

Design and Fabrication of Fixed Bed Reactor

K.P.Shankar^{1*}, G.Mouli², R.Muthukumar², D.Poovarasan², M.Prakash²

¹Assistant Professor, Department of Mechical Engg, SriGuru Institute of Technology, Coimbatore, TN, India.

²UG Student, Department of Mechical Engg, SriGuru Institute of Technology, Coimbatore, TN, India.

*Corresponding author E-Mail ID: shankarraajamech@gmail.com, Mobile: +91 9629385538.

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ABSTRACT

There are many bio waste available in our day to day life, instead of dumping them, we can make use of that waste matter by extracting oil from such bio wastes by using a setup called “fixed bed reactor” so many research has been made in past on this fixed bed reactor, in which we are conducting experiments on different bio wastes and going to extract oil on that corresponding wastes(dry seeds) with a heating element of 0 to 300°C, here we changed the cooling system and in that oil will be collected from the overflow of the condenser bath.

Keywords: Suspension system, C40, C70 steel, Al-SiC composites, Static structural analysis, Helical Spring.

1. INTRODUCTION

Waste refers to waste of all sorts of resources, however particularly the fabric resources that constitutes a big portion. Wastages are seen altogether walks of life, like improper isolation water faucets, use of wood and scrap as fuel, needless turning on lights and conspicuous left over at eating tables etc. Up to concerning ten to fifteen % grains in our country are devoured by birds, rats and different insects which may convert the deficit into surplus. Wastages may end up in business because of over specifications or underneath specifications. The origin is also industrial, residential, industrial, office, municipal construction and agricultural etc. Resources are also within the variety of time, energy, materials, capital within the variety of instrumentation / machines, or services like transport, health or communication. Material resources like solids, gases and liquids will be wasted. An energy resource is also human, star or physical could go as waste. A Non-Biodegradable material will be outlined as a sort of substance that can't be de-escalated by natural organisms and acts as a supply of pollution. Non-biodegradable wastes are people who can't be rotten or dissolved by natural agents. they continue to be on earth for thousands of years with none degradation. Non-Biodegradable wastes are people who cannot break down or degrade for several years. These are waste that can't develop into manure and that they gather inflicting pollution. Burning of those fuels causes additional pollution within the atmosphere. The non-biodegradable wastes become helpful once they will be recycled. Perishable waste includes any organic matter in waste which may be de-escalated into greenhouse emission, water, paraffin or easy organic molecules by micro-organisms and different living things by composting, aerobic digestion, anaerobic digestion or similar processes. In waste management, it additionally includes some inorganic materials which may be rotten by bacterium. Such materials embrace mineral and its product like gypsum board and different easy organic sulfates which may decompose to yield atomic number 1 provided in anaerobic land-fill conditions. In domestic waste assortment, the scope of perishable waste is also narrowed to incorporate solely those degradable wastes capable of being handled within the native waste handling facilities. Example- Human and animal waste product, Plant product like rubber, paper, wood, leaves, cotton, and wool, Dead

remains of living organisms, room waste, Agricultural waste. Non perishable materials are those that can't be degraded by natural processes into usable forms

2. REACTOR

A bioreactor might check with any factory-made or built device or system that supports a biologically active setting. In one case, a bioreactor could be a vessel that|during which|within which} a chemical action is meted out which involves organisms or biochemically active substances derived from such organisms.

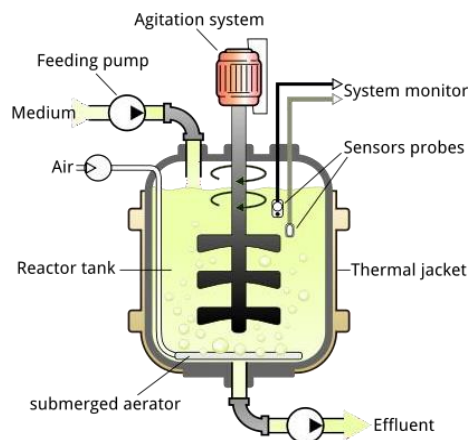


Fig1. General structure of bio reactor

A fixed bed reactor could be a cylindrical tube crammed with catalyst pellets with reactants flowing through the bed and being reborn into product. The flow of a set bed reactor is often downward.

3. PROBLEM IDENTIFICATION

Generally in bed reactor, condenser plays an vital role in the formation of the product. In which there is wastages of vapor which is coming from the boiler through the connective pipes. So, in order to avoid such wastages of vapors', we designed a new type of condensing technique by which 100% vapor can be converted into oil Thus we can achieve cent percent efficiency

4. DESIGN AND FABRICATION



Fig2. Experimental Setup

5. MATERIALS DESCRIPTION

5.1 Boiler

We used boiler to heat the seed and vaporizes the oil content in that seed.

Specification

Height - 200mm
Diameter - 130mm
Thickness - 0.5mm
Material - stainless steel
Temperature withstand upto 400°C



Fig 3

5.2 Heater

Nichrome coil is used to heat the boiler, we know that nichrome has the high melting point (i.e.) 1200°C and I also have very high electric resistance thus we can convert the electrical energy to heat energy.

Specification

Supply - AC
Power - 700w
Voltage - 220v



Fig 4

5.3 Connecting Pipe

It is used to transfer oil vapor that is created from the feeded seeds in boiler to condenser bath.

Specification

Diameter - 1"inch
Material - Stainless steel
Joints - Brass weld



Fig 5

5.4 Condenser Bath

It used to provide a bath for out coming hot vapor from the connecting pipe thereby it will get condense by contacting bath directly without any material medium. It has over flow duct on the side wall.

Specification

Material - Glass
Height - 183mm
Length - 450mm
Width - 150mm
Bath - Water (density- 997kg/)



Fig 6

5.5 Copper tube

It is used to carry heat from bath to cooling fan by carrying a flow of water from storage to storage tank through bath and cooling fan

Specification

Outer Diameter - 6.3mm
Inner diameter - 6mm
Material - Copper



Fig 7

5.6 Circulation Pump

It is used to circulate the water along the copper tube. The copper tube is running from bath to cooling fan

Specification

Q_{max} - 1500 L/hr
Power supply - AC
Delivery height - 0.8m
Type - Submersible (centrifugal)



Fig 8

5.7 Cooling Fan

It used to remove heat from copper tube to the atmosphere by the process called convection (i.e.) transferring heat by means of air medium

Specification

Size	- 6"inch
Power supply	- AC
Voltage	- 230v



Fig 9

5.8 Control Board

It is used to regulate the power supply to the heater and it having various meters like,

Specification

Voltmeter	– 0-500v
Thermocouple	- 0-1200°C
Circuit breaker	- (single pole)
Voltage regulator	- 7 stages



Fig 10

5.9 Circulation Tank

It is a separate tank contains water and acts as a reservoir, from which the circulation pump will sucks the water and delivers into a copper tube. Water level in this tank will remain same because the system is closed system.

6. EXPERIMENTAL WORKING

Due to high resistance of the heating coil it produce high temperature when the terminals were connected with source ,the heat will transferred to the heating chamber and the dry solid waste inside the heating chamber will get heated and this will made the oil content in the wastes to evaporate and it will move to condensing bath by means of connecting pipe. In condensing bath, due to water at normal atmospheric temperature and pressure, the vapor will get condensed and return to the liquid state. Now we all know that the density of oil is comparatively low (870kg/), so the oil will float on the top layer of the condenser bath and that can be collected in a separate container through over flow duct on the side wall off the condenser bath. In order to keep the bath in a atmospheric condition, separate cooling system is provided along with the condenser bath. Cooling system consists of circulating pump, copper tube, cooling fan and reservoir tank. Water will flows like the following

Reservoir → condensing bath → cooling fan → reservoir

7. CONCLUSION

In this experimental study, the unit production cost of pyrolytic oil from different waste such as tire, wood, dry seeds. The main products that can be found from the pyrolysis reactor are fuel, gas and char. The highest temperature of the reactor was 450°C. The use of waste for the production of pyrolysis oil will decrease the land filling, furnace oil, export, steel export and it will decrease dissipation of wastes with the aim of safer energy production. Te process also offers the potential for production of economically attractive non-fuel products.

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Conflict of Interest

None of the authors have any conflicts of interest to declare.

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