INVESTIGATING THE POTENTIAL REUSE OF X-PE IN NEW CONSTRUCTION APPLICATIONS.

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The premise

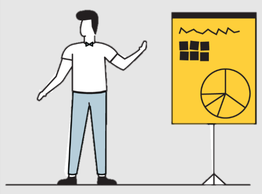
Today, the plastic recycling industry is mainly focused on the most commonly used thermoplastics, i.e. PE, PP,PS, PVC and PET. However, many smaller fractions do not yet have a market value or are considered nonrecyclable. One of these streams is multilayer underfloor heating pipes. These pipes consist of cross-linked polyethylene (x-PE) layers, both inside and outside, and an aluminium(Al) or EVOH core. There are also two thin adhesive layers between the outer layers and the core. These tubes provide excellent properties for the construction industry but are not easily recycled due to their multilayer composition and the use of x-PE, which cannot be easily remelted. With this work we will explore the potential to close the loop for these products. This will be done by evaluating the use of x-PE powder as a filler material for virgin PE which is used in current production. It is imaginable that recycled x-PE powder as a filler could lead to reduced cost and environmental impact as less virgin material would be required.

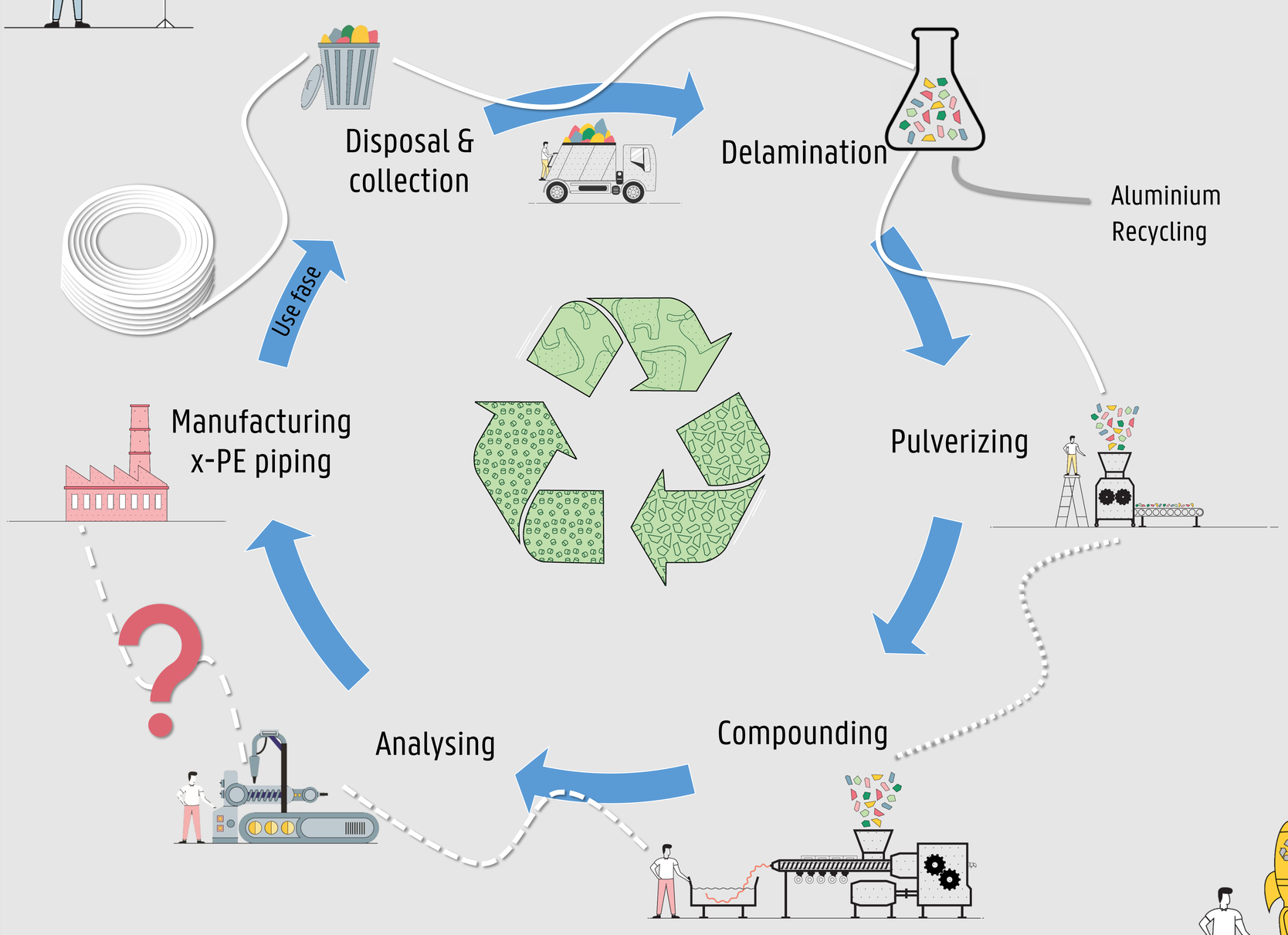
Materials and method

In this work, the x-PE has been separated from the aluminium and tie-layers, by means of chemical delamination which dissolves the adhesive layer. Then the material is rinsed, and aluminium removed by means of sink float system. Subsequently, the x-PE flakes are ground into a fine powder (≤ 0,6 mm). The powder is compounded as a filler in various rates (10, 20 & 30 m%) in the representative virgin HDPE grade this material is than extruded into strips and was send of to be crosslinked. The crosslinking grade was also verified for each blend. A slight variation was noticed which is mainly appointed to the variation in thickness. An overview of the materials is given below.

Blend	Filling rate (m%)	Crosslinking rate (%)
X0	0	71-79
X10	10	63-70
X20	20	66-79
X30	30	76-77

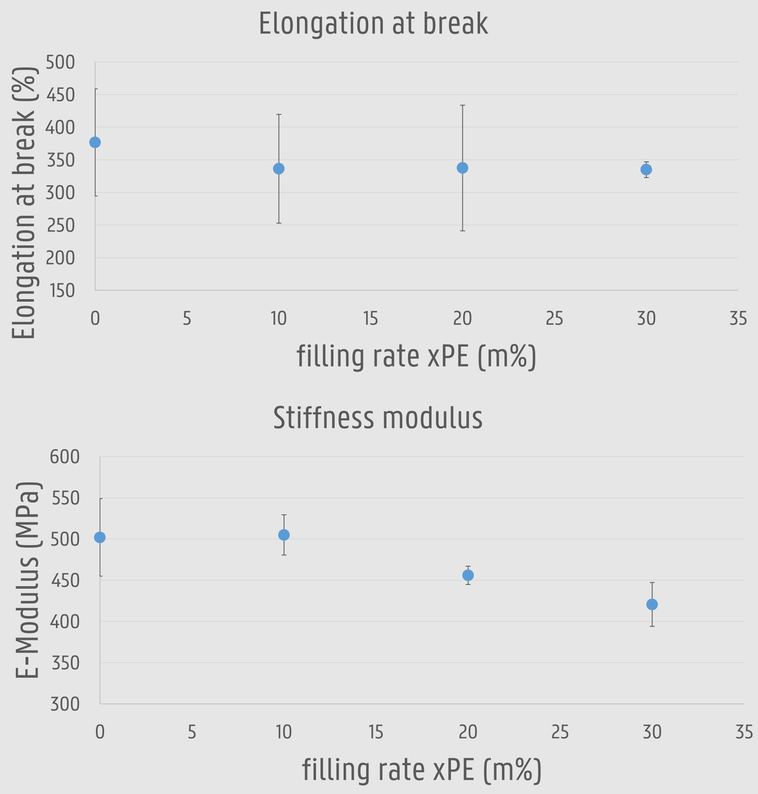
Closing the circle ?

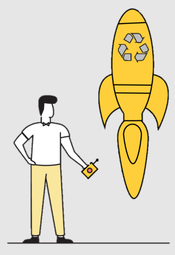




Preliminary results

- Slight decrease in stiffness
- Elongation at break, yield strength & tensile strength nearly unaffected
- Processing more challenging
- Initial results promising for further trials





Future scope

To continue this work further material analysis and process validation steps are required before a define conclusion can be made. The next step will be to continue with a more in-depth material property analysis.