MATERIALS SCIENCE AND TECHNOLOGY

DM 630/Michelin - Implementation of a new process for tire manufacturing

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Context of the research activity	The progressive electrification of passenger car market affects tires characteristics. Wear and rolling resistance will take more and more relevance. In order to satisfy the new needs it is necessary to change assembling machines to produce new dimensions with higher seats and smaller series due to progressive penetration of BEV. The new tire assembling process is called MB2 and it is a Michelin Patent. These machines need to be developed as prototypes with a lot of issues to be solved. Progetto finanziato dal PNRR a valere sul DM 630/2024 - CUP E14D24002460004
Objectives	The new tires assembling process called MB2 is a Michelin designed machine. This machine is divided into two steps: carcass fabrications and green tires assembling. Carcass assembling is based on a confection drum. The drum transfer pass in front of each station in order to add a constituent to the carcass. This process needs all the products conditioned in a particular way to be superposed onto confection drum. In particular the bottom zone is fully different and protector (the rubber product in contact with rim) is dived into two parts to facilitate the fabrication. The drum after carcass fabrication translate to green tires assembling zone. This final part of the machine is similar to the actual process but the new regulation (profilometer) for tread centering and metallic belt right position detection are fully new. Due to single drum it is necessary to obtain the right dimensional stability in order to prevent issues in superposition of the products. A mistake of 0.5 mm could affect a lot the tires performance and keeping under geometrical control is very critical for a big structure as the drum one.

	The PhD student will work in collaboration with Michelin (industrial sponsor) team in order to obtain the best regulation of the process for each dimension in order to obtain industrial fabrication of new tires with the new process MB2 The PhD student will work on product and process development. About product around one year will be necessary to re-study all the dimensions, at uncured status, in order to be able to fabricate them with the new process MB2. After that new dimensions for BEV will be developed exploiting MB2 machine. About process a lot of issues must be solved as usual when a prototype is under development. A lot of issues are expected on uniformity with a single drum for carcass confection and green tires assembling. It will be very important to exploit in the right way information from automatic devices and controls in order to respect the right architectural limits of tires.

Skills and competencies for the development of the activity	It is necessary to have mechanical bases in order to exploit the new machines and design of products. Chemical knowledge is important for right comprehension in sticking properties. Controls knowledge will be useful to understand the data collection from the process. It is also important to have some mathematical skills: i.e. uniformity signal is treated with Fourier Transform Soft skills are also important because it will be necessary a team work with people of different cultures and competencies.