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Analiza celowości zastosowania recyklingu materiałów stosowanych dla nowoopracowanych polimerowych podkładów kolejowych w oparciu o LCC

Analysis of the feasibility of recycling materials used for newly developed polymer railway sleepers based on LCC

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Abstract

The concept of the work concerns the examination of the possibility of using innovative polymer sleepers in Poland, taking into account the costs in the product life cycle, which may translate into economic efficiency and have a positive impact on the environment while maintaining the technical parameters of the track. The thesis was written for the needs of DB Cargo Polska and Infra Silesia S.A., of which DB Cargo Polska is a 100% shareholder.

Nowadays, conscious enterprises put great emphasis on development, improvement of care for the environment, improvement of safety while maintaining cost and economic rationality.

This doctoral dissertation consists of eight chapters. After the chapter "Presentation of the essence of the issue", the chapter "Review of the literature" was presented, in which the theoretical part of the issue was explored.

The theoretical part presents currently used solutions in the field of railway sleepers in Poland, as well as solutions used on the international arena. The legal possibilities of using innovative railway sleepers in Poland were analysed, pointing to the conditions for their implementation and use in Poland. For this purpose, the literature of Polish and foreign law was analysed. The economic aspect plays a very important role in the implementation of an innovative solution in a company that affects the market area. In this work, the impact of polymer primers on economics was also examined. In the theoretical part, LCC analysis methods were described, and one was selected, which was used at a later stage of the doctoral thesis to calculate the cost of 1 km of track on traditional sleepers vs. innovative. Showing the purposefulness of searching for new innovative solutions has also found its place in the chapter devoted to environmental aspects. This chapter shows the importance of Polish regulations as well as European directives on everyday activities undertaken in the company. In order to meet them in the future and to be able to adapt the company to the latest ecological standards, it is important to strategically plan the company's activities, taking into account care for the environment.

The following chapters are a presentation of the completed research work, bringing the goal of the work closer to completion and proving the thesis put forward in it. The research part consists of testing samples of polymer underlays obtained from two different manufacturers and made of two different materials: polyethylene and polyurethane. In

addition, the impact of innovative railway sleepers on the financial aspect of the company was examined. An analysis of the desirability of recycling materials used for newly developed polymer railway sleepers based on LCC was carried out and the key use of recycling for polyethylene used for innovative railway sleepers was proven in order to maintain economic viability.

An important implementation aspect of this work is to propose a legal path for the use of innovative railway sleepers on the railway infrastructure belonging to the so-called a small manager, which is Infra Silesia S.A. In addition, this chapter gives an overview of the factors to be considered when using innovative sleepers depending on the type of track

The sixth chapter collects and presents the results of the tests carried out both in terms of the properties of materials and the examined economic and legal aspects.

Keywords: polymeric sleepers, life cycle costs, innovations, sustainable development.