PAVING TILES

Input materials	Pre-condition/Pre-treatment	Operation & maintenance	Objectives / Key features	Key technical parameters
– Sand **Suitable plastic waste:** – LDPE (e.g. plastic bags, etc.)	Waste segregation at source Clean and dry LDPE	No regular operation and maintenance required.	Simple process of mixing LDPE plastic with sand to produce paying tiles.	Softening temperature: 70°C [1] Min. Melting temperature: 121°C [1]
Outputs / products	**Technical complexity**	**Maturity level**	**Educational aspect**	
Paving tiles	Low-level skill required for appropriate construction of infrastructure Low-level skill required for making tiles	Few documented cases worldwide	**Topics:** Plastic litter reduction, Consumption **Practical exercises:** Calculation of plastic quantities per produced items	

The process of making paving tiles is a downcycling method consisting of grinding plastic, melting it, mixing it with sand and eventually pouring it in tile molds before cooling.

LDPE plastic films, such as plastic bags and water bags are melted in a container (e.g barrel) using a fuel source (e.g. woodor gas) . Once the plastic has melted, sand is added and the mixture is then transferred to a greased mold. Once the mixture has hardened, the tile is removed from the mold and the tiles are left to cool down further.

Applicability: Paving tiles are aimed towards small-scale application (e.g. at communities or neighborhoods level).

Design considerations: The melting container can be made out of an oil drum barrel cut in half, (~80cm wide and 50cm high) and three legs made of rebar attached to it [2]. If possible use a shield to keep the fire concentrated under the barrel.

The mold can be constructed the same way as mold for concrete floor tiles. The walls of the mold should not be more than 4cm deep to avoid the material to stick to the sides [2].

Materials needed: To produce paving tiles a melting barrel, stirring equipment (e.g. spade with metal shaft), a metal table, tile mold and trowel are needed. In addition to that, fuel (firewood, other solid fuel or gas), as well as grease or oil (e.g. used engine oil)and clean, dry, and sieved sharp sand (e.g. construction sand) are required.

Technical operation & maintenance: It is important to select the right type of plastic to ensure an even melting temperature (120-150°C).

Plastic is slowly added to the warm container. As it melts it should be stirred continuously until no lumps remain. The melting process can take up to 20min. Care should be taken to avoid the melted plastic to get too hot and start burning.

Once plastic is melted, sand is added continuously in small amounts while still heating and stirring. Usually the sand to plastic ratio is 3:1, but may differ depending on the sand and type of plastic used. It is recommend trying out different mixture ratios before starting producing paving tiles in mass.

The mixture of plastic and sand is then removed using a shovel or spade and poured into a clean and oiled mold with a trowel. The mixture is pressed into the mold to avoid air gaps and left to set for a few minutes, while repeatedly shaking the mold to loosen the edges. Once the mixture has hardened enough that the tile does not collapse, the mold is removed. The tile is then left to further cool.

Health and safety: The process of making paving tiles should take place in a well-ventilated area. Workers should be equipped with proper personal protective equipment (PPE) with fireproof gloves (fabric and not rubber), heatproof boots, and appropriate mask.

People should not stand directly over the melting plastic while stirring and try to avoid breathing any fumes released from the melt.

Ensure that there is only LDPE and especially that no PVC or other plics are melted, as as fumes from other plastic can dangerous for health. You can consider having a temperature measuring device on the barrel to have a better control over the melting temperature.

Consider that the equipment will get hot to avoid accidental burns.

Costs: As paving tiles are made out of plastic waste and construction sand, the associated cost is very low. Installing a temperature control device would considerably make the process safer but would also increase the associated cost.

Social, legal and environmental considerations: Plastic is flammable in nature, which is why sand is used as fire retardant. After the tiles are worn out, it is not possible any longer to separate plastic from sand for recycling. The plastic tiles may crack over time when loaded with weight, which can cause a release of micro plastic.

Strengths and weaknesses:

- ⊕ Cheaper than conventional tiles
- ⊕ Tiles are water resistant
- ⊕ Tiles are good insulators for keeping warm and cold weather
- ⊕ Uses locally available resources
- ⊖ Downcycling option (no further recycling possible)
- ⊖ Risk of harmful gas release if temperature is too high and plastic is burnt

> References and further reading

1. PreciousPlastic, Commodity plastic practical info poster. 2018
2. Wasteaid, Making Waste Work: A toolkit – How to transform plastic waste into paving tiles. 2017