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RESEARCH ARTICLE OPEN ACCESS

The Life-cycle Assessment and Environmental Impacts of Coal Washery in India

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Abstract:

The purpose of the project is to evaluate the impact on the environment by a Coal Washery in India and recommend ways to increase their eco-friendly factor. The project basically has four features – Goal and Scope, Life cycle inventory, Impact assessment & Interpretation. Life Cycle Inventory (LCI) analysis involves creating an inventory of flows from and to nature for a product system. Inventory flows include inputs of water, energy, and raw materials, and releases to air, land, and water. Inventory analysis is followed by impact assessment. This phase of LCA is aimed at evaluating the significance of potential environmental impacts based on the LCI flow results. Life Cycle Interpretation is a systematic technique to identify, quantify, check and evaluate information from the results of the life cycle inventory and/or the life cycle impact assessment. The results from the inventory analysis and impact assessment aresummarized during the interpretation phase. The outcome of the interpretation phase is a set of conclusions and recommendations for the study.

Keywords — **Life-cycle assessment, coal washery**.

I. INTRODUCTION

The primary goal of this work is to compare the environmental impacts of a Coal Washery in India and recommend ways to improve environment friendliness of the company. Figure 1 demonstrates the life-cycle stages associated with mining of coal in India.The Life-cycle Assessment (LCA) starts by considering the raw materials used and stops before the product transportation phase (i.e. the coal combustion for power generation phase). No end-of-life treatment phase was considered because the associated data was not available in the software used to conduct this. The life-cycle values are calculated based on the functional unit of 1 Tonne of coal. Figure 2 shows the system boundary of this assessment. The previously present systems are not region-specific to India. Even though it has

a thorough analysis, it can't be used to find the environmental impacts caused by related companies in India. Moreover, LCA should be done forevery product from different plants separately.

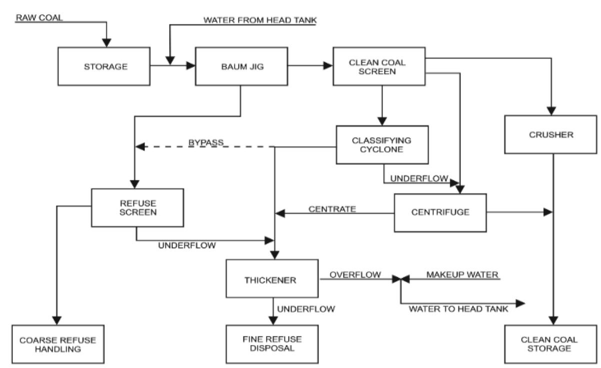


Figure 1 Coal Preparation

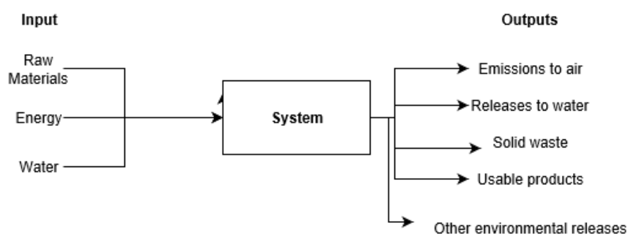


FIG. 2. LIFE CYCLE INVENTORY

II. GOAL AND SCOPE

The project basically has four features – Goal and Scope, Life cycle inventory, Impact assessment & Interpretation. Scope of the study sets out the context of the study and explains how and to whom the results are to be communicated. Life Cycle Inventory (LCI) analysis involves creating an inventory of flows from and to nature for a product system. Inventory flows include inputs of water, energy, and raw materials, and releases to air, land, and water. Inventory analysis is followed by impact assessment. This phase of LCA is aimed at evaluating the significance of potential environmental impacts based on the LCI flow results. Life Cycle Interpretation is a systematic technique to identify, quantify, check and evaluate information from the results of the life cycle inventory and/or the life cycle impact assessment. The results from the inventory analysis and impact assessment are summarized during the interpretation phase. The outcome of the interpretation phase is a set of conclusions and recommendations for the study.

III. LIMITATIONS OF THE STUDY

The LCA procedure is limited to one company in specific and the results might not apply to othercompanies. The LCA procedure is resource intensive and time consuming thus allowing room for error which can result in the data collected to be problematic. The LCA procedure depends on various factors like environmental characteristicswhich might differ from one area to another. Certain materials may not be considered because of their low impact factor which has very little effect on the outcome and aftermath.

IV. DATA ANALYSIS

Table 2 Water Consumption Per Unit Product

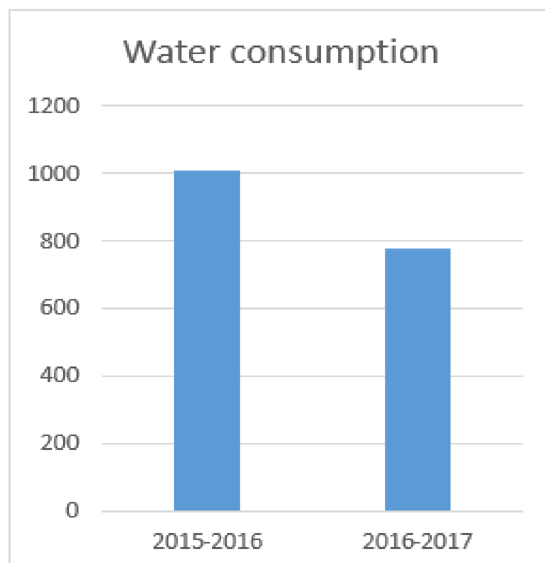
Sl No	Name of products	Process water consumption per unit of product output		
		Year 2015-2016	Year 2016-2017	Average
1	Clean coal	0.74 M³/Tonnes	0.69 M³/Tonnes	0.715 M³/Tonnes

V. IMPACT ANALYSIS

From table 1 and 2 we can say that the water usage is reduced drastically. It might be due to increased

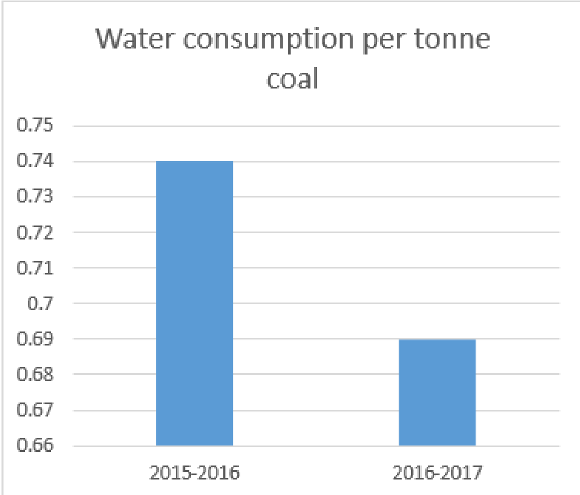
Table 3 Raw Material Consumption

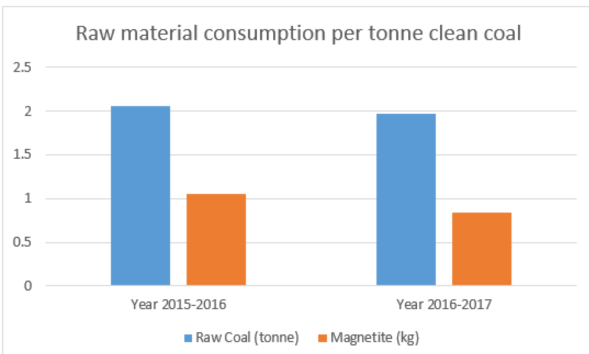
Sl	Name of raw	Name of the	Raw materials consumption per unit production output
			ge
			/tonne
			nne



usage of mine out water from the washery.

Since ground water is pumped out for mining, there is a chance of ground water depletionin near future.From table 3 we can see that a single tonne of clean coal is processed from 2 tonnes of raw coal and 1kg of magnetite.Around 2 tonnes of raw material is used in making a tonne of clean coal. There's about 50% wastage in this process.





The water consumption per day is high but proper measures to reduce it has been taken. Ground water depletion is a major problem.
For production of clean coal, there is about 50% wastage of raw material, which is properly disposed. From this we can infer that the method used here is not efficient. A more efficient can be used.

There is a lot of PM_{10} and $PM_{2.5}$ discharge daily, even though it is within limits. It will cause health hazards to the people nearby. PM_{10} and $PM_{2.5}$ include inhalable particles that are small enough to penetrate the thoracic region of the respiratory system. They are due to exposure over both the short term (hours, days) and long term (months, years) and include:

- respiratory and cardiovascular morbidity, such as aggravation of asthma, respiratory
- symptoms and an increase in hospital admissions.
- Mortality from cardiovascular and respiratory diseases and from lung cancer.

SO_2 and NO_2 emission causes acid rain and smog and ground level ozone layer, all of which are associated with adverse health effects. But since the emission is less, the impact will be small.
All wastes are disposed properly/sold to authorized recycler.

VI. CONCLUSION

It is possible to conclude that an increment of the renewable in the energy supply system would lead to an important decrement in the environmental impacts. LCA has been done for the system boundary mentioned in *Figure 1*. This boundary can be extended and LCA can be done for the whole process. Only that can say the actual LCA of the product.

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