



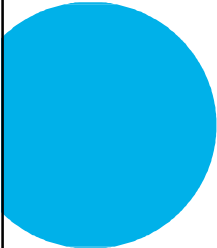
PolyUrethane Recycling Towards
a Smart Circular Economy

Smart Sorting of PU foams

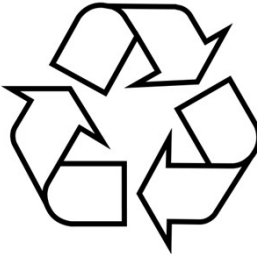
Katharina Ander, 01/12/2022



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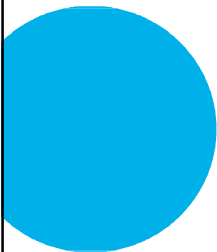


Scope of PReSmart



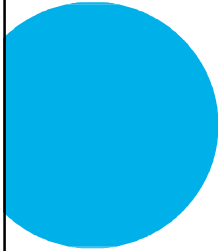
Smart sorting of polyurethane foams






Scope of Smart Sorting






[We Are REDWAVE - Passionate about intelligent sorting technologies for our mother earth!](https://www.youtube.com/watch?v=O7IVUY1TPQI&t=1s)
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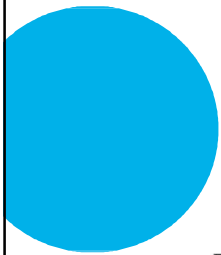


PUReSmart

Smart sorting of polyurethane foams

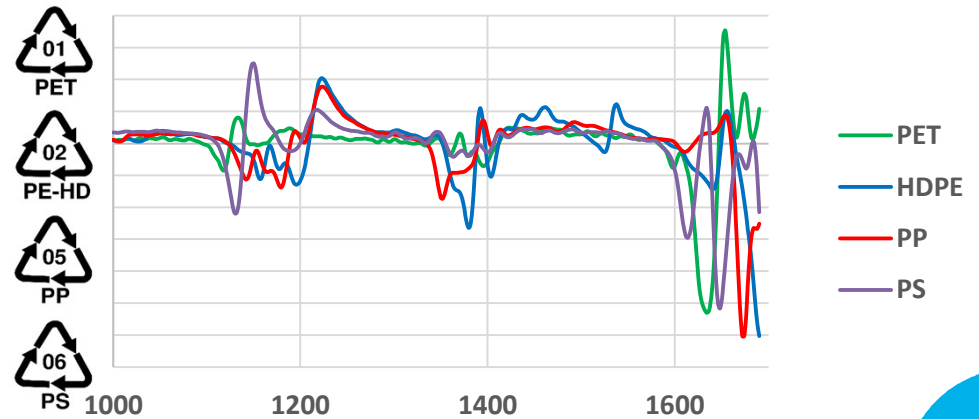
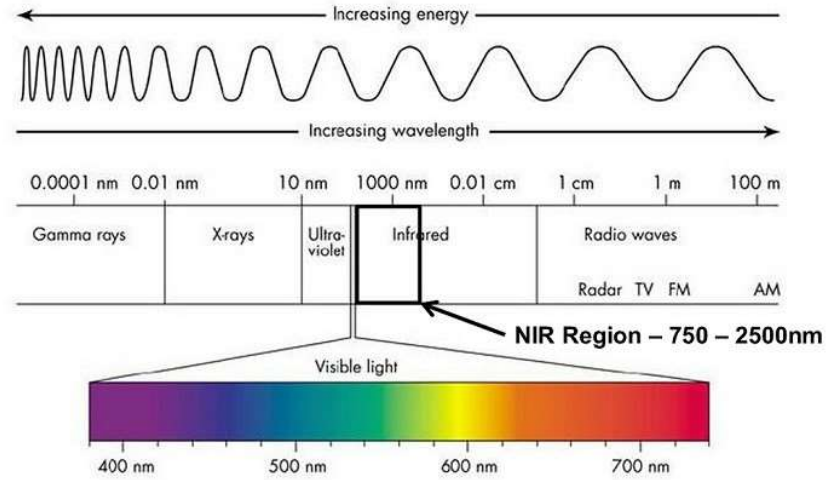
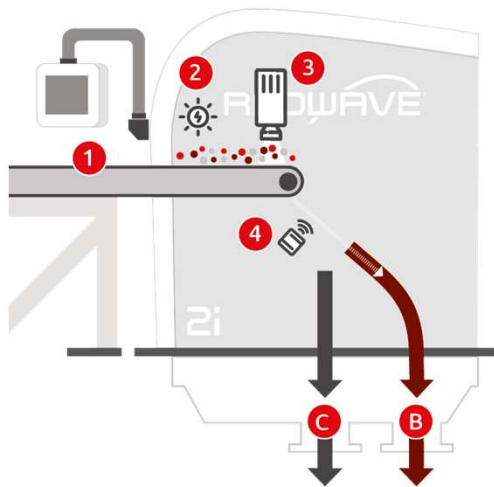


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Sorting Technology

FUNCTIONAL PRINCIPLE



Smart sorting of polyurethane foams



Sorting Technology



- Sensor fusion: NIR + C + M
- Belt speed > 3 m/s
- Pressure > 5 bar
- Machine width up to 2800 mm
- 2-way or 3-way sorting

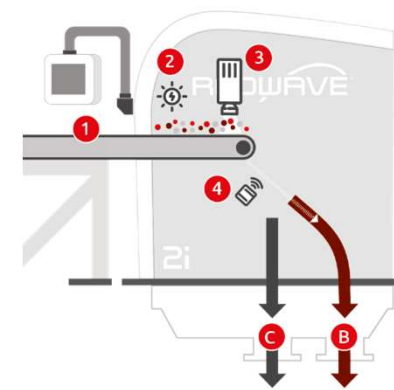
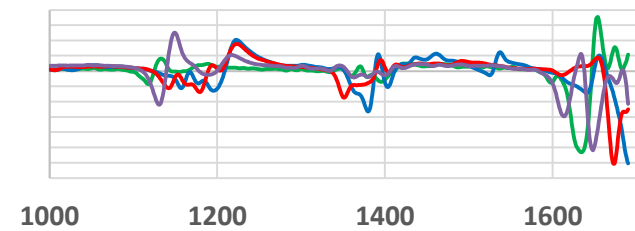
Objectives

Task 1

Development of sensors and software

Task 2

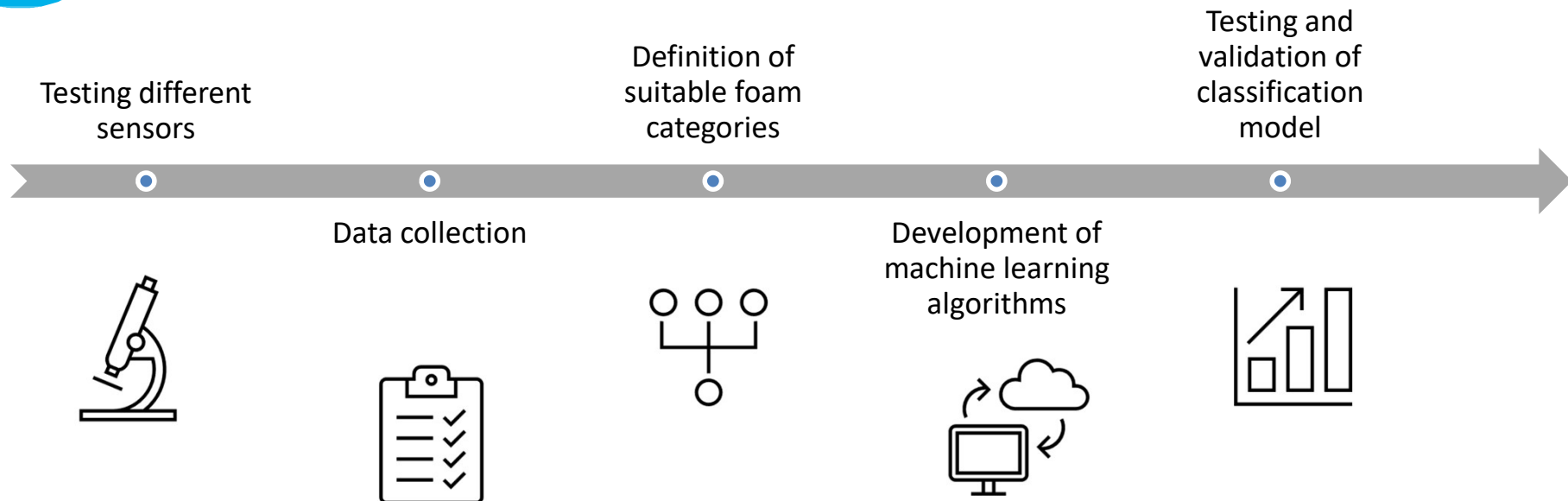
Mechanical and process design



Smart sorting of polyurethane foams

Methodology

Task 1: Development of sensors and software



Methodology

Task 2: Mechanical and process design

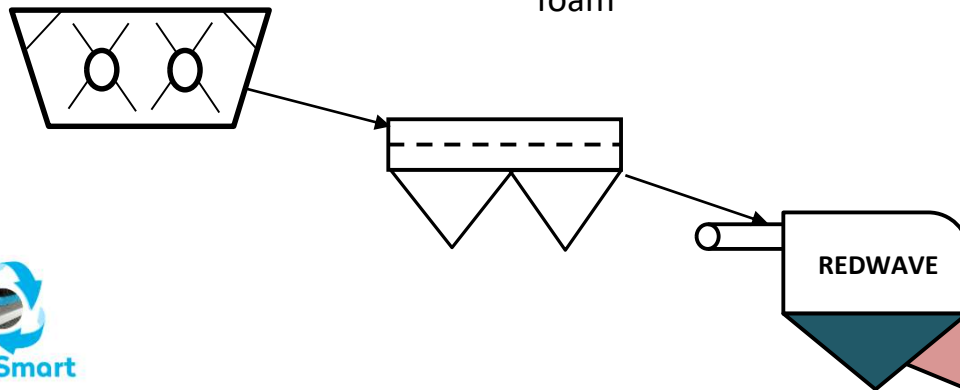
Mechanical pre-treatment of post-consumer mattresses

Testing of sensors and software in sorting environment



Mechanical design of a sorting machine adapted to PU flexible foam

Sorting – proof of concept





Results: Sensors & Software

- **Sensors:** NIR sensor proved suitable for discrimination of PU types
- **Data:** Collected more than 500 different PU samples = thousands of spectra
- **Software:** Main types that can be discriminated:
 - PU vs. non-PU
 - Ester vs. Ether
 - MDI vs. TDI
 - HR-based vs. Conventional-based polyol
 - Foams with flame retardants and other additives
- **Sorting algorithm can go much deeper and distinguish up to 20–30 different sub-types of PU foam.**

Results: Mechanical & Process Design

- **Pre-Treatment:**
 - Bales of dismantled mattresses were shredded into small pieces
 - Material was sieved to remove fines
- **Mechanical Design:**
 - Pilot sorting machine adapted to PU flexible foam sorting reached TRL 5
- **Sorting:**
 - Validation of sorting with test samples
 - Sorting of post-consumer material



Smart sorting of polyurethane foams

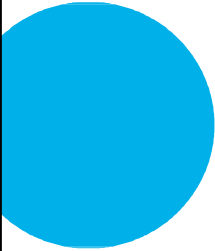
Achievements

- ✓ Blue-print for mechanical pre-treatment of mattresses
- ✓ Sorting solution for post-consumer flexible foam
- ✓ More than 200 kg (almost 20 m³) of post-consumer foam sorted into distinct fractions to be used as input to chemolysis



Smart sorting of polyurethane foams

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[Polyurethane recycling | REDWAVE develops new sorting possibility for Foam sorting](https://www.youtube.com/watch?v=Cp8338-AkM4&t=6s)
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Smart sorting of polyurethane foams



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PUReSmart RESTRICTED - Under Consortium Agreement, Confidential until Dec 31st 2026

Thank you

Any question?

