

USE OF REGIONAL WASTES AS SOLID FUEL

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ABSTRACT

Developed and developing countries have necessarily increased their productions in many industrial sectors and high production levels have forced that great amounts of wastes have been produced in those industrial plants. Those wastes are still produced in many countries. Waste materials of chemical plants may even be very hazardous to environment. Therefore, waste dispose have been so important that costing human life in some cases. Another serious effect of wastes is the cost of products. In order to decrease cost of products and to protect environment a certain amount of income should be provided by use of regional wastes produced as by-products. In the current global world, waste dispose raise the environmental issue for many industrial plants and also for urbanization. Evaluation of regional wastes in the different industries and consumption of wastes are the main concerns of environmentalists. Organic wastes produced in the country can be used as solid fuel or energy production.

1. INTRODUCTION

Waste evaluation of regional wastes as solid fuel is one of the effective methods. The chemical and physical properties should be suitable to the specifications of solid fuels. In particular, heat characteristics of regional wastes are the main features in the standards. Separately, mixing properties should be proper for use with the other types of solid fuels. The chemical refuses such as plastic and nylon type wastes are very dangerous for heating purposes and toxic gases evolved in burning of these type of waste materials should be hold-up in subsequent processes. This is hardly managed in waste boiler systems and costly. However, organic type waste materials such as dry plants, leaves, roots, decayed vegetables and fruits, wood chips and dry fertilisers may be used as solid fuel after controlled drying. The method burning organic wastes is greatly effective in highly organic waste producing countries instead of the method of disposing wastes in great closed sterile environments.

In this paper, regional waste materials such as rose plant wastes, dry fertilisers and urban wastes were investigated. The chemical and physical properties of these wastes were determined in the specifications of solid fuels. Fuel characters of the wastes were commented and a suitable beneficiation method was proposed

2. GENERAL DATA

The regional wastes that are discharged may be of significant value, but they are of little or no value to the people who want to dispose of them. It is greatly necessary to define the various types of solid wastes that are generated (Table 1).

Table 1. Various types of solid wastes generated in the region.

Source	Location	Type of Solid Waste
Residential	Low, medium and high rise apartments	Food wastes, rubbish, ashes, special wastes
Commercial	Stores, restaurants, markets, office buildings, hotels, motels, repair shops,	Food wastes, rubbish, ashes, construction wastes, special wastes, hazardous wastes
Municipal	Stores, restaurants, markets, office buildings, hotels, motels, repair shops,	Food wastes, rubbish, ashes, construction wastes, special wastes, hazardous wastes
Industrial	Construction, fabrication, light and heavy manufacturing, refineries, chemical plants, lumbering, mining and power plants	Food wastes, rubbish, ashes, construction wastes, hazardous wastes
Open Areas	Streets, parks, vacant lots, playgrounds, beaches, highways	Special wastes, rubbish
Treatment Plant Sites	Water, waste water and treatment effluents	Residual sludges
Agricultural	Field and row crops, orchards, vineyards, dairies, feed lots and farms	Spoiled food wastes, agricultural wastes, rubbish, hazardous wastes

Rubbish mainly consist of combustible and noncombustible solid wastes of households and commercial activities excluding food wastes. Typical combustible rubbish consist of materials such as paper, cardboard, plastics, textiles, rubber, leather, wood, furniture and garden trimmings. Noncombustible rubbish consists of items such as glass, crockery, tin cans, aluminium cans, ferrous and nonferrous metals. Ashes and residues are the materials remained from the burning of wood, coal, coke and other combustible wastes in homes, stores and plants.

Construction wastes are produced from the construction works in the forms of stones, concrete, bricks, plasters, lumber and plumbing parts. Special wastes are street sweepings, road side litter and municipal litter containers, dead animals and abandoned vehicles. Plant wastes are the solid or semisolid wastes from water, waste water and industrial waste sludges. The specific characteristics of these wastes can vary depending on the nature of the plant work. Agricultural wastes are produced from agricultural activities such as the planting and harvesting of row, field, tree and vine crops, the production of milk, wastes of animal slaughtering and the operation of feedlots.

Hazardous wastes are chemical, biological, flammable, explosive or radioactive wastes found in the form of gases, solids or sludges. The municipal solid wastes are substantially important part among the various types of solid wastes. The physical composition of an representative municipal solid waste are given in Table 2.

Table 2. The components of an representative solid waste.

Component	Waste amount tonnes/day	Waste amount %
Food wastes	6-26	15
Paper	25-45	40
Cardboard	3-15	4
Plastics	2-8	3
Textiles	0-4	2
Rubber	0-2	0.5
Leather	0-2	0.5
Garden Trimmings	0-20	12
Wood	1-4	2
Glass	4-16	8
Tin cans	2-8	6
Non ferrous metals	0-1	1
Ferrous metals	1-4	2
Dirt, ashes and brick	0-10	4

Combustible components in municipal solid wastes are food wastes, paper, cardboard, plastics, textiles, rubber, leather, wood and dirt. However, plastic and rubber type wastes mainly comprise high sulfur and toxic components and produces high amount of toxic gases after combustion. Thus, plastics and rubber type wastes should not be burned. The chemical analysis of combustible waste materials are given in Table 3.

Leather, textiles, food wastes, paper, cardboard and wood contain high amount of carbon and hydrogen among various types of regional wastes. Dirt mainly provides high amount of ash after burning. The calorific values of combustible regional wastes are given in Table 4.

Table 3. The chemical analysis of combustible regional wastes.

Waste type	C, %	H, %	O, %	N, %	S, %	Ash, %
Food wastes	48	6.4	37.6	2.6	0.4	5.0
Paper	43.5	6.0	44.0	0.3	0.2	6.0
Cardboards	44	5.9	44.6	0.3	0.2	5.0
Textiles	55	6.6	31.2	4.6	0.15	2.5
Leather	60	8.0	11.6	10.0	0.4	10.0
Wood	49.5	6.0	42.7	0.2	0.1	1.5
Dirt	26.3	3.0	2.0	0.5	0.2	68.0

Table 4. The calorific value ranges of combustible regional wastes

Waste type	Calorific value range kJ/kg	Calorific value range kcal/kg
Food wastes	3490-6980	830-1660
Paper	11630-18600	2770-4440
Cardboard	13950-17440	3330-4160
Wood	17440-19770	4160-4720

The calorific values of wood and cardboards are adequate for combustion systems used in the several industries and also improves the fuel characteristics used in waste burning boilers.

3. METHOD

Chemical analysis of rose wastes representatively taken from rose processing plants were made. The standard test methods used in the classification of solid fuels were carried out. The results of chemical analysis of the samples of rose wastes are given in Table 5.

Table 5. Chemical analysis of rose wastes

	Original rose waste	Air dried rose waste	Dried rose waste	Carbon based
Ash, %	6.7	10.4	12.8	-
Moisture, %	47.5	18.7	-	-
Flue matter, %	38.3	58.7	72.2	82.8
Fixed carbon, %	7.5	12.2	15.0	17.2
Total	100	100	100	100

The rose wastes disposed in slurry form are dried in air by holding the waste on a nylon sheet for a few days in a controlled room. Those rose wastes are then comminuted and

brought to a very fine size, minus 1 mm. Subsequently, those waste fine compressed with binder addition. As binder tar and gasoline were used. Additionally, fine coal samples were added to rose wastes to improve the quality of coal. A certain amount of rose waste addition to coal has decreased the ash and total sulfur contents of coal samples. Even the addition of rose wastes to coal increased the flue matter of coal samples. However, hygroscopic moisture of rose wastes were high, 18.7%, and this high moisture content decrease the qualities of coal briquettes produced from the mixture coal and rose wastes. The resistivity to water of the briquettes are very low due to high moisture capture. To improve this quality gasoline was used and the briquettes were capable to resist moisture.

The calorific values and sulfur contents of rose wastes are given in Table 6. Air dried rose wastes contain maximum 0.5 % total sulfur and they are very advantageous among the other type of solid fuels. When the high sulfur coals are mixed with rose wastes with high weight ratios total sulfur contents of coal briquettes greatly decrease and those low sulfur briquettes provide the environmental specifications for solid fuels. Additionally, calorific values of air dried rose wastes is very close to the calorific values of some lignites and even over those of some solid fuels. The calorific value of rose wastes is 4325 kcal/kg and can be classified as second class solid fuel among the solid fuels with this calorific value.

Table 6. Total sulfur and calorific value of rose wastes.

	Original rose waste	Air dried rose waste	Dried rose waste	Carbon based
Sulfur, %	0.3	0.5	0.6	-
Calorific value kcal/kg	2500	4325	5320	6100

4. RESULTS

It is clearly understood that huge amount of wastes produced in the world must be recycled or beneficiated by certain techniques. In this point of view, the organic wastes such as wood, wood chips, olive seeds, animal dirt, rose wastes, nut shells should be beneficiated in energy production as solid fuel. The most efficient use of this type organic waste can increase the qualities of other solid fuels and even provide the efficient evaluation of other solid fuel deposits.

REFERENCES

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