Minimization and Utilization of Oil Soaked Cotton Waste

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Abstract –Oil soaked cotton waste is considered as hazardous waste. In automobile industries and workshops, oil soaked cotton waste is generated during the manufacturing process on huge quantity. Safe disposal of cotton waste is the main issue of solid waste management of industry. Oil soaked cotton waste is categorized under incinerable hazardous waste as per Hazardous waste (Management, Handling and Trans Boundary Movement Rule, 2008). In this context, to solve the issue of disposal of oil soaked cotton waste, pellets will be produced from them using binder and additives as a fuel alternative.

Index Terms — Oil soaked cotton waste, pellets, disposal, fuel, hazardous waste management.

1. INTRODUCTION

There are three categories of hazardous waste enlisted in Hazardous Waste (Management, Handling and Trans Boundary Movement Rule, 2008) are recyclable waste, landfillable waste and incinerable waste. Oil soaked cotton waste is categorized under incinerable hazardous waste. Hazardous waste management is concern with the generation of hazardous waste. There are three principles of sustainable waste management are minimization waste generation, maximize waste recycling and reuse, ensure environmentally safe disposal of waste. Engineering industries generates huge amount of oil soaked cotton waste. This oil soaked cotton waste is non- recyclable, only cotton rags and oil soaked in them is recovered for reuse. Hence cautious disposal of oil soaked cotton waste is very important. The number of treatment options is available to dispose of cotton waste. Pelletization technology is one of the effective technology can be used for utilization and minimization of oil soaked cotton waste by producing fuel pellets from them by using binder and additives. There is over use of coal for the burning purpose in industries. Hence it cause over exploitation of conventional energy resource. Fuel pellets having a good heating value hence it may act as a fuel alternative to conventional energy sources.

Table No. 1 Physical Characteristic of Oil Soaked Cotton Waste

Sr. No.	Particulars	Observation
1	Physical state	Solid
2	Color	Multicolor
3	Texture	Dry

Table No. 2 Chemical Characteristic of Oil Soaked Cotton Waste

Sr. No.	Parameter	Unit	Result
1	Specific Gravity	g/cm^3	0.41
2	Calorific Value	Cal/g	4925
3	Flash Point	^0C	>65
4	pH	-	7.93
5	Sulphate as SO_4^-	mg/kg	4715.06
6	Chlorides as Cl^-	mg/kg	20.69
7	Organic Halogens	mg/kg	724.94
8	% Carbon	%	52.7
9	% Hydrogen	%	5.6
10	% Nitrogen	%	0.31
11	% Sulphur	%	BDL

Note- BDL= below detectable limit

1.1 Objectives:-

1) Fuel pellet production from oil soaked cotton waste ass a disposal solution.
2) Production and utilization of energy as a non-conventional energy source.

3) Conversion of waste to energy as a fuel alternative.

2. MATERIALS AND METHODS

- Materials used in this work: Oil Soaked Cotton Waste, Garden Waste, Binder, Pelleting Machine.
- Pelletizers produce cylindrical briquettes between 5mm and 30mm in diameter and of variable length. They have good mechanical strength and combustion characteristics. Pellets are suitable as a fuel for industrial applications where automatic feeding is required.
- Methodology adopted: Oil soaked cotton waste was made free from metal pieces, metal springs, etc. and was shredded using a waste shredder into fine pieces of approx. 3-4 mm size. A mixture of known amount of cotton waste with binder and filler was prepared. Flour was used as binder whereas garden waste was used as filler. The mixture was placed in pelleting machine and pellets were formed.

3. RESULTS AND DISCUSSION

I. Percentage Moisture Content:

It is calculated by taking the difference between initial weight and final weight of the sample.

II. Percentage Ash content:-

In the already weighed crucible, sample is taken. The crucible is placed in muffle furnace at 550^0 C for 8 hours.

Percentage Ash Content = [B/A]*100
Where A= weight of oven dried sample and
B = weight of ash

III. Percentage Volatile matter:-

In the already weighed crucible, sample is taken. The crucible is covered with lid and placed in muffle furnace at 960^0 C for 7-8 minutes.

Percentage Volatile Matter = [(A-B)/A]*100
Where A = weight of oven dried sample and
B = weight of sample after 7-8 mins in the furnace at 960^0C.

IV. Percentage Fixed Carbon:-
PFC = 100- [PVM+PAC]
Where PVM = percentage volatile matter
And PAC = percentage ash content

Table No. 3 Showing Results Obtained From Proximate Analysis of Bituminous Coal and Fuel Pellet

Sr. No.	Parameter	Bituminous Coal	Fuel Pellet
1	Moisture Content	5.96	6.8
2	Ash Content	38.65	6.3
3	Volatile Matter	20.7	84
4	Fixed Carbon	34.69	9.7

Table No. 4 Showing Calorific Value of Bituminous Coal Sample and Fuel Pellet

Sr. No.	Sample	Calorific Value (kcal/kg)
1	Bituminous Coal	4940
2	Fuel Pellet	5219

Moisture content of bituminous coal is 5.98 where for fuel pellet is 6%. Ash content is nothing but the impurity remaining after burning. Percentage ash content for bituminous coal was 38.65 where of pellet was 7.5. Volatile matter present in fuel enhances ignition of fuel. Hence PVM of bituminous coal was 20.7 where of fuel pellet was 84.1. Fixed carbon in fuel gives rough estimate of its heating value. Therefore, PFC of bituminous coal was 34.69 and of fuel pellet was 8.4.

Calorific value is the important characteristic of fuel. Calorific value of fuel determines the energy content of that fuel. The computed calorific value for fuel pellet was 5219 kcal/kg which is higher than D, E, F grade coals used in Indian industries. The chemical composition of fuel has strong influence over its combustibility.

4. CONCLUSION

Hazardous waste create financial burden on industries due to higher charges associated with disposal mechanism (about 30 Rs/Kg). The usage of oil soaked cotton waste will not only reduce pollution load on environment but will also ensure resource conservation. It is one of the solutions to promote recycling and achieve sustainable development. Hence utilization and minimization of oil soaked cotton waste through production of fuel pellets is a disposal solution for oil soaked cotton waste.

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