Machine learning assisted leak-free circular plastic packaging design from post-consumer waste

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Background: Knowledge gap in developing circular plastic pacakging under the current Dutch waste management – Mechanical Recycling
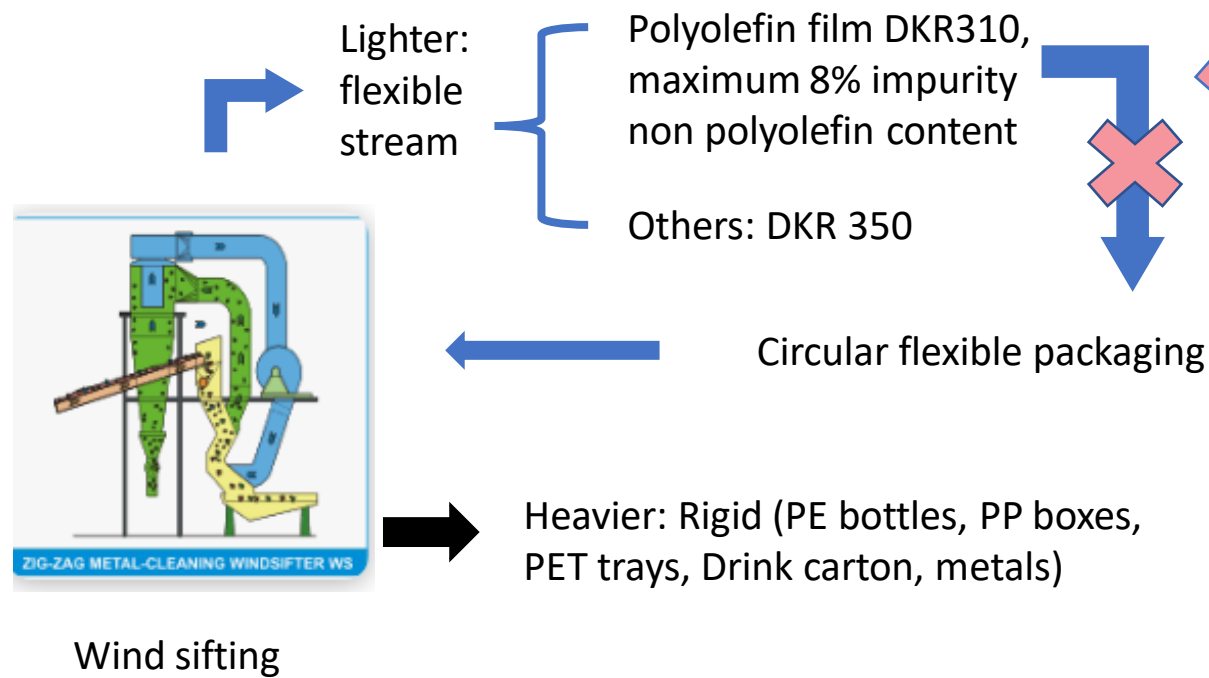
Nationaal Programma Circulaire Economie
2023-2030

P82:By 2030, reduce 50% of plastics from fossil fuel by using mechanical recycling, chemical recycling and biobased material

In NL and many other EU countries, waste plastics are currently mechanical recycled by using the following sorting system:

Lighter: flexible stream

Polyolefin film DKR310, maximum 8% impurity non polyolefin content

Others: DKR 350

Circular flexible packaging

ZIG-ZAG METAL-CLEANING WINDSIFTER WS

Wind sifting

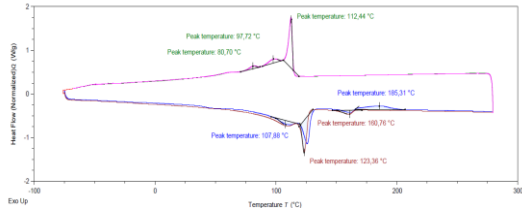Heavier: Rigid (PE bottles, PP boxes, PET trays, Drink carton, metals)

The content of DKR310 stream is inconsistent, process parameters for circular packaging from inconsistent material source is lacking
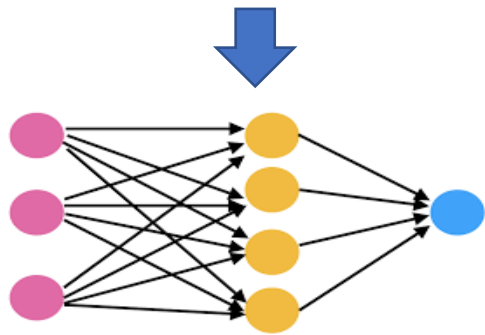
Machine Learning model to predict process parameters for *sealing* of circular packaging based on material characterization.

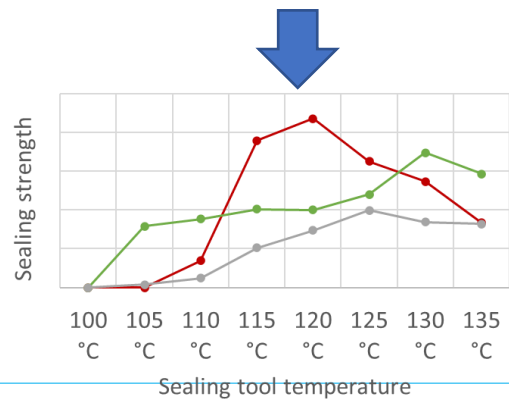# Machine learning assisted material model in sealing prediction

Working Flow of the material model:

Material Characterization

Machine Learning

Performance prediction -> Qualified circular packaging

Application of the model in circular packaging:

Circular pacakging with "Design for recycling" can be collected with mono stream

Current/ Advanced collection /sorting scheme

Mono material stream

Material model

Mix stream

Circular packaging made from mixed waste