

Design Guidelines for Recyclable Luminaires

Graduation project by Marjolein Laan

Committee

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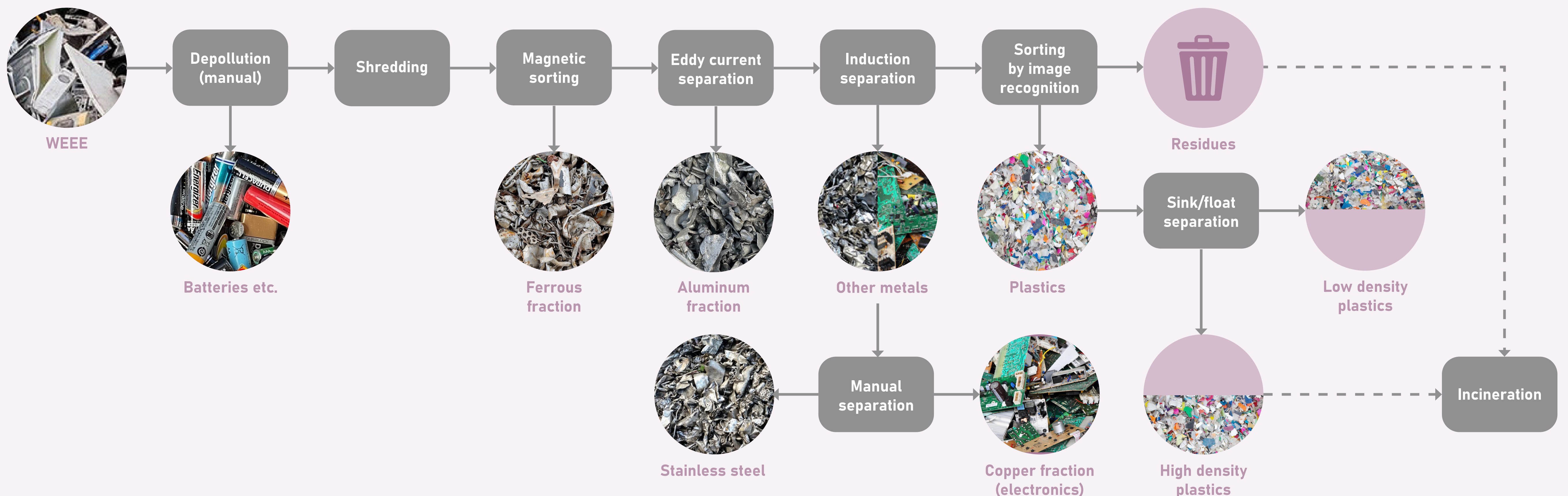
Signify

Company mentor

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WEEE recycling process (pre-processing)

WEEE = Waste from Electrical and Electronic Equipment, this includes end-of-life luminaires.



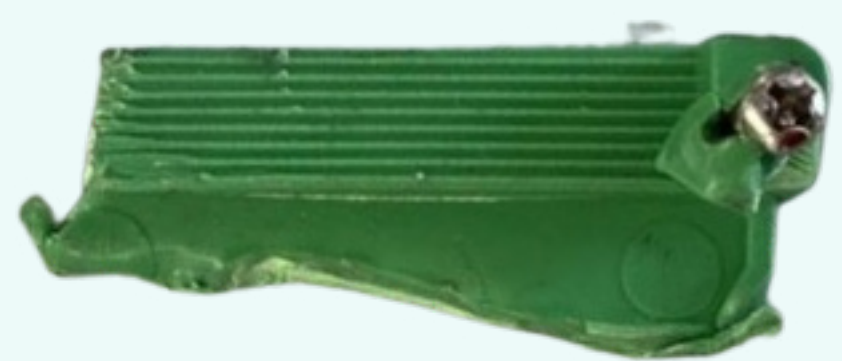
Component connection

Do not connect components of different materials in a way that hinders liberation when shredded.

Mixed fragments will cause loss of material and pollution of recycling streams, e.g.:



L2s glued to steel often do not liberate during shredding. This results in loss of the L2 materials and pollution of the steel fraction.



If a piece of plastic with a steel screw goes into the plastic fraction, the steel is lost and the plastic stream gets polluted.



When a bit of polymer enters a metal fraction, this is not a big problem because it will burn and serve as fuel. Some rubber joining the aluminum fraction, for example, is not such a problem.

- ✓ snap fits
- ✓ tape with low adhesive force
- ✓ plastic fasteners in metal components
- ✗ glue
- ✗ screws without fracture lines
- ✗ multiple-K processes (e.g. overmolding)

- ✓ connect components of same material, e.g.
 - steel screw in steel frame
 - two PS components welded together

- ✓ epoxy-based L2s
- ✗ aluminum-based L2s

Material selection

Use materials that will actually get recycled.

Choose materials for which recycling infrastructure is in place in the expected end-of-life time and location. This depends not only on technical possibilities, but also on economical viability.

- ✓ ABS, PE, PP, HIPS, PS, PC/ABS
- ✗ PA, PC
- ✓ Steel/iron, copper, aluminum, stainless steel

Be mindful of the use of additives in plastic.

Additives reduce the purity of recycled plastics.

In current recycling practices, additives which increase the density of a plastic can prevent the plastic from being recycled. This might pose challenges for plastics with flame retardant additives.

Potential solutions for plastics with flame retardants:

- ✓ Using metal instead of plastic.
- ✓ Rethinking the product so that the plastic component is not required to be flame retardant.
 - E.g. make an office panel surface mounted instead of recessed into the grid ceiling
 - E.g. lower the power of the luminaire so its flammability requirements are less strict