

FEASIBILITY REPORT						
PROJECT NO.	CLIENT	SECTION	DOCUMENT NO.	REV. NO.	PAGE NO.	ISSUE DATE
CBS-101	Enzyme Biodiesel	Biodiesel	CBS-FBR-2019	0	Page 1 of 9	04/05/2020

### FEASIBILITY REPORT

TITLE	: FEASIBILITY REPORT
CLIENT	: Enzyme Based Biodiesel Plant
PLANT	: 30 MT Per day BIODIESEL PLANT
LOCATION	: Indian State with overseas comparision
PROJECT NO.	: CBS-101
DOCUMENT NO.	: CBS-FBR-2020

0	04/02/2020	PCS	CBS	CBS	FOR APPROVAL
REV. NO.	DATE	PREPARED BY	CHECKED BY	APPROVED BY	REMARKS

<b>CONFIDENTIAL</b>	Confidential Feasibility Report By Chetan Sayankar Biodiesel consultant. S-Cube Mass Transfer Pvt. Ltd . This report will not be share to anybody without consulting to Mr. Chetan Sayankar .
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## 1. Preamble

Thank you very much for showing interest in S- Cube Mass Transfer Pvt Ltd Patented technology . In accordance with the consultancy services interest offered by your company Biodiesel business potential study.

This report encapsulates findings of the study carried out by the Consultant for data mining and for gaining sufficient information of Multifeed stock based Biodiesel plant opportunities in India , USA & rest of the World.

Based on the information gathered by the consultant, a preliminary assessment of business potential for production of Multifeedstock like Palm oil, Corn oil,Animal Tallow , etc Biodiesel is included in report.

## 2. What is Biodiesel?

Biodiesel refers to a non-petroleum-based diesel fuel consisting of short chain alkyl (Methyl or ethyl) esters, made by Transesterfication of vegetable oil or animal fat which can be used (alone, or blended with conventional petrodiesel) in unmodified diesel-engine vehicles. Biodiesel is distinguished from the straight vegetable oil (SVO) (sometimes referred to as "waste vegetable oil", "WVO", "used vegetable oil", "UVO", "pure plant oil", "PPO") used (alone, or blended) as fuels in some converted diesel vehicles. "Biodiesel" is standardized as mono-alkyl ester.

Biodiesel is a biofuel produced from various feedstock's including vegetable oils (such as oilseed, rapeseed and soya bean), animal fats or algae. Biodiesel can be blended with diesel for use in diesel engine vehicles. Biofuel – The term biofuel applies to any solid, liquid, or gaseous fuel produced from organic (once-living) matter. The word biofuel covers a wide range of products, some of which are commercially available today, and some of which are still in research and development. Biodiesel is a fuel made from plant oils that can be used in a conventional diesel engine.

Biodiesel is an environmentally safe, low polluting fuel for most diesels internal combustion and turbine engines. Can be mixed with petroleum diesel fuel and stored anywhere petroleum is. It is made from fresh or waste vegetable oils (triglycerides) that are a renewable energy source. Bio-diesel is an eco-friendly, alternative diesel fuel prepared from domestic renewable resources that is vegetables oils (edible & non-edible oil) and animal fats. These natural oils & fats are made up mainly of tryglycerides. These tryglycerides when reacted chemically with lower alcohols in presence of catalyst result in fatty acid esters. These esters **show striking similarity to petroleum derived diesel and are called "Bio-diesel"**.

## Enzymatic vs Chemical Process

Parameter	Enzymatic Process	Conventional Process
Reaction Temperature (°C)	Low Energy 10 – 40 °C	High Energy 60 -70 °C
Feedstock % FFA in Feedstock 1 - 99% FFA	Any purity Feedstock FFA Transformed into EE ( down to 2% FFA)	Only Pure Veg Oil Makes SOAP with FFA !! Should be pre-treated in an acidic process for removal !!
Water in Feedstocks	No effect on biocatalyst ( up to 5% H <sub>2</sub> O)	Destroys Catalyst - Interferes with the catalyst and results in producing soaps.
EE yield	>95%	Typically 95%
Glycerin quality	Transparent, and salt-free	Black-brownish, pH > 7 & contains salt
Catalyst removal	The biocatalyst is (Recyclable)	The final products require repeated washings for removal of the catalyst
Alcohol recovery	No excess of alcohol (water level (up to 5%))	Large Excess alcohol (% water is prohibited) requires stripping from the final products
Waste generation	Extremely low waste	Large Waste- saline/alkaline and catalyst waste H <sub>2</sub> O
Capital costs	Low - retrofitting enzymatic reactor possible	High CAPEX

### 3. Overview of the Study Objectives

#### Bio-Diesel Production in India

#### What is Bio-Diesel Production?

India is considered to be a diesel- deficit nation. Its production in India is not as per its rapidly growing demand. In order to overcome this deficiency, bio-diesel startup is the need of the hour in India. As it is considered to be a good substitute for conventional diesel. It is a renewable fuel that doesn't pollute the environment and can comfortably work on any diesel-powered machine.

*“Small and medium enterprises have bought Biodiesel and sold to individual consumers and Progressive farmers, in order to supply energy for brick kilns, backup power diesel generators etc.”*

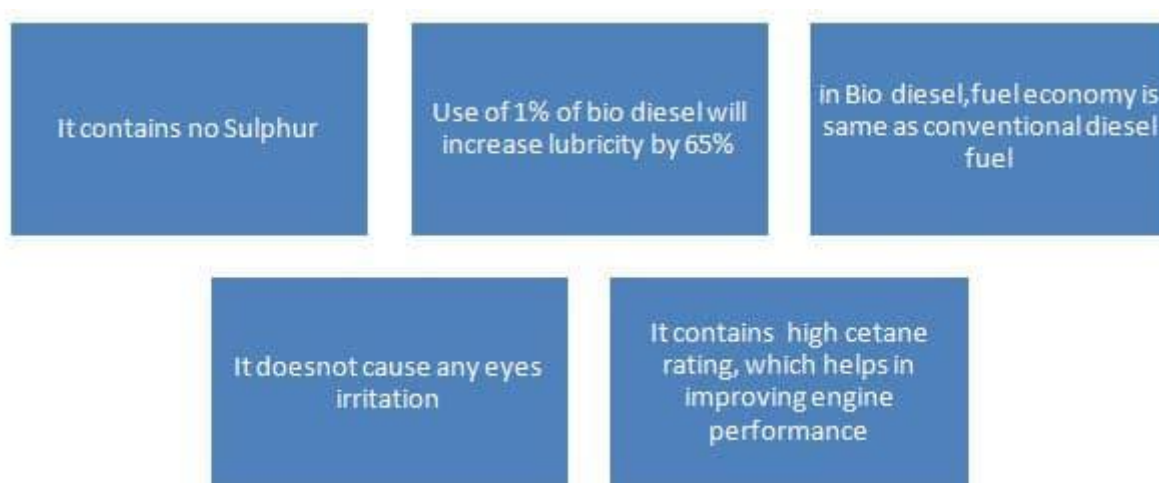
### **What will be the Investment and opportunities in the production of Bio-diesel in India?**

From the analysis, it has been predicted that bio-diesel production requires an investment of amount 20 – 30 crore in India with a profit margin of up to 15%.

### **How much is the growth of Bio-diesel production in Global Market?**

It has been predicted from the expert report that the market of Bio-diesel production has increased from \$82.7 billion in 2011 to \$185.3 billion in 2021. It has also been noticed that there had been a steady growth in 2016 but the rapid increase in production between 2017 and 2021 due to higher oil prices, emerging mandates, and advanced technologies. It has been concluded that global biofuel production will reach 65.7 billion gallons per year (BGPY) by 2021.

### **What are the advantages of Bio-diesel as fuel?**



### **How to make Bio-diesel?**

To make Bio-diesel, hydrocarbons (i.e oil or fats) are filtered and get mixed with an alcohol, which are usually methanol and a catalyst. Ester and glycerol bio-diesel fuel, are the major products of this reaction which have been used for commercial purposes.

## **What is the effect of GST on Bio-diesel production in India?**

Initially, with the implementation of GST 18% is a levy on Bio-diesel and ethanol, which has adversely impact the growth of the industry. The manufacturers applied to the department for reducing the rate to 5%. But currently, it has been reduced from 18% to 12%.

## **What steps to be considered before starting Bio-diesel plant?**

### **Complete research regarding the Bio-diesel Production**

Before initiating a biodiesel production company, it is mandatory to spend time and money on research and feasibility studies related to the bio-diesel production.

### **Formation of Business Plan**

For initiating this business, it is mandatory to prepare a prior business plan that clearly describes business and outline goals that leads towards the success of the business. It is an indeed document that describes the future of business.

### **Selection of Location**

The decision has to be taken regarding the location where to set up the plant for Bio-diesel Production.

## **What Licenses and permits are required for Bio-diesel Production?**

### **Company Registration:**

- For establishing the business of Bio-diesel Production, the applicant first registered its entity in the form of Partnership, Company, Limited Liability Partnership.

### **Factory Licenses:**

- District factory Inspectorate approval is required for setting up of the factory of Bio-diesel production.

### **Pollution Control Board Clearance:**

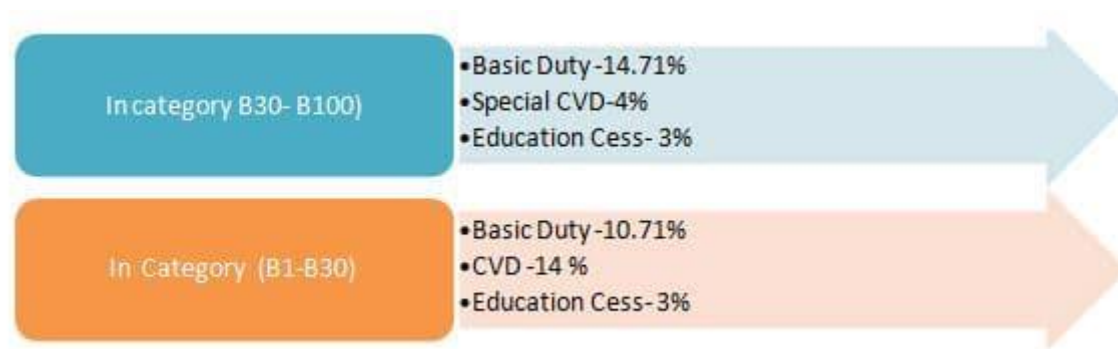
- In spite of ignoring this fact that, Multi-feedstock Biodiesel Processing Plants are non-polluting, it is mandatory to obtain clearance of pollution control board.

### Explosive License:

- An Explosive License is required from the Directorate of Explosive for the storage of Methanol.

### **At what rate, Import duty is charged on Biodiesel?**

*As Import of Biodiesel, Come in the following two categories:*



### **How much Biodiesel is exported from India?**

It has been analyzed that, in 2016, India has exported 53 million liters of B-100 at an estimated value greater than \$27 million. Philippines, China, Malaysia, Spain, Netherlands, UAE, Nepal, and Kenya are the main (re-)export destinations.

To meet the increasing energy needs of the country and to provide Energy Security, National Policy on Biofuels was announced in December 2009. The major goals of the policy are Development and utilization of indigenous non-food feed stocks raised on degraded or waste lands, thrust on research and development on cultivation, processing and production of biofuels and a blending mandate of 20% Ethanol and Bio-diesel by 2017. The Policy can be seen at [National Policy on Biofuels](#)

The objective of biofuel programme is to support R&D, Pilot plant/Demonstration projects leading to commercial development of 2<sup>nd</sup> Generation biofuels. The ministry supports R & D projects for development of technologies for production of biofuels through Biogas, Pyrolysis and Gasification, besides promoting deployment of technologies for pilot and full-scale projects on biofuels in general.



### FSSAI in talks with industry to convert used-cooking oil into bio-diesel

#### **NEW DELHI, JULY 2**

With the new regulations for monitoring “used cooking oils” coming into force from July 1, the Food Safety and Standards Authority of India (FSSAI) on Monday said the implementation of these regulations will require focus on consumer education, enforcement as well as creation of an eco-system for collection of “used cooking oil” to produce biodiesel.

FSSAI said it is in discussion with the Indian Biodiesel Association to establish a nation-wide eco-system for collection of used cooking oil and its conversion to bio-diesel.

The new regulations have set the maximum permissible limit of Total Polar Compound (TPC) in edible oil at 25 per cent. Repeated frying and usage of edible oil changes its physiochemical and nutrition properties and leads to the formation of TPC, which makes it unfit for human consumption.

“From July 1, onwards, all Food Business Operators (FBOs) would be required to monitor the quality of oil during frying by complying with the said regulations,” FSSAI said in a statement. The Food Authority has also established testing protocols for Total Polar Compounds.

Pawan Agarwal, CEO, FSSAI, said effective implementation of used cooking oil standards require “Triple E strategy” and a co-ordinated effort.

“First ‘E’ in the ‘Triple E Strategy’ is ‘Education’ that is educating both the consumers and food businesses about public health consequences of spoiled ‘used cooking oil’. Second ‘E’ is ‘Enforcement’, particularly amongst large food processing plants, restaurants and fast-food joints that are frying food in large quantities; and the third ‘E’ is developing an ‘Ecosystem’ for collection of used cooking oil and producing biodiesel from it”, he added.

FSSAI has also advised State Food Safety Commissioners to focus on awareness and education programmes, surveillance and enforcement activities for these new set of regulations. “Annually, about 23-million tonne cooking oil is consumed in India. There is potential to recover and use about 3 million tonnes of this for production of bio-diesel,” FSSAI added.

As of now, used cooking oil is either not discarded or disposed in an environmentally hazardous manner and sometimes even finds its way to smaller restaurants, *dhaabas* and street-vendors.

The Biodiesel industry in USA is growing year by year for last many years and still growing mainly to control greenhouse gas emission and global warming.

**Production** - U.S. production of biodiesel was 126 million gallons in February 2018. Biodiesel production during February 2018 was 2 million gallons higher than production in January 2018. Biodiesel production from the Midwest region (Petroleum Administration for Defense District 2) accounted for 68 percent of the United States total. Production came from 96 biodiesel plants with capacity of 2.4 BGY.

**Sales** - Producer sales of biodiesel during February 2018 included 48 million gallons sold as B100 (100% biodiesel) and an additional 70 million gallons of B100 sold in biodiesel blends with diesel fuel derived from petroleum.

**Feedstocks** - There were a total of 953 million pounds of feedstocks used to produce biodiesel in February 2018. Soybean oil remained the largest biodiesel feedstock during February 2018 with 496 million pounds consumed.

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#### 4. Payback Period for 30 MT Per day

Sr No	Description	Cons/day	Unit	Rate (Rs)	Rate (\$)	Total Expenses (Rs)	Total Expenses (\$)
1	Feedstock ( Palm , UCO, etc)	34885	Lit	30	0.77	1046543.8	26861.29
		31745	Kg	33	0.85		
2	Enzyme	89.84	Lit	1560	53	140158	4761.8
3	Methanol	4509	Lit	28	0.40	126259	1803.7
4	Sodium Bicarbonate	635	kg	25	0.40	15873	253.96
5	H2SO4 (93 % V/V)	19.41	Lit	35	0.69	679	13.39
6	Phosphoric Acid (85% w/w)	565.2	Lit	76	0.52	42955	293.90
7	Bleaching Earth (Daitomaceous Earth) (99 % w/w)	476.2	kg	32	0.22	15238	104.8
8	Power Consumption	5143	Units	7	0.12	36000.0	617.14
9	Water	30	Lit	1	0.15	30	4.5
10	Natural Gas For Thermic Fluid Heater	8400	m3	11	0.26	92400	2184.00
11	Steam Consumption (Optional)	131765	kg	1	0.01	131764.7	1317.65

Total Cost						1516135	36898
Cost Of Production (COP/Lit)						47	1.137
Sr No	Description	Production	Unit	Rate (Rs)	Rate (\$)	Total Expenses (Rs)	Total Expenses (\$)
1	Technical Glycerine	2442	Lit	65	1.92	158726	4688.5
		3174.5	kg	50	1.48		
2	Bio Diesel	32442.9	Lit	59	1.31	1914128	42500.1
		28549.7	Kg	67.0	1.49		
Sr No.	Description	Unit	Val. Ind	Val. USA			
1	Raw Material Including Chemical ,Enzyme Stock	Days	15				
2	Average Salary /Person/Month	NA	40000	2000			
3	Interest on Term loan	%	12%	14%			
4	Interest on Working Capital	%	12%	12%			
5	Sales Expenses	%	3%	2%			
6	Administrative Expenses	%	1%	2%			

<b>7</b>	Deprecation Rate	%	10%	6%
<b>8</b>	Tax Rate	%	30%	11%
<b>9</b>	Utilities Cost factor	NA	1.4	1.3
<b>10</b>	RIN Credit (USA Only)	\$/lit of Biodiesel	NA	0.26
<b>11</b>	No of Employee in Biodiesel Plant	No	27	27

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Project Investment (INR)						
Sr No .	Description	INR (lac)	\$ (US Dollar)	Cost to Consultant (lac)	Cost to consultant \$ (US Dollar)	
1	Land and Land Development (5Acr)	150	223880			
2	Civil & Structure	400	597014			
3	Main Plant and Machinery	2522	3764179			
4	Air compressors	16.8	23400	12	18000	
5	Hot oil Boiler	77	105300	55	81000	
6	Chiller System	35	46800	25	36000	
7	Nitrogen System	15.4	15600	11	12000	
8	Cooling Tower	0	0	0	0	
9	Storage Tanks (Biodiesel, Crude Glycerine, Technical Glycerine, Methanol ,Crude Oil)	0				
10	Balance of Electrical	0				
11	Fire Fighting, Lab Equipment, Weight Bridge and Miscellaneous	0				
12	Yard Piping					
13	Water Treatment Plant					
14	Transportation, Insurance ,GST etc.					
15	Contingencies	45	67164			
16	Working Capital	208	511391.7			
	Total	3469.36	5354728	NA	NA	
Sales Revenue						
Sr No .	Type of Product	Qty MT/Annum	Rate Rs /MT	Sales /Annum (Lac)	Rate \$ /MT	Sales /Annum (\$)
1	Bio Diesel	9992	67045.5	6699.5	1488.64	14875050

2	Tech Glycerine	1111	50000	555.5	1476.92	1640980	
Total				7255.0		1651603	0
Expenses (Per Annum)							
A Variable Expenses							
Sr No .	Type of Product	Qty Per /Annum	Rate Rs	Uom	Sales /Annum (Lac)	Rate \$	Sales /Annum (\$)
1	Crude Corn Oil (MT)	11110.8	32967.0	MT	3662.90	846.2	9401451
2	Natural Gas (M3)	2940000	11	M3	323.40	0.26	764400
3	Electricity (Unit)	1800000.0	7	Unit	126.00	0.12	216000
4	Chemicals				1194.1		2531021
Total					5306.4		12912873
B Fixed Expenses							
Sr No .	Description	Value	Rate (Lac)	Rate \$			
1	Equity	40%	1387.7	2141891.			
2	Term loan	60%	2081.61	3212837.			
Total			3469.3	5354728			
Working Capital							
Sr No .	Description	Rate (Lac)	Rate \$				
1	Raw Material Including Chemical, Enzyme Stock	208	511391.7				
Fixed Expenses Per Annum							
Sr No .	Description	Rate (Lac)/Annum	Rate (\$)/Annum				
a	Interest on Term loan	249.79	449797.2				
b	Interest on Working Capital	24.98	61367.01				
c	Sales Expenses	217.65	330320.6				

d	Salary & Wages	129.6	648000
e	Administrative Expenses	72.55	330320.6
	<b>Total</b>	<b>694.57</b>	<b>1819805</b>
Sr No	Description	Rate (Lac)/Annum	Rate (\$)/Annum
1	Fixed Expenses	694.6	1819805
2	Variable Expenses	5306.4	12912873
3	<b>Total expenses</b>	<b>6000.9</b>	<b>14732679</b>
<b>Contribution</b>			
Sr No	Description	Rate (Lac)/Annum	Rate (\$)/Annum
1	Sales Revenue	7255.0	16516030
2	Total Expenses	6000.9	14732679.0
3	<b>Contribution</b>	<b>1254.0</b>	<b>1783351</b>
<b>Depreciation</b>			
Sr No	Description	Rate (Lac)/Annum	Rate (\$)/Annum
1	Depreciation @ 10 % of Project Investent	<b>346.94</b>	321283.7
<b>Gross Profit</b>			
Sr No	Description	Rate (Lac)/Annum	Rate (\$)/Annum
1	Gross Profit	<b>907.1</b>	1462068
<b>Tax on Gross Profit</b>			
Sr No	Description	Rate (Lac)/Annum	Rate (\$)/Annum
1	Tax on Gross Profit	<b>272.1</b>	160827.5



Profit After Tax			
Sr No .	Description	Rate (Lac)/An num	Rate (\$)/Annum
1	Profit after Tax	635.0	1301240
Money Generation			
Sr No .	Description	Rate (Lac)/An num	Rate (\$)/Annum
1	Money Generation	981.9	1301240
RIN Credit			
Sr No .	Description	Rate (Lac)/An num	Rate (\$)/Annum
1	RIN Credit	NA	2952300
Payback Period			
Sr No .	Description	Year (Ind)	Year (USA)
1	Payback Period	3.53	1.3

SECTION A) EQUIPMENT:-			
AREA/TRAIN	SECTION	EQUIPMENT	Prices for 30TPD in INR
BIO DIESEL TRAIN	ESTER/TRANSESTERIFICATION	SCMT-ENZ-T-903	INR 1,528,676.48
		SCMT-ENZ-T-905	INR 1,528,676.48
		SCMT-ENZ-T-901	INR 1,104,044.10
		SCMT-ENZ-CF-T-901	INR 182,591.93
		SCMT-ENZ-CF-T-902	INR 182,591.93
		SCMT-ENZ-CF-901	INR 182,591.93
		SCMT-ENZ-CF-902	INR 182,591.93
		SCMT-ENZ-PFT-901	INR 262,500.00
		SCMT-ENZ-PFT-902	INR 337,500.00
		SCMT-ENZ-MIX-901	INR 24,150.00
		SCMT-ENZ-MIX-902	INR 19,500.00
		SCMT-ENZ-MIX-903	INR 22,500.00
		SCMT-ENZ-MIX-904	INR 20,325.00
		SCMT-ENZ-MX-903(STATIC AGITATOR)	INR 24,150.00
		SCMT-ENZ-MX-905(STATIC AGITATOR)	INR 24,150.00
		SCMT-ENZ-MX-901(STATIC AGITATOR)	INR 24,150.00
	COALESCER	SCMT-COA-COA-1001	INR 573,253.50
		SCMT-COA-COA-1002	INR 573,253.50
		SCMT-COA-PFT-1001	INR 412,500.00
		SCMT-COA-PFT-1002	INR 337,500.00
	ESTER GUARD BED	SCMT-BD10-T-1101	INR 1,104,044.10
		SCMT-BD10-PFT-1101	INR 34,125.00
		SCMT-BD19-T-601	INR 1,104,044.10
	ESTERIFICATION RESIN	SCMT-BD20-T-701	INR 1,104,044.10
		SCMT-BD20-MX-701	INR 34,125.00
		SCMT-BD20-T-702	INR 300,000.00
	ESTERIFICATION FLASH VESSEL	SCMT-FS-T-801	INR 417,116.33
		SCMT-FS-T-802	INR 808,160.33
		SCMT-FS-T-803	INR 417,116.33
		SCMT-FS-PU-803(LIQUID RING VACUUM PUMP)	INR 192,433.50

GLYCERIN SECTION	GPU FLASH EVAPORATOR	SCMT-GPU-T-2801	INR	1,295,383.43
		SCMT-GPU-V-2802	INR	808,160.33
		SCMT-GPU-T-2802	INR	417,116.33
		SCMT-HEX-2801	INR	525,000.00
		SCMT-GPU-T-2804	INR	2,625,000.00
	FFA SODIUM SEPARATOR	SCMT-GPU-T-2905	INR	1,295,383.43
		SCMT-GPU-COA-2901	INR	2,675,183.85
		SCMT-GPU-T-2901	INR	559,200.00
		SCMT-GPU-T-2906	INR	417,116.33
		SCMT-GPU-T-2907	INR	1,295,383.43
		SCMT-GPU-T-2902	INR	1,875,000.00
		SCMT-GPU-V-2908		
		SCMT-GPU-HE-2901		
		SCMT-GPU-HE-2902		
		SCMT-FILTER	INR	2,625,000.00
CARBON BED VESSEL	SCMT-CC-VSL-3101	INR	743,100.00	
	SCMT-CC-VSL-3102	INR	743,100.00	
COLUMN SECTION	GLYCERIN DISTILLATION	SCMT-GPU-WFE-3001		
		SCMT-GPU-T-3001		
		SCMT-GPU-T-3002		
		SCMT-GPU-T-3003	INR	4,950,000.00
	METHANOL WATER COLUMN UNIT	SCMT-SRXC-VSL-1801		
		SCMT-SRXC-T-1802		
		SCMT-SRXC-T-1801		
		SCMT-SRXC-T-1803	INR	2,532,931.95
	BIODIESEL DISTILLATION COLUMN	SCMT-BD-VSL-1301		
		SCMT-BD-T-1301		
		SCMT-BD-T-1302		
		SCMT-BD-T-1303		
		SCMT-BD-T-1304		
SCMT-HEX-1301(REBOILER)				
SCMT-BD-HE-1301(PREHEATER)				
SCMT-BD-HE-1304 (AIR COOLER)				
SCMT-WASTE TANK	INR	9,375,000.00		
		Total Equipment Cost	INR	47,819,464.58

SECTION B) INSTRUMENTS, MCC/PLC, STRUCTURE:-			Price
Instrument Cost		INR	9,399,981.75
MCC PLC Cost		INR	5,639,988.75
Utility Cost-Storage Tanks, Cooling Tower, etc. (Client Scope)		INR	18,799,962.75
Structure		INR	14,099,972.25
<b>SECTION C)</b>	<b>Total Cost</b>	<b>INR</b>	<b>47,939,905.50</b>
Basic Engineering & Detail Engineering		INR	6,332,485.50
Erection, Installation & Commissioning support		INR	2,848,194.00
Contingency & Risk Factor		INR	4,746,990.75
(SCMT Charges Instllation & Local Company) etc		INR	33,228,900.00
<b>SECTION D)</b>	<b>Total Cost (Inclusively Item A, B &amp; D)</b>	<b>INR</b>	<b>190,855,845.83</b>

### Enzyme and Cavitation Based Biodiesel Process

