

To Increase Feasibility of Biodiesel Obtain Thoroughly From Household Residues

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ABSTRACT

Now-a-days developing countries are chasing air pollution due to emitted effluents like CO₂, CO, SO₂, NO_x, HC, etc mostly result of burning fuel. So Greener fuel that is Biodiesel is best alternative to feed much more demands against non-renewable fuel also deals the price as compared to traditional one. The main objective is to lower the cost along with alternative route for methanol production which is supplement to Biodiesel, which ultimately makes it more feasible and best method to waste management. This process makes use of methane obtained from gas produced by Septic tanks also by decomposition of bio-degradable wastes. Hence further conversion of methane to methanol takes place by fermentation. So it is beneficial to make Biodiesel use on large scale and all its required composition is obtained within home. Thus this process is economical as it saves fossil-fuel cost also makes disposal of home wastes and inturn protects environment.

Keywords: Thermoplastic, Transessterification, Cloud Point, TAG- Triacyl-glycerol.

I. INTRODUCTION

In future decades, there will be excessive demand for energy required for various purposes. Because of fast depletion of fossil fuel, their increasing prices all this problems are solved using 'Biodiesel' an best renewable non-conventional fuel source.

As correctly stated by Sir Rudolph Diesel, "the use of vegetable oil as engine fuel may seem insignificant today but such oils may became in course of time as important as petroleum and coaltar products of present." As Biodiesel is composed of plants, vegetables even used oils as well as rendered animal fats, which is purely green and domestically producible. The biodiesel can be made from oils of

Soyabean, Groundnut, Mustard, cottonseed (most cheap and viable), etc. also some animal fats are capable. On mentioned basis US annually estimated to produced 5 billion gallons of biodiesel. But above constituents faces problem of jelly formation due to paraffin present at low temperature is one of the drawback. Also due to methanol cost along with transportation made biodiesel expensive.

As per daily observation due to certain difficulties and complex processes lead to Biodiesel ignorance. So to overcome the trial was made successfully to obtain Biodiesel at domestic level with more simplicity and ease which would help its inculcation in day to day life with 90% reduced cost than fossil fuel.

Thus we produced biodiesel from home made methanol which also saves transportation cost and makes it 90% cheaper than fossil fuels. As the desirable property of biodiesel to dissolve thermoplastic, successfully eliminated first drawback of coagulation as by mixing mustard oil with cotton seed plus mixing thermoplastic.

The fuel formation of various oils is given below:

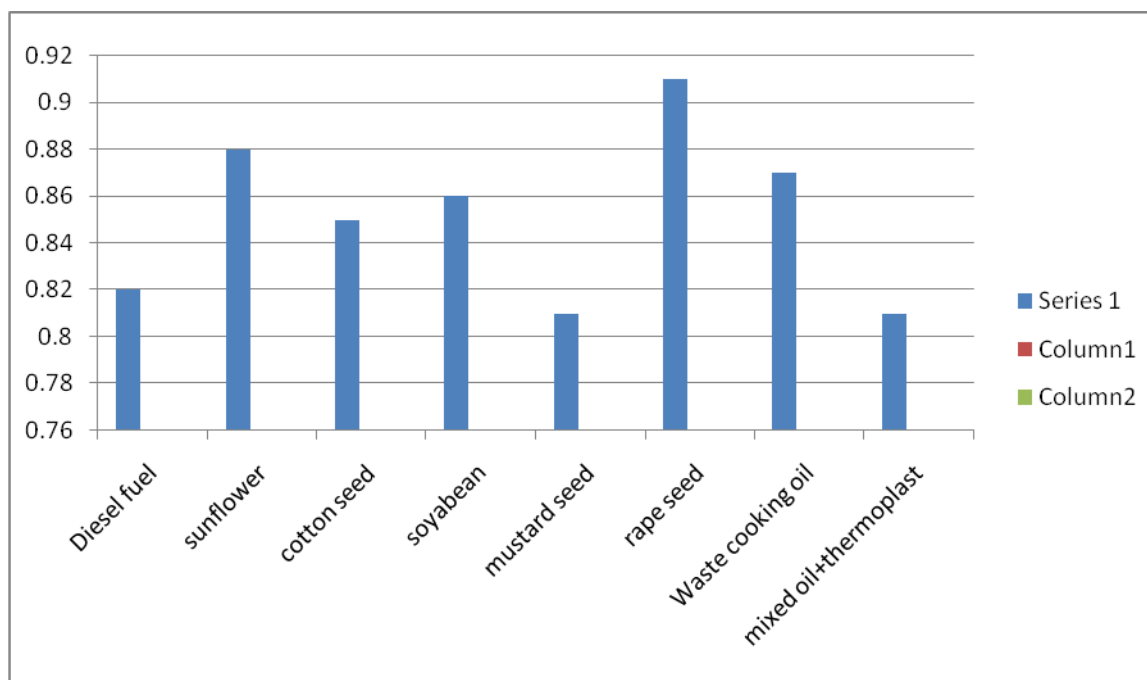


Fig 11: Comparison of Specific Gravity of waste cooking oil with other biodiesel fuel

TABLE 1: The below table gives Combustion Capability with Specific Gravity in detail:

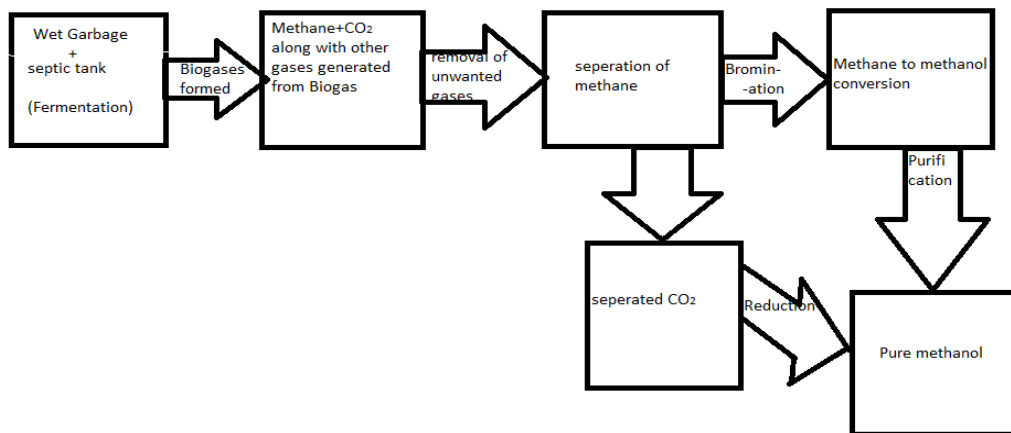
Fuel type	Heat of Combustion(KJ/Kg)	Specific Gravity
Diesel fuel	43350	0.815
Sunflower Biodiesel	40570	0.880
Cotton seed Biodiesel	40580	0.850
Soyabean Biodiesel	39760	0.860
Mustard seed Biodiesel	41030	0.813
Mixed oil+Thermoplastic Biodiesel	41800	0.810

Henceforth, the reaction proceeds with addition of Methanol with above oils. So our main focus was to produce methanol in home with domestic equipments. The methanol is obtained by bromination of stored methane gas collected from Septic tank outlet and outlet of small wet garbage mini bio gas plant. The equipments used were discarded simple tools, which we considered as waste.

Thus our motto to produce convenient biodiesel, simply processed and truly “Best Out Of The Waste” product.

II.METHODOLOGY

This typical process consist of formation of methanol by the block diagram as shown below:

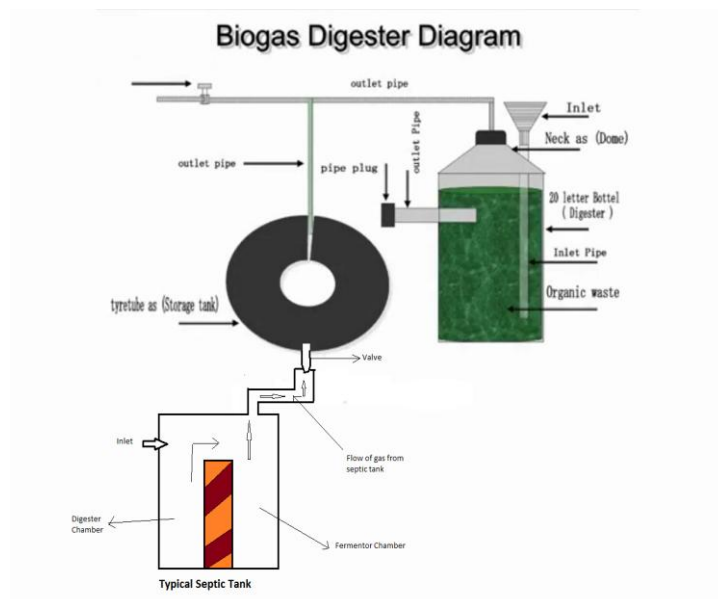


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Fig 2:The Flowchart of Methanol production

The above denoted block diagram shows typical biogas plant which produces the methane gas hence proceeds to methanol. The process so described is simple and with least setup cost which finally gives biodiesel which is money saving.

Fig 3: The detailed methane generation is stated below:

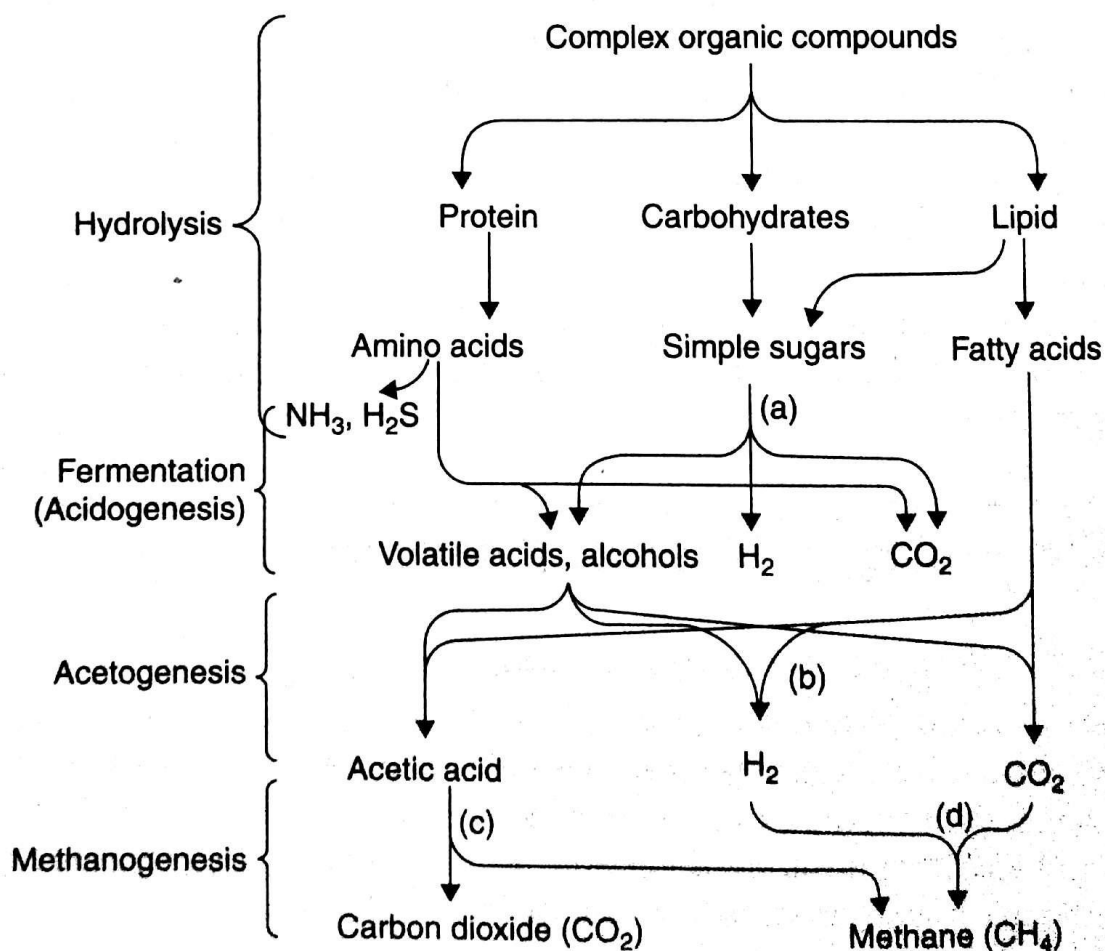


The aspects of above methane production plant are- specific container acting as mini biogas plant, pvc pipes, t-shape valves, tyre tube, outlet from septic tank and other simple accessories.

The formation of methane is listed below:

- Connect pvc pipe to outlet of specific container then to its upper valve and further directly to tyre tube.
- Now take 20lit bottle (disposer of wet garbage) for putting wet garbage in it and other biodegradable waste.
- Cut and fit the pipes properly as shown in above diagram. So the proper connection should be ensured by connecting outlet of mini gas plants to inlet valve of tyre tube.
- Similarly more amount of gas can be obtained by residues of septic tank which is considered as totally invain. Thus outlet from this tank is given to tube by proper pipe and valve arrangement.
- So In this way we can obtained large amount of methane gas at household level which is not only sufficient but more than requirement for biodiesel production.

The methane formation from fermenter chamber takes place as:



After methane generation next step is to convert methane to methanol which consist of direct conversion to methanol and other route is bromination.



This conversion is bit possible requires unique condition.

The another route :

The from biogas plant is scrubbed for H_2O then passed through Br_2/CCL_4 solution for bromination of CH_4 finally $\text{CH}_3\text{-Br}$ is passed through KOH again to get $\text{CH}_3\text{-OH}$ and K-Br . Methyl alcohol is separated by fractional distillation process. These experiment can be performed in open or well ventilated labs, the process of alcohol formation is easy and convenient.

Thus we obtain Methanol at domestic level i.e which is expensive outside.

The main aspect of our experiment was to produce better quality, jelly formation resistant, more heat producible and domestic level Biodiesel with negligible amount. Preferred methods of production of biodiesel typically consist of blending of oil sources with alcohols with aid of either acid or base catalysis, the simple procedures outlined for production of fuel-grade biodiesel from various oil sections is given in this section:

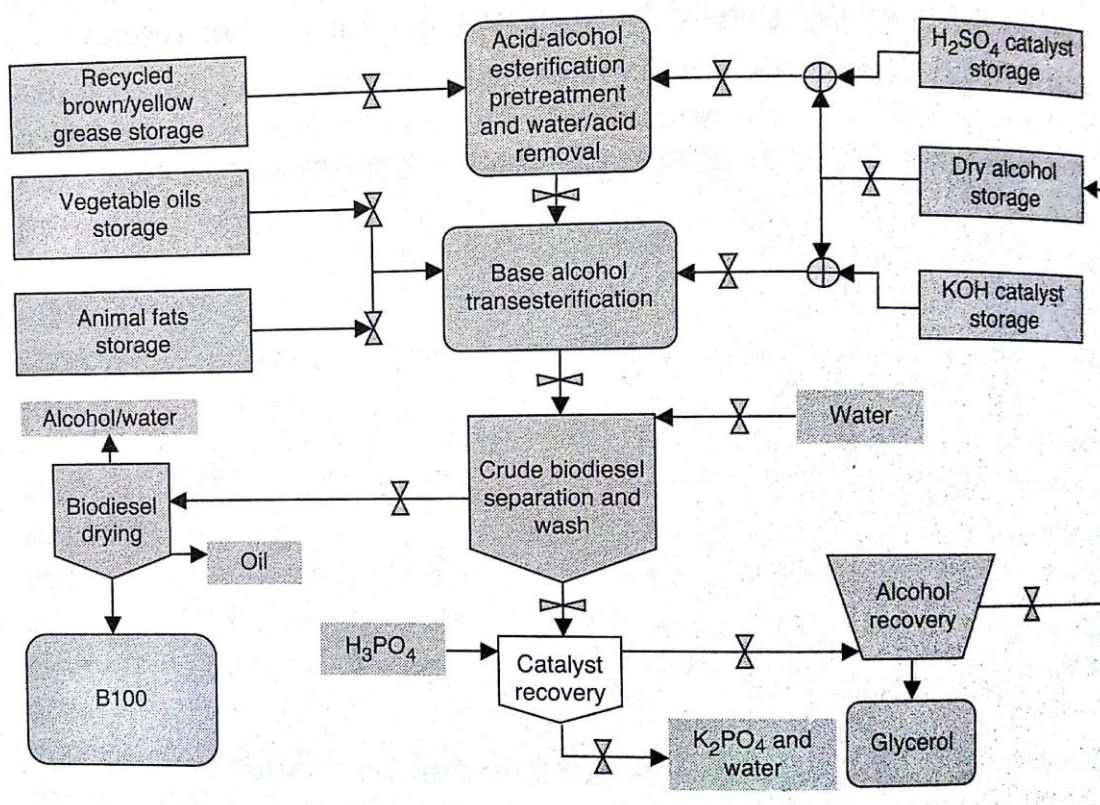


Fig 4:Flowchart of Biodiesel production

The Blending of Methanol with used oil, which contains yellow or brown grease like content for further reaction. The oil used was mixed i.e Mustard with Cottonseed which was cheapest among other and combines properties of both type and gave better results than traditional way.

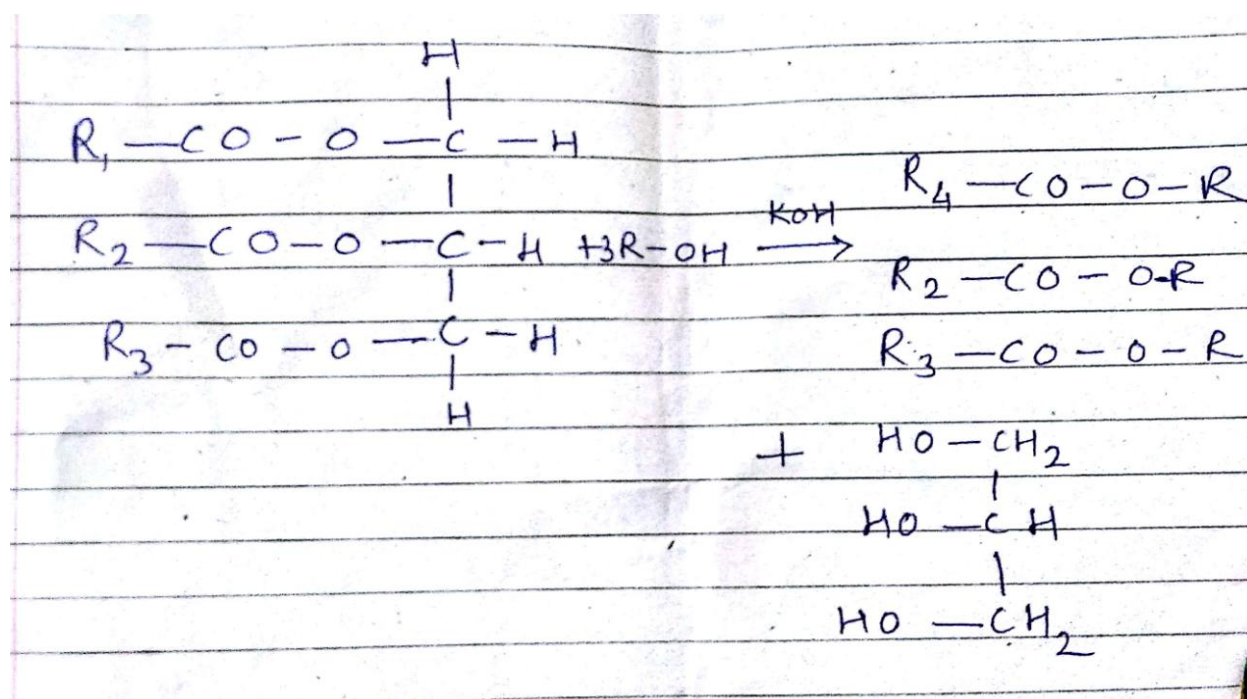
The blending to form Biodiesel involves;

- Heating of oil about 60°C with using heating mantle with temperature range $0-120^{\circ}\text{C}$ to further reduce reaction time.
- **Addition of Catalyst(KOH):** Less than 1 gm of KOH as roughly described by titration process was added to methanol(which was 60% in excess) prior to Methanolysis of heated oil. Continuous agitation for 90min using shaker was done to ensure complete dissolution of catalyst.
- **Transesterification:** The methanol to excess was added to preheated oil in 250ml beaker serving as a bath reactor. The mixture was agitated in at 200rpm for 90min and then left overnight to phase separation to take place due to gravity. The yield about 40% was obtained, though it can be greatly improved by tampering with the process using thermokinetics condition. This aspect is ongoing and can be separately published. The following step is purification of fuel. The representation is:



- **Washing of Fuel:** This was done using small quantity of water. The purpose is to wash out the remnants of catalyst and other impurities. The washing process was repeated for several times until the washed water becomes clear. The clean biodiesel was dried in an incubator for 48hr, the final product was analyzed to determine its fuel properties.

The actual reaction takes place as:



These reaction is then lastly followed by Reduction process.

Despite traditional method of using Biodiesel we modified the process by changing some oil composition of biodieseli.e mixed Mustard oil with Cotton seed oil as mustard has less paraffin content and cottonseed is cheap. After proper purification of biodiesel, before use in engine we added thermoplastic which gets dissolved in it and prevents gelly formation as well as increases heat during combustion. So as given above, we can totally

avoid ever price increasing fossil fuel(diesel) instead by following this way we can easily produce more biodiesel as per requirement and can save much more with simple household things that will lead to reduction in pollution rate hence helps in sustaining environment.

III.RESULT AND RECOMMENDATION

The Result of estimated biogas use is not upto its mark except some countries as shown:

All Biofuels Index at Q2 2007

Ranking*		Country	All Biofuels	Ethanol	Biodiesel	Infrastructure
1	(1)	US	75	81	69	90
2	(2)	Brazil	71	76	66	94
3	(3)	Germany	67	69	64	81
4	(4)	France	66	65	67	70
5	(5)	Spain	65	66	64	61
6	(7)	Sweden	59	62	56	76
7	(6)	UK	58	60	58	76
8	(8)	Canada	57	65	49	66
9	(9)	Italy	53	51	55	47
10	(10)	Thailand	52	52	52	44
11	(11)	China	51	53	49	50
12	(13)	The Netherlands	51	51	51	59
13	(-)	Indonesia	49	48	50	44
14	(14)	India	48	50	46	46
15	(12)	Australia	47	51	45	56

Source: Ernst & Young

*Ranking in the Q1 2007 All Biofuels Index in brackets

TABLE 2: Biodiesel and Ethanol use

This findings shows that even many parts are unknown to household production of biodiesel,these process is totally made from discarded(domestic garbage) hence negligible initial cost but can produce litres of biodiesel within course of process so helps in dealing with increasing cost and demand of natural fuels.As there is day by day rise in price so became very inconvenient,some price rates of local market listed below:

City/Rate per litre	Before	Now
Delhi	Rs 65.64	Rs 73.18
Mumbai	Rs 70.66	Rs 78.57
Kolkata	Rs 70.03	Rs 77.88
Chennai	Rs 69.55	Rs 77.53

Although till now biodiesel was considered as expensive due to requirement of foreign component methanol(costly) so was ignored but we produced methane within home using waste products so its beneficial

and reduced (only initial setup cost) cost and made convenient for use. By this way one can try for commercial use also by collecting garbage hence will check pollution ultimately.

Also another cause or its ignorance was its cloud formation at low temperature i.e. coagulation was eliminated by addition of thermoplastic to biodiesel composition which additionally supported combustion in engine.

Henceforth biodiesel should be produced at domestic level which indirectly cleans environment by disposal of household residues and saves money.

IV. CONCLUSION

Thus Biodiesel obtained from this process is proved beneficial as-

- All composition of biodiesel is prepared at household level so no chances of going in market for buying any expensive components (i.e. methanol)
- Utilizes almost all bio-degradable household wastes.
- Very profitable and non polluting fuel generation only requires lesser setup cost.
- Efficiency can be increased by adding Thermoplastic to it.
- The cheapest fuel production method.

So to meet ever increasing demand of exhaustible Fossil fuel, Biodiesel is best alternative with much more advantages. Uses all the composition which is considered as waste, also let to be wasted as it is thus utilized at its best level to satisfy energy demands.

The process proceeds with normal limitation discussed as follows:

- Slow process as involves microbial digestion.
- Can require small additional place for some reactions as mentioned.
- Efficiency of Biodiesel is less as compared to traditional.
- Elimination of paraffin from oil to prevent cloud point formation is difficult task.

As everything has minor drawbacks but in front of its numerous advantages, it can be practiced at domestic scale as being profitable and ecofriendly. Thus we get multibeneficial fuel with tremendous reduced cost.

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