

Upcycling of waste polyurethane foam into absorbent pellets

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Introduction

Although many recycling/upcycling methods for polyurethane waste have been examined and devised so far, the mechanical method is, by nature, the least energy and resource consuming, and should be explored in all possible respects.



Figure 1. Typical PU waste



Figure 2. Pellets

A variant of the process of mechanical upcycling of polyurethane foam into absorption pellets is devised and installed in a production line, as part of the regular recycling operations at E-Reciklaža 2010 company in Serbia. Polyurethane foam's spongy properties, with affinity to oils and greases, are utilised to produce a useful absorbent material for collecting and containing waste oil, grease and emulsions. This has shown to be an effective way of mitigating oil and grease contamination of surfaces, even in challenging weather conditions, due to the chemical affinity of the material primarily towards oils and greases.

Results & Discussion

The technology is based on extracting the material from electrical appliances (e.g. refrigerators), crushing and milling of the starting material to powder with granulation of cca. 0.25 mm. This is then followed by controlled humidifying to about 17%, in order to obtain the optimum for pelletisation. The pelletisation is carried out under these conditions in a dedicated machine (Figure 1) with two outputs - the pellet and the excess water vapour, which is condensed. The pellet is then treated on a vibrational surface, where fine powder is sucked in by a cyclone device, and the rest is sorted. In this way three granulations are obtained: coarse (~8 mm, 30%), fine (~3 mm, 65%), and powder (~0.25 mm, 5%).

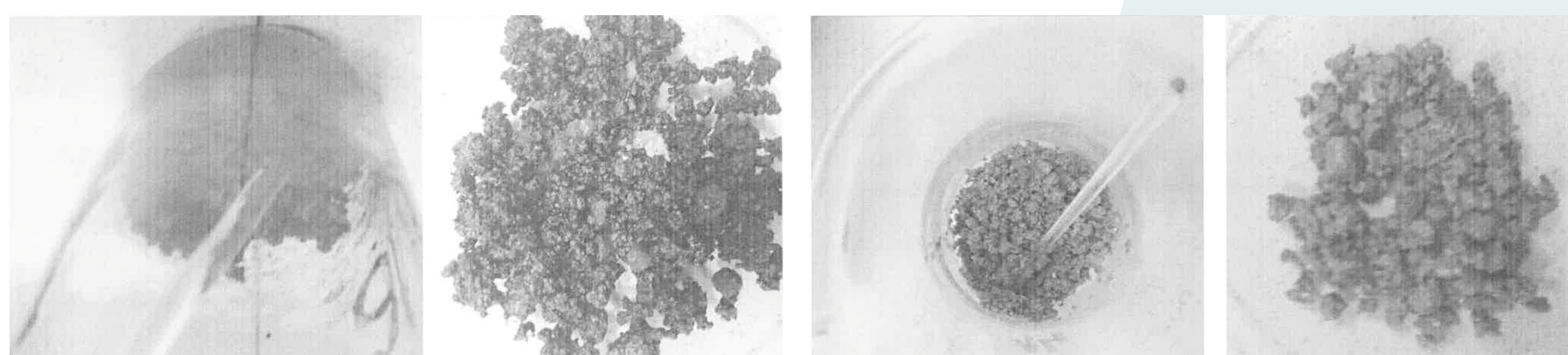


Figure 5. Successful test of waste grease and waste oil absorption by the pellets



Figure 3. PU insulation source

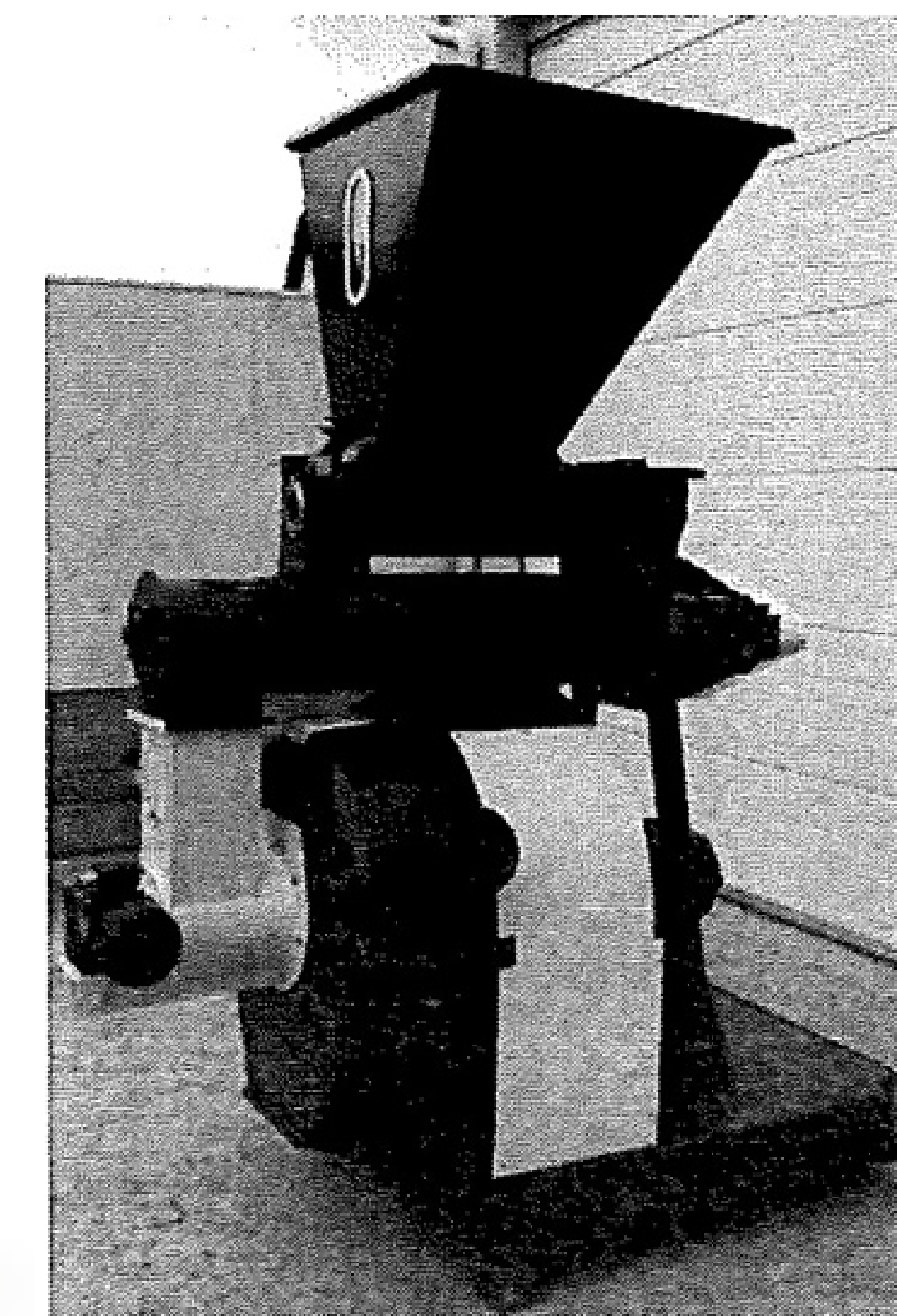


Figure 4. Pelletisation machine

Conclusion

The process is similar to other processes of obtaining absorbent pellets (e.g. www.seg-online.de) but is adapted to the specific characteristics of the incoming material of the local/regional market, and offering greater variety of output products, for a greater spectrum of uses (e.g. fine powder can be effectively used on flat or polished surfaces, or introduced into streams with controlled dosage, etc.).

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