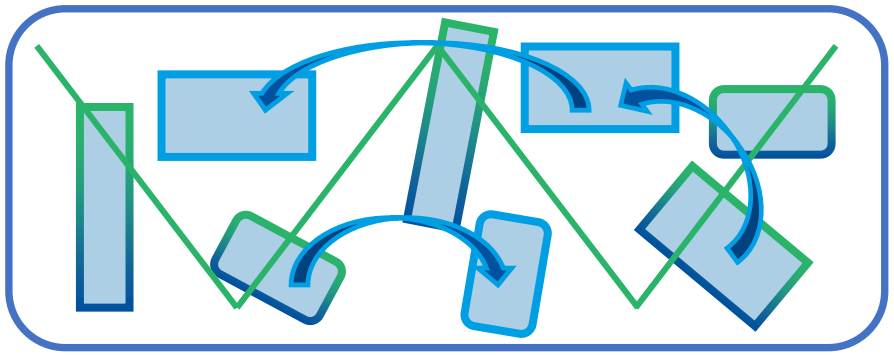
2nd step IA: Define shape and size of LIBS analysed pieces



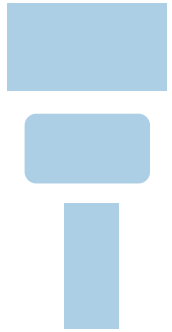
3rd step IA: Find similar objects



Heavy melting scrap verification – Modell (M)



1st step M: Define composition of single pieces by assignment of LIBS analysis

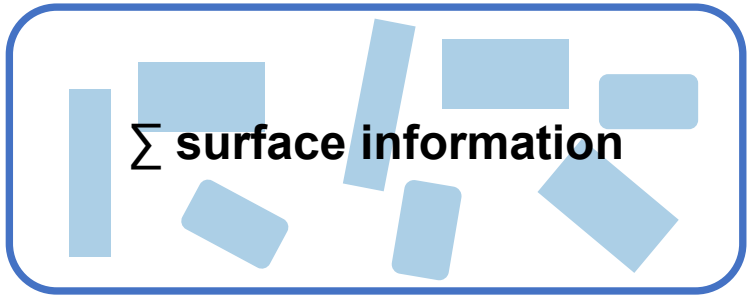


x_1 Fe + y_1 Cu + z_1 S

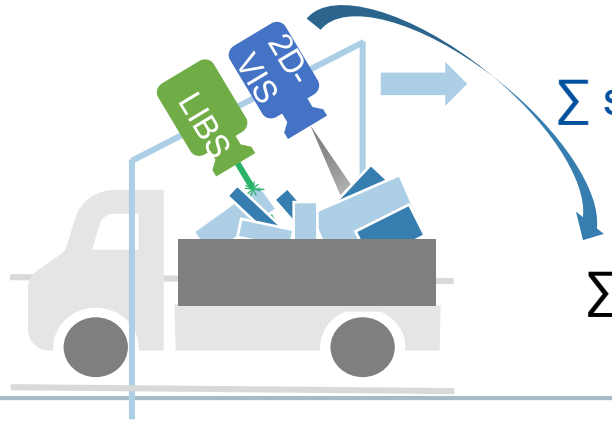
x_2 Fe + y_2 Cu + z_2 S

x_3 Fe + y_3 Cu + z_3 S

2nd step M: Calculate avg. composition of all pieces on surface of truck



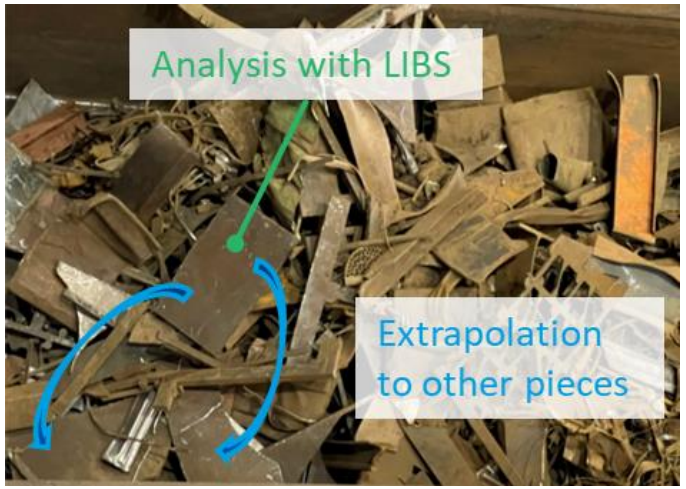
3rd step M: Estimate avg. composition of bulk using height level data (and weight)



∑ surface information
+ scrap height

∑ volume information

Heavy melting scrap verification

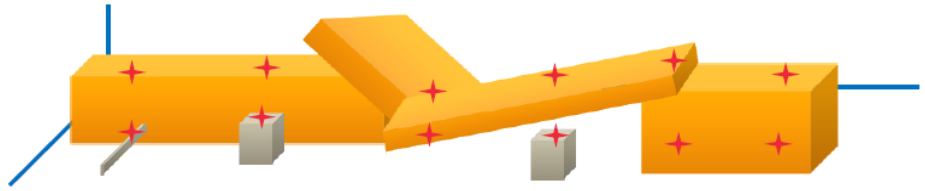


Conclusions

Data from LIBS, height measurement and camera to be combined

- Use camera for object recognition
- Classify scrap by shape and size
- Align LIBS and camera data and extrapolate
  → Surface information
- Use camera and height data for estimation of volume of objects
  → Volume information
- Digital twin for the characteristics of the HMS truckload

- Representativity of the data: surface versus volume:



DiGreeS

Thank you for your attention on behalf of the DiGreeS consortium.