



Power Generation from Non Edible Seed Cakes

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Abstract : Non edible seed oils are blended with diesel and used as a fuel from vehicle. After oil extraction the disposal of seed cakes are too difficult. Generally the seed cakes directly cannot able to feed animal food and the dehydration is also difficult. In this aspect the production of non edible seeds are gradually decreased. This research focused the power generation from Non Edible Jatropha and Non Edible Castor Seed cakes by using gasification technology and concludes that the Non edible Jatropha Seed Cakes yields maximum power when compare to Non Edible Castor Seed Cakes with less fuel consumption. The test is carried out of a fabricated 2kWe Biomass gasifier unit in Periyar Maniammai University, Vallam, Thanjavur, Tamilnadu.

Key words: Non edible seed cakes, Jatropha seed cake, Castor seed cake, Generation.

Introduction:

Things being they are making nation is going up against such an arrangement of issues, for example, bolster, control, warmth, and so forth. The sporadic progression of individuals the utilization of fuel is in like way expanded. Because of the slacking of the basic source non consumable oils mixed with the fortifies use the vehicles. Non Consumable Jatropha and Non Palatable Castor oils are utilized unmistakable applications mixed with oils. Thusly the making of the seeds are amplified yet the demand raised reusing/reuse then the specialists are secured different strategy for reuse the seed cakes, for example, Methenation, Corrosive neutralizer time etcetera., this examination paper centered a sort of reusing of the seed cakes for electric vitality period utilizing gasification improvement.

In India, the greater part of inside towns can't benefit control office. Certain strategy of individuals gets electrical criticalness effortlessly and recognizes it and in the interim another game-plan of society won't get and the areas are in piece outs. The rule reason is to passing on imperativeness to such places are particularly troublesome and the usage cost is too high. Because of this they won't set up to pick up power supply. So that the association expected to finish downsized scale structures or crossbreed control framework to meet their significance requests.

In like manner, it requires conveying centrality from the locally open fuel and moreover the period can get a handle on the accidental fuel or the mix of fortifies then just it is conceivable to make electric criticalness and to get steady power supply.

As showed by the Association of criticalness period report exhibits the nonattendance of electric centrality is raised to 8% up in the midst of the year 1984 – 2013 [1],[2],[3]. 75% shock rate and 288 million people lived in without power. Also, a relative time the season of non-possible power source is likewise lessened from 68% to 57% in the midst of the time of 2011 to 2035 [4], [5], [6].

India has been accountable for fitting around 10% of the progression when all is said in done centrality ask for since 2000. Its criticalness ask for in this period has essentially duplicated, pushing the country's share all in all demand up to 5.7% in 2013 from 4.4% toward the begin of the century. While stunning, this degree is still well underneath India's optimal around 18% current share of general masses, a strong pointer of the potential for further progress. Passed on a for each capita present, importance ask for in India has made by an all the all the more unassuming 46% since 2000 and remains just around 33% of the world ordinary, superfluously lower than the typical for the African landmass [7].

Peak control deficiency in the country tumbled to 5.4% at 7,556 megawatts (MW) in April from 7.4% a year back in view of extended reason for suppression and lower control use by states. The decline being utilized as a part of certain north Indian states was relied on to a slight intra-state sort out scattering of essentialness. As demonstrated by the latest data by the Central Power Pro (CEA), the total essential in the country a month prior was 1,40,998 MW, as against the supply of 1,33,442 MW—a pinnacle control inadequacy of 5.4% [8]. In 2015-16, the per-capita essentialness utilize is 22.042 Giga Joules (0.527 Mtoe) except for standard biomass use and the importance imperativeness of the Indian economy is 0.271 Super Joules for each INR (65 kcal/INR) [9].

To defeat it and to diminish the square outs, it is fundamental to make electrical criticalness relying upon the general fills to confine the piece outs and growth the electric vitality clients. the non consumable seeds are utilized different applications, for example, fabricated industry, concoction making and so on, This examination concentrates on Power period from Non pleasant seed cakes (Jatropha Non Eatable Seed Cakes, Castor Non Satisfactory Seed Cakes) utilizing Gasification Improvement.

It focuses on the possible use of oil seed cakes (castor, karanja, Jatropha and mahua) as bio pesticide against vermin, the extraction and unmistakable insistence of the dynamic piece responsible for the damaging quality for each oil seed cake and the aftereffects of the lab level bioassay of the dynamic part on termite bug [10].

This review discusses distinctive occupations of oil cakes in creating and biotechnological traces, their regard expansion by use in sustain and essentialness source (for the time of biogas, bio-oil) in like way [11].

The methodology of unsaturated fat methyl ester (Endorsement) of RSO was examined by GC. Normal examination of RSO and RSO-biodiesel were other than performed. Warm properties of the oil and biodiesel were evaluated by TGA examination. The biodiesel properties of RSO were explored and seen to be comparable with diesel [12].

Unsaturated fat methyl ester (Reputation) from chilly crushed soapnut seed oil was envisioned as biodiesel hotspot shockingly. Soapnut oil was found to have standard of 9.1% free FA, 84.43% triglycerides, 4.88% sterol and 1.59% others. Jatropha oil contains around 14% free FA, about 5% higher than soapnut oil. Soapnut oil biodiesel contains around 85% unsaturated FA while jatropha oil biodiesel was found to have around 80% unsaturated FA. Oleic hazardous clearly was the dazzling FA in both soapnut and jatropha biodiesel. Over 97% change to Notoriety was ace for both soapnut and jatropha oil [13].

The present paper focuses on the use of oil seed cakes as a substrate for the advancement of living being *Paecilomyces* and as bio pesticide against termite. The foul element parts accountable for the destructiveness for each oil seed cake were expelled and the lab level bioassays were done against termite. Karanja cake based agar medium at C:N extent 40:1 and pH 7 conveyed most outrageous extended improvement and spore check per petri dish which were at standard with business Czapeck-Dox agar media. The watery and methanolic removes and the foul element parts from each one of the cakes exhibited capable termite mortality [14] and it centers the different utilizations of Non Consumable Jatropha Seed Cakes [15].

The review paper depicts the fuel properties of biodiesel creation get ready and the most basic components that effect the transesterification reaction of non consumable oils [16]. From the overview finished up the vast majority of the Non palatable seed utilized as a part of the type of oil with different applications.

Objectives of the research:

- ✓ Meet the energy demand in rural applications
- ✓ To increase the usage of gasifier for Thermal/ Power Generation
- ✓ To increase the production of Non Edible Cakes (Jatropha, Castor, Pungamia etc.)
- ✓ To improve the effective utilization of cakes
- ✓ Increase the local employability

Social relevance and usefulness of the proposed research:

- To avoid human hazardous
- Reduce the CO₂ emission
- Effective utilization of non edible seed cakes

Biomass Gasifier:

It is not another vitality framework. There are confirmations that it is utilized amid the Second World War. Be that as it may, from that point forward, the improvement of petroleum derivatives it is not utilized further. At present the rotting of petroleum derivatives brought about the need of exchange vitality, the vitality division concentrates on different sorts of sustainable power source to take care of the vitality demand. Biomass Gasifier is one of the promising strategies to meet this. The incomplete ignition of fills creates gas. The maker gas can be utilized either in warm application or power era. For the most part it can be ordered into different sorts, for example, UP draft Gasifier, down draft Gasifier, and so on; Down draft Gasifier is utilized to Electrical Vitality era from the seed cakes.

Gasification:

Gasification is a procedure that believes natural or non-renewable energy source based carbonaceous materials into carbon monoxide, hydrogen and carbon dioxide. This is accomplished by responding the material at high temperatures (>700 °C), without ignition, with a controlled measure of oxygen as well as steam [17].



Figure – 1 Fabricated 2 Kw Biomass Gasifier

It was accomplished by utilizing different procedures. They are Drying, Pyrolysis, Oxidation, and Decrease.

Drying: The seed cake are warmed and dried at the highest point of the Gasifier unit. Dampness contained in the seed cake is evacuated in this district to a level underneath 20%.

Pyrolysis: The dried seed cake enters the second zone. The vaporous items from de-volatilization are in part consumed with the current air. This procedure is named as Pyrolysis.

Oxidation: The yield from the Pyrolysis zone responds with the scorch without oxygen at the temperature around 800-900oC.

Decrease: From this zone the CO₂ and H₂O respond with the carbon in the singe which causes these gasses to diminish to CO, H₂ and CH₄ deserting the minerals of the scorch as fiery debris. At that point the maker gas exist the reactor commonly in the scope of 200 – 300oC.

Working system:

To accomplish the power quality investigation it includes different procedures they are demonstrated as follows.

(i) Fuel readiness

The oil removed Jatropha seed cakes were gathered from the oil factories. The seed cakes are having 10 % to 16 % oil content. This oil substance will make disintegration and erosion issue. Thus before utilize it ought to dried utilizing normal drying procedure or utilizing dryer. To lessen the dampness content it can be utilized to sustain as a fuel to the Gasifier.

(ii) Gasification

After the drying procedure the seed cakes are encouraged into the Gasifier and terminating process. At the same time exchanged on the blower, the blower sucks the different mixes of gasses with fine tidy particles.

(iii) Filtering unit

After that the gasification procedure the gasses will enter the separating unit. This unit is utilized to evacuate the clean particles and the undesirable gasses.

(i) Analyzer

The maker gas enters into the analyzer. The analyzer examination different blend of gasses, for example, CO, CO₂, C_nH_m and so on,

CHNS Analysis – Jatropha Seed Cake

Weight: 5.5690 mg

Si.No	Parameter	Content in %
01	C	42.39
02	H	19.33
03	N	4.311
04	S	0.039

CHNS Analysis – Castor Seed Cake

weight: 5.56 mg

Si.No	Parameter	Content in %
01	C	32.08
02	H	4.228
03	N	5.159
04	S	000

Conversion Efficiency (n_c) – Jatropha Seed Cake:

The following equation was used to determine the conversion efficiency (n_c) of the gasifier.

$$n_c = \frac{\text{Gas flow} \times \text{GCV of gas}}{\text{Feed rate} \times \text{HHV of fuel}} \times 100$$

Calculated conversion efficiency of Jatropha seed cake shown in below table– 1

Feed rate	Gas flow	GCV of gas	HHV	n_c
4	16.4	2454	18200	55.4
5	18.2	2676	18200	53.51
6	20.7	2973	18200	67.22

Calculated conversion efficiency of Castor seed cake shown in below table -2

Feed rate	Gas flow	GCV of gas	HHV	η_c
4	15.8	2085	17470	47.14
5	18	2554	17470	52.62
6	20.5	2923	17470	57.16

(i) Utilization

At last the maker gas is entered into the generator. The generator produces electrical power and it can be used the different blend of burdens, for example, Resistive load, Inductive load, and so forth.

Trial Consider:

The Non eatable Jatropha seed cakes are non-degradable material. It can't be utilized to bolster creatures and it won't get dried out. This seed cake was utilized to create Warm vitality/Electric vitality and yield was confirmed [18]. A convenient manufactured 2 kW biomass gasifier is appeared in figure 1 and the heap test is confirmed with the assistance of Resistive and Inductive loads.



Experimental set up for Biomass Gasifier Power generation with Inductive / Resistive loads

Load test (without gasifier – R - Load):

Table -1 shows that the various output current/power depending upon the load.

Table – 3

Voltage: 230 V

Sl.No	I in Amps	P in Watts
1	2.5	110
2	3.0	165
3	3.5	235
4	4.0	340
5	4.5	395
6	5.0	465
7	5.5	480

Load test (with gasifier –R - Load):

Fuel : Petrol65% Producer Gas 35 % (Jatropha Seed Cakes)

(Note: The fuel –Petrol consumption is find out with the help of Millage tester/ Fuel tester)

Table -4 various output Current/Power depending upon the load.Voltage: 230 V

Sl.No	I in Amps	P in Watts
1	2.5	110
2	3.0	165
3	3.5	235
4	4.0	340
5	4.5	395
6	5.0	465
7	5.5	480

Load test (without gasifier – L - Load):

Table -5 shows that the various output current/power depending upon the load.Voltage: 230 V

Sl.No	I in Amps	P in Watts
1	2.4	200
2	2.8	320
3	3.0	480
4	3.2	560
5	3.6	640
6	4.0	800
7	4.3	880

Load test (with gasifier –L - Load):

Fuel: Petrol 65 % Producer Gas 35 %

(Note: The fuel –Petrol consumption is find out with the help of Millage tester/ Fuel tester)

Table -6 various output Current/Power depending upon the load.Voltage: 230 V

Sl.No	I in Amps	P in Watts
1	2.3	200
2	2.6	320
3	3.2	480
4	3.5	560
5	3.8	640
6	4.0	800
7	4.5	880

Load test (with gasifier –R - Load):

Fuel : Petrol 70% Producer Gas 30 % (Castor Seed Cakes)

(Note: The fuel –Petrol consumption is find out with the help of Millage tester/ Fuel tester)

Table -7 various output Current/Power depending upon the load.Voltage: 230 V

Sl.No	I in Amps	P in Watts
1	2.5	110
2	3.0	165
3	3.5	235
4	4.0	340
5	4.5	395
6	5.0	465
7	5.5	480

Load test (with gasifier –L - Load):

Fuel - Petrol=70 % Producer Gas = 30 %

(Note: The fuel –Petrol consumption is find out with the help of Millage tester/ Fuel tester)

Table -8 various output Current/Power depending upon the load.Voltage: 230 V

Sl.No	I in Amps	P in Watts
1	2.5	200
2	2.6	320
3	3.4	480
4	3.5	560
5	3.8	640
6	4.2	800
7	4.5	880

Conclusion:

The exploration work infers that the different parameters of Non Palatable Jatropha seed cakes were broke down. Also, it finishes up the Non Eatable Jatropha seed cake could be utilized to power era and the yield power was checked by utilizing Resistive and Inductive burdens. Jatropha Seed Cake associated with 0.25 kW with Gasifier unit it devoured 65% Oil and 35% of Maker gas delivered by Jatropha seed cakes and a similar load Castor seed cake will expend 70% of Oil and 30% of Created gas. This outcome demonstrates that Both Non Palatable Seed cakes are appropriate for power era. What's more, at present the usage of Jatropha seed cake minimal more financial of energy era when contrast with Castor seed cakes. In future the examination work broadens the powerful usage of the seed cakes to embrace different strategies. And to upgrade the utilization of Non Eatable Seed Cakes for different applications.

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