cost reductions, including $1.6 million in annual savings from optimized processes enabled by Graphista's technologies.

According to forecasts, by 2030 automation will affect 23% of manufacturing jobs. In 2022, it was recorded 127 hacker attacks on AI systems.

LITERATURE

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STUDY OF THE STRUCTURE OF RUBBERS WITH ROSIN-CONTAINING AND NANOSCALE COMPONENTS

In the rubber industry there are a large number of products with complex construction. In such products it is important to ensure sufficient adhesion. One of the ways to realise these requirements is the use of adhesion enhancers. Rosin and products based on it are used as adhesion enhancers [1]. The introduction of rosin into rubber compounds reduces their viscosity, significantly increases adhesion and, due to its acidic nature, slows down sub-vulcanisation. In the presence of rosin, dispersion of powdered ingredients is improved and high elastic and dynamic properties of rubbers are maintained [2].

However, every year, the demand for rosin increases significantly, resulting in its shortage. In this regard, the practical use of new and effective rosin substitutes in elastomeric materials is an actual direction of research and development work.

Nanoscale additives are increasingly used in the rubber industry. Due to their small size and large specific surface area, they are able to influence the structure and properties of rubbers [3]. The aim of the work was to evaluate the influence of rosin-containing and nanoscale additives on the structure of elastomeric compositions. Rubber compound samples used for tyre sidewall production were used as research objects. The samples under study were injected with canifoleterpene styrene-maleic anhydride (CTSMA) at a dosage of 2 m. p.% per 100 m. p.% of rubber. KTSMA was obtained by high temperature treatment of a mixture of turpentine and styrene with maleic anhydride. The comparison sample was a filled rubber compound with industrial adhesion enhancer - pine rosin, which was used in equal dosage with the experimental additives.

As nanoscale components we used samples of diamond-containing charge of ASHA-A grade and ultradisperse diamond UDA SP produced by NP JSC 'Sinta' (Minsk, Republic of Belarus). Nanomodifying agents were introduced into the filled elastomeric compositions at dosages of 0.1 and 0.2 m. p.% per 100.0 m. p.% of rubber. The structural parameters of the spatial mesh were estimated using the equilibrium swelling method.

It was found that the replacement of rosin by KTSMA does not lead to a significant change in crosslinking density. When nano-sized additives ASHA-A and UDA are introduced into the rubber compound with KTSMA, the crosslinking density decreases, and to a greater extent when UDA is introduced. Thus, when ASHA-A nanosize additive is introduced into rubber blend with CTSMA, the crosslinking density decreases up to 4.5%, and when UDA additive is introduced up to 12%. At introduction of nano-additives into the rubber mixture with rosin, a decrease in crosslinking density is also observed, and to a greater extent at introduction of UDA nano-additive. Thus, in rubber containing rosin and ASHA-A crosslinking density decreases to 3%, and in rubber containing rosin and UDA nano-additive to 8%. It should be noted that when the dosage of ASHA-A and UDA nano additives is increased, the crosslinking density decreases in all rubbers. The change in cross-linking density may be due to the adsorption of the vulcanising group on the surface of ASHA-A and UDA particles, which leads to the formation of a sparser cross-linking network.

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