Innovations and Industrial Technologies 2025

AN INNOVATIVE VENT

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ABSTRACT

As part of the research conducted by FOLNET Polska sp. z o.o., an innovative composite material based on polypropylene was developed, in which microsilica fly ash waste serves as the filler. The appropriate composition of raw materials ensures that the developed material exhibits enhanced resistance to moisture and UV radiation.

OBJECTIVES

Within the project, the technological parameters of the composite processing were determined experimentally, and key material properties — including rheological and mechanical characteristics — were analyzed

RESULTS

The product innovation consists of a ventilation vent made of this composite material using injection molding technology. Research demonstrated that the new design provides greater ventilation efficiency compared to products with the same primary function available on the domestic market (with the same cross-sectional diameter of the cap). Achieving the intended results would not have been possible without the use of advanced computational methods. Their application enabled the integration of the designer's aesthetic vision with the constraints of the target production technology and the material properties.
Numerical simulations using the Finite Element Method (FEM) in the field of Computational Fluid Dynamics (CFD) were carried out to determine flow parameters around the given geometry, as well as to analyze the pressure and velocity distribution for the developed structure (based on the PN-EN 13141-5:2006 standard). Additional calculations were performed to determine stress distribution and maximum deformations under specific operating conditions.

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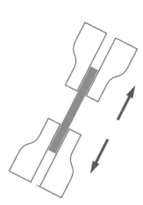
CONCLUSIONS

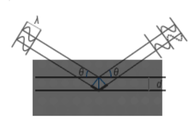
The results of the simulation studies and the superiority of the developed product solution over competing products were experimentally confirmed. Tests were conducted in an aerodynamic tunnel, following the procedure described in the PN-EN 13141-5 standard. The tested material consisted of chimney caps. The tests included measurements of pressure drop, airflow rate interaction, and wind flow interaction.
After confirming the functional advantages, the project results were implemented in industrial practice by incorporating the R&D outcomes into the business operations of FOLNET Polska sp. z o.o., through the launch of production

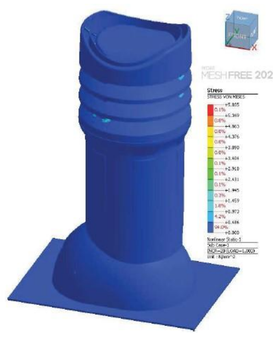


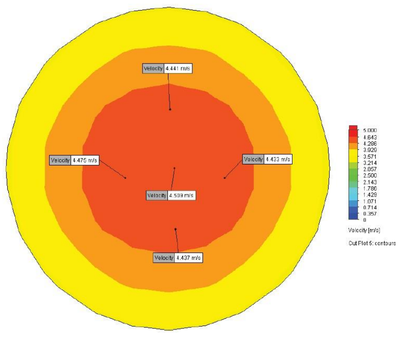
TENSILE STRENTH **COLOUR STABILITY**

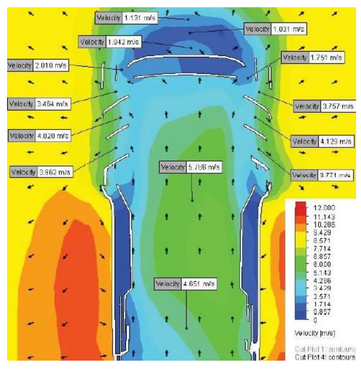
FOLNET's composite
(0 hours vs. 1 000 hours in UV-B conditions)

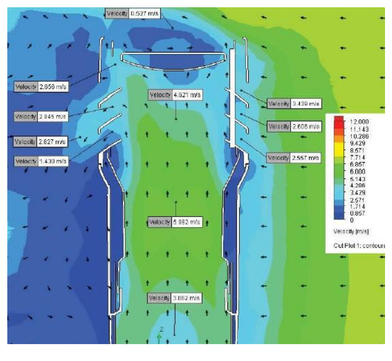
$\Delta R_m < 5\%$ $\Delta E < 2.0$











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