MODEL DETAILED ROJECT REPORT

FOR UPGRADATION OF DISTILLERY EFFLUENT TREATMENT SYSTEM TO ACHIEVE ZERO LIQUID DISCHARGE (ZLD)

C O N T E N T

List of Abbreviations	
ZLD	Zero Liquid Discharge
DPR	Detailed Project Report
CPCB	Central Pollution Control Board
TCD	Tonnes Crushing Per Day
ETP	Effluent Treatment Plant
FIs	Financial Institutions
KLPD	Kilo Litre Per Day
MT	Metric Tonne
KWH	KiloWatt Per Hour
IRR	Internal Rate of Return
DSRC	Debt Service Coverage Ratio
CPU	Condensate Polishing Unit
UASB	Upward Anaerobic Sludge Blanket
RCC	Reinforced Cement Concrete
RO	Reverse Osmosis
ROMBR	Reverse Osmosis Membrane Bio-Reactors
SBT	Soil Bio-Technology
SBTP	Soil Bio-Technology Process
NCDC	National Cooperative Development Corporation
SDF	Sugar Development Fund
PH	Potential of Hydrogen Ion
BOD	Biological Oxygen Demand
COD	Chemical Oxygen Demand
P&M	Plant & Machinery
MEE	Multi Effect Evaporation
GC	Galvanized Corrugated
AC	Asbestos Cement
CBMSW	Concentrated Bio-Methanated Spent Wash
CREP	Corporate Responsibility for Environmental Protection

Executive Summary

1.1 Project at a Glance

ABC is a cooperative society registered under Cooperative Societies Act and having a sugar mill having a capacity of 5000 TCD. For utilization of its own molasses and to pay more remunerative price to sugarcane growers, the society installed a 40 KLPD distillery unit based on continuous fermentation system with atmospheric distillation. However, the distillery has been closed down by Central Pollution Control Board for not fulfilling of pollution norms. As per the norms of Central Pollution Control Board for Corporate Responsibility for Environment Protection, the sugar mill has decided to install standalone Multiple Effect Evaporation system for concentration of bio-methanated spent wash from 5% solids to 30% and condensate polishing unit to achieve Zero Liquid Discharge (ZLD). The treated water from condensate polishing unit will be used for process and non-process application thereby reducing the fresh water requirement of the distillery unit.

1.2 Project Cost is estimated at Rs.1200.00 lakh as detailed below:

Bio-Gas Plant

(Rs. in lakh)

Sl.No.	Particulars	Amount
1	Plant & Machinery	180.00
2	Pipe line & Burner	30.00
3	Digestor Strengthening	25.00
	Total	**235.00**
	GST @28%	**65.00**
A	**Total Cost with GST**	**300.00**

Bio-Methanated Spentwash Evaporation Plant

(Rs. in lakh)

Sl. No.	Particulars	Amount
1	Civil Works	250.00
2	Plant & Machinery	450.00
3	Preliminary & Pre-operative Expenses	54.00
4	Contingencies	20.00
5	GST on P&M @28%	126.00
B	**Total including GST**	**900.00**
	Total Project cost (A+B):	**1200.00**

1.3 Means of Finance

(Rs. in lakh)

Sl. No.	Particulars	% of project cost	Amount
1	Own share of sugar mill	10%	120.00
2	Soft loan from SDF	40%	480.00
3	Term loan from FI/Banks	50%	600.00
	Total	**100%**	**1200.00**

1.4 Financial Parameters

After implementation of the project, the distillery would be run for minimum of 220 days. The profitability projections has been worked out for 10 years and enclosed at Annexure-1. Profitability projections indicate that cash generations from distillery would be sufficient to meet the debt service obligations as detailed below:-

(Rs. in lakh)

Sl. No.	Particulars	1st year	2nd year	3rd year	4th year	5th year
1	Installed capacity (KLPD)	40	40	40	40	40
2	Gross Days	210	220	220	220	220
3	Capacity utilization (%)	80	90	100	100	100
4	Total production (Lakh Lit.)	67.20	79.20	88.00	88.00	88.00
5	Annual income	2394.40	2829.60	3144.00	3144.00	3144.00
6	Expenditure	2434.67	2699.54	2866.20	2855.23	2847.59
7	Net profit	-40.27	130.06	277.80	288.77	296.41
8	Cash available for Debt service	222.48	363.51	482.20	466.70	450.08
9	Debt service obligation	87.00	294.85	278.65	262.45	246.25
10	DSCR	2.56	1.23	1.73	1.78	1.83
11	Average DSCR	2.59				
12	IRR	28.70%				
13	Payback period	3.3 years				

1.5 Strengths of the Project

- Background and experience of the promoters
- Sustained availability of raw materials
- Substantial environmental benefits
- Proven technology with highest efficiency

1.6 Implementation Schedule

The entire project will be commissioned by November, 2019. Meticulous planning and strong project management will ensure this schedule.

1.7 Environment & Socio-Economic value:

With this project, the society will be able to meet the norms of the CPCB and re-start the closed distillery. This will help the society to pay more remunerative price to sugarcane growers.

1.8 Conclusions

Over all, the project is well conceived and conceptualized, with sound commercial viability. The expected financial returns are quite satisfactory. The project is being implemented by promoters having requisite background and experience and with experienced professionals, experts and consultants. All perceived risks have adequate safe guards. The project is recommended for lending by financial institutions.

PROJECT PROFILE

Project Profile for Installation of standalone Multiple Effect Evaporation Plant to Concentrate Bio-methanated Spent Wash (5% to 30% solids) and Condensate Polishing Unit.

Sr. No	Particulars	Information
i.	Name and Address	ABC
ii	Constitution and Type	Co-operative Society
iii.	**Project Concept**	
	a. Products	Concentrated bio-methanated spent wash (30% solids)
	b. Working days/Annum	220 days
	c. Bio-methanated spent wash feed to evaporation, (5 % solids)	480 M^3/day
iv.	Concentrated bio- spent wash generation (30% Solids)	75 M^3/day
v	Press Mud Cake Available	32375 MT/annum
vi.	Actual SW:PMC mixing ratio	1:1 will be achieved
vii.	Steam requirement, MT/ day	Max. 84 MT for the project
viii.	Electricity requirement,	Max. 6000 KWH/day for the project
ix.	Water requirement M^3/day	NIL [The process condensate (480 M^3/day) after treatment in the polishing unit will be reused for process & non-process applications in distillery.]
x.	Staff and Labour	8 Nos. (Plant Operators 4 and Workers 4)
xi.	**Financial pattern**	
	a) Own Contribution	(10%) Rs.120.00 lakh
	b) SDF Loan	(40%) Rs.480.00 lakh
	c) Term loan from FI/Bank	(50%) Rs.600.00 lakh
	Total:	**(100%) Rs.1200.00 lakh**
xii.	**Capacity Utilization of Distillery plant**	**100 %**
	a. Internal Rate of Return (IRR)	28.70%
	b. Average Debt Service Coverage Ratio (DSCR)	2.59
	c. Payback period	3.3 years

INTRODUCTION

ABC is a cooperative society registered under Cooperative Societies Act and having a sugar mill having a capacity of 5000 TCD. The performance of the sugar mill during the last five years was as under:-

Sr. No.	Particulars	2013-14	2014-15	2015-16	2016-17	2017-18
1	Cane Crushed (Lakh MT)	9.25	9.25	9.25	9.25	9.25
2	Sugar Produced (Lakh Qtls.)	10.73	10.73	10.73	10.73	10.73
3	Recovery % Cane	11.60	11.60	11.60	11.60	11.60
4	Molasses Produced (MT)	32,375	32,375	32,375	32,375	32,375
5	Press-mud produced (MT)	32,375	32,375	32,375	32,375	32,375

(*This is the hypothetical data and the sugar mill may provide actual data for the past 5 years*)

For utilization of its own molasses and to pay more remunerative price to sugarcane growers, the society installed a 40 KLPD distillery unit based on continuous fermentation system with atmospheric distillation. However, the distillery has been closed down by Central Pollution Control Board for not fulfilling of pollution norms. As per the norms of Central Pollution Control Board for Corporate Responsibility for Environment Protection, the sugar mill has decided to install standalone Multiple Effect Evaporation system for concentration of bio-methanated spent wash from 5% solids to 30% and condensate polishing unit to achieve Zero Liquid Discharge (ZLD). The treated water from condensate polishing unit will be used for process and non-process application thereby reducing the fresh water requirement of the distillery unit.

PROJECT DETAILS

The ABC sugar mill is having 40 KLPD Bio-still continuous fermentation with yeast recycle and atmospheric distillation system. The spent wash generation from distillation unit using re-boiler is around 480 M^3/day. To meet the directions / conditions stipulated by Central Pollution Control Board (CPCB) to reduce quantity of spent wash generation and for effective treatment of spent wash, the sugar mill management has decided to up-grade its existing effluent treatment system by revamping existing two digesters followed by multiple effect evaporation plant to concentrate bio-methanated spent wash followed by scientific bio-composting system for achieving "Zero Spent Wash Discharge".

By considering the press mud available and the concentrated spent wash generated after evaporation the distillery will be able to meet the spent wash to press mud mixing ratio prescribed by Central Pollution Control Board.

The sugar factory management has also decided to install condensate polishing unit (CPU) for treatment of evaporation process condensate and spent lees. After treatment in CPU, treated water will be reused for distillery cooling tower make up or for fermentation process. In this way distillery will be able to achieve zero liquid discharge.

The society has decided to revamp existing Bio-methanation plant and install standalone Multiple Effect Evaporation system for concentration of bio-methanated spent wash from 5% solids to 30% and condensate polishing unit to achieve Zero Liquid Discharge (ZLD). The treated water from condensate polishing unit will be used for process and non-process application thereby reducing the fresh water requirement of the distillery unit.

After implementation of the project, the ABC sugar mill will be able to meet the stipulated guideline of the CPCB and will be able to run the distillery unit for 220 days without any problem.

Configuration of Plant & machinery for proposed project has been suggested with installation of multiple effect evaporation system to concentrate and reduce the bio-methanated spent wash generation and condensate polishing unit to treat process condensate water.

The sugar mill is having old biogas plant with two bio-gas digesters of 2585 M^3 capacity each based on UASB (Upward Anaerobic sludge Blanket) technology. These digesters are not in operation for last several years and hence not in good condition. Only RCC tank structure is in good condition. Rest of the component of the digester needs to be replaced. The sugar mill shall revamp the old bio digesters to produce methane gas and burn methane gas in the existing boilers of sugar mill for generating steam which will result in saving of the bagasse fuel.

TECHNOLOGY

A. MULTIPLE EFFECT EV APORATION

Evaporators are classified by the number of effects. In a single-effect evaporator, steam provides energy for vaporization and the vapour product is condensed and removed from the system. In a double-effect evaporator, the vapour product off the first effect is used to provide energy for a second vaporization unit. Triple- effect evaporator, the vapour product off the second effect is used to provide energy for a third vaporization unit. This cascading of effects can continue for many stages. For special application's, Multiple-effect evaporators consisting of even 12 effects have been designed. Multiple-effect evaporators can remove much larger amounts of solvent than is possible in a single effect.

Proposed Multiple Effect Evaporation System:

In the evaporation system the 5% solids bio-methanated spent wash will be concentrated to 30% solids. The evaporation system may be based on falling film multistage or forced circulation or a combination of both. In the evaporation system the spent wash feed will be taken in level controlled balance tank and will be passed backward through heaters using vapour from preceding effect as heating medium. Pre-heated feed will be then fed to the 1st effect calandria top so that liquid falls inside the tube area in the form of thin film. Dry saturated steam/vapour will be supplied as heating media in the shell side, which causes evaporation of water from feed liquid in the calandria. Vapours produced will be separated in 1st vapour separator and will be passed to the shell side of 2nd calandria as heating media. Concentrated spent wash from 1st effect will be transferred to the 2nd effect calandria. It will be then passed through all the calandria to get the required concentration. Concentrated spent wash with required solids will be taken out as product from last calandria. Vapours from last effect will be cooled in condenser. Total evaporation will be carried out under vacuum generated from vacuum pump. The process condensate originating from the evaporation system will be treated in the condensate treatment system as per the pollution control norms.

B. CONDENSATE POLISHING UNIT FOR TREATMENT OF-LOW STRENGTH EFFLUENT

Following condensate polishing treatment schemes are adopted by the industry:

i) Conventional aerobic treatment (Extended aeration)

ii) Conventional aerobic treatment followed by membrane technology

iii) Conventional anaerobic treatment followed by aerobic (extended or diffused aeration) treatment followed by polishing

iv) RO - MBR Technology

v) Photo-oxidation

Considering the initial capital investment and recurring cost for operation of the scheme, Soil Bio-Technology (SBT) appears to be most economical for treatment of process condensate evaporation, spent lees of distillation and RO permeate etc. Therefore, soil bio-technology scheme for treatment of process condensate of distillation, evaporation, RO permeate etc. is proposed.

Soil Bio-Technology Process (SBTP)

The proposed system is designed for treatment of evaporation process condensate or RO permeate and spent lees of a distillery unit. The process condensate and spent lees treated by such system can be reused back into the distillery cooling tower as cooling water make-up thereby reducing the requirement of fresh water as well as solving the waste water disposal to a great extent.

The technology is based on a bio-conversion process where fundamental reactions of nature namely respiration, photosynthesis and mineral weathering take place in a media housing micro and macro organisms which bring about the desired purification. SBTP is an oxygen supplying biological engine and so the process can treat all types of water - domestic, municipal and industrial. SBTP is suitable for treating water with salinity <2500 mg/L. When salinity levels exceed, reaction rates in the SBTP system are lower and hence the system design may be adjusted suitably to achieve the purification desired. If salinity is very high an

additional facility using RO technology can also be included. The facilities of a treatment process for water and waste water consists of a raw water, tank, bioreactor containment, treated water tank and associated piping, pumps & electrical.

i) Equalization Tank

Hot process condensate (Temperature 70°C to 80°C) and other waste water stream from the evaporation section are collected in an equalization tank where the streams are mixed well.

ii) Effluent Cooler

Hot effluent from the collection tank is pumped via plate heat exchanger which will be taken care in the evaporation section, where it is cooled to 35°C.

iii) PH Correction

The cooled effluent then enters in to a static mixer, where it is neutralized by using caustic solution. The cool effluent is dosed using a dosing system consisting of dosing tank and dosing pumps. Dosing is controlled using P H sensor attached on downstream of the static mixer.

iv) Ozonation Treatment

Ozone treatment is given to the neutralize effluent at the rate of 10 ppm. Ozone has been used in waste water treatment for decades as a form of tertiary sterilization. Ozone has a very strong oxidation potential which makes it ideal in waste water treatment applications and will react with unsaturated hydrocarbons very effectively.

Ozone combined with micro bubble diffusion allows for extremely high mass transfer of the gas to wastewater. This means creating a supersaturate solution of ozone with little to no off gassing in a very stable state. Supersaturate ozone solutions allow reactions with unsaturated hydrocarbons. BOD, COD, TSS and bacteria are easily eliminated very efficiently and economically, as a result there is no primary or secondary sludge formation.

v) Bio-reactor Treatment

Ozonated water or waste water is pumped over the bio-reactor; the suspended solids are removed by the top media which is scrapped and discarded. The water trickles into the bed and treated water collects in the filtrate tank. Recirculation pumps are provided to obtain desired hydraulic retention times; hence treated waste water is recycled to the bioreactor. Finally treated waste water is collected in the storage tank and reused either in process or non process for molasses dilution or as cooling tower make-up water thereby reducing the requirement of fresh water.

The sugar Mill has proposed to install Soil Bio-technology unit for treatment of process condensate of evaporation, spent lees of distillation and other low strength waste streams etc. The details are given below:

S. No.	Particulars	Quantity
i)	Spent lees	80M^3/ day
ii)	Evaporation plant process & steam condensate	420m^3 / day
	Total	**500m^3 / day**

C. SCIENTIFIC BIO-COMPOSTING

For effective treatment of distillery spent wash, bio-methanation as a primary treatment followed by multi effect evaporation as a secondary treatment followed by bio-composting as a final treatment may be adopted. The raw spent wash generation from atmospheric distillation it is around 480 M^3/day. For treatment the raw spent wash will be treated in bio-digesters.

The total bio-methanated spent wash generation from both digesters will be around 480 M^3/day (Total solid, 5%). This treated spent wash will be then fed to evaporation plant for concentration up to 30% solids. The concentrated spent wash generation after evaporation will be 75 M^3/day. The concentrated BMSW will be mixed with Press-mud in bio-composting process and concentrated spent wash (30%) generation will be around 22500 M^3/annum. By considering the press mud

available and the concentrated spent wash generated after evaporation distillery will meet the spent wash to press mud mixing ratio of 1:1 for 60 days cycle.

The sugar mill has proposed to install Condensate Polishing Unit (CPU) for treatment of evaporation process steam condensate (approx. Total quantity 420 M^3/day) and spent lees 80 M^3/day. After treatment in CPU, treated water will be reused for distillery cooling tower make up or for fermentation process.

The advantages of bio-composting over other methods of treatment are given below:

1. Negligible power requirement.
2. Zero effluent discharge to inland watercourses.
3. Bio-compost produced is rich in micronutrients i.e. organic and inorganic nutrients.
4. Bio-compost can be sold to farmers and substantial amount of income can be generated.
5. Good solution for distilleries attached to a sugar factories.

Technical calculations

Spent wash generation	12 ltrs/ ltr. of RS .
The total spent wash generation	40 KLPDx12 = 480 m^3/day
Bio - gas generation per ltr. of RS produced	0.37m^3
One ltr. of spent wash concentration	100 gms/ltr. of spent wash

Computation of Bagasse Saving due to Bio – gas

Assuming 450m^3 average spent wash generation	= 450000 ltrs.x100gm/1000
	= 45000 kgs/day of COD
	= 45000x65%=29250 kg COD*
So 29250 kg COD x0.5**	= 14625m^3 of biogas generated per day.
Average calorific value of biogas	= 4500 kcal/m^3
So 14625 x 4500	= 65812500 Kcal/day and bio gas has 75% thermal efficiency So, 49359375 kcal converted into steam from biogas.
Enthalpy of steam is about	= 670 kcal/kg.
Therefore, 49359375 / 670	= 73670.708 kg (steam generation per day)
One kg of bagasse (50% moisture) gives	= 2.2 kg of steam
73670.708/2.2	= 33.486 MT of Bagasse saving per day

If bagasse is @Rs 2000/MT, then 2000x33.486 = Rs. 66972.00 savings per day for approximately 150 days.

(COD-Chemical Oxygen Demand used by the bacteria). **One kg of COD destroyed generates 0.5 m^3 of bio gas.

CIVIL WORKS AND PLANT & MACHINERY

ABC sugar mill has proposed to install multiple effect falling film evaporation plant to concentrate & reduce the bio-methanated spent wash generation and condensate polishing unit to treat process condensate water.

A. Building and other Civil Works

Building is required for evaporation plant - equipment, utilities, laboratory etc. Now-a-days open buildings are preferred as far as possible in order to avoid hazards due to fire and obnoxious gases. Multi Effect Evaporator (MEE) plant can be AC sheet roofing building with proper staging exception such portions where operating staff is required to be present all the time. Such system will reduce the cost of building substantially.

Evaporation Section

The evaporation building will be MS structure of R.C.C. foundations 2M depth below ground level and plinth height 0.75 M above ground level. For ground floor filling 1:4:8 base concrete is to be made and IPS flooring 50 mm thick cement concrete 1:2:4. A.C. Sheets roofing & outside cladding to the operational floor. All equipment foundations are RCC and drains are brick masonry with waterproof cement. Staircases at operational floor. MS grating for staircases & floors, chequered plate 5.5 mm thick at operational floor.

An evaporation operational (control) room can be accommodated in the same building. Brick wall having super structure with internal external plaster & paint. Red oxide coat & two coats of synthetic enamel paint for MS structure.

Cooling Tower

R.C.C. basin on RCC raft slab, RCC foundations for pumps. Foundations depth 0.6 M below ground level

Building for evaporation plant - equipment, utilities, laboratory, Rest room for workers, sanitary blocks and Stores block etc. will be used with required

modification in present set up. Other civil works and structure can be modified with respect to the requirement.

B. Details of Equipment

Sr. No.	Particulars	Specification
1	Feed Tank	One; capacity 150m^3
2	Online Filter	1 set; MOC – SS - 304
3	Automatic Flow Control Valve	1 set; MOC – SS - 304
4	Bio-methanated Spent wash Transfer Pump from Bio-methanated Storage Tank	1+1 centrifugal type
5	Feed Pump	1+1 centrifugal type
6	Feed Pre-heaters	1 set of shell & tube type
7	Multiple Effect Evaporators (Min. 5 Effects)	Type: Falling film / forced circulation
8	Vapour & Liquid Separators	Gas liquid separator type
9	Thermal Vapour Re-compressor (TVR)	1 set; MOC Body – SS 304 Nozzle – SS 304
10	Evaporator Recycle Pumps	1+1 centrifugal type
11	Surface Condenser	1 set of shell & tube type
12	Product Tank (Conc. Spent wash tank)	For a minimum 6 hrs retention time
13	Conc. Spent wash Transfer Pump	1+1 centrifugal type
14	Vacuum Pump	1+1 water ring type
15	Process Vapour Condensate Tank	Vertical / Cylindrical type
16	Process/Steam Condensate Tank	1+1 centrifugal type
17	Air Compressor with Dryer	1+1 and the capacity is to be satisfied
18	Vapour Duct	1 set of MOC – SS - 304
19	Seal Water Tank	To be specified
20	Degasser	To be specified
21	Seal Water Transfer Pump	1+1 centrifugal type
22	Piping & Fittings	All SS 304 piping
23	CIP Tank & System	Cylinder shell with conical top and flat bottom
24	Control Panel (MCC)	Panel will be of damp proof construction. The instrument panel will be pre-wired to terminal connection
25	Instrument air compressor with dryer	1+1

Specification of Plant & Machinery may be vary from case to case basis and may be finalised in consultation with concerned sugar factory and supplier.

Following technical aspects may be considered into account while selecting the technology:

1. The experience and background of companies.
2. The salient feature of the process.
3. Working of process or applicability of process treatment of Indian molasses based distillery effluent.
4. Consumption of utilities like steam, power etc.
5. Cleaning frequency and duration.
6. Back up guarantees.

MANAGEMENT AND ORGANIZATION

Manpower for the project:

The Evaporation plant and Condensate polishing unit shall be under Administrative Control of the Sugar Factory. The Distillery Manager shall be responsible for day to day working of the distillery and effluent treatment system. To run the evaporation plant and CPU unit, four evaporation plant operators and four unskilled workers are to be provided. Existing skilled staff i.e. Electrical Engineer, Instrumentation Engineer, Fitters, Wire-mans, etc. available with mill to assist the evaporation plant operators.

PROJECT COST

The project cost estimates of up-gradation of effluent treatment plant have been prepared on the assumptions that the plant & machinery as per standard specifications shall be purchased from the approved machinery suppliers in India, whereas the civil construction of various buildings and machinery foundation shall be carried out by the local contractors using locally available construction materials including brick, cement, steel, GC sheets etc. On the basis of present market price and anticipated escalations up to the scheduled date of commissioning, the capital cost of the proposed scheme of-installation of ZLD approximately will be Rs.1200.00 lakh.

Bio-Gas Plant

(Rs. in lakh)

Sl.No.	Particulars	Cost
1	Plant & Machinery	180.00
2	Pipe line & Burner	30.00
3	Digestor Strengthening	25.00
	Total	**235.00**
	GST @28%	**65.00**
A	**Total Cost including GST**	**300.00**

Bio-Methanated Spentwash Evaporation Plant

(Rs. in lakh)

Sl. No.	Particulars	Cost
1	Civil Works	250.00
2	Plant & Machinery	450.00
3	Preliminary & Pre-operative Expenses	54.00
4	Contingencies	20.00
5	GST on P&M @28%	126.00
B	**Total including GST**	**900.00**
	Total Project cost (A+B):	**1200.00**

The above estimates are on the basis of the prevalent market price. However the cost would be depending upon the location of the Project.

Bio-Methanated Spentwash Evaporation Plant : Break-up of cost

Particulars of civil works to be made:

Sl. No.	Particulars	Amount (Rs. in lakh)
1.	Standalone Evaporation Civil & Structural work	75.00
2.	Condensate polishing unit for 700 M^3/day	175.00
	Total	**250.00**

Details of plant and machinery:

Sl. No.	Particulars	Amount (Rs. in lakh)
1.	Standalone Evaporation - (Conc. 30 % solids)	400.00
2.	CPU plant & machinery	50.00
I.	Basic Cost of Plant & Machinery (1+2)	450.00
II.	Add GST @28%	126.00
III.	Plant & Machinery Cost including GST	576.00

Preliminary and pre-operative expenses:

Sl. No.	Particulars	Amount (Rs. in lakh)
1.	Interest on Term loan during construction period	43.50
2.	Insurance during Construction, including erection insurance	1.13
3.	D.P.R charges	1.28
4.	Inspection fee	2.00
5.	Bank charges	5.09
6	Tender document preparation charges	1.00
	Total	54.00

Provision for contingencies:

Sl. No.	Particulars	Amount (Rs. in lakh)
1.	Provision for contingencies @3% on Civil works and on Plant and Machinery including machinery foundation.	20.00
	Total	20.00

PROJECT FUNDING

Government of India, Ministry of Consumer Affairs, Food and Public Distribution, Department of Food and Public Distribution also provides soft loan assistance upto 40% of project cost from Sugar Development Fund for setting up of Zero Liquid Discharge (ZLD) projects. The estimated project cost of Rs.1200.00 lakh may be financed as under:

(Rs. in lakhs)

Sl. No.	Particulars	% of project cost	Amount
1	Own share of sugar mill	10%	120.00
2	Soft loan from SDF	40%	480.00
3	Term loan from FI/Banks	50%	600.00
	Total	**100%**	**1200.00**

The society's share of contribution against the total project cost @10% comes to Rs.120.00 lakh. The own contribution of Rs.120.00 lakh may be met from surplus funds available with the society or may raise additional share capital from the cane grower members.

FINANCIAL VIABILITY

FINANCIAL VIABILITY:

Since the proposed project is a statutory requirement to run the distillery, no additional revenue will be generated from the project. However, since the distillery is already closed and cannot be run without the proposed project, the revenue generation from the distillery has been considered while working out the Profitability and cash flow projection. The profitability projections have been worked out for 10 years and are enclosed in the Annexure. Salient features of the projected profitability, cash available for debt servicing, debt service obligation and debt service coverage ratio for the distillery project are as under:-

(Rs. in lakh)

Sl. No.	Particulars	1	2	3	4	5
1.	Installed capacity (KLPD)	40	40	40	40	40
2.	Gross Days	210	220	220	220	220
3.	Capacity utilization (%)	80	90	100	100	100
4	Total production (Lakh Lit.)	67.20	79.20	88.00	88.00	88.00
5	Annual income	2394.40	2829.60	3144.00	3144.00	3144.00
6	Expenditure	2434.67	2699.54	2866.20	2855.23	2847.59
7	Net profit	-40.27	130.06	277.80	288.77	296.41
8	Cash available for Debt service	222.48	363.51	482.20	466.70	450.08
9	Debt service obligation	87.00	294.85	278.65	262.45	246.25
10	DSCR	2.56	1.23	1.73	1.78	1.83
11	Average DSCR	2.59				
12	IRR	28.70%				
13	Payback period	3.3 years				

As indicated above. The average DSCR is 2.59 implying that the cash availability would be sufficient to meet the debt service obligation. If, for any reason, the cash availability is lesser, the society would utilize the cash generation of the sugar mill for meeting the debt service obligation of distillery. The Internal Rate of Return (IRR) computed over a period of 10 years is 28.70% implying that the project is viable.

Assumptions

The following assumptions have been made while working out the financial viability of the project.

S. No.	Particulars	Amount (@Rs.)
1	Sale realization from a) Rectified spirit b) Bio-compose	 Rs. 34.00 per litre Rs.350.00 per MT
2	Molasses cost	Rs.5500.00 per MT
3	Steam cost	Rs.1100.00 per MT
4	Electricity cost	Rs.6.00 KWh
5	Yield of Alcohol	270 Litres/MT of molasses
6	Repair & Maintenance	3% on Plant & Machinery 2% on Building Increased by 5% in each year
7	Insurance	0.25% on the project cost
8	Depreciation	Civil – 10% P&M – 15%
9	Repayment of Term loan	7 years including 1 year moratorium in payment of principal. No moratorium on the payment of interest.
10	Interest rate of Term loan	11.10%
11	Repayment of SDF loan	4 years including 1 year moratorium. No moratorium on the payment of interest.
12	Interest rate of SDF loan	2.00% below the Bank rate of RBI. Present bank rate is 6.25%. As such the present SDF rate is 4.25%.
13	Interest Rate of Working Capital	12.00%

Salary and wages:

The calculation of salary and wages has been made keeping in view the permanent staff, casual works employed on fully automation of the unit, particularly for distillery plant. Increase in salary @7.5% has been taken per year from operation of the project.

Project SWOT Analysis

Strengths (S):

- Background and experience of the shareholders, as well as leadership from the promoters.
- Favourable policy regime for ethanol at the Central Govt. and in State Government.
- Innovation, commitment and vision of the promoters, with backward and forward integration planned right from beginning.
- Professional and business like approach of the promoters, with meticulous planning for speedy and successful implementation and operation.
- Excellent response to project, at the local farmer level, State Government., FIs and equity partners.
- Availability of molasses for smooth operation of the distillery.
- Deployment of latest technologies and equipment for ethanol project.

Weaknesses (W):

- Fluctuation in the prices of Molasses.
- Changes in the Govt. policies related to ethanol.
- Delay in project implementation may affect the viability of the project.

Opportunities (O):

- Excellent opportunity for expansion of ethanol plants for increasing the revenue.

Threats (T):

- Adverse changes in Govt. policies, particularly related to sugar and ethanol prices.
- Natural calamities like Drought / Flood in the area of operation of the society

Risk Management

Risk	Particular	Mitigates
Performance Risk	Ensured molasses availability	Experienced senior professionals and staff appointed for the purpose. Availability of molasses from the nearby sugar mills.
Marketing Risk	Ethanol Sale / Export	Good marketing channel. Value added products proposed.
Regulatory Risk	Conversion / clearance / tariff order	No problem as various governmental agencies have already expressed their willingness for purchase of Ethanol
Financial Risk	Financial viability of the project	Satisfactory DSCR / IRR.

Key Management Features

- Appointment of Project Team, required experts and consultants, as well as top level staff - right from the beginning.
- Securing all required balance permissions / NOCs / approvals quickly and achieving the financial closure at the earliest.
- Selection of right technology and equipment suppliers for effluent treatment system.
- Effective project management for timely execution.

Annexure- I

Profitability Projections											(Rs. in lakh)	
Sl. No.	**Particulars**	**Unit**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1	Capacity (RS)	LPD	40000	40000	40000	40000	40000	40000	40000	40000	40000	40000
2	Days		210	220	220	220	220	220	220	220	220	220
3	Utilisation	%	80	90	100	100	100	100	100	100	100	100
4	Rectified Spirit Produced	Lakh litres	67.20	79.20	88.00	88.00	88.00	88.00	88.00	88.00	88.00	88.00
5	Molasses used	MT	24888.89	29333.33	32592.59	32592.59	32592.59	32592.59	32592.59	32592.59	32592.59	32592.59
A	**INCOME**											
1	@ Rs.34 per litre Rectified Spirit	34	2284.80	2692.80	2992.00	2992.00	2992.00	2992.00	2992.00	2992.00	2992.00	2992.00
2	Income from sale of Bio-compost		28.00	45.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00
3	Bagasse saving	2000	81.60	91.80	102.00	102.00	102.00	102.00	102.00	102.00	102.00	102.00
	Total Income		2394.40	2829.60	3144.00	3144.00	3144.00	3144.00	3144.00	3144.00	3144.00	3144.00
B	**EXPENDITURE**											
1	Molasses-Own @ Rs.5500/- per MT	5500	1368.89	1613.33	1792.59	1792.59	1792.59	1792.59	1792.59	1792.59	1792.59	1792.59
2	Steam Cost	1100/MT	388.08	406.56	406.56	406.56	406.56	406.56	406.56	406.56	406.56	406.56
3	Power cost		166.32	182.08	182.08	182.08	182.08	182.08	182.08	182.08	182.08	182.08
4	Water charges		10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
5	Chemicals		16.00	18.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
6	Salary & wages		160.00	172.00	184.90	198.77	213.68	229.70	246.93	265.45	285.36	306.76
7	Repair & maintenance.		29.63	31.11	32.67	34.30	36.02	37.82	39.71	41.69	43.78	45.97
8	Insurance		3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
9	Overhead/Misc. expenses		20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
10	Administrative exp		10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
11	Depreciation-Civil		25.00	22.50	20.25	18.23	16.40	14.76	13.29	11.96	10.76	9.69

12	Depreciation-P&M		123.15	104.68	88.98	75.63	64.29	54.64	46.45	39.48	33.56	28.52
13	Interest on WC		48.00	48.00	48.00	48.00	48.00	48.00	48.00	48.00	48.00	48.00
14	Interest on term Loan	11.10%	66.60	58.28	47.18	36.08	24.98	13.88	2.78	0.00	0.00	0.00
15	Interest on SDF Loan	4.25%	20.40	16.58	11.48	6.38	1.28					
	Total Expenditure		2434.67	2699.54	2866.20	2855.23	2847.59	2843.03	2841.38	2850.81	2865.69	2883.17
C	**Net Profit**		-40.27	130.06	277.80	288.77	296.41	300.97	302.62	293.19	278.31	260.83
D	**Cash for debt service**	-1200.00	222.48	363.51	482.20	466.70	450.08	432.25	413.13	392.63	370.63	347.04
E	**Debt Dervice obligation**											
1	Intt. On Term Loan		66.60	58.28	47.18	36.08	24.98	13.88	2.78	0.00	0.00	0.00
2	Term loan Installment		0.00	100.00	100.00	100.00	100.00	100.00	100.00	0.00	0.00	
3	Intt. On SDF Loan		20.40	16.58	11.48	6.38	1.28					
4	SDF loan Installment		0.00	120.00	120.00	120.00	120.00					
	Total Debt service		87.00	294.85	278.65	262.45	246.25	113.88	102.78	0.00	0.00	0.00
F	**DSCR**		2.56	1.23	1.73	1.78	1.83	3.80	4.02	0.00		
G	**Avg. DSCR**		**2.59**									
H	**IRR**		**28.70%**									
I	**Payback period**	**3.3 years**										

Annexure II

Term Loan Amount - Rs.600.00 lakh

Rate of Interest - @11.10%

Repayment period - 7 years including 1 year moratorium

Repayment frequency 12 half yearly instalment @ Rs.50.00 lakh each

Interest payment - Half yearly

Particulars	**Instalment**													
	Moratorium		**1st Inst.**	**2nd Inst.**	**3rd Inst.**	**4th Inst.**	**5th Inst.**	**6th Inst.**	**7th Inst.**	**8th Inst.**	**9th Inst.**	**10th Inst.**	**11th Inst.**	**12th Inst.**
Principal Instalment	0	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	00.00
Yearly Instalment	50.00		100.00		100.00		100.00		100.00		100.00		50.00	
Interest Instalment Half yearly	33.30	33.30	30.53	27.75	24.98	22.20	19.43	16.65	13.88	11.10	8.33	5.55	2.78	0.00
Yearly Interest	66.60		58.28		47.18		36.08		24.98		13.88		2.78	

Annexure III

SDF Loan Amount	-	Rs.480.00 lakh
Rate of Interest	-	@ 4.25% (2% below the RBI Bank rate of 6.25%)
Repayment period	-	4 years including 1 year moratorium
Repayment frequency	-	8 half yearly instalment @ Rs.60.00 lakh each
Interest payment	-	Half yearly

Particulars	**Instalment**									
	Moratorium		**1st Inst.**	**2nd Inst.**	**3rd Inst.**	**4th Inst.**	**5th Inst.**	**6th Inst.**	**7th Inst.**	**8th Inst.**
Principal Installment	0	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	00.00
Yearly Installment	60.00		120.00		120.00		120.00		60.00	
Interest Installment Half yearly	10.20	10.20	8.93	7.65	6.38	5.10	3.83	2.55	1.28	0.00
Yearly Interest	20.40		16.58		11.48		6.38		1.28	