# 3. Technical e-NEWSLETTER

# New tailored BIO-COMPOSITE based on hop fibre

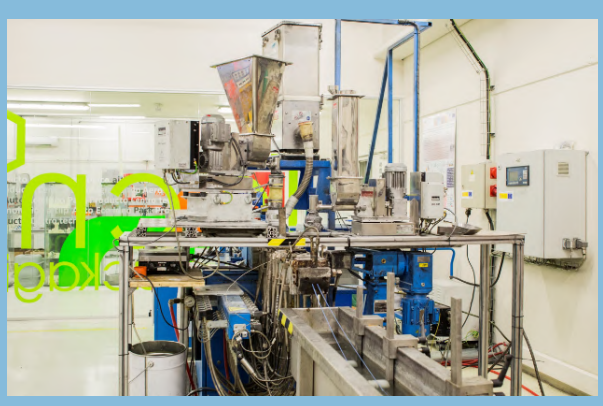
Author (text and pictures):
Vanesa Martínez-Nogués. European Project Manager - TECNOPACKAGING

June 2021

In the BIOTHOP project, TECNOPACKAGING (SME, Zaragoza, Spain), in collaboration with ZELFOS Technology (transformation of hop fibre) and TECOS (injection of horticulture products), is generating new families of bioplastic composite materials integrating hop fibre. The hop-based materials are being adapted for the injection moulding of planting pots, and they will be replicated for film extrusion applications (agricultural protective films) and sheet casting properties for the production of thermo-formed trays. So far, three families of materials have been developed using three different combinations of bio-based commercial polymers in combination with different percentages of modified hop fibre. In total, over 15 formulations have been developed during the first two years of the project for the production of flexible planting pots for agricultural purposes.

## PROCESS TO PRODUCE THE HOP-BASED COMPOSITE MATERIALS

To revalorise and maximise the use of hop fibre after the harvesting season, at TECNOPACKAGING we have developed and adapted the extrusion-compounding process to produce a novel bio-composite integrating the fibre into biodegradable polymeric matrixes. For that purpose, a Coperion ZSK 26 twin-screw compounder is used and its temperature and pressure profiles, together with a special feeding system, have been adapted to produce the hop-based composite materials.



Extrusion compounding Coperion ZSK 26 twin-screw machine used for the production of bio-composites.

The process is divided into several steps: drying of raw materials in an air oven at a low temperature (to avoid the degradation of the hop fibres), feeding of the materials into the extruder, melting and mixing of the ingredients in the screw, a cooling down phase in a water bath, and finally, pelletising. In addition, the hop-based polymer pellets go through a final drying step at a low temperature to remove the excess water and to have the pellets ready for storage and sending to TECOS for injection moulding of biodegradable planting pots.


Full extrusion-compounding process followed at TECNOPACKAGING from the reception of the fibre to the production of the hop-based bio-composite.

## CURRENT RESULTS

During the first year and a half of the project, three families of bio-composites and over 15 hop-based formulations have been developed. Up to 40 % of hop fibre has been integrated in the novel biomaterials and used to produce highly flexible plant pots for the hop agricultural market. The formulations have been successfully adapted to intermediate and end-user requirements: injection processing conditions and final mechanical properties of the pots.

Bio-based polymer to be mixed with the treated hop fibers from ZELFOS

Example of hop fibre treated by ZELFOS

Example of hop-based bio-composite produced at TECNOPACKAGING

Die output with hop-based composite filament

Hop-based composites prepared for the drying process


Different formulations of hop-based bio-composites transformed into tensile and flexural experiments to characterize mechanical properties

## PLANS

From now until the end of the project in 2022, TECNOPACKAGING plans is to select the most appropriate formulation from the three families and produce it on a large scale for the injection moulding of planting pots at TECOS. In addition, TECNO will work on the transferability of the hop-based bio-composites to other sectorial applications. For example, TECNO can develop films for uses in agriculture as protection bags for fruits or mulching films for the land crops. Moreover, TECNOPACKAGING will collaborate with TECOS to expand the replication markets effectively, including by formulating an industrialisation plan for the most interesting products.

## CONCLUSION

In collaboration with BIOTHOP partners, TECNOPACKAGING has successfully produced a total of three new families of hop-based bio-composites to generate biodegradable and flexible planting pots by injection moulding. By doing so, TECNOPACKAGING is fostering a circular economy approach revalorising the hop agricultural waste produced during the hop harvesting season. The introduction of up to 40 % hop fibre into the new bio-based composite material substantially reduces the use of fossil-based materials and minimises the greenhouse gas emissions into the atmosphere, contributing to achieving the UN Sustainable Development Goals towards a Sustainable Europe by 2030.

For further information, please click **https://www.life-biothop.eu**
**or visit and follow us on our social networks, where we publish our news regularly**:

INŠTITUT ZA HMELJARSTVO IN PIVOVARSTVO SLOVENIJE
Slovenian Institute of Hop Research and Brewing

Lankhorst|Yarns

TRIDAS ENVIRONMENT FRIENDLY PACKAGING

Razvojna agencija Savinja
Gospodarsko interesno združenje

Tecn packaging

TECOS Slovenian Tool and Die Development Centre

Zelfo TECHNOLOGY

LIFE18 ENV/SI/000056
With the contribution of the LIFE Programme of the European Union

REPUBLIKA SLOVENIJA
MINISTRSTVO ZA OKOLJE IN PROSTOR

BRASLOVČE POLZELA PREBOLD TABOR VRANSKO ŽALEC

ZDRUŽENJE HMELJARJEV SLOVENIJE

This project is co-financed by European Union through the LIFE Programme. The technical e-newsletter reflects only the author`s view and exempts the European Commission for any use that may be made of the information it contains.