



International Scientific Conference “Environmental and Climate Technologies”, CONECT 2017,
10–12 May 2017, Riga, Latvia

Optimisation of resources flows in pellet manufacture

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Abstract

Every human that lives in northern areas knows that there is a need for heat source. Heat sources are many kinds. The variation between them depends of the state (liquid, solid or gas) they are in and if they are carbon neutral. Environmentally friendly solution is to use wood for heating purposes. Nowadays lots of consumers use wood pellets. The market is increasing tremendously. The goal of this paper is to find existing problems in resources flows in pellet manufacture and offer possible solutions to increase the overall efficiency. Results show that there are three most parts of production flow- waste, water and heat – that can make a significant change towards less impact to the environment. There has been taken in consideration industrial symbiosis implementation but overall studies show that it might not be the most valuable option developing towards most possible efficiency level in pellet manufacturing.

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Peer review statement - Peer-review under responsibility of the scientific committee of the International Scientific Conference “Environmental and Climate Technologies”.

Keywords: pellet manufacture; resources; optimisation; waste management

1. Introduction

To make an organization more efficient and use fewer resources to produce better product is very crucial for any company, regardless of field of business. One of the main resources in pellet manufacturing besides timber, electricity, manpower and other materials is heat. In every manufacture, there are waste that comes in various shapes and forms. By trying to find a way how to reduce waste in every production there are on the world, the better chance to make it possible is to make less impact. Making everything in the harmless way is the only way how to reduce

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expenses and find the greener path. As the pellet market in European Union is increasing its amounts, the production sites will grow in size and count in the future. All kind of manufacture industry is responsible for significant proportion of environmental damage; it is essential to achieve a solution that will decrease the impact. The aim of overall energy strategy is to decrease demand and thus reduce emissions of CO₂ (which contribute significantly to the greenhouse effect and reduce emissions of other pollutants such as SO₂ and NO_x which cause acid rain and its results problems) [1]. Improving energy efficiency and producing more energy from renewable sources is the way how to deal with the up come problem.

There are waste treatment hierarchy that shows what is the best and which is the worst treatment to the waste. As from production side looking by this pyramid organization can understand in which category it is and what should be done next to increase the efficiency. In Fig. 1 there can be seen all the parts of the waste treatment hierarchy.

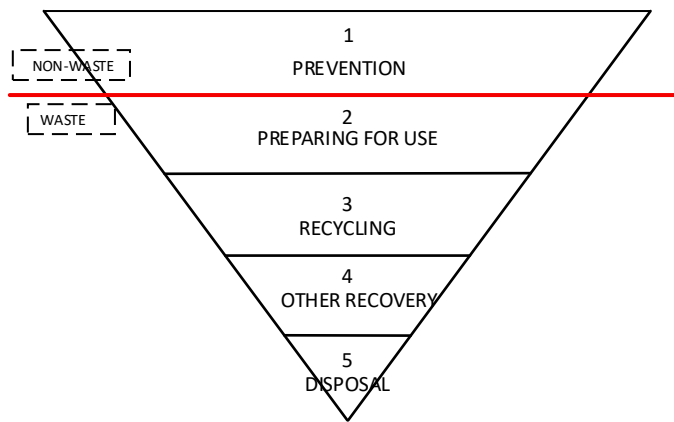


Fig. 1. Waste hierarchy [2].

The aim of this research is to optimize resources flow in pellet manufacture to reduce various kinds of waste. Research examines pellet manufacture's weak parts that produce waste, use too much energy and is not built in the best possible way. By examining whole manufacturing process part by part, it shows where something could be done differently. Author divides research in two main waste fields: Energy and water; different kind of solid waste. Wood pellets production amount since 2006 till 2015 have increased by 250 percent, in 2015 reaching 28 million tonnes. More than half of all wood pellets are produced in Europe [3] and the Baltic States have emerged as one of the largest wood pellet producing regions in Europe.

2. Methodology

To draw out the research there where several tools used. The options of optimisation are divided into two parts as stated before. First part of the research treats solid waste. In each process, there are inputs and outputs as they combined make up the efficiency, impact to environment and the profit amount. In pellet manufacturing process, there are three main waste types – water, heat and defective final product and bark. As in Fig. 2 solid waste types are shown in the specific places where they occur.

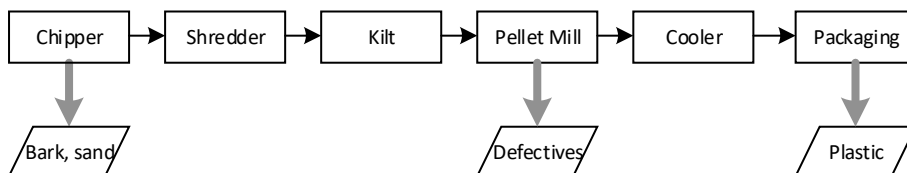


Fig. 2. Waste from pellet manufacture.

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