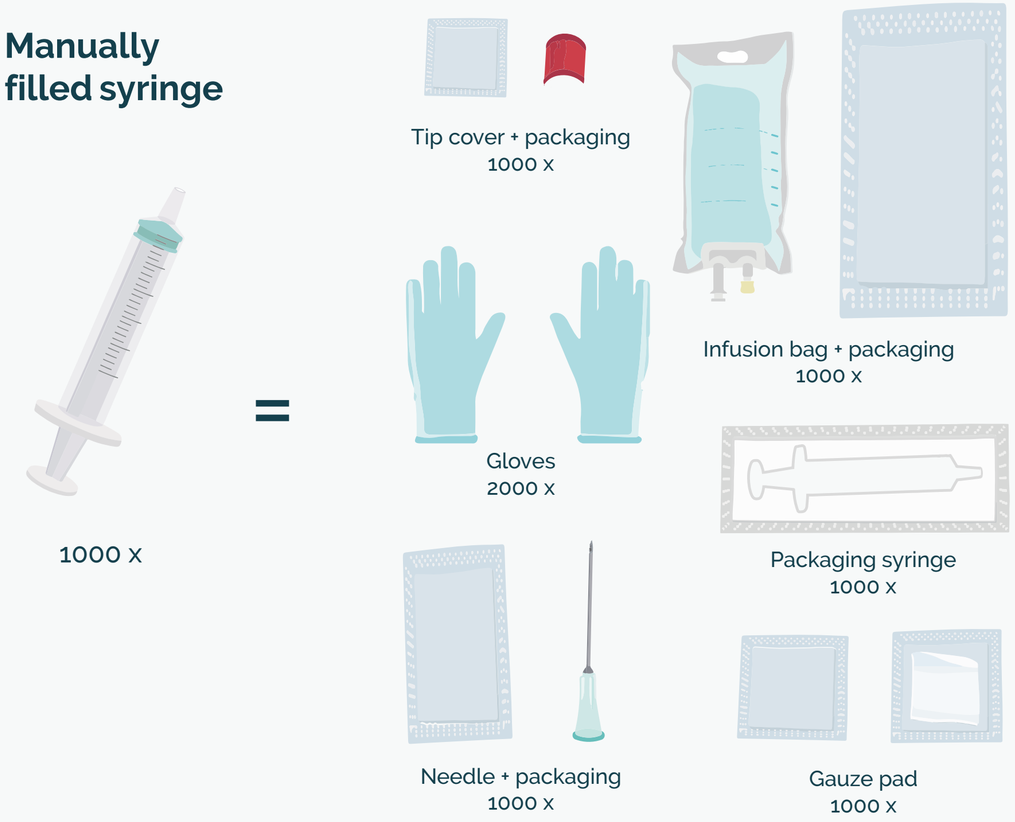
Towards a circular ICU

Reducing the environmental impact of syringes in the Intensive Care Unit

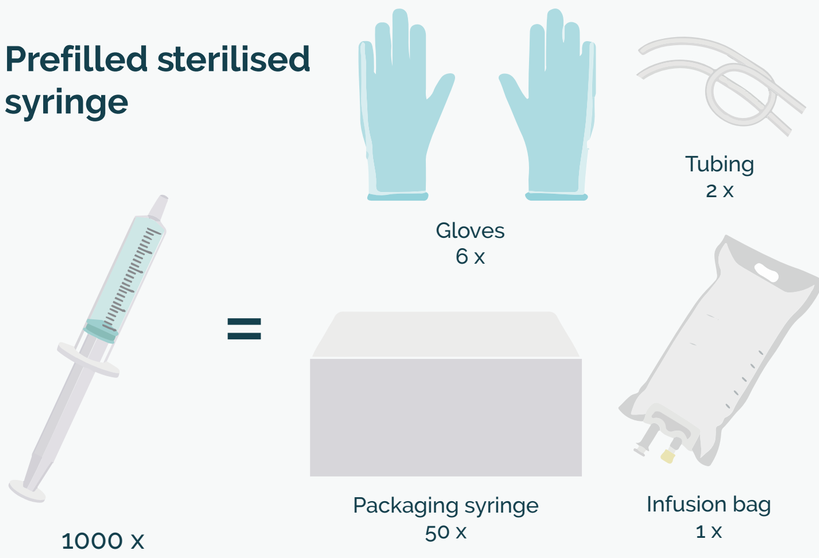
This graduation project reduced the environmental impact of syringes in the Intensive Care Unit (ICU) of Erasmus University Medical Centre (MC) by designing solutions based on circular strategies.

Manually filled syringe

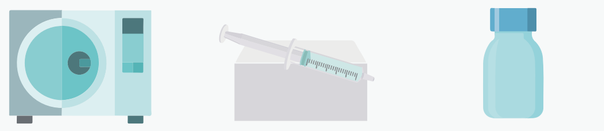


Research showed that most waste is produced during the preparation of syringes. This is because many additional single-use disposable items are needed for filling manually. Prefilled sterilised syringes (PFSS) are mass produced and have less by-products per syringe. Therefore, they are more environmentally friendly.

Prefilled sterilised syringe

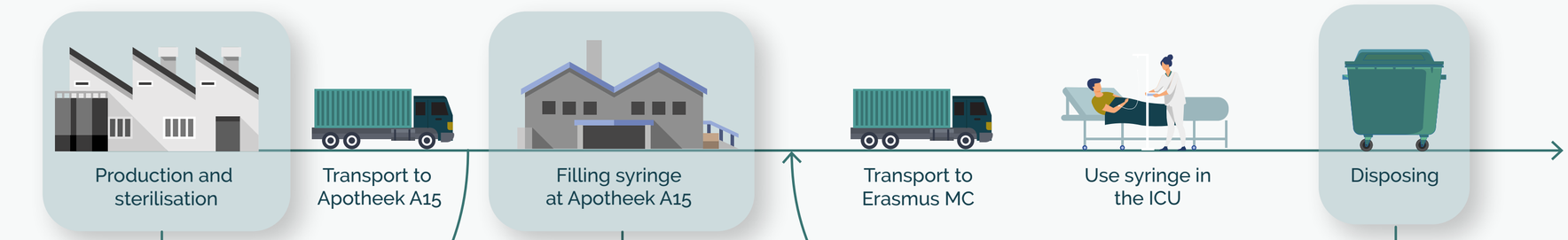


Impact hotspots PFSS



However, a life cycle analysis of PFSS showed various new impact hotspots in the filling process. The final design of this project consists of an improved filling process for mass produced PFSS, based on circular strategies.

Process optimisation



1 No double sterilisation
reduction in energy use

2 Change material
reduction of 45% in ReCiPe Endpoint

3 Make the process more time efficient
from 7 to 4 days per batch*

4 Change from producing on demand to stock
eliminate leftover materials

5 Decrease amount of residual drug solution
reduction of 75% in leftover medication

6 Improve the stopper machine
from 5% to 0% fallout

7 Repurpose white plastic box as needle container
48 kg of plastic repurposed as 250 needle containers

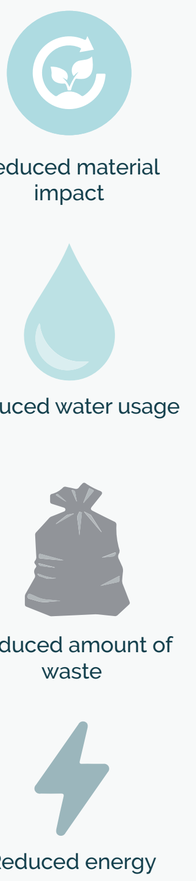
8 Change steam to gamma sterilisation
no water use, reduction in energy use

9 Do not deliver with plungers
saves 65 kg of plastic per batch

10 Return used syringes to Apotheek A15 to reuse
reduces 248 kg of waste per batch per lifecycle

*one batch is 5.000 syringes

Reduced impact



Source icons: Metabolic (2019)

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Reducing the environmental impact of syringes in the Intensive Care Unit
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