# PRODUCTION OF RENEWABLE CORK POWDER ADDED MULTIFUNCTIONAL POLYESTER YARN ON THE INDUSTRIAL SCALE

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**Abstract:** The interest in products obtained from renewable resources is increasing with the increase in environmental awareness and the decrease in oil resources. At the same time, the rapidly advancing technology in our world and the increasing competitiveness of companies have revealed the need for such materials. Considering all these, cork attracts attention as a renewable additive material with unique properties. Additionally, cork is a potential material for new applications and sectors.

Cork is the name given to the outer bark of the cork oak (Quercus Suber L.), the characteristic tree of the Western Mediterranean Basin. Cork, a renewable and reusable raw material, has many uses worldwide. By-products (cork powders of various sizes) are formed resulting from the transformation of cork into various products. In industrial cork processing, up to 30% of cork powder is released and is used in low-value-added applications. Cork by-products can be used in the production of composite materials by incorporating them into various polymeric matrices. Cork powders that cannot be used as by-products are burned and used to obtain energy.

Technological developments and increasing competition in the textile industry require designing and producing high-performance products and developing materials that offer many functions. Although cork has unique properties such as heat and sound insulation and has increased in popularity in many sectors, there is no study on its inclusion in textile yarns. In this study, polyester yarns containing cork powder were produced for the first time. The production cycle was given in the Figure 1. Firstly, the bottle stoppers were subjected to a simple grinding process and turned into powder. Cork powders were converted into masterbatch granules to be mixed with polyester chips. Polybutylene terephthalate (PBT) polymer was used as a carrier in obtaining masterbatch. Masterbatch production was carried out to contain 10% cork powder (90% PBT). Partially oriented yarns (POY) were produced on the industrial scale melt spinning line dosing the masterbatches into the melt polyester at the ratio of 1%. Textured polyester yarns of 150 denier 48 filaments were obtained from POY yarns with the false twist texturing method. SEM analysis was performed on cork powders and POY yarns. The twill woven fabric was produced using the textured polyester yarns in the weft and warp directions. The fabrics with cork powder additives were compared with fabrics without additives produced with the same parameters. Sound absorption coefficient measurements were made in an impedance tube (30 mm) using the TS-EN-ISO 10534-2:2003 standard. The test was conducted in the 200 Hz to 6400 Hz frequency range. Starting from 800 Hz, certain percentage increases were observed in fabrics with cork powder additives compared to those without additives. The most significant increase was appointed at 2500 Hz with 34.82%. Thermal insulation tests were performed using the Alambeta test device. 15% increase in thermal insulation occurred by using cork powder additive.


**Figure 1** Production cycle of cork powder added polyester yarn

As a result, it was evaluated that the cork powder additive has a significant potential to provide remarkable differences in polyester yarn properties despite its minimal amount of cork powder content in terms of the properties examined. The use of cork powder as an additive in synthetic yarn production will allow new applications in the textile industry. At the same time, it will be ensured that the cork powder, which is generally in the position of waste material, is brought into the circular economy.

***Keywords:*** *oak cork, polyester yarn, multifunctionality, thermal insulation, sound absorption, sustainability.*

***ACKNOWLEDGEMENT****: This work was supported by TUBITAK 1505 University-Industry Cooperation Support Program (Project Number: 5220053).*