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How to support storage process in dismantling facility with IT solutions? – case study

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Abstract

Warehousing becomes one of the most important process carried out in the disassembling facility. Legal requirements, company's limitations in terms of resources (space, people, money) and a variety of storage parts (different size, lack of standards), cause many problems in the warehouse process. Efficiency of warehousing becomes increasingly important due to the need of finding new opportunities for growth of competitive advantage for dismantling station. The aim of the work is to develop the concept of an IT tool supporting decision-making process related to the parts allocation in the warehouse. Authors assume that parts' classification and their proper storage will contribute benefits in the context of implementing the concept of sustainable development in practice. Article has got a demonstrative-concept character with elements of a case study.

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1. Introduction

Skillful management of End of Life Vehicles (hereafter: ELV) is related to benefits which may be considered in the following categories: financial, ecologic and social [1], what corresponds to the Sustainable Development concept.

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Perceiving the significance of ELVs problem, there were established worldwide legal requirements, e.g. members of European Union have to follow Directive on End-of Life Vehicle 2000/53/EC, according to which each country is obligated to organize its vehicle recycling system. In Poland, dismantling facility is a key object in the recycling network [2, 3], which is authorized object of managing ELVs – the hazardous waste.

Taking into account the characteristic features of the vehicle fleet in Poland in terms of number of vehicles and the average age of the vehicle, as well as the forecast to maintain the upward trend, it was assumed that Poland is a country with a high potential for companies from recycling sector, particularly disassembling facilities [3, 4]. What is more Polish used to buy spare parts from market of used parts, because of the lower price as well as availability of old parts which are not produced any more.

Considering the high potential for disassembling companies in Poland, there are many illegal objects which are managing hazardous waste against law requirements, what becomes harmful for people and Environment, what makes them more competitive than legal dismantlers.

Polish disassembling companies are mostly Small and Medium Sized, where most processes are made manually by workers. Authors claim that disassembling facility is a type of specific manufacturing company, where are realized processes well known from the traditional manufacturing company, including: procurement, warehousing, marketing, distribution, production, although the materials streams are different (e.g. part or waste is a final product, meanwhile in the production company part is required for manufacturing a final product). Dismantler receives stream of ELVs which is divided as a result of disassembling process into three streams: hazardous substances and dangerous elements suitable for disposal, parts appropriate for reuse and elements suitable for recovery or recycling. Each stream has to be stored in adequate conditions, what is regulated by law. It is crucial from the perspective of the high importance level on pollution of the Environment, what is directly related to the people's health (local community). Moreover it is associated with economic results of the company. According to the previous research conducted by authors, owners of disassembling facilities noticed that more than 65% of revenues are created by sale of used spare parts, which may be sold when they are stored in appropriate conditions. Sale of spare parts is not only the best solution from the perspective of the economic result of the company, but it is also justified in authors opinion, from the perspective of the growing national Economy, because of reuse scenario realization.

In accordance to the goal of the paper, authors focused on warehousing process, which was defined as the main process in the disassembly facility, from the perspective of the economy, Environment and people. Taking into consideration problem with the illegal objects, authors assumed that each initiative which might improve the competitive position of legal disassembling facility will be valuable and desired.

Consequently, the primary goal of this study was to prepare the concept of IT tool supporting the decision making process in the area of warehousing on the example of the selected disassembling facility, which is one of the biggest representative of that sector in Poland.

The paper consists of three parts. In the first part there are presented decision-making problems in the warehouse. The next section shows the significance of IT tools for controlling in warehouse management process. Then there is described the concept of an IT tool to support decision-making in the area of storage with the use of UML diagrams. At the end there are presented conclusions with direction of future research.

2. Decision problems in the disassembling facility warehouse

In the result of the literature review, authors claim that there is no paper which would consider problems of warehouse area in disassembling facility.

There are many works focused on problems related to the location of the warehouse (e.g.[5]), design (e.g. [6]), application of the IT systems (e.g. RFID in [7]), etc., because there is high potential related to that process.

In the *Introduction section*, authors pointed out, that disassembling facility is a specific kind of manufacturing company. Each production system is addicted to supplies of the system creates by inputs of: material, energy and information. Inside the production systems there are processes in the result of which there are obtained products. The dismantling station is the system (Hereafter: SSD) consisted of inputs and outputs. This system can be very generally described as follows:

$$SSD = \langle (S_m, S_i, S_k), R \rangle \quad (1)$$

where:

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