Use of Robotics in Final Sample Preparation

Introducing Umicore

A global materials technology and recycling group

One of three global leaders in emission control catalysts for light-duty and heavy-duty vehicles and for all fuel types

A leading supplier of key materials for rechargeable batteries used in electrified transportation and portable electronics

The world's leading recycler of complex waste streams containing precious and other valuable metals

Introducing UPMR

The leading precious metals recycler

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Precious Metals Refining

Largest and most complex precious metals recycling operation in the world

Processes more than 200 different types of raw materials

World leading refiner of 17 different metals

World class environmental and quality standards

Sampling

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Sampling

- Extracting a small representative quantity from tonnes of a material
- Dedicated processes for all raw materials, using material-specific procedures
- Secured area
- About 240 people
- +/- 9,000 lots/year
- +/- 18.000 m² of Sampling area

Final Sample Preparation

- About 25 people
- Different materials:
  - 2200 Industrial byproducts
  - 5300 Recyclabes
  - 1500 Internal products

Strategic purpose of Automation projects

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We continuously innovate our sampling processes to maintain our leadership position through automation and information management. This is focused on 2 main drivers:

1. Increased robustness:
   - Maximal accuracy and repeatability by minimizing the human interaction
   - Focus on high equipment availability

2. Reducing throughput times

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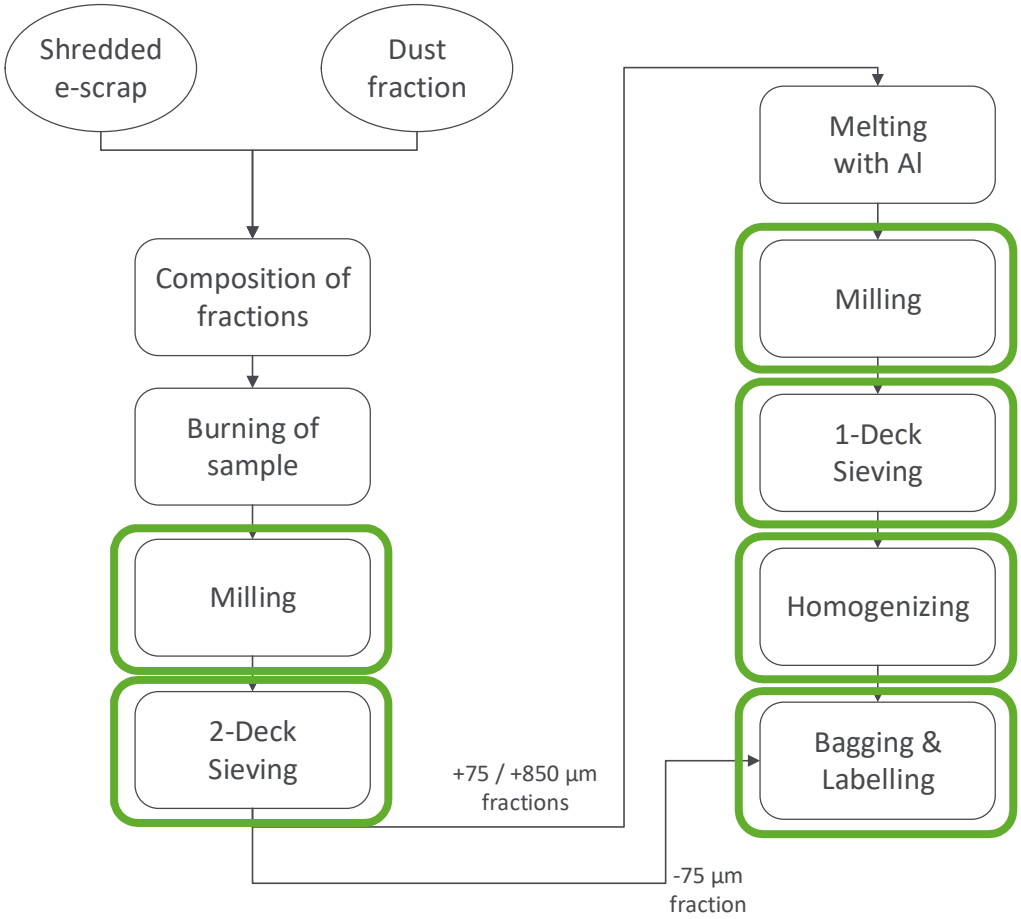
Flow of Final Sample preparation for e-scrap



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Overview of the setup

1. Central Robot arm
2. Input magazine for burnt e-scrap
3. Continuous mill
4. 2 Deck sieve
5. Magazines (In & Out)
6. Crusher – Splitter
7. Mills
8. 1 Deck sieves
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11. Bagging
12. Labelling
13. Bagging Magazine

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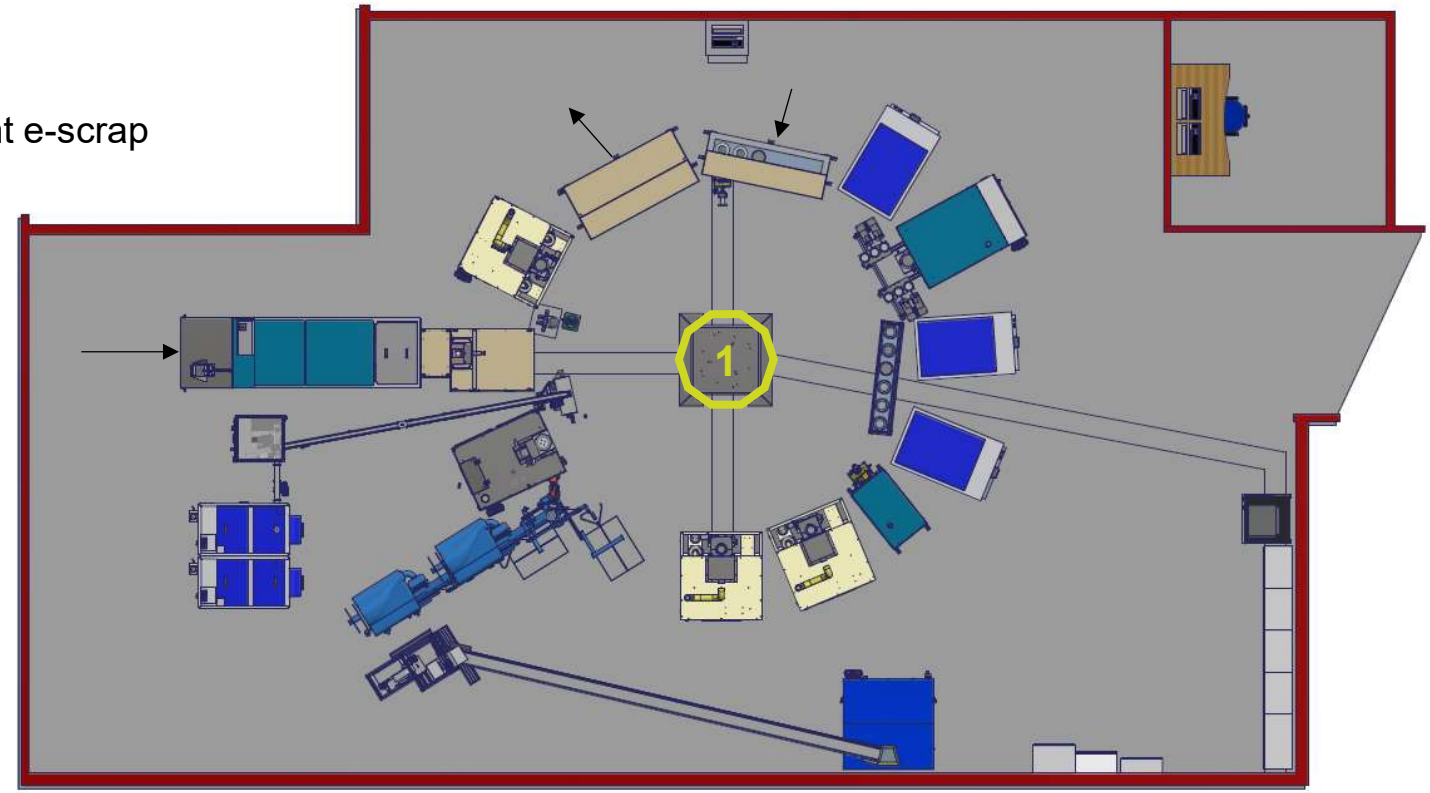

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Central Robot Arm

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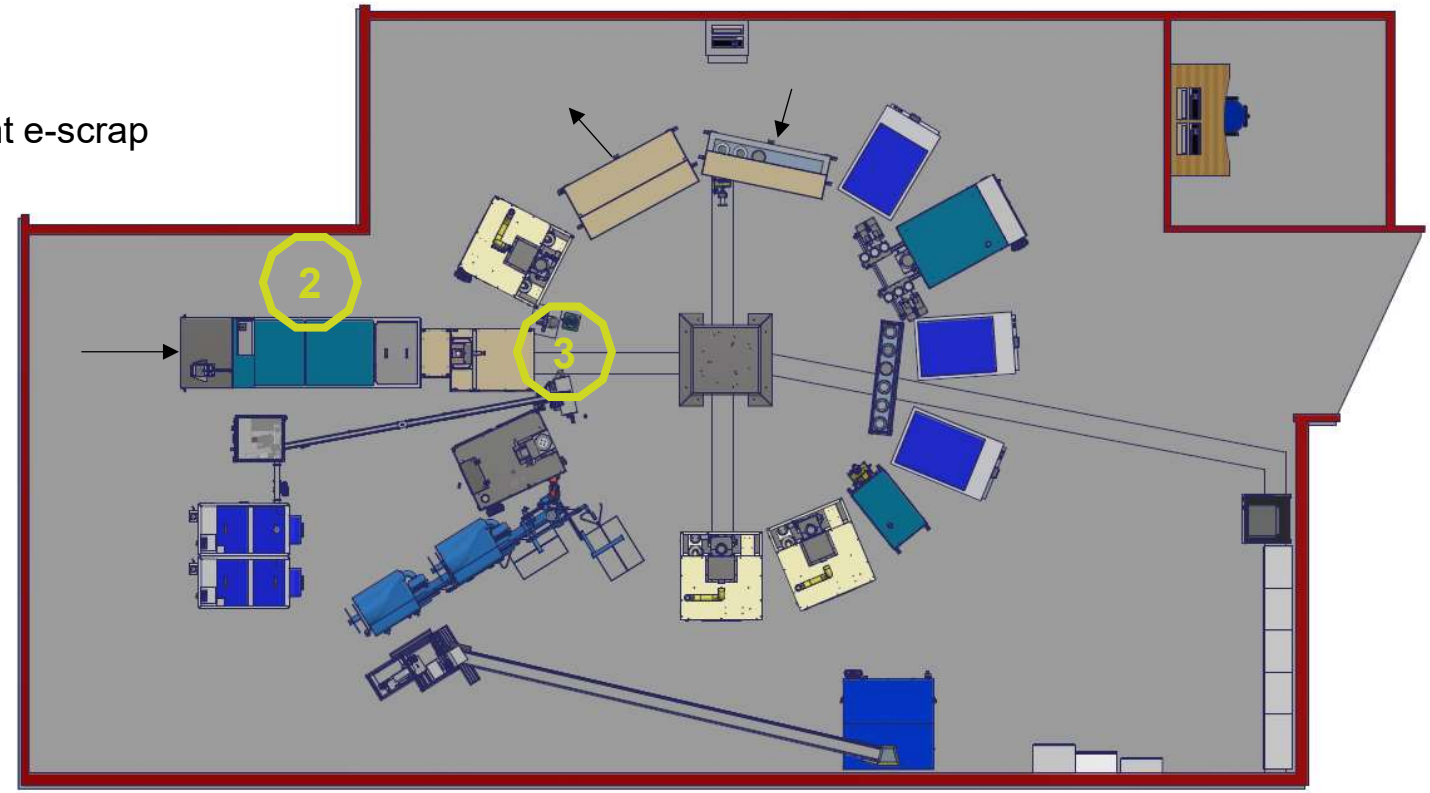

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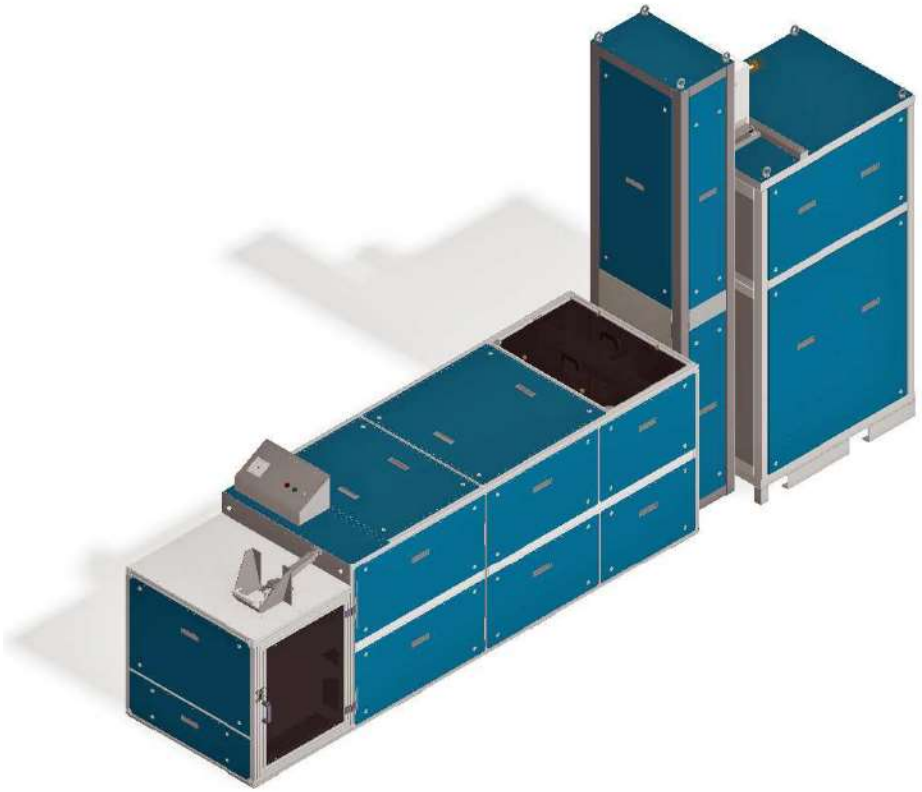
Input magazine for burnt e-scrap & Continuous mill



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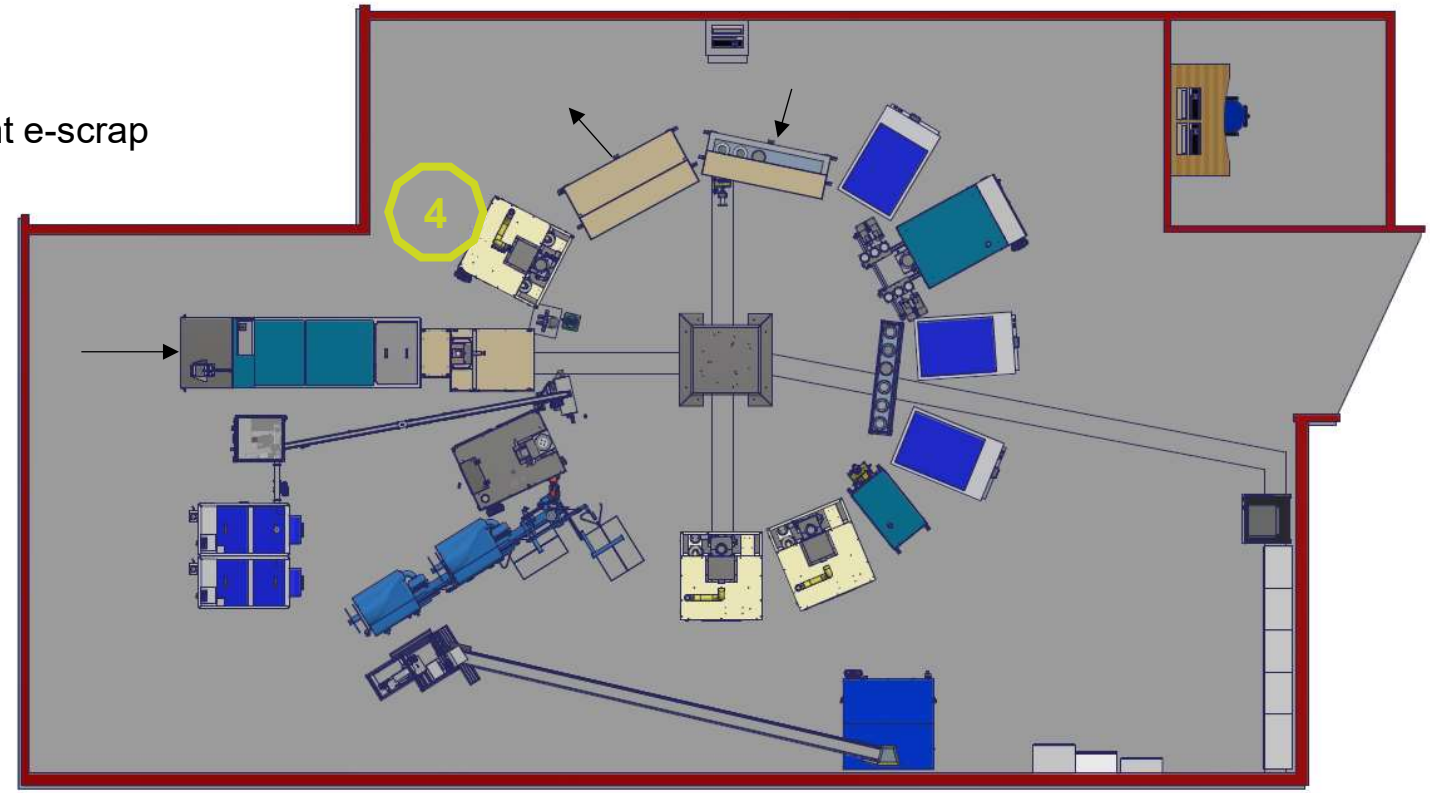

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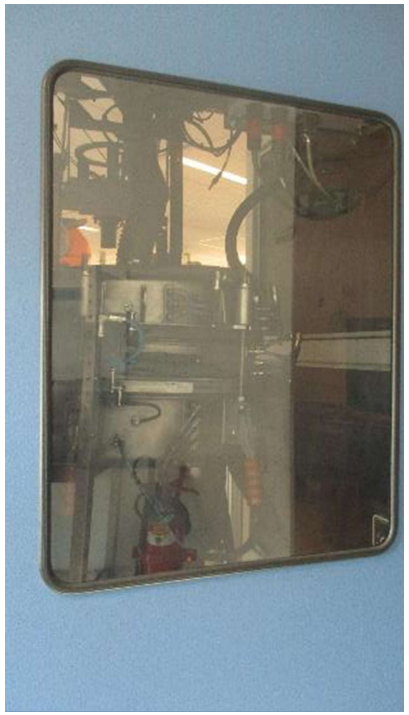
2 Deck Sieve



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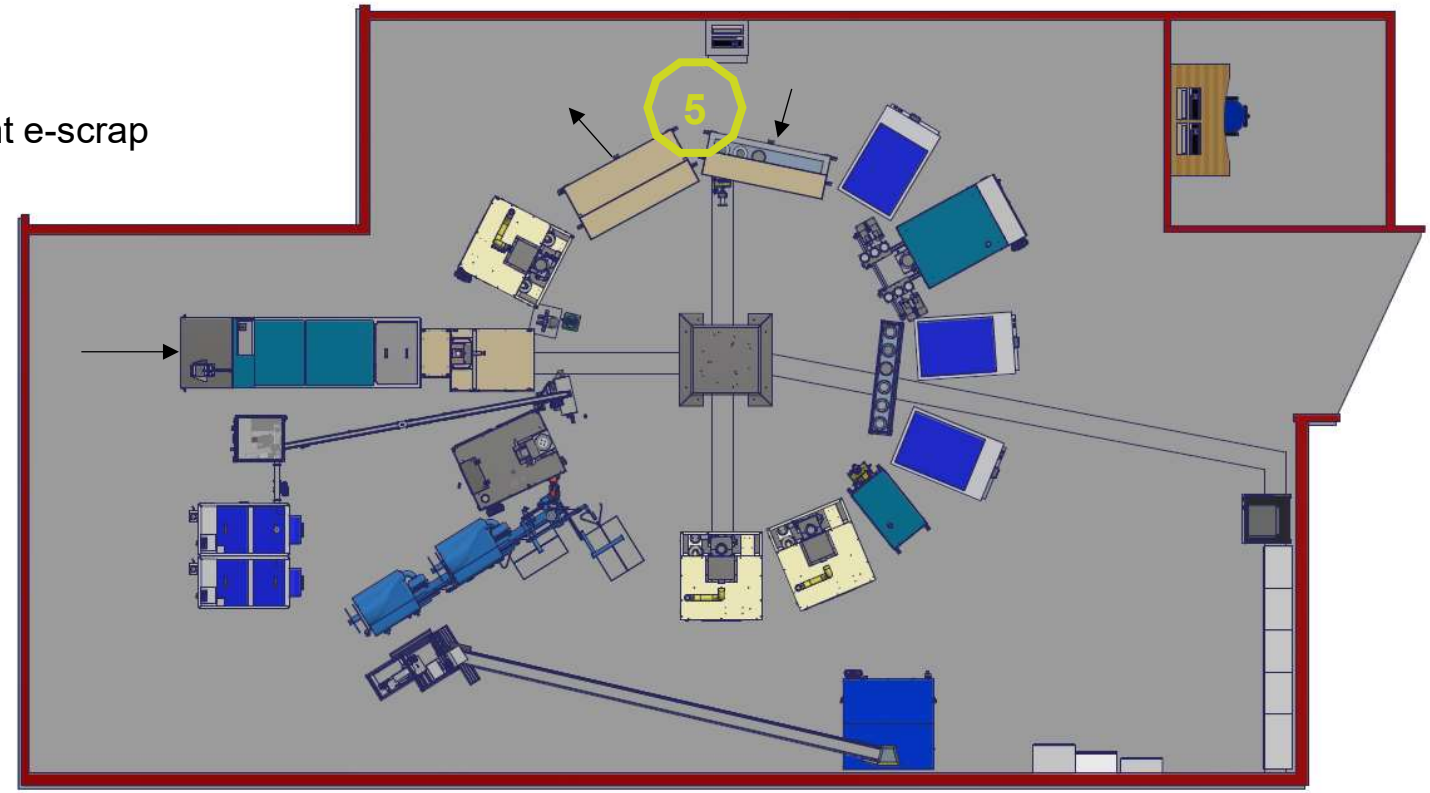

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Magazines (In & Out)

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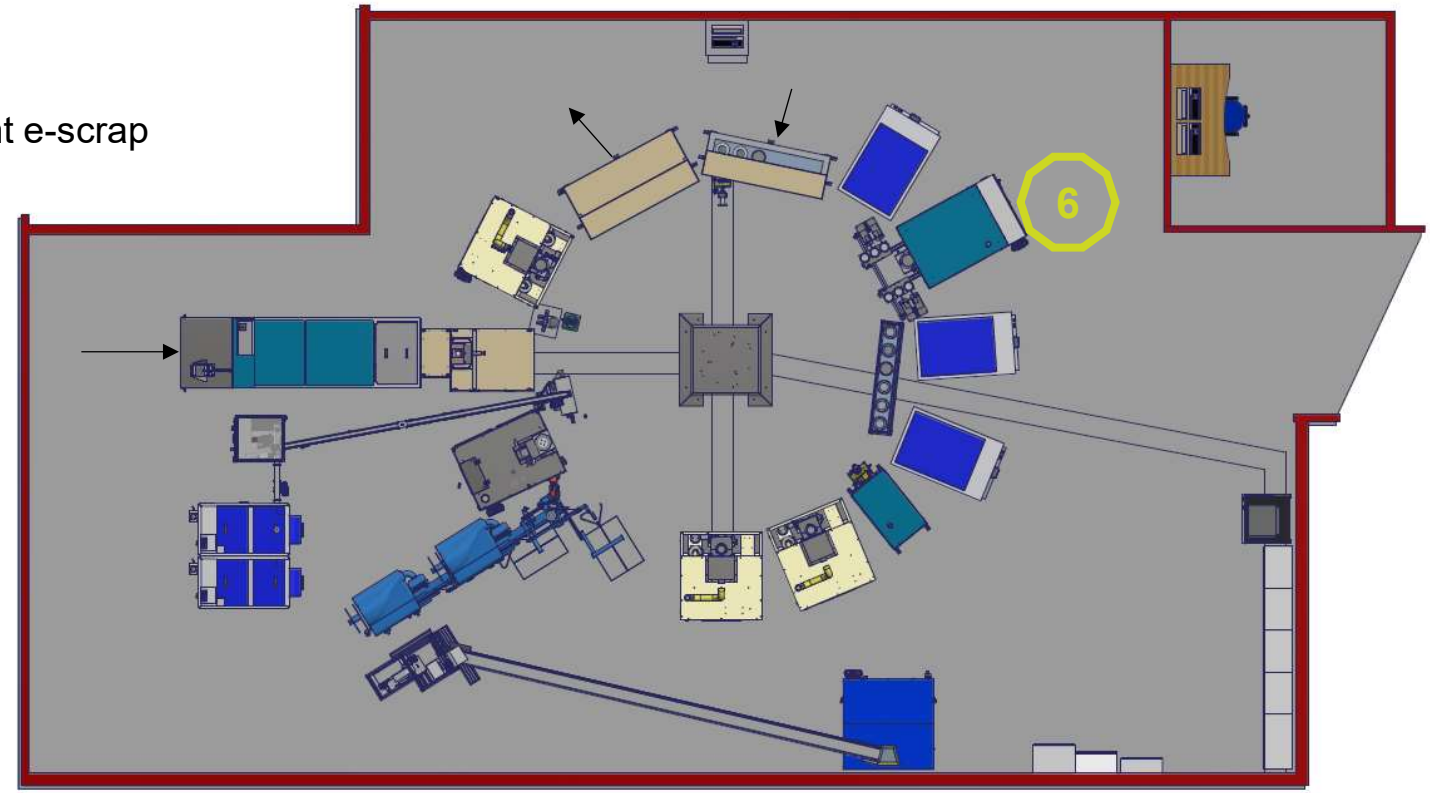

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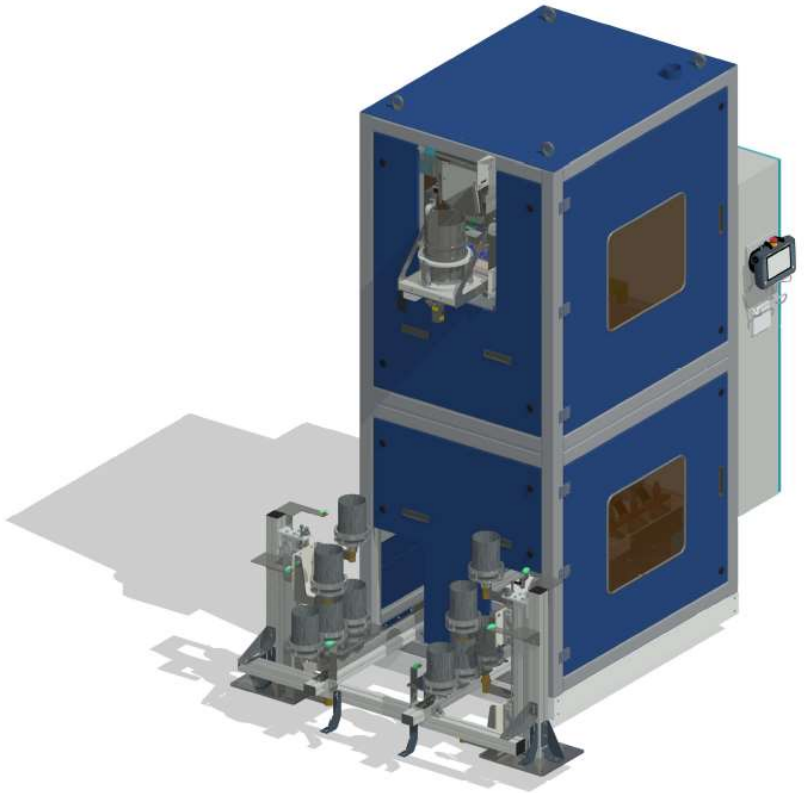
Crusher - Splitter



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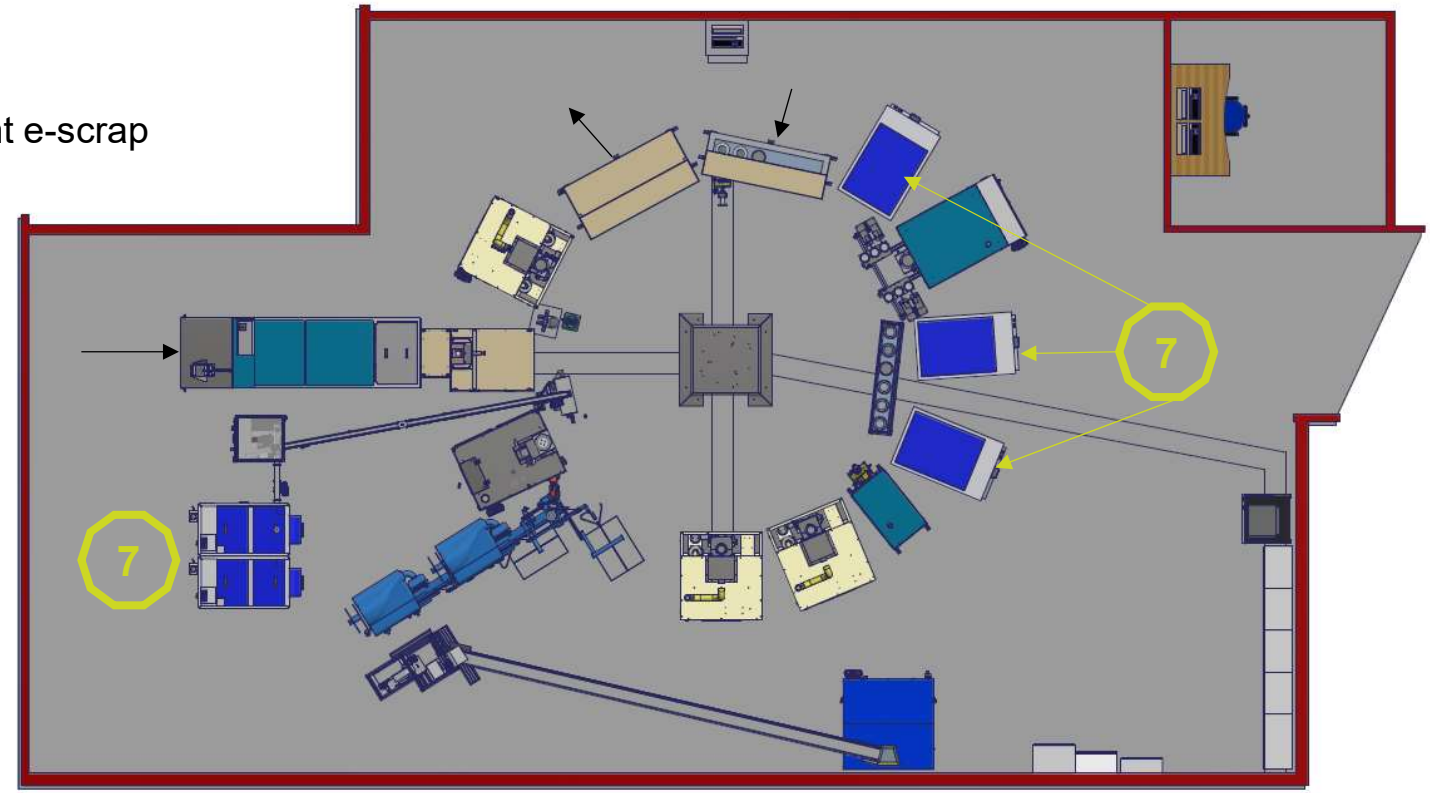

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Mills

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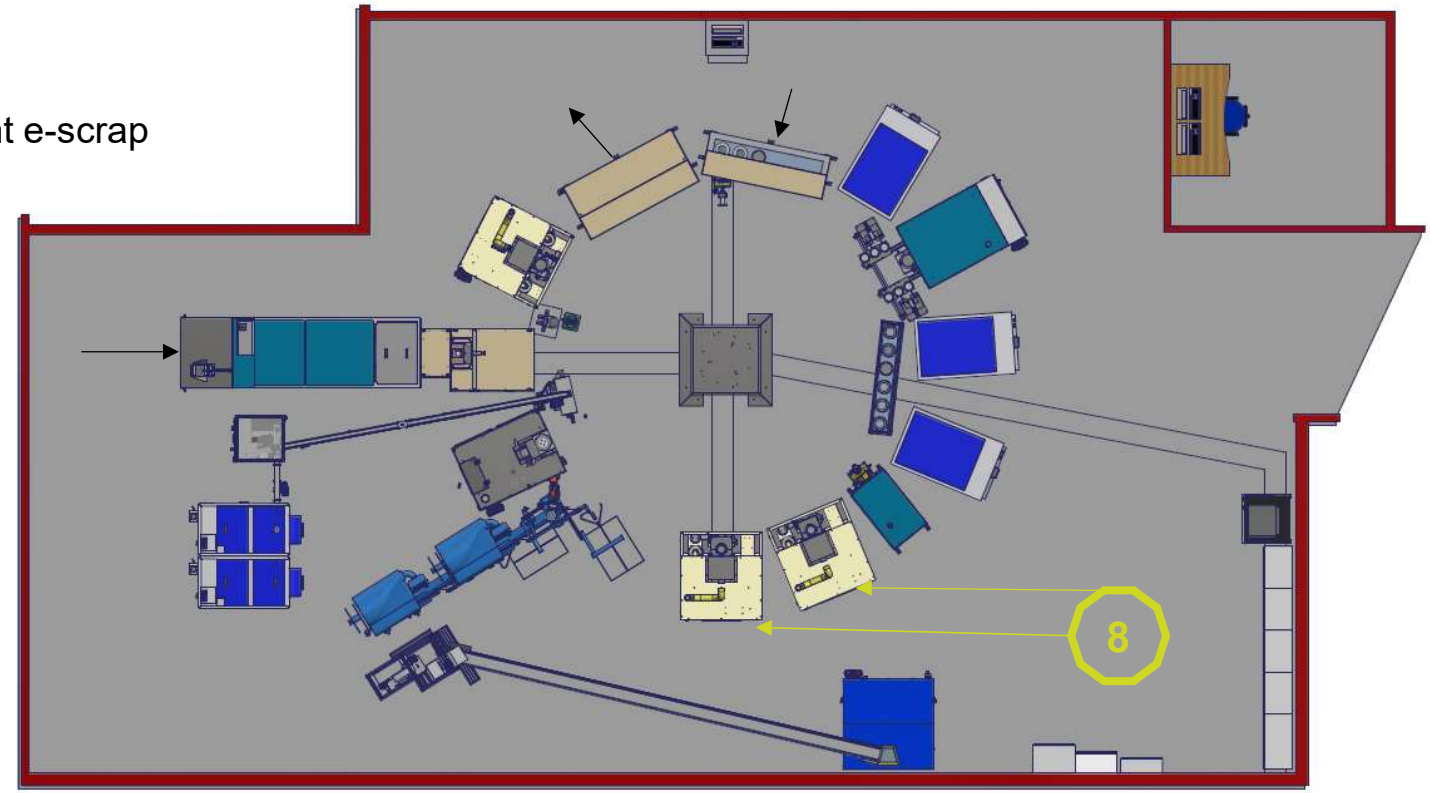

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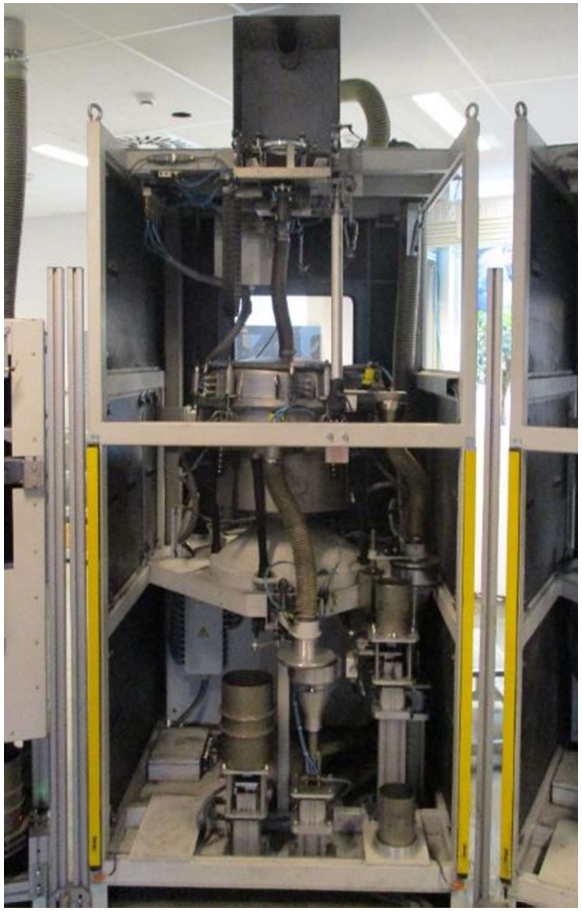
1 Deck Sieves



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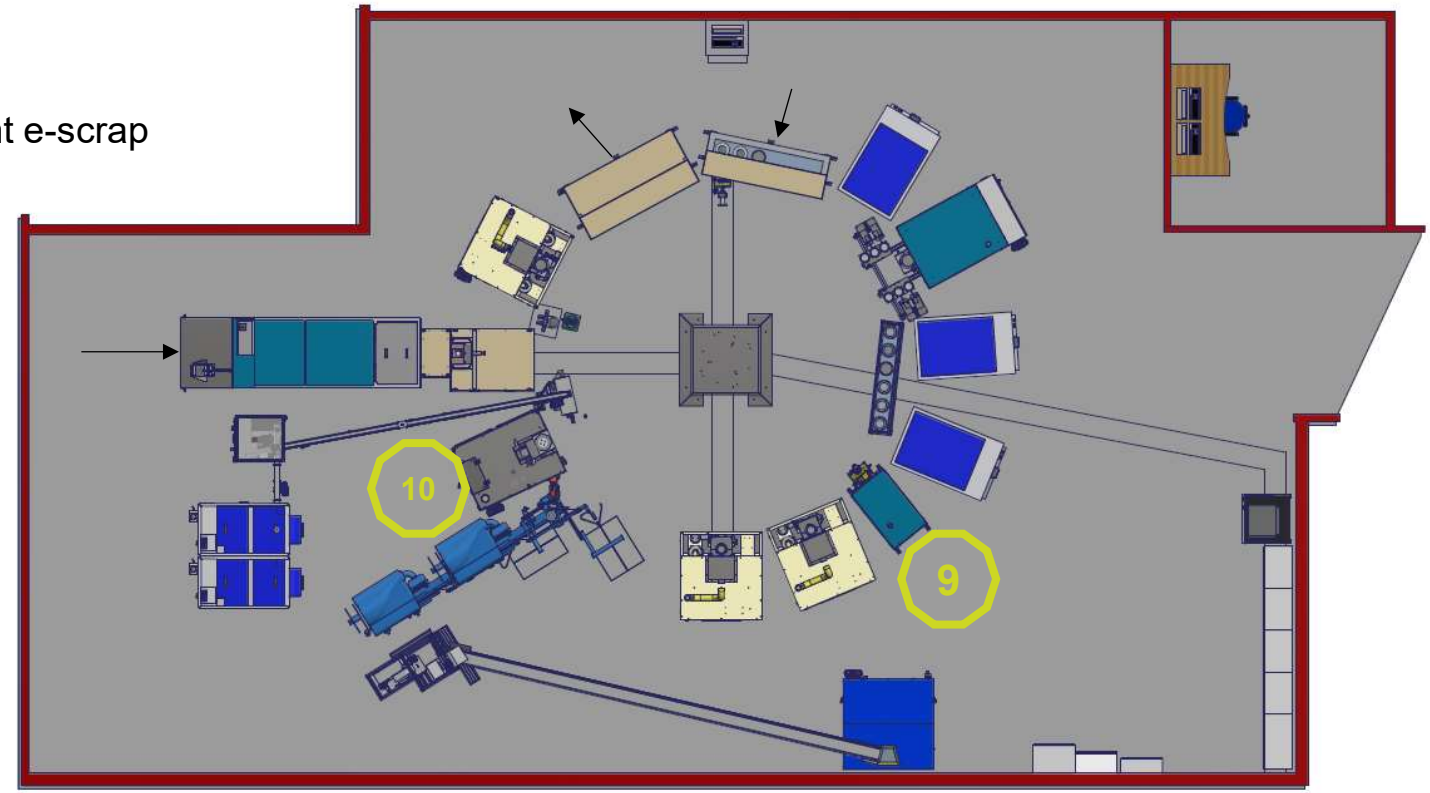

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2 and 16 way splitter

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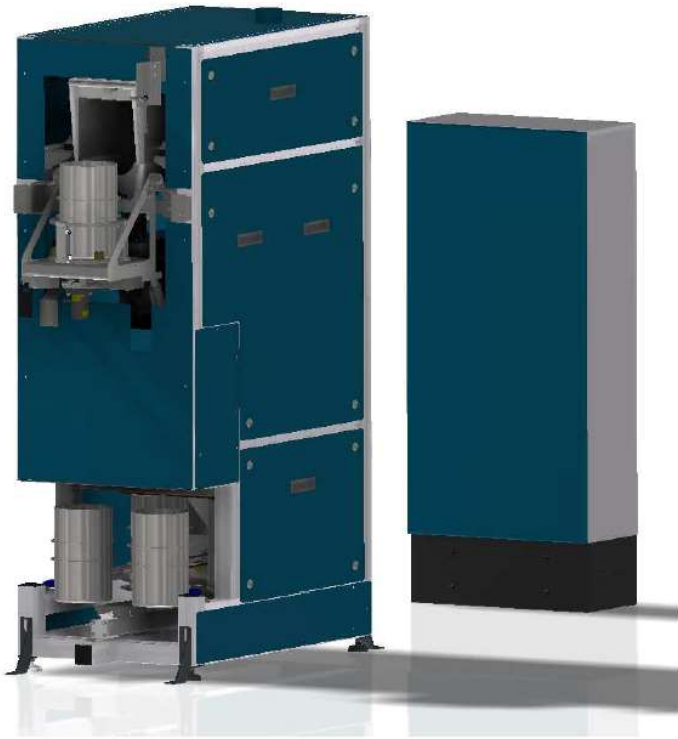

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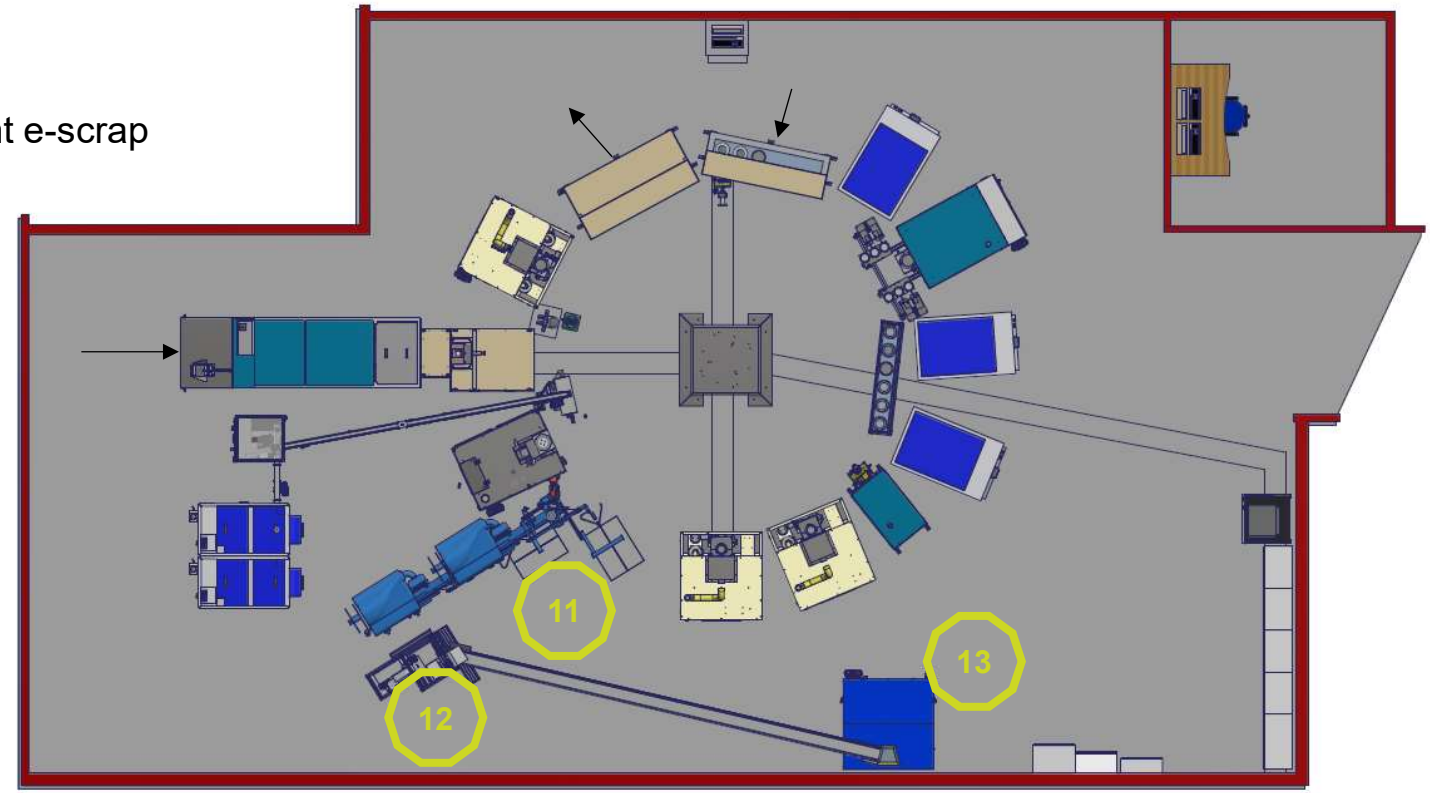

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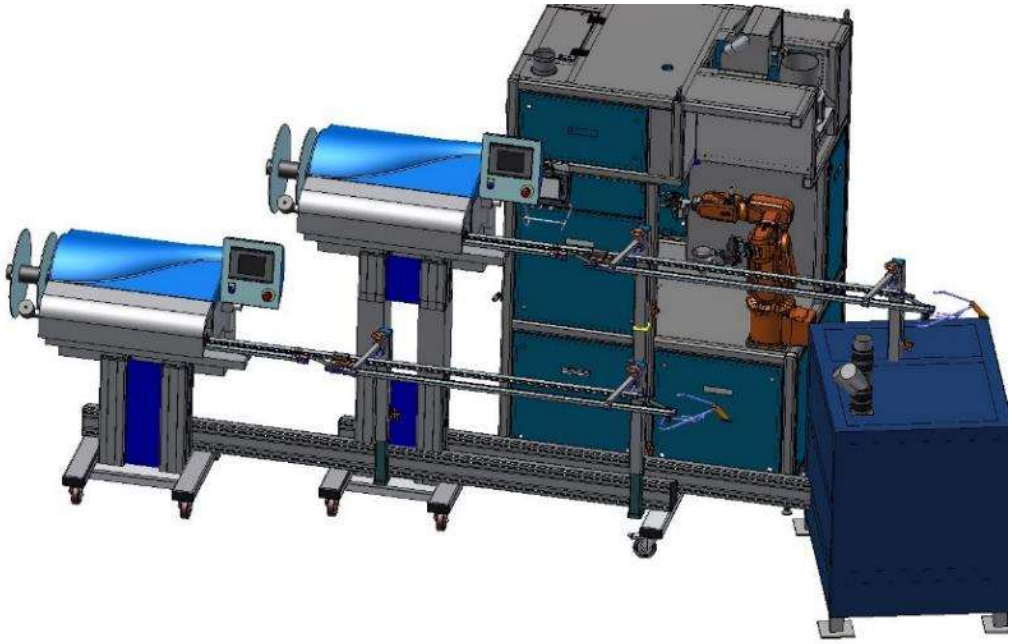
Bagging



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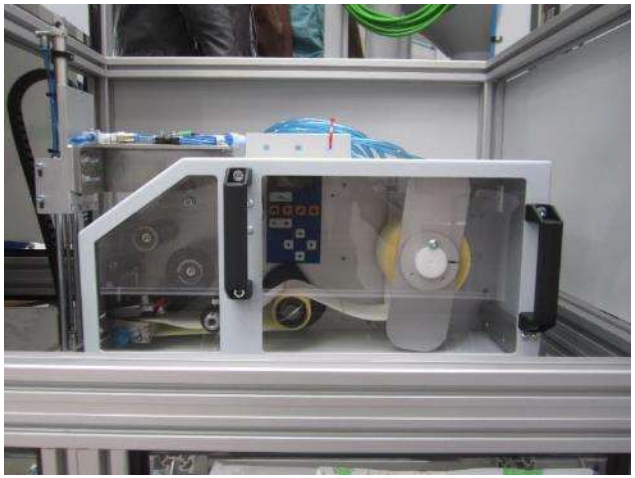
Labelling & Bagging Magazine



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Characteristics

- Capacity
  - Average: 8-10 lots/shift
  - Different lots can be processed in parallel
  - Strongly depends on the type of material and the physical aspect
  - The cycle time is also influenced by the number of recycles in the Automation

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Movie

Round up

Achievements and next steps

- We are an industry leader in Sampling and continuously innovate our sampling processes through automation

- With this project we have already accomplished to process several complex material samples:
  - We started with products with high feasibility
    - E-scrap
    - Concentrates
    - Certain Industrial Byproducts
    - Internal products

Round up

Final goals

- Further research is still ongoing to expand the product range processed by the Automation
  - Spent Automotive Catalysts
  - Spent Industrial Catalysts – Al based
  - Different PM and PGM sludges
  - …

- Number of samples to be processed via the Automation:
  - > 50% of Customer lots
  - > 50% of Internal lots
  - > 90% of all lots via bagging and labelling

Round up

Points of attention

- However, there are still points of attention:
  - High investment cost
  - Intensive and time consuming research
  - Project duration: 3 to 5 years
  - Automation in sampling only makes sense when there is enough volume
  - Learning curve to increase the flexibility of the Automation (cleaning cycles,…)
  - Need for higher skilled staff

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materials for a better life