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Research Paper

Reducing Waste and Increasing Productivity in a Petrochemical Olefin Unit in the South of Iran with the Material Flow Costing Method

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1. ABSTRACT

In the challenge of chemical production, management will be successful if it has production waste and by-products in terms of mass and finance. The new method of material flow costing (MFCA) is using green productivity tools, which increases productivity with a mass and financial approach and increasing efficiency. This method saves money by initially identifying and then providing a scientific and practical way to prevent material loss (waste), energy, costs and CO₂ emissions. To achieve this goal, MFCA can be used to calculate the true costs of losses (hidden costs). Therefore, the purpose of this study is the production wastes in the olefin unit of a petrochemical company in the south of Iran and the cost characteristics of these wastes using the MFCA tool. Also, methodological solutions to reduce these wastes and increase productivity in this industrial unit have been presented. Based on the application of productivity improvement strategies, a 40% reduction in coke waste and a 10% increase in ethylene production are predicted in the process.

Keywords: Productivity, material flow costing, olefin, waste reduction.

2. INTRODUCTION

The petrochemical complex units, as one of the main sectors of the oil industry, are one of the important industries of each country. This industry has a history of 50 years in Iran, which is one of the poles of the petrochemical industry in the Middle East, but this development has consumed a large amount of energy and also caused environmental issues [1]. Material flow cost accounting (MFCA) is a management tool designed to protect the environment, enhance the competitiveness of large companies and develop complex methods. Major environmental challenges such as climate change, waste generation, and environmental pollution are mainly attributed to profit-oriented decisions made by companies [2-4]. The material flow cost accounting method measures the flow and inventory of materials, which includes raw materials and parts and components of the production process, in physical and monetary units. In this article, applies the MFCA to investigate the material, energetic and economic costs. Also, some of the recommendations (based on MFCA theory) are declared to increase of productivity of the unit.

3. RESULTS AND DISCUSSION

MFCA was originally developed by the Institut für Management und Umwelt, Germany, and introduced to Japan in 1999. As mentioned before, Material Flow Cost Accounting (MFCA) is a method used by businesses to enhance their material efficiency and is standardized through ISO 14051. The MFCA method was employed. To evaluate true costs in plants and specify positive and negative products the first step to implementing material flow cost accounting is to understand the amount of input and output flows in the process. Figure 1 shows the block flow diagram for C2 plant. Based on a site visit, the simulation of the process, the PFD Plots

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and technical data available in the total complex of C2 unit wastes were listed and categorized. The C2 plant is considered as a cost center and the cost of utility services is also calculated

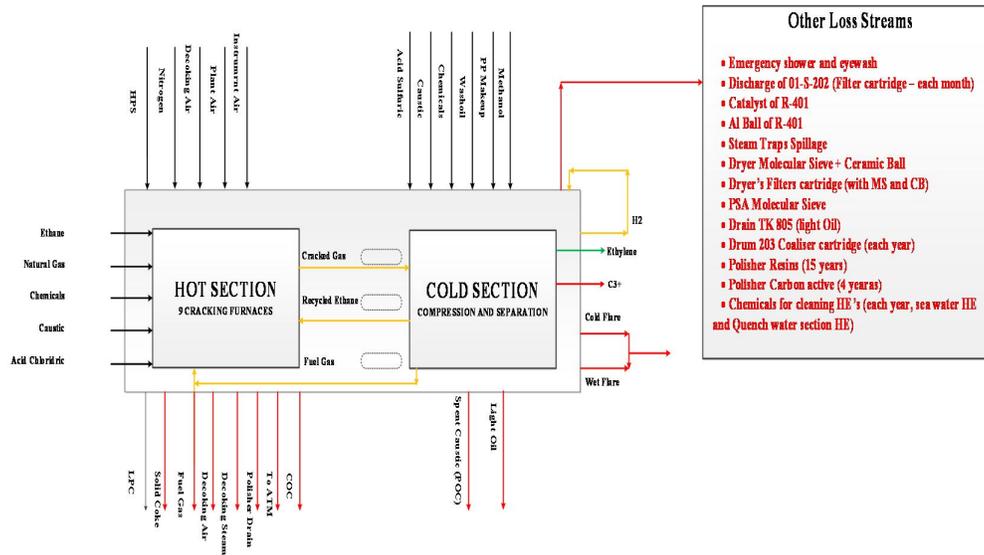


Figure 1. Block flow diagram of C2 plant

4. RESULTS AND DISCUSSION

First, The ISO 14051 standard is implemented in the olefin unit and then the calculation of the material flow cost accounting method was done. In this step, positive and negative products must first be determined. For this purpose, the two products ethylene and propylene are considered as positive products and other products produced in the process are considered as negative products. Next, figures 2 and 3 show the ratio of cost distribution of feed, system, energy and waste management on products.

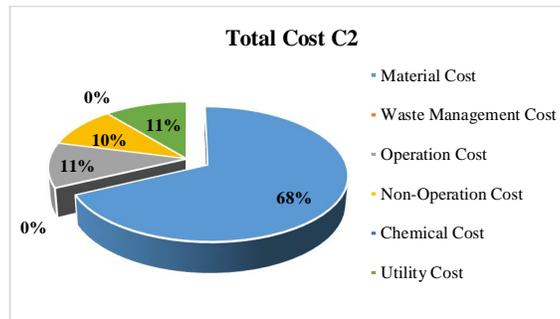


Figure 2. The all of costs

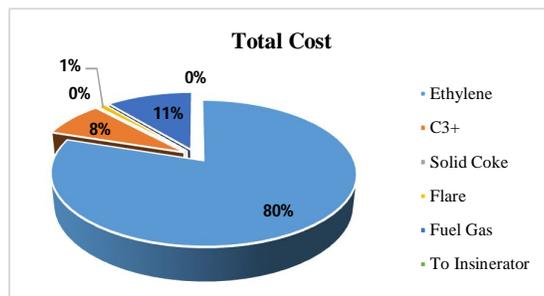


Figure 3. Allocation of total cost to positive and negative products

5. CONCLUSION

In this research, negative and positive products in the petrochemical olefin unit were identified and the true cost was assigned to waste and products. In order to increase productivity, solutions were presented to improve



the processes. By implementing appropriate strategies, amount of negative products decreases and this increases the percentage of positive products.

6. REFERENCES

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