

UPM BioMotion™ Renewable Functional Fillers (RFF): A new and innovative material class designed to increase sustainability of rubber and plastic end-use applications

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Climate change, raw material scarcity, regulatory pressure, and consumer preferences for sustainable products, are key drivers for replacing fossil-based materials with innovative, renewable, and sustainable solutions. Especially rubber and plastics materials used by leading industry sectors, e.g., automotive, building and construction, consumer electronics, and packaging are often in contradiction to a circular economy approach, because the vast majority is not biobased, highly CO₂-intensive, hard to recycle, and not biodegradable. To address these needs, UPM has developed a completely new material class of renewable functional fillers, which enables a switch from fossil raw materials to sustainable alternatives: UPM BioMotion™ RFF. It will be produced at UPM's award-winning, first-of-its-kind biorefinery in Leuna, Germany, for which start of production is planned at the end of 2024.

UPM BioMotion™ RFF combines a unique set of properties for rubber and plastic applications enabling the next step towards a more sustainable future. It is made from responsibly sourced hardwood from regional, sustainably managed forests and climate neutral considering cradle to gate system boundaries. Renewable raw materials accumulate carbon during plant growth, by sequestration of carbon dioxide from air. The amount of biobased carbon in a product can be measured and certified.

UPM BioMotion™ RFF has been awarded the highest quality level “DIN-Geprüft biobased” certification mark. Its biobased carbon content has been confirmed 100% according to ASTM D6866 test method. Thanks to its low material density of only 1.3 g/cm³, UPM BioMotion™ RFF is regarded truly light weight. This combination of properties creates high value in rubber and plastic applications especially at high filler loadings. Both, the increased biobased carbon content, and the reduced weight compared to classical polymeric compounds are directly measurable in the final articles.

But also, the use of UPM BioMotion™ RFF as additive for thermoplastic materials has proven to be of high potential for a truly circular economy. Its application as pigment yields a characteristic black coloring, with a slightly reddish and yellowish tone. In contrast to articles colored with carbon blacks, near infrared (NIR) detection of the base polymer is still possible allowing for sorting and thus recycling of the plastic materials.

Independently of the filler loading, UPM BioMotion™ RFF has proven to be the perfect additive for industrial, home, and soil composting under the frame of DIN EN 13432. According to the standard a material is defined to be compostable, if it is naturally capable being degraded in new biomass, mineral salts, water, and carbon dioxide in the environment. UPM BioMotion™ RFF has been awarded the certification mark “Additive for compostability according to EN 13432” by DIN CERTCO with unlimited use quantity in the final product.

By presenting a broad range of different examples from low to high filler loadings we will show that UPM BioMotion™ RFF is a new and innovative material class, designed to increase the sustainability performance of various end-use applications made from rubber and plastics.