

Investigating the influence of preliminary processing of waste tires on collection and transportation costs and vehicle emissions

P. Nowakowski¹, A. Król¹

¹Faculty of Transport, Silesian University of Technology, Katowice, ul. Krasińskiego 8, 40-019 Poland

Keywords: waste tires, collection and transportation costs, decision making, circular economy

Presenting author email: Piotr.Nowakowski@polsl.pl

Abstract

The article investigates different methods of collection, loading, and transportation of waste tires picked from collection points. One of the common methods is loading the tires directly into a container – dumped from the storage area in a free manner. Alternative methods use preliminary processing of waste tires, like cutting, baling and inserting one tire inside another one. The methods of preliminary processing to increase the efficiency of their loading are presented in our study. On the basis of the analysis of several scenarios of tire collection, the costs and parameters related to the mass and volume of the tires to be picked up were determined.

The research results are useful for assessing the methods of collecting and transporting used tires taking into account the criteria of economic and environmental factors. A novel hybrid method of combined multi-criteria decision supporting methods AHP and PROMETHEE was applied to investigate the most profitable collection method of waste tires including economic and environmental criteria. The results show the most profitable method is the collection by routing of heavy truck and pickup of waste tires from a local network after preprocessing. Compacting of waste by reducing its volume requires shorter routes and minimizes the negative influence of exhaust emissions on the natural environment. The results of the analysis can be used as a guideline for waste transportation companies including all collection points to reduce costs, especially in regions where transport costs due to distances constitute the largest share of costs.

Acknowledgements

The publication was (partially) supported by the Rector's grant No 12/030/RGJ18/0016, Silesian University of Technology, 2018.