# UNIT- DISTILLERY

Ref no- DSM/100/2014
Dt-05.APRIL.2014

**To,**

## The Director

**Ministry of Environment & forest (IA Division)**

**Paryawaran Bhawan**

**Lodhi road, CGO complex**

**New Delhi**

**Subject- Application form-1 & Pre-feasibility report for Environmental Clearance(EC) for the Expansion of Distillery from 200 KLPD to 350 KLPD (RS/ENA/AA) and 3.0 MW Power at Vill- Allehapur, Tehsil – Dhampur, Distt- Bijnor(U.P)**

## Reg- TORs

**OUR TREATMENT STRATEGY- BIOMETHANATION, RO, MEE, BIOCOMPOST, INCENERATION ONE TIME CONTROLLED LAND APPLICATION.**

Dear Sir

Kindly find enclosed herewith dully filled form-1& Pre-feasibility report for Environmental Clearance(EC) for the Expansion of Distillery from 200 KLPD to 350 KLPD (RS/ENA/AA)plant and 3.0 Power at Vill- Allehapur, Tehsil – Dhampur, Distt- Bijnor( U.P).

Kindly consider our application for the **grant of TOR** for which we shall be highly obliged.

Thanking you,

Yours faithfully

Sandeep Sharma
**Executive President**
Dhampur Sugar Mills Dhampur
Distt.Bijnor – U.P.
Mobile no-07895022222

## Enclosures:


1. Salient features of the project : 4-5
2. Form-1 :6- 18
3. Proposed Terms of reference :19 - 25
4. Pre-feasibility report :26 - 35
5. Water Balance :36 - 37
6. Location Map/Layout plan : 38
7. One Time Controlled Land Application :39 - 48
8. Technical project report :49 - 93
9. Summary of project cost : 92- 93

**All papers in soft (CD)**

# FORM - 1

**FOR**

**THE PROPOSED**

# EXPANSION OF EXISTING DISTILLERY FROM 200KL TO 350KL (Molasses Based)

**WITHIN EXISTING PREMISES;**

**By;**

**DHAMPUR SUGAR MILLS LTD.,**
**Unit :DISTILLERY –DHAMPUR**
**DISTT- BIJNOR - 246761**

**Submitted to**

**MINISTRY OF ENVIRONMENT AND FOREST , NEW DELHI**

# SALIENT FEATURES OF THE PROJECT

| Serial Number | Item | Details | |
|---|---|---|---|
| 1. | **Name of the project** | Dhampur Sugar Mills Ltd Unit : DISTILLERY | |
| 2. | **Location of the project** | Vill- Allehapur<br>Tehsil- Dhampur, District- Bijnor (U.P) | |
| 3. | **Total project area** | Existing Land : 25 Acres<br>Proposed Land : Not Required | |
| | | **Total Land : 25 Acres** | |
| 4. | **Proposed Expansion capacity of Distillery** | **Existing : 200 KLPD** RS/ENA/AA<br>**Proposed Expansion : 150 KLPD** RS/ENA/AA | |
| | | **Total Capacity : 350 KLPD** RS/ENA/AA | |
| 5. | **Proposed capacity of Power generation** | **Existing : Nil**<br>**Proposed : 3MW** | |
| | | **Total : 3MW** | |
| 6. | **Total project cost** | Rs10737.00 LAKHS (Estimated) | |
| 7. | **Category of Project** | 'A' | |
| 8. | **Raw material** | **Molasses** | |
| 9. | **Quantity of Molasses** | Existing : 900 MT/day<br>Proposed Expansion : 675 MT/day | |
| | | Total : 1575 MT/day | |
| 10. | **Steam requirement** | For Existing : 30 TPH<br>For Expansion : 22 TPH<br>Total Requirement : 52 TPH | |
| 11. | **Water requirement** | **Existing** | **Proposed** Expansion |
| | | Industrial : 3000 KLPD<br>Domestic : 20 KLPD | Industrial : 2250 KLPD<br>Domestic : Nil |
| | | Total Requirement After Expansion –<br>Industrial : 5250 KLPD@ 15 KL / KL of Product<br>Domestic : 20 KLPD<br>Total : 5270 KLPD | |
| 12. | **Waste water generation** | Existing | **Proposed** Expansion |
| | | 2000@ $10M^3$/KL of Product | 1500 KLPD @ 10 $M^3$/KL of Product |
| | | Total Waste Water Generation After Expansion – 3500KLPD @ $10M^3$/KL of Product | |
| 13. | **Waste water treatment** | **BIOMETHANATION, RO, MEE, BIOCOMPOST, INCENERATION,ONE TIME LAND APPLICATION AS MANURE** | |
| 14. | **Evaporation plant** | 1400 KLPD existing available | |

| | | |
|---|---|---|
| | **capacity** | |
| **15.** | **Concentrated spent wash quantity For Expansion** | 150KLPD @40% W/W total solids This thick liquor thus obtained is used as fuel in boiler along with bagasse/other biomass fuels |
| **16.** | **Waste water discharge** | **ZERO** |
| **17.** | **No of Boilers** | Existing – None, Steam Requirement Shall be met from existing Sugar unit / Power Division. Proposed Expansion - (01) 40 TPH SLOP fired Boiler. |
| **18.** | **Fuel quality & quantity** | Proposed expansion - Concentrated spent wash (SLOP) 163 T/Day & Bagasse as support fuel 360 TPD |
| **19.** | **Air pollution control device** | In Proposed Boiler (40 TPH) - ESP ( electro static precipitator) |
| **20.** | **No of Stack** | Existing Stack – 01 No 90 meters height attached with proposed boiler |
| **21.** | **Solid waste generation**<br>**(I)Suspended solids from Spent slops coming out from Distillation DISPOSAL-**<br><br>**(II) Fly ash from Boiler**<br><br>**DISPOSAL-** | Bagasse Fly Ash + SLOP Ash = 53 T/ Day<br><br>Total Ash Shall be used as Manure due to Nutritive value. |
| **22.** | **Power Generation** | Proposed : 3 MW |
| **23.** | **Power requirement** | For 350 KL Plant : 52 MW (Process Plus Effluent Treatment) |
| **24.** | **Green belt development** | Approx. 40 % of total area |
| **25.** | **Cost towards Environmental protection measures( Capital cost)** | Approx. Rs2150 lacs |
| **26.** | **Recurring cost towards Environmental control measures.** | Approx. 70 Lacs per annum |
| **27.** | **CSR expenses** | Upto 2% of the total profit |

# FORM - 1

**(1) Basic Information**

| Sl. No. | Information/ Checklist Confirmation | Details thereof (with approximate quantities/rates, wherever possible) with source of information data |
|---|---|---|
| 1 | Name of the Project | Dhampur Sugar Mills Ltd; Unit : DISTILLERY Distt. Bijnor (UP)- 246761 |
| 2 | Sr. No in the Schedule | Schedule 5(g) under category–A of EIA Notification dated 14th September 2006. |
| 3 | Proposed capacity/Area/length/tonnage to be handled/command area/lease area/number of wells to be drilled. | Expansion of existing distillery production capacity from 200KLPD to 350KLPD and 3.0 MW Power ,<br>Project cost: **10737.00** LAKHS+ CSR@2 % of total profit. |
| 4 | New/Expansion/Modernization | Expansion 150 KLPD and 3.0 MW Power |
| 5 | Existing capacity/Area etc | Existing capacity : 200 KLPD<br>Our Previous EC no :<br>J-11011/605/2007 - IA<br>Dated – 17 Sep 2007 |
| 6 | Category of Project i.e. A or B | Category – A |
| 7 | Does it attract the specific condition? If yes, please specify. | No |
| 8 | Does it attract the specific condition? If yes, please specify. | No |
| 9 | Location | Village:Allehapur<br>Tehsil: Dhampur<br>Block: Dhampur<br>District: Bijnor<br>State: Uttar Pradesh |
| 10 | Nearest railway station/airport along with distance in Kms. | **Railway Station:**<br>Dhampur - (Broad gauge)- 3 Km -N.Railway<br>**Airport:** Dehradun Jolly Grant Airport-113 km |
| 11 | Nearest town, City, District Headquarters along with distance in Kms. | Dhampur : 3 km<br>Distt- Bijnor : 45 Km |
| 12 | Village Panchayats, ZillaParishad, Municipal Corporation, Local body (Complete postal addresses with telephone nos to be given) | Panchayat: Allahapur<br>ZillaParishad: Bijnor<br>Municipal Corporation: NA |

| | | |
|---|---|---|
| 13 | Name of the applicant | Mr. Sandeep Sharma |
| 14 | Registered address | Dhampur Sugar Mills Ltd., Dhampur, Railway Road, Tehsil: Dhampur, Distt. Bijnor |
| 15 | Address for correspondence | DHAMPUR SUGAR MILLS UNIT – DISTILLERY Dhampur- Distt Bijnor U.P. |
| | Name | Shri Sandeep Sharma |
| | Designation | Executive President |
| | Address | Dhampur Sugar Mills Dhampur Distt. Bijnor – U.P. |
| | Pin Code | 246761 |
| | E-mail | sandeepsharma@dhampur.com, |
| | Telephone No. | (01344)-220662,220009, Mob. No. 7895022222 Fax- 01344-220006 |
| 16 | Details of Alternatives sites examined, if any. Location of these sites should be shown on a topo sheet. | Expansion will be done within existing premises |
| 17 | Interlinked projects | Existing Sugar Factory |
| 18 | Whether separate application of interlinked project has been submitted | Not applicable |
| 19 | If yes, date of submission | Not interlinked |
| 20 | If no, reason | Expansion of existing Distillery |
| 21 | Whether the proposal involves approval/clearance under: If yes, details of the same and their status to be given.<br>• The forest (Conservation) Act, 1980.<br>• The wildlife (Protection) Act, 1972<br>• The C.R.Z. Notification, 1992 | No<br>No<br>No |
| 22 | Whether there is any Government Order/Policy relevant/relation to the site | No |
| 23 | Forest land involved (Hectares) | No |

| | | |
|---|---|---|
| 24 | Whether there is any litigation pending against the project and/or land in which the project is propose to be set up?<br>• Name of the Court<br>• Case No<br>• Orders/directions of the court, if any and its relevance with the proposed project. | No |

**(II)ACTIVITY**

1. **Construction, operation or decommissioning of the Project involving actions, which will cause physical changes in the locality (topography, land use, changes in water bodies, etc.)**

| Sl. No. | Information/Checklist confirmation | Yes / No | Details thereof (with approximate quantities /rates, wherever possible) with source of information data |
|---|---|---|---|
| 1.1 | Permanent or temporary change in land use, land cover or topography including increase in intensity of land use (with respect to local land use plan) | Yes | Expansion will be done within existing premises |
| 1.2 | Clearance of existing land, vegetation and buildings? | NO | Land is without habitation. |
| 1.3 | Creation of new land uses? | Yes | For expansion purposes |
| 1.4 | Pre-construction investigations e.g. bore-houses, soil testing? | Yes | Raw Water Characteristics:<br>pH: 7.5; Conductivity: 310 microsiemens/cm;<br>TDS: 160 ppm; Total Hardness: 140 ppm;<br>Total Alkalinity: 80 ppm<br>Soil Bearing Capacity: 8-10 $T/m^2$ |
| 1.5 | Construction works? | Yes | Expansion of Molasses Storage, Fermentation, Distillery, ware house, Utilities & related ETP |
| 1.6 | Demolition works? | Yes | No demolition work is envisaged |
| 1.7 | Temporary sites used for construction works or housing of construction workers? | Yes | Construction workers shall be housed temporarily at the proposed site, for which temporary shelters shall be created. |
| 1.8 | Above ground buildings, structures or earthworks including linear structures, cut and fill or excavations | Yes | However, no linear structure, excavation as site is flat. |
| 1.9 | Underground works | No | Only foundation work. |

| | | | |
|---|---|---|---|
| | **including mining or tunnelling?** | | |
| **1.10** | **Reclamation works?** | No | None |
| **1.11** | **Dredging?** | No | None |
| **1.12** | **Offshore structures?** | No | None |
| **1.13** | **Production and manufacturing processes?** | Yes | Fermentation & Distillation |
| **1.14** | **Facilities for storage of goods or materials?** | Yes | Warehouse for raw material and finished chemicals. |
| **1.15** | **Facilities for treatment or disposal of solid waste or liquid effluents?** | Yes | **Proposed 350 KLPD Treatment system-** BIOMETHANATION + RO + MEE + BIOCOMPOST + INCINERATION + ONE TIME CONTROLLED APPLICATION AS MANURE |
| **1.16** | **Facilities for long term housing of operational workers?** | No | Housing facilities are available for long term housing of operational workers. |
| **1.17** | **New road, rail or sea traffic during construction or operation?** | No | Not required. |
| **1.18** | **New road, rail, air, waterborne or other transport infrastructure including new or altered routes and stations, ports, airports etc?** | No | Not required. |
| **1.19** | **Closure or diversion of existing transport routes or infrastructure leading to changes in traffic movements?** | No | Not required. |
| **1.20** | **New or diverted transmission lines or pipelines?** | No | Not required |
| **1.21** | **Impoundment, damming, culverting, realignment or other changes to the hydrology of water sources or aquifers?** | No | Not required |
| **1.22** | **Stream crossings?** | No | Not required |
| **1.23** | **Abstraction or transfers of water from ground or surface waters?** | Yes | Existing Requirement : 3000 KLPD<br>Proposed requirement for Expansion : 2250 KLPD @15 KL/KL of spirit<br>Total Water Requirement : 5250 KLPD<br>Water requirement will be meet out from |

| | | | |
|---|---|---|---|
| | | | already existing tubewells (no new tubewell will be bored) |
| **1.24** | **Changes in water bodies or the land surface affecting drainage or run-off?** | No | |
| **1.25** | **Transport of personnel or materials for construction, operation or decommissioning?** | Yes | Most of the personnel shall reside within the plant premises. Any additional shall travel using public/private transport system.<br>Construction material shall be transported by road.<br>Part of raw material required during operation shall be generated in the plant itself during the manufacturing process. Other material shall be transported by road. |
| **1.26** | **Long-term dismantling or decommissioning or restoration works?** | No | |
| **1.27** | **Ongoing activity during decommissioning which could have an impact on the environment?** | No | |
| **1.28** | **Influx of people to an area in either temporarily or permanently?** | Yes | 100 Nos. During construction phase. |
| **1.29** | **Introduction of alien species?** | No | |
| **1.30** | **Loss of native species or genetic diversity?** | No | |
| **1.31** | **Any other actions?** | - | N/A |

**2. Use of natural resources for construction or operation of the Project (such as land, water, materials or energy, especially any resources which are non-renewable or in short supply)**

| Sl. No. | Information/Checklist confirmation | Yes/ No | Details thereof (with approximate quantities /rates, wherever possible) with source of information data |
|---|---|---|---|
| **2.1** | **Land especially undeveloped** | Yes | Within existing premises. |

| | | | |
|---|---|---|---|
| | **or agricultural land (ha)** | | Distillery expansion will be carried out within the existing factory premises and available land area of sugar factory<br>All the land is already industrial land |
| **2.2** | **Water (expected source & competing users) unit: KLD** | Yes | 5250 KLPD for 350 KLPD spirit Production (All water requirement will be meet out from existing tube wells). |
| **2.3** | **Mineral (MT)** | No | |
| **2.4** | **Construction material - stone, aggregates, and / soil (expected source - MT)** | Yes | Material from excavation at project site shall be used for construction. Additional construction materials like stone, aggregate, sand shall be procured from nearby areas. |
| **2.5** | **Forests and timber (source - MT)** | No | |
| **2.6** | **Energy including electricity and fuels (source, competing users) Unit: fuel (MT), energy (MW)** | Yes | Fuel: Bagasse : 360 T/Day, Slop :163T/Day<br>Proposed SLOP fired Boiler capacity : 40 TPH -01 no. |
| **2.7** | **Any other natural resources (use appropriate standard units)** | - | |

3. **Use, storage, transport, handling or production of substances or materials, which could be harmful to human health or the environment or raise concerns about actual or perceived risks to human health**

| Sl. No. | Information/Checklist confirmation | Yes/ No | Details thereof (with approximate quantities /rates, wherever possible) with source of information data |
|---|---|---|---|
| 3.1 | List of substances or materials, which are hazardous (as per MSIHC rules) to human health or the environment (flora, fauna, and water supplies) | No | N/A |
| 3.2 | Changes in occurrence of disease or affect disease vectors (e.g. insect or water borne diseases) | No | |
| 3.3 | Affect the welfare of people e.g. by changing living conditions? | Yes | The project shall impact welfare of people by generating employment opportunities. |
| 3.4 | Vulnerable groups of people who could be affected by the project e.g. hospital patients, children, the elderly etc., | No | |
| 3.5 | Any other causes | No | |

4. **Production of solid wastes during construction or operation or decommissioning (MT/month)**

| Sl. No. | Information/Checklist confirmation | Yes/ No | Details thereof (with approximate quantities /rates, wherever possible) with source of information data |
|---|---|---|---|
| 4.1 | Spoil, overburden or mine wastes | No | |
| 4.2 | Municipal waste (domestic and or commercial wastes) | No | Domestic waste- Through septic tank & soak pit<br>Commercial waste- Will be sold to recyclers. |
| 4.3 | Hazardous wastes (as per Hazardous Waste Management Rules) | Yes | Waste insulating and lubricating oil, oil barrels shall be collected in dedicated drums and stored on impervious concrete floor. The same shall be sold to vendors authorised by MoEF/UPPCB for recycling. |
| 4.4 | Other industrial process wastes | Yes | Proposed Expansion –<br>Bagasse Ash generation ; 7-8 T/day<br>SLOP Ash Generation – 45 T/Day |

| | | | |
|---|---|---|---|
| **4.5** | **Surplus product** | No | |
| **4.6** | **Sewage sludge or other sludge from effluent treatment** | - | - |
| **4.7** | **Construction or demolition wastes** | - | N/A |
| **4.8** | **Redundant machinery or equipment** | No | |
| **4.9** | **Contaminated soils or other materials** | No | |
| **4.10** | **Agricultural wastes** | No | |
| **4.11** | **Other solid wastes** | No | |

**5.Release of pollutants or any hazardous, toxic or noxious substances to air (Kg/hr)**

| Sl. No. | Information/Checklist confirmation | Yes/ No | Details thereof (with approximate quantities /rates, wherever possible) with source of information data |
|---|---|---|---|
| **5.1** | **Emissions from combustion of fossil fuels from stationary or mobile sources** | Yes | Boiler operations shall result in emissions. A 90 m stack along with 40 TPH boiler, with ESP. The stack shall be of RCC with internal fire-brick lining |
| **5.2** | **Emissions from production processes** | Yes | SPM ,NOX,SO2,CO |
| **5.3** | **Emissions from materials handling including storage or transport** | Yes | Dust emissions and fugitive emissions shall arise from raw material storage, handling and transport. The control measures shall include concrete/asphalt road construction, water sprinkling, tarpaulin cover on trucks carrying raw materials and covered storage yard for fuel. |
| **5.4** | **Emissions from construction activities including plant and equipment** | Yes | Emissions during construction phase shall be from operation of DG set. The existing DG set of the Distillery shall be used, which has a chimney of adequate height. with aquatic chambers. |
| **5.5** | **Dust or odours from handling of materials including construction materials, sewage and waste** | Yes | Dust shall be generated during civil construction and movement of vehicles. These activities shall be for a short duration and their impact shall be minimised by taking the following measures:<br>• Water sprinkling<br>• Use of dust arresting panels/ sheets<br>• Regular removal of construction waste |

| | | | |
|---|---|---|---|
| | | | material<br>• Proper storage of construction material<br>• Use of cover on trucks<br>• Speed limit for vehicles |
| **5.6** | **Emissions from incineration of waste** | No | |
| **5.7** | **Emissions from burning of waste in open air (e.g. slash materials, construction debris)** | No | |
| **5.8** | **Emissions from any other sources** | - | - |

**6. Generation of Noise and Vibration, and Emissions of Light and Heat**

| Sl. No. | Information/Checklist confirmation | Yes/ No | Details thereof (with approximate quantities /rates, wherever possible) with source of information data |
|---|---|---|---|
| **6.1** | **From operation of equipment e.g. engines, ventilation plant, crushers** | Yes | Noise shall be generated during construction phase by construction and material handling equipment. During operation phase, noise shall be generated by the operation of pumps, air compressors, boilers, TG set etc.as open structure is there, no abnormal sound level is expected. Persons working in the high noise area will be provided the required earplugs & earmuffs. |
| **6.2** | **From industrial or similar processes** | Yes | During operation phase, noise shall be generated by the operation of pumps, air compressors, boilers, TG set etc. Effective mitigation measures shall be built in. |
| **6.3** | **From construction or demolition.** | Yes | Noise shall be generated during construction phase by construction and material handling equipment. This shall largely be localised. Effective mitigation measures like barrier sheets, earplugs for labour etc. shall be provided. |
| **6.4** | **From blasting or piling** | Yes | Preparation of foundations for equipment shall be undertaken with necessary precautions. |
| **6.5** | **From construction or operational traffic** | Yes | There will be marginal additional traffic which may not lead to any increase in the noise levels. |
| **6.6** | **From lighting or cooling systems** | No | No equipment shall be permitted to be installed in proposed township which |

| | | | |
|---|---|---|---|
| | | | generates noise level exceeding the permissible standards |
| **6.7** | **From any other sources** | No | |

**7. Risks of contamination of land or water from releases of pollutants into the ground or into sewers, surface waters, groundwater, coastal waters or the sea**

| Sl. No. | Information/Checklist confirmation | Yes/ No | Details thereof (with approximate quantities /rates, wherever possible) with source of information data |
|---|---|---|---|
| **7.1** | **From handling, storage, use or spillage of hazardous materials** | No | All necessary precautions shall be taken in storage and handling of hazardous materials. Waste insulating and lubricating oil, oil barrels shall be collected in dedicated drums and stored on impervious concrete floor. The same shall be sold to vendors authorised by MoEF/UPPCB for recycling. |
| **7.2** | **From discharge of sewage or other effluents to water or the land (expected mode and place of discharge)** | No | It is ZERO discharge based Distillery |
| **7.3** | **By deposition of pollutants emitted to air into the land or into water** | No | Existing 90 m stack with ESP shall be provided for the boiler. |
| **7.4** | **From any other sources** | No | |
| **7.5** | **Is there a risk of long term build up of pollutants in the environment from these sources?** | No | |

**8.Risk of accidents during construction or operation of the Project, which could affect human health or the environment**

| Sl.No. | Information/Checklist confirmation | Yes/ No | Details thereof (with approximate quantities /rates, wherever possible) with source of information data |
|---|---|---|---|
| **8.1** | **From explosions, spillages, fires etc from storage handling, use or production of hazardous substances** | | Adequate safety measures will be followed to control of fire. As per applicable safety regulations. |

| | | | |
|---|---|---|---|
| **8.2** | **From any other causes** | No | All standard safety measures shall be taken during establishment and operation of proposed Distillery expansion. |
| **8.3** | **Could the project be affected by natural disasters causing environmental damage (e.g. floods, earthquakes, landslides, cloudburstetc)?** | No | The proposed project area lies in Zone 4 Seismic Area. All necessary design considerations for earthquake resistant structures shall be incorporated in the design of the project.<br>The area is not prone to landslides, floods, cloudburst etc. |

**9.Factors which should be considered (such as consequential development) which could lead to environmental effects or the potential for cumulative impacts with other existing or planned activities in the locality**

| Sl.No. | Information/Checklist confirmation | Yes/ No | Details thereof (with approximate quantities /rates, wherever possible) with source of information data |
|---|---|---|---|
| **9.1** | **Lead to development of supporting facilities, ancillary development or development stimulated by the project which could have impact on the environment e.g.:**<br>**- Supporting infrastructure (roads, power supply, waste or waste water treatment, etc.)**<br>**- housing development**<br>**- extractive industries**<br>**- supply industries.**<br>**- other** | Yes | The project shall lead to development and prosperity of the area by generating additional employment opportunities.<br><br>Green belt development and other such activities undertaken by project proponents shall have a positive impact on the ecology of the area. |
| **9.2** | **Lead to after-use of the site, which could have an impact on the environment** | No | |
| **9.3** | **Set a precedent for later developments** | Yes | It will increase Ethanol production of the country, which in turn in the long run could lead to further industrial development and considerable savings of Petrol. |
| **9.4** | **Have cumulative effects due to proximity to other existing or planned projects with similar effects.** | No | |

**(III) ENVIRONMENTAL SENSITIVITY**

| Sl. No. | Areas | Name/ Identity | Aerial distance (within 15 km.) of proposed project location boundary |
|---|---|---|---|
| 1 | Areas protected under international conventions national or local legislation for their ecological, landscape cultural or other related value | No | |
| 2 | Areas which are important or sensitive for ecological reasons (Wetlands, watercourses or other water bodies, coastal zone, biospheres, mountains, forests) | No | River Khoh Is The Nearest River. At Distance 3.4 Km From Site. |
| 3 | Areas used by protected, important or sensitive species of flora or fauna for breeding, nesting, foraging, resting, over wintering, migration | No | |
| 4 | Inland, coastal, marine or underground waters | No | |
| 5 | State, National boundaries | No | |
| 6 | Routes or facilities used by the public for access to recreation or other tourist, pilgrim areas | No | |
| 7 | Defense installations | No | |
| 8 | Densely populated or built-up area | No | The proposed project site lies in the vicinity of Village –Allehpur |
| 9 | Areas occupied by sensitive man-made land uses (hospitals, schools, places of worship, community facilities) | No | Some such areas exist in village - Allehpur |
| 10 | Areas containing important, high quality or scarce resources (ground water resources, surface resources, forestry, | No | No such area exists. |

| | | | |
|---|---|---|---|
| | **agriculture, fisheries, tourism, minerals)** | | |
| **11** | **Areas already subjected to pollution or environmental damage. (those where existing legal environmental standards are exceeded)** | No | No such area exists. |
| **12** | **Areas susceptible to natural hazard which could cause the project to present environmental problems (earthquakes, subsidence, landslides, erosion, flooding or extreme or adverse climatic conditions)** | No | The proposed project area lies in Zone 4 Seismic Area. All necessary design considerations for earthquake resistant structures shall be incorporated in the design of the project. |

I hereby give an undertaking that the data and information given in the application and enclosures are true to the best of my knowledge and belief and I am aware that if any part of the data and information submitted is found to be false or misleading at any stage, the project will be rejected and clearance given, if any to the project will be revoked at our risk and cost.

**Date:**

**Place: Dhampur**

**Signature of the applicant**

**(Name: Sandeep Sharma)**
**Executive President**
**Dhampur Sugar Mills Ltd**
**Dhampur 246761,**
**DISTT.Bijnor (U.P.)**

**Authorised Signatory**

## TERMS OF REFERENCE

## 1.0 PROPOSED SCOPE OF WORK FOR EIA STUDY

The components of the EIA study include:

- Determination of baseline data using primary data generation and secondary data available from various government published reports on air, meteorology, water, soil, flora & fauna, socio-economics, infrastructure, sensitive areas (forests, archaeological, historical etc);
- Detailed description of all elements of the project activities during the pre-construction, construction and operational phases. The elements analyzed include the infrastructures of the project including drainage features, roads, waste collection, disposal and management and utility requirements;
- Identification of the sources of pollution and assessing the impacts on the environment due to proposed Distillery unit;
- Preparation of EIA and EMP documents with recommendations on preventive and mitigative measures for limiting the impact on environment to the desired level during various stages of project. Development of a suitable post study-monitoring program to comply with various environmental regulations; and
- Risk Assessment (RA) and Disaster Management Plan (DMP) describing the probable risks and preventive & precautionary measures to be followed in the event of emergency situations such as accidents, fire etc.

## 2.0 BASELINE ENVIRONMENTAL DATA GENERATION

| Sr. No. | Attributes | Scope of Work |
|---|---|---|
| 1 | Ambient Air Quality | **8 Locations - 2 days/week for 13 weeks.** PM10, PM2.5, $SO_2$, $NO_X$, .will be collected.<br><br>Design of ambient air quality sampling network with regard to topography, population, sensitive locations, emission sources, background concentrations and possible impact zones, through application of screening air quality models for assessing the maximum GLC zones prior to start of baseline study. |
| 2 | Meteorological data | **1 Location – 90 days**<br>A fully instrumented continuous recording micro-meteorological observatory with battery back-up facilities will be installed to facilities to measure barometric pressures, Wind speed, direction, temperature, humidity, cloud cover and rainfall will be monitored with one hr avg. recording. Occurrence of Inversions will be calculated based |

| Sr. No. | Attributes | Scope of Work |
|---|---|---|
| | | on the daily temperature profile.<br><br>This is to be further supported by the meteorological data for last 5-years for the area of interest from the nearest meteorological observatory and Trend analysis of micrometeorological data generated at the site. |
| 3 | Water Quality | **8 Locations – Once during study period**<br>Parameters as per IS-10500, IS:2296 and EPA Act as applicable etc will be carried out for surface water and ground water in the study area.<br>The survey also include estimation of water balance, recommendations on water conservation and rain water harvesting measures based on past experience on similar projects; water samples will be collected around the ash pond area to know the baseline water quality around ash pond. |
| 4 | Soil Quality | Soil profile of minimum 1-m depth at **8locations once during the study period** will be undertaken for parameters related to afforestation, organic matter, water percolation, infiltration rate, water holding capacity, nutrients, pollutants etc. will be carried out. |
| 5 | Noise Levels | **8 Locations once during the study period** for 24 hrs at each location during EIA study for Leq, Ld and Ln. |
| 6 | Land use | Land use as per the district census handbooks as well as with the help of satellite imagery will be presented in 10-km radius study area. **Once in the study period**. |
| 7 | Geology and Hydro-geological aspects | These aspects will be covered for study area for the proposed project. The data will be compiled for geology and hydrogeology from the primary survey as well as secondary sources. **Once in the study period.** |
| 8 | Socio-Economic and Health aspects | Socio-economic and health aspects will be covered for 0.5-km, 0.5-3.0 km, 3.0-10.0 km from the periphery of the site based on the Census documents and NIC database for the past two decades. **Once in the study period.** |
| 9 | Ecological studies (Terrestrial and Aquatic) | Flora and fauna will be studied in 10-km radius study area, **once during the study period.** These studies will be based on primary as well as |

| Sr. No. | Attributes | Scope of Work |
|---|---|---|
| | | secondary sources.<br>The survey also includes assessment of the species diversity, density, abundance etc. in the study area and formulation of ecological indexes, assessment of likely changes on flora and fauna due to the project related activities, suggestions for conservation and protection of flora and fauna in the study area and suggestions for development of new conservation areas locally. |
| 10 | Aesthetic/Cultural / Sensitive Aspects | Identification of all historical/ archeological sites/cultural/ religious / tourist interests/ deference installations in the study area. Other sensitive locations such as tropical forests, important lakes, important lakes, biosphere reserves, coastal areas rich in coral reef within 25-km radius will be identified. **Once in the study period.** |
| 11 | Traffic Survey | Traffic volumes will be measured **once during the study period at three important traffic intersections** leading to the project matter to assess the traffic volumes. |

## 3.0 Legislation and Regulatory Considerations:

Government policies, legislation and regulations relevant to the proposal will be identified. Local plans and policies will also be evaluated. Project characteristics will be analyzed to ensure compliance with these policies, legislation and regulations. Appropriate recommendations will be provided to ensure regulatory compliance. The legislation relevant to the project will be summarized and presented in the EIA Report.

## 4.0Environmental Impact Assessment

There are various qualitative as well as quantitative methods of conducting EIA studies, each having its own merits and demerits. We intend to use the best logical tool to assess the impact of the project.

A qualitative and quantitative assessment of pollution aspects of proposed project (air and dust, wastewater, noise pollution, wastewater discharges etc.) will also be done to identify the adequacy of the proposed control measures as well as the likely impact on existing critical areas. The short term and long-term impacts, particularly on sensitive targets such as endangered species, plants and historically important monuments, will be identified and mitigation measures to reduce adverse impacts will be suggested.

**Air Impacts:**

Emission Inventory will be carried in an area of 10-km around the project site. A computer based internationally recognized mathematical air quality models – **Aermod 8.2** and other model suitable for the region will be identified and run to predict the concentration of $SO_2$, NOx& SPM due to the operation of the proposed project. The dispersion model results will be included in the report using isopleths or other graphical methods, over laying a land use map of the surrounding area.

- Prediction of short term and long term ground level concentrations of $SO_2$, $NO_x$, HC, RSPM and SPM and graphical representation in the form of isopleths through application of air quality models taking effects of terrain and requirements specified in the publication by Central Pollution Control Board, New Delhi – 'Assessment of Impact on Air Environment: Guidelines for conducting Air Quality Modeling';
- Justification of air dispersion modeling used with a detailed listing of all assumptions; and
- Combined impacts due to the existing plant and the proposed new plant will be estimated.

**Water Environment**

- Estimation of water balance for the proposed plant.
- Characterization/collection of data on waste water streams;
- Assessment of the nature of effluents likely to be discharged and its impact;
- Assessment of feasibility of water recycles, and reuse for green belt development and irrigation;
- Recommendations on water conservation measures based on past experience on similar projects.

**Land Environment**

- Collection of data on soil characteristics and soil types;
- Quantification of solid wastes likely to be generated during operation and suggestions on proper collection, treatment and disposal methods;
- Delineation of environmentally compatible options for value added utilization of solid wastes;
- Strengthening of green belt keeping in view the selected plant species and attenuation factors for noise and air pollutants.

**Biological Environment**

- Collection of the existing and available information on flora and fauna in the study area including rare and endangered species;
- Assessment of the species diversity, density, abundance etc. in the study area;

- Assessment of likely changes on flora and fauna due to the projects and related activities;
- Delineation of conservation measures for the protection of flora and fauna in the study area.

**Noise Impacts:**

Sources of noise and its impact on the environment would be clearly brought out. The noise level at varying distances for multi-sources will be predicted using suitable model. A comparison of measured noise (Leq) at monitoring locations to that of predicted noise levels (Leq) would be made and mitigatory measures required, if any, will be recommended to conform to regulatory ambient air noise standards.
We propose to estimate increase in noise levels over the baseline conditions in different zones like industrial, residential and sensitive areas like hospitals, wild life habitation etc. The potential noise level exposure will be determined and evaluated for acceptable limits of exposure.

**Socio-economic and Health Environment**

- Study of parameters to assess/characterize the quality of life in the study area;
- Assessment of changes from the baseline in the socio-economic parameters due to proposed plant operations;
- Assessment of economic benefits to community.

**Aesthetic/Cultural**

- Identification of all historical/archeological sites/monuments in the study area

**Traffic Study**

- Field study at important points on the approach roads to assess the existing total daily traffic, peak hour traffic and traffic composition;
- Assessment of the change in traffic composition and volumes.

## 5.0Environment Management Plan

For each potential negative impact identified, recommendations will be presented for avoidance, minimization or mitigation of impacts along with costs associated with potential mitigation.
An EIA/EMP, based on three months baseline study, will be prepared for the project. The EMP will address the following:

- Identify and summarize all anticipated significant adverse environmental impacts;
- Identify and summarize all mitigation measures, including the type of impact to which it relates and the conditions under which it is required;

- Define a set of policies and objectives for environmental performance and continual enhancement of performance;
- Green belt development plan;
- Recommend monitoring and reporting procedures including the parameters to monitored, methods to be used, sampling locations, frequency of measurements, detection limits and definition of thresholds that will signal the need for corrective actions;
- Recommend capacity development and training requirements for implementation of EMP;
- Recommend an organizational structure for effective implementation of the EMP; and
- Draw up an implementation and cost schedule for EMP.

An environmental monitoring and management plan will be developed for the sensitive elements of the environment that may require monitoring during construction and implementation of the proposed project. Recommendations will be made on the institutional arrangements that will be necessary to ensure effective monitoring and management.

A detailed management and monitoring program will be developed to reduce the effects of potential negative environmental impacts.

## 6.0Risk Assessment and Disaster Management Plan

Risk Assessment studies comprising sub-activities such as hazard identification, assessment and quantification of risk for suggesting risk mitigation measures based on Maximum Credible Accident (MCA) Analysis to be carried out for the proposed project. Preparation of the Risk Assessment Report will be followed by Disaster Management Plan (DMP) and Emergency Preparedness Plan (EPP) based on the quantitative Risk Assessment of the proposed activity and associated infrastructure for the project.
The study includes identification of process hazards, preliminary of hazardous sections of the plant and that of storage with recourse to fire and explosion index for these units, analysis of major inventories in process and storage and identification of major hazardous locations of the plant with recourse to GoI rules, 1989.

## 7.0Occupational Health and Safety

We will review the safety management and occupational health surveillance system in the proposed facility plant and recommend for further appropriate measures.

## 8. One Time Controlled Land Application

- Study of one time controlled application of spent wash on agriculture in crop, water, soil in study area.

**Ministry of Environment and Forests**

**Pre-Feasibility Report as per Ministry of Environment and Forests Letter dated 30th December, 2010**

| Contents | Details |
|---|---|
| **1. Executive Summary** | **M/s** Dhampur Sugar Mills Ltd Unit : DISTILLERY<br><br>Location - Vill- Allehapur<br>Tehsil- Dhampur, District- Bijnor (U.P)<br><br>**Location Co-ordinates:**<br>Latitude : 29°17.236' N<br>Longitude: 78° 30.900' E<br><br>**Total project cost :-**10737.00 LAKHS.<br>**Area :-** 25 Acre |
| **2. Introduction of the project Background information** | The proposed Expansion of Distillery Plant is from 200 KLPD to 350 KLPD and 3 MW.<br>It is Green field project .<br>Proposed within the premise of existing Distillery Premises belt due to availability of molasses from sugar unit.<br>Ethyl alcohol is agriculture based product which is recognized globally by different name like Rectified Spirit, Denatured Spirit, Extra Neutral Alcohol, Absolute Alcohol etc. with multiple uses, like chemical industries, pharmaceutical Solvents, potable purposes and as other alternative source of energy world wise.<br><br>Alochol can be produced either synthetically from petroleum substances or by fermentation from Sugar or starchy substrates using yeast.<br><br>**INDUSTRIAL USE OF ALCOHOL**<br><br>Important feed stock for manufacture of various Carbon Based chemicals like Acetic Acid, Butanol, Butadine, PVC etc.<br><br>Alcohol is also used in essential drugs and |

| Contents | Details |
|---|---|
| | formulations.<br><br>**Beverages-** Since ages manking is using alcohol for potable purpose and India too the consumption of alcohol for potable purposes is as high as that of industrual use.<br><br>For potable purposes in India the alcohol is used to manufacture country liquor or Indian made foreign liquor. Extra neutral alcohol is most suited to produce potable liquor so it is in high demand.<br><br>**FUEL ETHANOL-** Alcohol has a great future in the energy sector. August 13, 2002 was a historic day for the Indian Ethanol programme as on this day the Government of India finaly announced that from January 1, 2003 blending of 5% of Ethanol were be made mandatory in Nine States and Four Union Territories of India i.e. 70% of Gasoline consumed in India has to doped with 5% of Ethanol. To ensure that 350 million Liters of Ethanol of right quality will have to be made available in adequate quantities to various oil depothrough out the Country.<br><br>In future when India has to reduce the dependence on petroleum imports due to very high world market prices the doping of gasoline by ethanol may go as high as 10% to 20%. In that case the requirement of ethanol will be still higher as shown below-<br><br>The present supply and future projection in terms of ethanol use in India - |

| | |
|---|---|
| Ethanol Required per Annum @ 5% blending | 450 Million Liters |
| Ethanol Required per Annum @ 10% blending | 900 Million Liters |

| Contents | Details |
|---|---|
| | <table><tr><td>Average production of Alcohol per Annum</td><td>1600 Million Liters</td></tr></table><br>The projection of fuel ethanol required with the @5% blending is about 31% of total alcohol production in India. Considering the possibility of blending of petrol @ 10% in near future the requirement will increase substantially and therefore installation of more ethanol plants also becomes necessary in order to cope up with the requirement.<br><br>Alcohol has a very important place in the country's economy. This a vital raw material for a number of chemicals. It has been a source of larger amount of revenue by way of excise duty levied by state government on alcoholic liquors. It has potential as fuel in the form of power alcohol for blending of gasoline in ratio 20 : 80.<br><br>Fermentation alcohol is in great demand in countries like Japan, USA, Canada, Sri Lanka etc. The synthetic alcohol produced from Neptha of petroleum crude is not useful for beverages. These countries import large quantities of alcohol and India is one main supplier.<br><br>India produced 25% of the world cane molasses production. Uttar Pradesh has enough potential to develop cane production to increase the capacity of existing sugar factories and produce as much molasses as possible to increase alcohol production and earn revenue for Uttar Pradesh and India on the whole and can also help in industrial growth of Uttar Pradesh.<br><br>The main process involved in production of Alcohol from cane molasses are fermentation in which sugars are broken down in alcohol and Carbon-di- Oxide ($CO_2$) and then pumped to |

| Contents | Details |
|---|---|
| | distillation section in which alcohol is stripped off from fermented wash in form of Vapour and then condensed to have Alcohol.<br><br>These days many Technologies are available for fermentation process like Batch Fermentation, Bio Still Process, Hiform-Continuous Fermentation etc.<br><br>The same way the various technologies of distillation process range from -<br><br>• Convetional direct steam Heating &Rectifer columns.<br><br>• Multi pressure distillation technology heating for Strippng off alcohol under vacuum in flubex heat exchanger known as MPR technology. |
| i. Identification of project and project proponent. In case of mining project, a copy of mining lease/letter of intent should be given. | N/A |
| ii. Brief description of nature of the project. | The proposed Expansion of Distillery Plant from 200 KLPD to 350 KLPD and 3 MW power. It is Green field project .Proposed within the premise of existing sugar belt due to availability of molasses from own sugar mill. |
| iii. Need for the project and its importance to the country and or region. | Besides the technical and environmental benefits fuel ethanol offers, it makes tremendous economic sense in India as India's Import bill of crude petroleum is increasing every year.<br><br>India is number two in the world in Sugarcane production. The number of sugar factories is 416 and 295 distilleries in the country. Large number of sugar factories co-produce ethanol. The introduction of ethanol fuel will give big boost to Indian economy by following ways:<br><br>• The efficiency and commercial viability of sugar factories will improve. |

<table>
<tr><th>Contents</th><th>Details</th></tr>
<tr><td></td><td>
<ul>
<li>Farmers will get higher price for sugarcane which will improve the socio-economic status of farmers.</li>
<li>Agriculture will get boost because of additional production of sorghum, jawar and sugarcane.</li>
<li>Mixing of ethanol to petrol will save foreign exchange worth Rs. 4000 crores every year.</li>
<li>Less dependence on imports and cheaper cost o production of ethanol will bring down the prices of fuels.</li>
<li>Overall it is "Ecofriendly Project".</li>
</ul>
In view of the above positive results, it is recommended without any reservation that the establishment of this factory be granted.
</td></tr>
<tr><td>iv. Demand-Supply Gap.</td><td>
<table>
<tr><td>Ethanol Required per Annum @ 5% blending</td><td>450 Million Liters</td></tr>
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In future when India has to reduce the dependence on petroleum imports due to very high world market prices the doping of gasoline by ethanol may go as high as 10% to
</td></tr>
</table>

| Contents | Details |
|---|---|
| | 20%. In that case the requirement of ethanol will be still higher as shown below-<br><br>The present supply and future projection in terms of ethanol use in India -The projection of fuel ethanol required with the @5% blending is about 31% of total alcohol production in India. Considering the possibility of blending of petrol @ 10% in near future the requirement will increase substantially and therefore installation of more ethanol plants also becomes necessary in order to cope up with the requirement. |
| v. Imports vs. Indigenous production. | Only indigenous production. |
| vi. Export Possibility. | No |
| vii. Domestic/export Markets. | Domestic Only |
| viii. Employment Generation (Direct and Indirect) due to the project. | Direct employment :- approx 70 persons<br>Indirect employment :- approx 100 persons |
| **3. Project Description** | |
| i. Type of project including interlinked and interdependent projects, if any. | Expansion of Distillery Unit |
| ii. Location (map showing general location, specific location, and project boundary & project site layout) with coordinates. | Location map Enclosed (Google EARTH MAP) |
| iii. Details of alternate sites considered and the basis of selecting the proposed site, particularly the environmental considerations gone into should be highlighted. | Proposed site is adjacent to the existing sugar unit so it is convenient to operate by our common officer/staffs. Proposed Expansion will be Done in Existing Distillery Capacity |
| iv. Size or magnitude of operation. | 350 KLPD Distillery along with 3 MW power |
| v. Project description with process details (a schematic diagram! flow chart showing the project layout, components of the project etc. should be given) | Distillation And Fermentation flow diagram enclosed with Project report. |
| vi. Raw material required along with estimated quantity, likely source, marketing area of final products, Mode of | Molasses is 675 **MT/day for Expansion** which will be transported from the local source. |

| Contents | Details |
|---|---|
| transport of raw Material and Finished Product. | |
| vii. Resource optimization/recycling and reuse envisaged in the project, if any, should be briefly outlined. | Waste Water (Spent Wash) shall be used in boiler as a fuel. |
| viii. Availability of water its source, Energy/power requirement and source should be given. | Ground water through Tube well.<br>Existing water requirement-<br>• Industrial use: 3000 M3/Day<br>• Domestic Use: 20 M3/Day<br>Expansion Water requirement<br>• Industrial use: 2250 M3/Day<br>• Domestic Use: Nil M3/Day |
| | **Total Water Requirement-**<br>• Industrial use: 5250 M3/Day<br>• Domestic Use: 20 M3/Day |
| ix. Quantity of wastes to be generated (liquid and solid) and scheme for their Management/ disposal. | **Liquid effluents-**<br>• Industrial waste: 3500 M3/Day will be utilized in Incernation Boiler as a fuel.<br>• Domestic Waste: 12 M3/Day will be treated in separate soak pit and septic tank.<br>**Solid Waste**- Bagasse Ash + Slop Ash= 53 MT/day shall be used as a manure. |
| x. Schematic representations of the feasibility drawing which give information of EIA purpose. | It will be enclosed in EIA report. |
| **4. Site Analysis** | |
| i. Connectivity. | **Railway Station:**<br>Dhampur - (Broad gauge)- 3 Km -N.Railway<br>**Airport:** Dehradun Jolly Grant Airport-113 km |
| ii. Land Form, Land use and Land ownership. | Plain land ,Industrial Land is registered under Dhampur Sugar Mills. |

| Contents | Details |
|---|---|
| iii. Topography (along with map). | Location Map (Google Earth map) enclosed |
| iv. Existing land use pattern (agriculture, non-agriculture, forest, water bodies (including area under CRZ)), shortest distances from the periphery of the project to periphery of sanctuary, eco from the HFL industrial area, be given. | Land use pattern will be incorporated in EIA Study report. |
| v. Existing Infrastructure. | Existing Distillery Unit |
| vi. Soil classification | Silty/clay/sand |
| vii. Climatic data from secondary sources. | Max. Temp:42 Degree C<br>Mini. Temp: 4 Degree C<br>Ave Temp: 28 Degree C<br>Relative Humidity: 65 – 85 % |
| viii. Social Infrastructure available. | Road, School & electricity. |
| **5.Planning Brief** | |
| i. Planning Concept (type of industries, transportation etc) Town and Planning/ Development authority Classification | Transportation by Road. |
| ii. Population Projection | 70-80 Staff |
| iii. Land use planning (breakup along with green belt etc). | 60% for Plant establishment and other Facilities and Green belt development: 40% of total area of existing land. |
| iv. Assessment of Infrastructure Demand (Physical & Social). | Local labours & construction material. |
| v. Amenities/Facilities. | Companies employees and costumer / consumer shall be provided. |
| **6. Proposed Infrastructure** | |
| i. Industrial Area (Processing Area). | Industrial land |
| ii. Residential Area (Non Processing Area). | Available with existing Sugar mill. |
| iii. Green Belt. | Green belt development: 40% of total area of existing land. |
| iv. Social Infrastructure. | Proposed expansion will lead to the |

| Contents | Details |
|---|---|
| | development of certain local ancillary facilities and consequent employment opportunities. Further the proposed expansion will also lead to the development of market, trade centers, banking activities etc. |
| v. Connectivity (Traffic and Rail/Metro/Water ways etc) | **Railway Station:**<br>Dhampur - (Broad gauge)- 17 Km -N.Railway<br>**Airport:** New Delhi Air Port, 230Km<br>Road:National Highway -74<br>Road: State Highway - 49 |
| vi. Drinking Water Management (Source water) | Ground water. |
| vii. Sewerage System. | Septic tank / Sock pit for domestic effluent treatment. |
| viii. Industrial Waste Management. | . |
| ix. Solid Waste Management. | 1-Bagasse Ash used in filling of low lying areas or in manufacturing of fly ash bricks<br>2- Flop used as a Manure |
| x. Power Requirement & Supply / source. | Power generation 3 MW is proposed which Shall be used 100% in house uses . |
| **7. Rehabilitation and Resettlement (R&R) Plan** | |
| i. Policy to be adopted (Central/State) in respect Of the project affected persons including home oustees, land oustees and landless laborers (a brief outline to be given). | No R & R |
| **8. Project Schedule & Cost Estimates** | |
| ii. Likely date of start of construction and likely date of completion (Time schedule for the project to be given). | After receipt of NOC & Environmental Clearance. |
| iii. Estimated project cost along with analysis in terms of economic viability of the project. | Rs10737 .00 Lakhs |
| **9. Analysis of proposal (Final Recommendations)** | |

| Contents | Details |
|---|---|
| i. Financial and social benefits with special emphasis on the benefit to the local people including tribal population, if any, in the area. | **Financial Benefits:**<br>Benefits and advantages of bagasse/biomass cogeneration include:<br>a) Increasing the viability of sugar mills<br>b) Increased fuel efficiency<br><br>**Social Benefits:**<br>Greater employment for local populations<br><br>**Environmental benefits:**<br>a) Low emission of particulates,SO2,NOx and CO2 compared to coal and other fossils fuels<br>b) It is a Green field project.<br>c) Own generation of power.<br>**Other Benefits:**<br>Revenues to the State and Central ex-chequers.<br>Over all development of Bijnour District in particular and Uttar Pradesh State in general. |

## WATER BALANCE CHART

## For 350 KLPD Molasses based distillery

**Total Water Inputs :**

The total water input streams are as mentioned below:

| **TOTAL WATER INPUTS** | | |
|---|---|---|
| | **Total Qty.** | **UNIT** |
| PROCESS WATER IN FERMENTATION | 3160 | KL |
| DM WATER FOR RS DILUTION | 3527 | KL |
| DM WATER FOR BOILER FEED | 2592 | KL |
| WATER IN MOLASSES | 410 | KL |
| SOFT WATER FOR VACUUM PUMP & OTHERS | 224 | KL |
| SOFT WATER MAKEUP FOR COOLING TOWER | 2624 | KL |
| OTHER DOMESTIC USAGE (PROVISIONAL) | 89 | KL |
| MISC. WASHINGS (PROVISIONAL) | 47 | KL |
| | **12673** | **KL** |

**Total Water Outputs :**

The total water output streams are as mentioned below:

| **TOTAL WATER OUTPUTS** | | |
|---|---|---|
| | **Total Qty.** | **UNIT** |
| STEAM CONDENSATE | 2288 | KL |
| WATER IN SPENT WASH | 2988 | KL |
| SPENT LEES (RECTIFIER) | 3428 | KL |
| SPENT LEES (PRE-RECTIFIER) | 487 | KL |
| CT EVAPORATION & DRIFT LOSSES | 2824 | KL |
| DOMESTIC CONSUMPTION | 89 | KL |
| BOILER DRIFT & BLOWDOWN | 355 | KL |
| VACUUM PUMP SEALING / PURGE | 172 | KL |
| MISC. WASHINGS | 42 | KL |
| | | |
| | **12673** | **KL** |

Note: The above mentioned data is tentative and subject to variation; can be confirmed only after detailed engineering.

**Total Recycle and Utilization Streams :**

The total water recycle and utilization streams are as mentioned below:

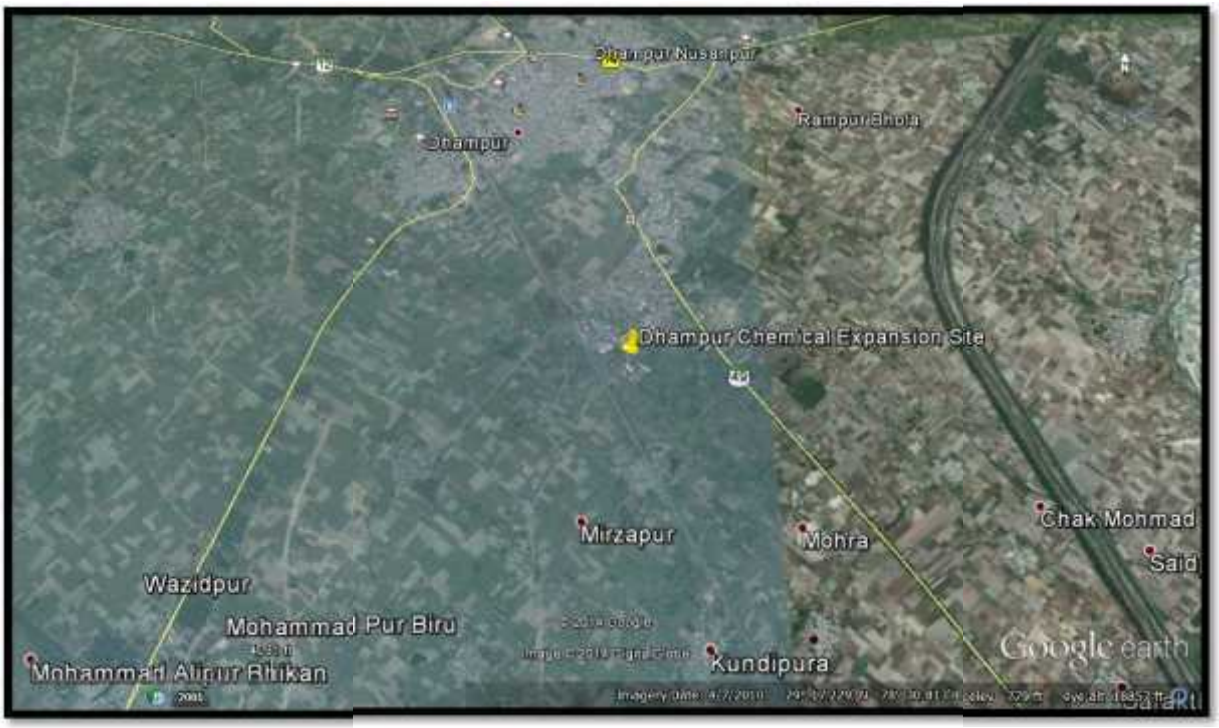
| **TOTAL WATER OUTPUTS** | | |
|---|---|---|
| | **Total Qty.** | **UNIT** |
| LEES RECYCLE FOR RS DILUTION | 2595 | KL |
| STEAM CONDENSATE RECYCLE FOR BOILER | 2020 | KL |
| SPENT LEES (RECT) - COOLING TOWER MAKEUP | 352 | KL |
| PROCESS CONDENSATE RECYCLE TO PROCESS & CT | 2353 | KL |
| VACUUM PUMP WATER RECIRCULATION | 150 | KL |
| **Total Recycling /Utilizations of water per day (70%)** | **7470** | KL |

| **AFTER ALL RECYCLES (70% ) :** | | |
|---|---|---|
| **TOTAL FRESH WATER INPUT** | **5203** | **KL** |

The above mentioned data is tentative and subject to variations; to be confirmed after detailed engineering.

**TOTAL FRESH WATER REQUIREMENT IS 15 KL/KL PRODUCT**

# Location of Proposed Expansion




## Location Of Proposed Expansion On Topo Sheet

# OUR TREATMENT STRATEGY

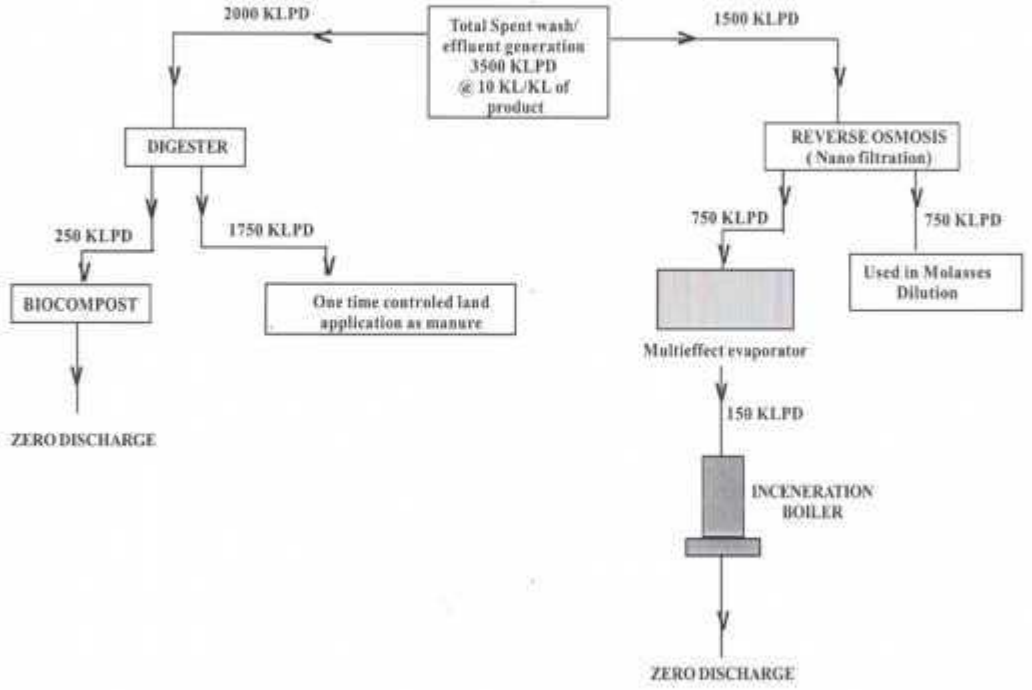
# For 350 KLPD DISTILLERY PLANT

## Total Factory Capacity – 350KLPD after expansion

## Treatment Strategy of DISTILLERY

## Dhampur Unit

**TOTAL FACTORY CAPACITY - 350 KLPD after Expansion**
**TREATMENT STRATEGY OF DSM CHEMICALS DHAMPUR UNIT**



**SPENT WASH TREATMENT AND UTILIZATION**

Dhampur Sugar Mills, Distillery Unit, Dhampur, which is an attached distillery along with a 12000 TCD Sugar unit now proposes to expand its distillery capacity from 200 KLD to 350 KLD of rectified sprit/AA/ENA. The capacity enhancement to this continuous process distillery is likely to increase the spent wash generated from 2000 KLD to 3500 KLD during distillery operation.

The distillery endeavors to maintain its spent wash discharge at 10 KL per KL of alcohol which is within the range of 8.5 to 11.0 KL/KL, generally generated from continuous process molasses based distilleries. The raw spent wash from continuous process molasses based distillery operations is generally expected to exhibit the following characteristics.

| | |
|---|---|
| Volume | 10-12 |
| Color | Dark Brown |
| PH | 4.0-4.3 |
| COD | 110000-130000 |
| BOD | 55000-65000 |
| Solids | 130000-160000 |
| Calcium | 4500-6000 |
| Chlorides | 6000-7500 |
| Sulphates | 4500-8500 |
| Total Nitrogen | 1000-1400 |
| Potassium | 10000-14000 |
| Phosphorous | 300-500 |
| Sodium | 1400-1500 |

Spent wash with a design characteristics as above is proposed to be segregated and treated through 2 streams-

1. 2000 KLD out of a Total Spent Wash generation of 3500 KL is proposed to be routed through a Continuous Stirred Tank Reactor. Post Methanated effluents are proposed to be used for Bio-composting (250 KLD) and One Time Controlled Land application (1750 KLD).

2. 1500 KLD out of a total spent wash generation of 3500 KLD is proposed to be subjected to nano filtration and concentrated in a multi effect evaporator. The reject which will be about 150 KL is proposed to be burnt in an incinerator and the permeate used for dilution of molasses.

The Continuous Stirred Tank Reactor, the nano filtration unit and the multi effect evaporator of adequate capacities are already installed and handling 2000 KLD spent wash per day. Bio-methanated effluents from the C.S.T.R are presently taken to a Reverse Osmosis unit from where they are sent to the multi effect evaporator and the rejects for bio-composting. Permeates are used for dilution of molasses. The modified scheme will utilize 2000 KLD of postmethanated effluents, from the existing unit for one time controlled land application(1750 KLD) and composting( 250 KLD) and the balance of raw spent wash(1500 KLD) would be taken directly to the R.O and M.E.E units which are adequately designed to accept raw spent wash.

**Continuous Stirred Tank Reactor**

The CSTR process is a high rate process in which anaerobic digestion takes place in the mesophlic range (37-39`c) and at a pH of around 7.2. Hydrolysis, acidogenesis and Methanogenesis are carried out in a single reactor. The reactor also has a recirculation arrangement of settled solids from treated spent wash in order to maintain adequate population of micro organisms. The CSTR process is very consistent with a high Biogas generation and the capacity to reduce the BOD by 95% and COD by 65 to 70%.

**Nano filtration(Reverse Osmosis) and Multi effect evaporation**

Nano filtration technologies have the distinct ability to process both the raw and post methanated spent wash to give a stream of clear and colorless water and the other of concentrated spent wash in a ratio of 50:50 in the case of biomethanated and 45:55 in the case of raw spentwash . The reduced volume of concentrated spent wash also facilitates convenient composting. Two nano filtration units with a capacity of 800$m^3$ each are installed and are suitable for both raw and biomethanated spent wash. In case of direct spent wash feed, the quantity of permeate may be around 45% instead of 50-52%. The reject would be about 55%.The membrane can work at a pH of 4.5-5.

Multi effect evaporation will be utilized to concentrate the RO rejects expected to be 750 KLD and reduce them to 150 KLD. This will be Incinerated in a freshly proposed Incinerator and ash used as manure.

The existing Multi Effect concentration unit is of 1400m3/day capacity along with 70% and 90% concentration unit. The unit is suitable for raw spent wash and Bio-Methanated spent wash feed. The raw spent wash unit efficiency will be much better as compared to Bio-Methanated spent wash feed.

**Utilisation of postmethanated spent wash in presown land(Controlled) application**

The Central Pollution Control Board, in 2005, issued a protocol for one time controlled land application of post methanated distillery spent wash as liquid manure. The said protocol advocates the use of post methanated spent wash with a BOD of less than 7000 mg/L and a pH of more than 7.

Post methanated spent wash has been recommended to be applied uniformly on land at least 20 days prior to the sowing of the crop and ploughed before raising the crops. The protocol has also prescribed the application rates for various crops which for loam are 90-125 m3/ha for sugarcane and 80-150 m3/ha for paddy etc. The Central Pollution Control Board had recommended Bio methanation followed by pre-sown irrigation as a 'Zero discharge option' to be followed by distilleries.

The Industry (Dhampur Sugars) has a command area of 56465 Hectares from where it sources its cane crop. Out of this the total cane area is 41419 Hectares, with a sowing season spreading from October to May, wheat crop area is 10500 Hectares with a sowing season spread from November to December and the Paddy area is 8550 Hectares with the sowing season in July and August. The industry proposes to use 1750 KLD of post methanated spent wash for presown irrigation/ controlled land application. The total spent wash available for utilization on a 270 days working of the plant is expected to be 472500 KL per annum. Assuming a minimum application rate of 90 $m^3$ per Ha as per the protocol prescribed by the

Central Pollution Control Board, the land requirement works out to be only 5250 Ha as against the total cane area availability of 41419 Ha. Sufficient land is therefore available.

The only shortcoming that the Central Pollution Control Board has found with the utilization of biomethanated spent wash, in its resolution of May 2008, is that the effluents cannot be utilized in the Monsoon season although the CPCB protocol also suggests that a minimum storage of one month shall be provided for the storage of effluents during the monsoon season. The Industry has an existing storage capacity of 36000 Kilolitres for storage of effluents. This will be augmented to 70000 Kilolitres to provide for the required on month holding capacity and shall be sufficient safeguard against the apprehensions of the CPCB.

**JUSTIFICATIONS FOR THE USE OF SPENT WASH AS FERTILIZER AND FOR BIO-COMPOST**

In spite of the recalcitrant nature of spent wash and the enormous damage, which may be caused as a result of uncontrolled discharge of untreated spent wash into water bodies and lands, many authors have classified it as a dilute organic fertilizer with 7 to 9% solids and 90 to 93% water. More than 75% of the solids are organic in nature and about 25% are inorganic. The occurrence of nitrogen in a mostly colloidal form allows it to behave as a slow release fertilizer and better than any inorganic source of nitrogen. The presence of phosphorus in the organic form has also enabled a better availability. In a study comparing spent wash to farm yard manure, it has been observed that spent wash solids contained more ether soluble, alcohol soluble and hot water soluble fractions than farm yard manure and a total potassium content almost 12 times higher than farm yard manure.

Organic compounds extracted by alkaline reagents have been found to be humic in nature and similar to those in soil. They also do not contain any toxic elements or compounds and the highly acidic nature and rich calcium and magnesium contents make them a good agent for reclamation of non salinesodic soils.

Because of its high organic matter, the spent wash is also a potential source of bioenergy. If this energy is trapped, distilleries producing 3.2 billion litres of alcohol can generate 5 trillion kilo calories of energy annually, apart from the post-methanated effluents providing 2,45,000 tonnes of potassium, 12,500 tonnes of nitrogen and 2,100 tonnes of phosphorus. One year's effluent has been estimated to meet the potassium

requirements of 1.55 million hectare land, nitrogen requirement of 0.13 million hectare and phosphorus requirement of 0.025 million hectare of land if two crops are taken in a year.

Estimates also point out to the fact that the 40 billion litres of effluents generated from distilleries have at least Rs 500 crores of macronutrients (N, P, K and S) and Rs 50 crores worth of micronutrients and organics. The environmental costs of these effluents is put at Rs 800 crores, which includes Rs 100 crores to fisheries, 500 crores to water treatment, 100 crores on public health and 100 crores on landscape.

It has been widely recognized that there is a need of utilizing the nutrient capacity of spent wash to recharge the soil in order to maintain its continued productivity.

In Australia spent wash is blended with additional crop nutrients and sold as manure. CSR Ethanol is the second largest Australian producer of fuel ethanol. CSR Sugar produces 40% of Australia's sugar. Ethanol products and Fertilizer products are the two main product streams at CSR's Sarina Distillery in Mackay near North Queensland. The distillery is marketing Bio-dunder, a process co product which is value added into a complete liquid fertilizer. Bio-dunder is certified as organic and has been granted "Beneficial Use" status by the E.P.A. The key advantages of using Bio-dunder are the recycling of nutrients back into the soil. In Australia Bio-dunder fertilizer is now precision applied using variable rate application technology. The fertilizer returns are positively supported by projections in agriculture outputs. The Australian Government has recognized that CSR'S Sarina Distillery has changed into an environmental pariah in the local community into a welcome industry. Apart from process innovations, they have turned a pollutant into a saleable, import replacing product and improved its business position through an increased community acceptance. The communities complaints have also ended. Conversion of Spent wash into Biodunder also resulted in the

Use of Biodunder as a cane field potassium fertilizer.

Elimination of odour and contamination of water bodies.

Increased plant productivity

Improved quality of ethanol production.

Reduction in steam usage within the plant by 30%.

Reduction in water consumption by 70%.

Bio-dunder has been accepted by Cane and other farmers as a valuable potassium-rich fertilizer and 100% of the Bio-dunder product at the Sarina distillery is now recycled into this market. Previously only imported fertilizers were used. In 1992, the Australian Chemical Industry Council awarded its annual Environment Award to CSR employees who had been instrumental in developing the Biodunder concept.

Dunder (or concentrated spent wash) from the Sarina Distillery is also blended with Nitrogen, $H2SO_4$ and Phosphorous and converted into another product called "Liquid One Shot" for application as fertilizer in cane and other crops. Nitrogen volatilization is reduced in liquid One shot products, uptake by plants is more rapid and it is cost competitive.

Spent wash could also be utilized for composting the trash in the field. In Brazil, the accumulated trash material in the sugarcane harvested field is sprayed with spent wash to facilitate the accelerated composting of the trash in the field itself. Brazilian experience suggests that efficient application technologies and spray applications reduce the damage to soil and prevent ground water pollution. Up to 70% crops are being irrigated by spent wash.

**Central Pollution Control Board on One Time Land Application**

The CPCB in its document entitled "Management of Distillery Wastewater" (Resource Recycling Series: RERES/4/2001-2002) had suggested the following options:

- Biomethanation followed by irrigation
- Biomethanation and secondary treatment followed by irrigation or disposal in surface water
- Composting after or without biomethanation
- Controlled land application, after or without biomethanation
- Concentration and incineration with energy recovery
- Disposal by dilution in sea or estuary after biomethanation

The CPCB has recognized in the above document that a combination of composting and controlled land methods of spent wash utilization is an ideal disposal option.

The Charter on Corporate Environmental Responsibility, 2003, does not speak of one time controlled land application as a treatment option but in 2005, the CPCB published a protocol for one time controlled land application of treated biomethanated distillery spent

wash as liquid manure, which was based on field and experimental studies carried by the I.A.R.I, Delhi and Tamil Nadu Agricultural University, Coimbatore. The said protocol advocates the use of post methanated spent wash with a BOD of less than 7000 mg/L and a pH of more than 7. Post methanated spent wash has been recommended to be applied uniformly on land at least 20 days prior to the sowing of the crop and ploughed before raising the crops. It has also prescribed the application rates for various crops which for loam are 90-125 m3/ha for sugarcane and 80-150 m3/ha for paddy etc.

The Central Pollution Control Board had recommended Bio methanation followed by pre-sown irrigation as a 'Zero discharge option' to be followed by distilleries. In 2008the CPCB through a Board resolution decided not to permit existing stand alone distilleries for expansion based on composting, ferti-irrigation and one time land application. There were no recommendations with respect to existing attached distilleries going in for an expansion. Existing distilleries (both stand alone or attached) which were not complying with standards were expected to switch over from composting, ferti-irrigation and one time land application in a time bound manner. The CPCB does not appear to have discouraged pre-sown application in the case of existing attached distilleries going in for expansion.

The Member Secretary, CPCB in his paper of 2011 (Emerging Issues and Emerging Technologies in Distillery Sector) has referred to one time land application as an irrigation system, while the protocol of 2005 by the CPCB refers to it, as a manuring system. The contention of the CPCB against one time land application appears to be based on difficulties in the rainy season, high dilution to meet irrigation norms and ground water contamination. All these apprehensions have not been able to take into consideration that the technology also involves spent wash to be sprayed uniformly on agricultural land.

The CPCB had prescribed Guidelines for Water Quality Management in January 2008. These guidelines have recognized that the reuse and recycling of wastes for agricultural purpose would not only help to reduce the pollution and requirements of fresh water for such use but also would supplement the much needed nutrients and organic manure to plants. These guidelines also state that the resolution under CREP should also be adhered to. The CPCB resolution of May 2008 does not find any demerit in its statement of January 2008 regarding the enormous irrigation and fertilization potential of spent wash. It only says that

ferti-irrigation, composting and land application options did not work in rainy seasons. Interestingly the said minutes, which discourage use of spent wash in ferti-irrigation, composting and land application, on the very next page also recognize that "As per CPCB, the bio-compost contains 2.5% nitrogen, 1.8% phosphorus and 3% potassium. Based on the total production of bio-compost produced, the requirement of nitrogen on an all India basis is met up to 6.24%, phosphorus 9.06% and potassium 51.06%. Moreover, the above fertilizer is produced from organic matter substituting the imported chemical fertilizer, which is highly subsidized."

The CPCB, Central Zonal Office, Bhopal has published a report entitled "Assessment of grain based fermentation technology, waste treatment options, disposal of treated effluents" in 2010-11. This paper also recognizes Controlled Land application as a viable alternative but refers to it as not being supported by regulatory agencies because of management problems. It admits that the Protocol developed by CPCB is based on the protocols followed in other parts of the world with great success and also studies carried out by Agricultural Universities in India.

The same paper also suggests that concentration and incineration is also associated with problems of high COD condensates, sludge disposal (as composting is not allowed), clogging of boilers and that the sustainability of this technology needs to be established.

No standards have been prescribed by the CPCB for ferti-irrigation (the CPCB earlier accepts 500 mg/L BOD and 2100 mg/L TDS as safe criteria) or for one time land application and composting it would appear just if existing attached distilleries are allowed to operate as per the existing protocols, evaluated in terms of the protocols for these technologies and required to shift only if they do not meet the protocol. It is important to again note here that emerging technologies may require major changes and the fact that hardly 25% existing distilleries are in a portion to concentrate spent wash. Only 24 distilleries in U.P. are having R.O. system.

Co-processing of spent wash concentrate has been recommended to the extent of 3.0 to 3.5% of heat/coal substitution – a concentration up to which co-processing of spent wash has not been considered to influence clinker quality or change kiln behavior. A maximum loading of 1000 Litres per hour has been experimented. This would only mean about 24 KLD of concentrated or about 50 KLD of raw spent wash per day in a 3000 TPD cement kiln. This is a very small quantity as compared to the total spent wash available. Also the availability of willing cement mills, furnaces and TPPs may be limited in the area of the distillery. U.P. has been reported to have 56 molasses based distilleries, with only 1 cement plant and 11 TPPs. This would again support the view of a mix of technologies with bio-composting, ferti-irrigation and one time land application also being considered on account of their ecological and agronomical advantage. Co-processing could however be a preferred option for standalone distilleries and in Karnataka, Madhya Pradesh and Rajasthan where the ratio of cement plants/TPPs to distilleries is higher. In terms of the co-processing project, the CPCB document accepts that "Even though the initial trials appear encouraging, the effect of inorganic constituents in spent wash on the finished product is to be assessed." It also recognizes that "The applicability of the technology for Distilleries that are located far away is to be assessed in terms of cost effectiveness".

# TECHNICAL PROJECT REPORT
# FOR
# EXPANSION OF MOLASSES BASED DISTILLERY PLANT
# FROM
# CAPACITY200 KLPD TO 350KLPD

## PRODUCT NAME

**RECTIFIED SPIRIT/EXTRA NEUTRAL ALCOHOL/ABSOLUTE ALCOHOL-150 KLPD and 3.0 MW**

**OUR TREATMENT STRATEGY- BIOMETHANATION, RO, MEE, INCENERATION, BIO COMPOST, ONE TIME LAND APPPLICATION**


**Submitted By:**

**Dhampur Sugar Mills,**
**Unit - DSM chemical**
**DISTILLERY UNIT- Allehapur,**
**DISTT. Bijnor (U.P.)**

## CONTENTS


| SECTION | TITLE | PAGE No. |
|---|---|---|
| | | |
| | EXECUTIVE SUMMARY | |
| | | |
| 1 | BACKGROUND | 03 |
| | | |
| 2 | NEED FOR ETHANOL PLANT | 04 |
| | | |
| 3 | PROCESS DESCRIPTION | 07 |
| | | |
| 4-5 | PROJECT AT A GLANCE, DESIGN BASIS, PERFORMANCE PARAMETERS, ANDPRODUCT SPECIFICATIONS | 12 |
| | | |
| 6 | EQUIPMENT LIST | 20 |
| | | |
| 7 | EFFLUENT TREATMENT PLANT | 30 |
| | | |
| 8 | MAN POWER REQUIREMENT | 40 |
| | | |
| 9 | PROJECT IMPLEMENATION SCEDULE | 41 |
| | | |
| 10 | ESTIMATED COST OF PROJECT | 43 |

## EXECUTIVE SUMMARY

DSMChemicals, a unit of the Dhampur Sugar Mills Ltd is located in district Bijnor of Uttar Pradesh. The factory is most ideally located with respect to the availability of raw material, water, skilled and unskilled manpower and infrastructure facilities.

In view of the availability of molasses from sugar plant at Mansurpur and other sugar plants of the group located nearby, it is a suitable location for setting up an ethanol plant to meet the demand of the automobile fuel sector. Blending of Ethanol with petrol is being encouraged by the Indian Government to reduce the country's dependence on high priced imported crude oil.Rectified Spirit internal consumption has also gone up for our expanded capacity of Ethyl Acetate.

Ethanol is manufactured from molasses in three steps. First molasses is fermented to produce fermented wash, followed by distillation of fermented wash to produce rectified spirit and finally rectified spirit is dehydrated into ethanol, using molecular sieve system. Molecular sieve system is better than the conventional distillation system as it consumes less steam as compared to the latter.

A suitable effluent treatment plant has been conceived to reduce BOD level to the acceptable limit. Spent wash will be first treated in a bio-methanation plant, which converts organic matter into useful energy in the form of biogas. Biogas is sent to the Boiler as a Fuel, resulting in saving of bagasse. Spent wash from the bio-methanation plant is proposed to be converted into useful manure by bio-composting.
Total project cost for the proposed ethanol plant is estimated at 10737.00Lacs.The project is planned to be funded partly through commercial loans and partly through the Sugar Development Fund. The cost benefit analysis indicates that the project is commercially viable and offers a favourable debt service coverage ratio.

**SECTION 1**
**BACKGROUND**

The Dhampur Sugar Mills Ltd (DSM) started operation in 1933 with a 300 TCD sugar mill located at Dhampur in North India and has a successful track record of about seven decades of efficient operation. During this period it has grown into one of the largest sugar manufacturing groups in India, owning at present five sugar mills in the state of Uttar Pradesh with a combined cane crushing capacity of more than 40,000 TCD.

DSM has diversified into molasses based chemicals, by setting up a distillery and manufacturing facilities for alcohol based chemicals, such as; ethyl acetate. Licensed and Installed Distillery Capacity is 200 KLPD. Distillery is already in production of Rectified Spirit ENA and Fuel Ethanol. Apart from alcohol production DSM presently having a esterification plant producing 140 MT/day Ethyl Acetate.

DSM is now proposing to exapand the Distillery Capacity from **200 KLPD to 350 KLPD,** which will be based on most modern technologies and the state of art features. Project will result in Higher efficiencies, Energy conservation and Zero Effluent Discharge.

The present project report covers salient features of the project; such as market scenario, process of manufacture, raw material and utilities, project implementation schedule and estimated cost of project.

**This Project Report involves the additional Infrastructure required to enhance the capacity of distillery from 200 KLPD to 350 KLPD i.e. an additional set up of 150 KLPD Distillery with Effluent Handling System.**

## SECTION 2
## NEED FOR ETHANOL PLANT

India is predominantly an agro based economy. Sugarcane plays a vital role in this agro-based economy by providing sugar, the main sweetener, used in India. The state of Uttar Pradesh is the largest producer of sugarcane in India among all the states and accounts for over 45% of the sugarcane production in the country.

There are three important by- products of the sugar industry:

- **Molasses** which is converted into alcohol, an important raw material for organic chemicals and polymer industry.
- **Bagasse** which is used as a fuel for cogeneration of power and also as a raw material for production of paper.
- **Press Mud** which is used for the effluent treatment to produce biofertiliser.

The sugarcane available in U.P. yields on an average; 10% sugar, 32% bagasse and 4% molasses. Molasses is used for manufacturing industrial alcohol, potable alcohol and other organic chemicals.

There are at present more than 45 distillery units in U.P., of which 80% are in private sector and 20% in the Government / Cooperative sector. Functional, distilleries are about 85% and two are based on non conventional sources of raw material i.e. broken grain and malt.

The Alcohol Distillery industry in U.P., with its link to the sugar industry constitutes a major segment of the state's industrialization. Its contribution to the state revenue is second only to the trade tax realization in the state. This is also the highest contribution by any single industry to the state exchequer. It also provides employment to about 10000 persons in the state, thus leading to overall growth.

With the opening up of the automobile fuel sector for blending with ethanol and favorable export of hydrous ethanol, the alcohol industry is slated for a major expansion to play a vital role in meeting the ever- growing energy requirement of the country. Ethanol blended fuel is set to be made mandatory once again, as part of a long term commitment to the blending programme in keeping with the policy prevailing in countries, such as the USA and Brazil. The main reason for switching back to ethanol blending is the better properties of ethanol as an oxygenate compared to the conventional oxygenate MTBE. The latter is being phased out globally on the contention that it is carcinogenic. Moreover, ethanol blending is expected to reduce the country's dependence on high priced imported crude oil.

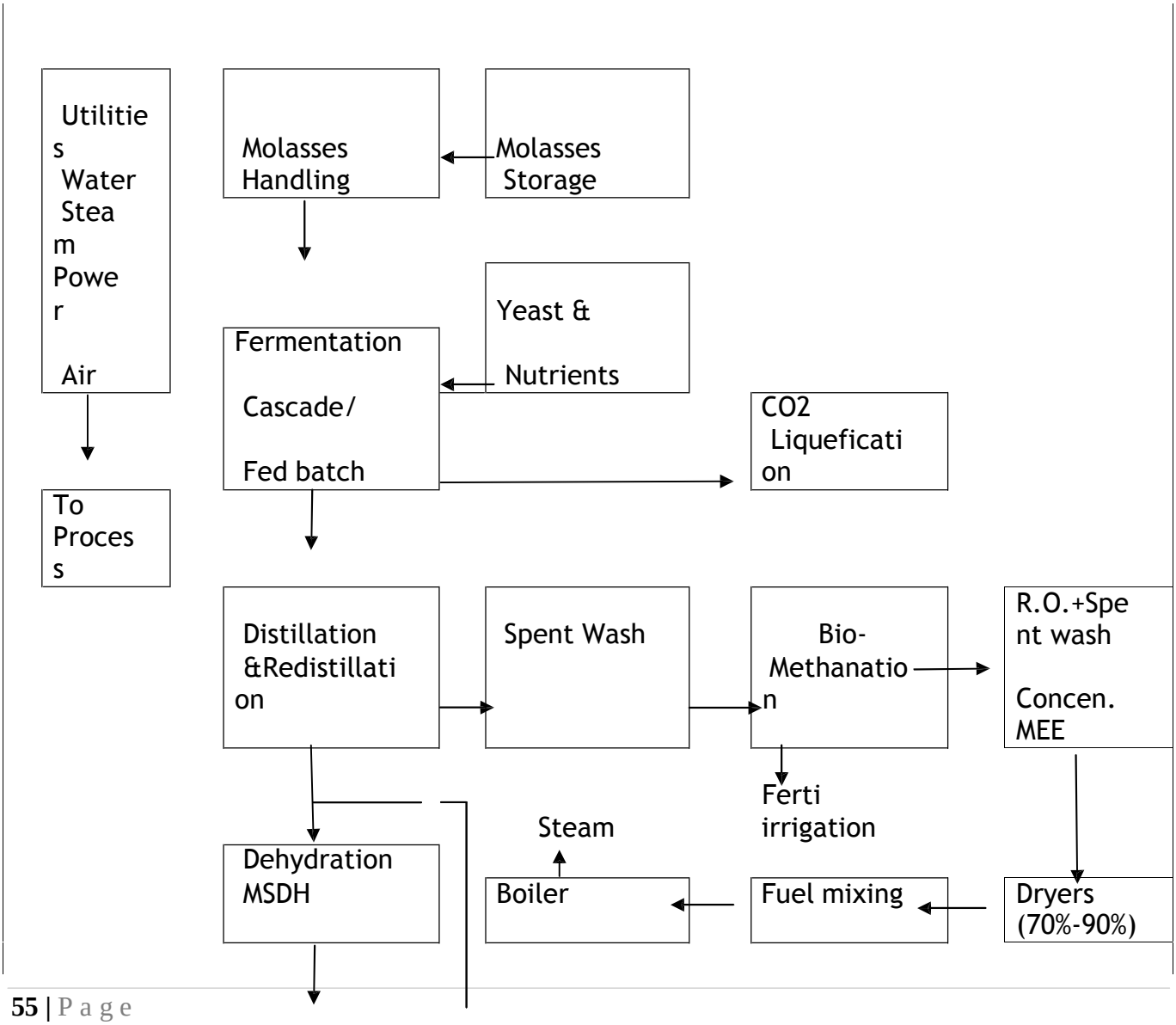
Sugar industry will also benefit, as its profitability will increase by producing a value added product, having an assured market.

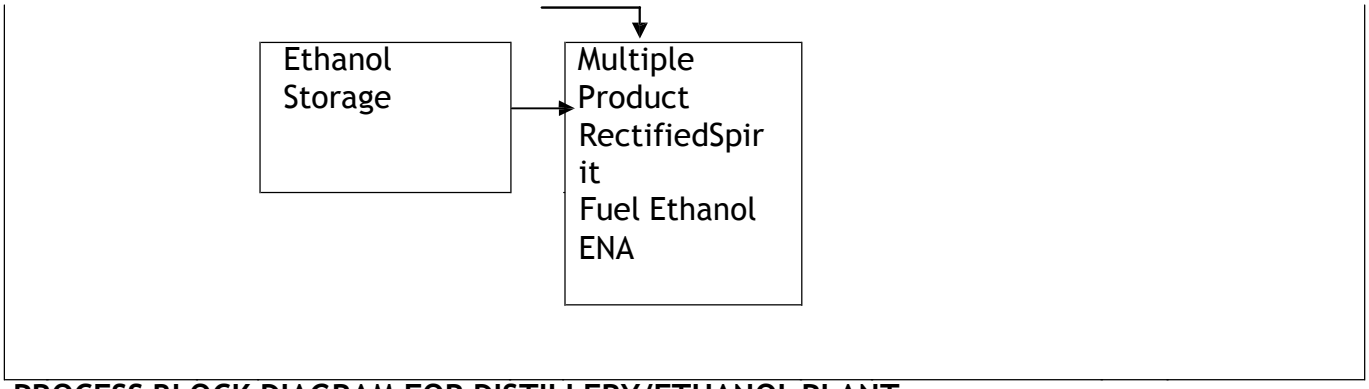
This diversification will also strengthen the sugar industry's ability to balance the Sugar and Ethanol production according to the prevailing International prices of sugar and crude oil. This is the kind of model successfully employed by the Brazilian sugar industry.

In the wake of increased ethanol prices world wide, many potential producers of ethanol have been prompted to re-evaluate opportunities in the sector. There is also increased enthusiasm for national fuel ethanol programme designed to reduce vehicle carbon emissions.

**SECTION 3**

**PROCESS DESCRIPTION: DISTILLERY BLOCK DIAGRAM**






**PROCESS BLOCK DIAGRAM FOR DISTILLERY/ETHANOL PLANT**

**The process for the manufacture of Ethanol consists of the following steps:**

- Fermentation of molasses to produce fermented wash.
- Distillation of fermented wash to produce rectified spirit (RS).
- Distillation of fermented wash to produce Extra Neutral Alcohol (ENA).
- Dehydration of RS to Ethanol, using the molecular sieve system.

### 3.1 FERMENTATION:

#### 3.1.1 Molasses: Storage & Handling

Molasses is a by product of the sugar industry and is generally stored in steel tanks. It is pumped to the molasses weighing system located in the plant premises. The weighing system is generally a load cell based system with a counter for measurement of quantity of molasses being processed in a given period of time. After weighment, molasses is pumped to the molasses diluter located alongside the fermenter.

#### 3.1.2 Yeast Propagation:

Molasses is taken into the yeast vessel and sterilized by steam. Yeast seed material is prepared and added to the yeast vessels by inoculating molasses with yeast. The contents of the yeast vessel are then transferred to the yeast activation vessel. The purpose of aeration in the yeast activation is to allow time for the multiplication of the yeast cells.

### 3.1.3 Fermentation:

The purpose of fermentation is to convert the fermentable sugars into alcohol. During fermentation, sugars are broken down into alcohol and carbon dioxide. Significant heat release takes place during fermentation, however; the fermentation temperature is maintained between 32-34 deg C by recirculation of cooling water through forced circulation heat exchangers.

The fermentation system has a provision for addition of anti foam, nutrients etc. Alcohol concentration of 5% V/V is maintained in the first fermenter, while the same is maintained between 7-8% V/V in the second fermenter, depending upon FS content of molasses. CO2 is collected and is passed through a CO2 scrubber in order to recover any alcohol, escaping with the gas. The alcohol containing the water is returned to the system and mixed with the fermented wash. The CO2 is taken to the CO2 bottling plant.

At the end of the fermentation cycle, wash is received in a wash holding tank, from where it is fed to the distillation section. Yeast growth critically required for the fermentation process, is maintained under aerobic conditions and the aerated cell mass is transferred to the fermenters.

### 3.1.4.a Distillation of Wash to Rectified Spirit:

The process requires analyser, aldehyde, degasifying and rectifier cum exhaust columns. The analyser, aldehyde and degasifying columns are operated under vacuum, whereas; rectifier cum exhaust column is operated under pressure.

Rectifier column top vapours meet the energy requirement for analyser column. The rectifier column top vapours are condensed in a thermo-siphon reboiler, connected to a flash tank and then flash vapours are injected into the analyser column.

The fermented wash is fed to the degasifying column top. Analyser vapours are condensed and fed to the rectifier column. Final RS is drawn from the top of the rectifier column.

### 3.1.4.b Distillation of Wash to ENA Spirit:

The process requires analyser, aldehyde, degasifying and primary rectifier cum exhaust columns, hydro-extractive distillation column, rectifier column, fusel oil column, refining

column. The analyser, aldehyde and degasifying columns, refining columns are operated under vacuum, whereas; rectifier cum exhaust column, fusel oil column and hydroextractive distillation column are operated under pressure.

Rectifier column top vapours meet the energy requirement for analyser column. The rectifier column top vapours are condensed in a thermo-siphon reboiler, connected to a flash tank and then flash vapours are injected into the analyser column. The hydroextractice distillation column top vapour is used for heating refining column and fusel oil column top vapour is used for heating heads cum dealdehyde column.

The fermented wash is fed to the degasifying column top. Analyser vapours are condensed and fed to the rectifier column. Final RS is drawn from the top of the rectifier column. The RS is fed to hydroextractive column for purification. The dilute alcohol from bottom of this column is fed to the Rectifier column where from the top ENA is taken and fed to refining column. The final refined ENA product is taken from refining column bottom.

### 3.2 Ethanol Plant Based on Molecular Sieve

The skid mounted molecular sieve dehydration system is configured as a stand-alone unit and is capable of operating independently from any other process equipment, once properly connected to the utilities.

The unit consists of two beds of desiccant and an evaporator / regeneration column. While one bed is on line, the other is regenerated for an equal period. A computer-controlled control system actuates the required valves operation, switching the flow from one bed to the other in a continuous operation, at the same time constantly monitoring all process, quality and safety parameters.

The feed is pre-heated and fed to the evaporation / regeneration column. The vapours are drawn from the top of the column and are partially condensed. A part of the vapour drawn is superheated and sent to Sieve bed 1, where the vapour is dehydrated, condensed and cooled, and pumped to storage. A portion of the dry vapour is purged to sieve Bed 2, under vacuum, to regenerate the bed in preparation for cycle changeover when bed 2 goes on line.

The regeneration process releases the adsorbed water and ethanol as low strength vapours. These are condensed and recycled with the feed to the evaporation column. A stillage stream (containing not more than 500 ppm ethanol) is obtained from the bottom of the evaporation column.

**SECTION 4**

**PROJECT AT A GLANCE**

**A) DESIGN BASIS OF THE ETHANOL PROJECT**

| | | | |
|---|---|---|---|
| **1.** | **Capacity of the plant** | **:** | **150,000 litres per day total Additional Alcohol. (Design Basis)** |
| **2.** | **Extra Neutral Alcohol** | **:** | **150,000 litres per day.** |
| **3.** | **Anhydrous Alcohol** | **:** | **150,000 litres per day.** |
| 4. | Raw material | : | Cane Molasses with 40 % FS Min. |
| **5.** | **Molasses Requirement** | **:** | **650- 680 MT per Day(avg. 675MT/day)** |
| 6. | Water source | : | Ground water after suitable treatment. |
| 7. | Fuel for steam | : | Bagasse – Dhampur Sugar |
| 8. | Electricity source | : | Steam turbine for regular operation |
| 9. | Waste water treatment | :: | Bio-methanation, Ferti-irrigation, RO and Bio-composting Spent wash concentration,Concentrate Mass mixing with bagasse and feed to Boiler. |

**4 B) PERFORMANCE PARAMETERS**

| | Parameters | Description |
|---|---|---|
| 1 | Plant capacity | 150,000 litres / day |
| 2 | Main products | 145,000 litres / day of Fuel Grade Ethanol<br>OR Rectified Spirit /ENA<br>5,000 liters per day Technical Alcohol at 95 % v/v.<br>**OR 150,000 litres / day Anhydrous Alcohol at 99.8 % v/v.**<br>It can produce above products simultaneously in any ratio. |
| 3 | Technology | **Cascade continuous fermentation with special yeast strain.**<br>The fermentation is trouble & maintenance free without using recycle of yeast or spent wash, which ensures cleaner & longer fermentation cycle.<br>**8 columns vacuum distillation with hydro extractive distillation.**<br>The distillation is designed to produce any of the products at any ratio and superfine neutral alcohol is produced using hydro extractive distillation. |
| 4 | Efficiency & alcohol yield at 45 % w/w Fermentable sugars | 1. EFFICIENCY<br>Fermentation efficiency–88-90 % (91% for FS more than 45%)<br>Distillation efficiency – 98.0 %<br>2. YIELD<br>265 to 267 litres 96 % v/v alcohol per Ton molasses at 45 % Fermentable Sugars.<br>251 TO 253litres of 99.8% v/v Alcohol per Ton of molasses at 45 % Fermentable Sugars. |

**SECTION 5**

**SPECIFICATIONS – PRODUCT, INPUT AND PROJECT**

**PRODUCT SPECIFICATIONS**

**Indian Standard 6613 of 1972, Revised 1984**

**Specification requirements for ENA ( Extra Neutral Alcohol)**

| | | |
|---|---|---|
| 1. | Relative density at 15°C | 0.81245 - 0.81679 |
| 2. | Ethanol content, percent by volume at 15.6 °C | 94 – 96 |
| 3. | Miscibility with water | Miscible |
| 4. | Alkalinity | Nil |
| 5. | Acidity, as acetic acid, g/100 ml, maximum | 0.002 (20 p.p.m) |
| 6. | Residue on evaporation, g/100 ml, maximum | 0.002 (20 p.p.m) |
| 7. | Aldehydes, as acetaldehyde, g/100 ml, maximum | 0.004 (40 p.p.m) |
| 8. | Esters, as ethyl acetate, g/100 ml, maximum | 0.01 (100 p.p.m) |
| 9. | Copper, as Cu, g/100 ml, maximum | 0.0002 (2 p.p.m) |
| 10. | Lead, as Pb, g/100 ml, maximum | Nil |
| 11. | Methyl alcohol: | To satisfy test |
| 12. | Isopropyl alcohol, acetone and other ketones | To satisfy test |
| 13. | Furfural | To satisfy test |
| 14. | Permanganate decolonization time, minimum, minutes | 30 |

## Indian Standard 323 of 1959
## Specifications requirements for Rectified Spirit
## Grade 1 (Potable) and Grade 2 (Industrial)

| | | Grade 1 | Grade 2 | Test method (Refer to appendix) |
|---|---|---|---|---|
| 1. | Specific gravity at 15.6°C, maximum: | 0.8171 | 0.8171 | B |
| 2. | Ethanol content: | | | |
| | (a) Percent by volume at 15.6°C, minimum: | 94.68 | 94.68 | C |
| | (b) Degrees overproof, minimum: | 66 | 66 | C |
| 3. | Miscibility with water: | Miscible | Miscible | D |
| 4. | Alkalinity: | Nil | Nil | E |
| 5. | Acidity, as acetic acid, percent by weight, maximum: | 0.002 (20 ppm) | 0.01 (100 ppm) | E |
| 6. | Residue on evaporation, percent by weight, maximum: | 0.005 (50 ppm) | 0.01 (100 ppm) | F |
| 7. | Aldehydes, as acetaldehyde, g/100 ml, maximum: | 0.006 (60 ppm) | 0.10 (1000 ppm) | G |
| 8. | Esters, as ethyl acetate, g/100 ml, maximum: | 0.02 (200 ppm) | - | H |
| 9. | Copper, as Cu, g/100 ml, maximum: | 0.0004 (4 ppm) | - | J |
| 10. | Lead, as Pb, g/100 ml, maximum: | 0.0001 (1 ppm) | - | K |
| 11. | Methyl alcohol: | To satisfy test. | - | L |
| 12. | Fusel oil: | To satisfy test. | - | M |
| 13. | Furfural: | To satisfy test. | - | N |

****Please note: The figures in parentheses for parts per million (ppm) do not appear in the original standard, but have been added here to facilitate comparison with standards of other countrie

**ANHYDROUS ALCOHOL SPECIFICATIONS FOR FUEL USE**

**Fuel Ethanol Specifications: IS 15464: 2004**

| **Absolute (Anhydrous) Alcohol** | **Special Grade** | **Test Method** |
|---|---|---|
| Relative Density @ 15.6/15.6 $^{o}$C, Max. | 0.7961 | A |
| Ethanol content @ 15.6 $^{o}$C, vol %, v/v Min. (excluding denaturant) | 99.6 | B |
| Miscibility with water | Miscible | C |
| Alkalinity | Nil | D |
| Acidity (CH3COOH), mg/l, Max. | 30 | D |
| Residue on evaporation, wt%, Max. | 0.005 | E |
| Aldehydes, as (CH3CHO), mg/l, Max. | 60 | F |
| Copper, mg/kg, Max | 0.1 | G |
| Conductivity, micro S/m, Max. | 300 | H |
| Methyl alcohol, mg/l, Max. | 300 | J |
| Appearance | Clear & Bright | Visual |

**SPECIFICATIONS OF INPUTS**

**1. MOLASSES**

Molasses should be free from caramalisation products and known inhibitory elements of yeast metabolism i.e. lead, Arsenic polyelectrolytes etc. or micro organisms producing side products. Such available molasses will have :-

(a) Fermentable sugars : Min 40% (w/w)
(b) F/N Ratio : Min 0.9 ***
(c) Sulphated ash : Max 15 % (w/w)
(d) Volatile Acids : Normal - 5000 to 8,000 ppm
(e) Bacterial content : Max. 10 cfu/gm
(f) Caramel content : Max 0.3 Absorbance at 375 nm.

*** : Ratio of Fermentable sugars to Non-Fermentable sugars.

**2. PROCESS WATER / SEALING / CLEANING / TESTING WATER**

Process water should be filtered and shall not contain any E. COLI or COLIFORM bacteria with total germs count being limited to 60 Nos / ml. The chloride content shall be less than 25 ppm.

**3 COOLING WATER FOR CIRCULATION**

Cooling water at a temperature of 30 Deg. C max. with a total hardness of 5 ppm maximum & Total Dissolved solids of 30 ppm max.

**4 SULPHURIC ACID**

Concentrated, Commercial Grade, Composition as below value in % W/W
(a) Sulphuric Acid : 98 MIN
(b) Lead : 0.001 MAX
(c) Arsenic : 0.0001 MAX
(d) Iron : 0.03 MAX
(e) Moisture : 2 MAX

**5 UREA**

In the form of prills or pellets with total Nitrogen not less than 46% W/W.

**6 DIAMMONIUM PHOSPHATE ( D A P )**

In the form of granules. Composition as below. Values in % w/w
(a) P205 : 50 MIN
(b) Nitrogen : 20 MIN

(c) Arsenic : 0.0001 MAX.
(d) Iron : 0.01 MAX.
(e) Lead : 0.001 MAX

**7 ANTIFOAM**

Turkey red oil. Composition as below, Value in % w/w
(a) Degree of sulphation : 6 MIN
(b) Total alkali (KOH) : 3 MAX.
(c) Total fatty matter : 60 MIN
(d) Total Ash : 8 MIN
(e) pH : 6.5 - 7.5

**8 STEAM FOR PASTEURISATION**

Dry, saturated should be provided at the inlet of steam header in fermentation plant. and the pressure required shall be 1.5 kg/cm2 (g) at the steam header.

**9 STEAM FOR DISTILLATION**

Dry, saturated should be provided at the inlet of steam header in Distillation plant and the pressure required shall be 3.0 kg/cm2 (g) at steam header. The max variation in the steam pressure shall not be more than +/- 0.1 kg/cm2.

**PROJECT SPECIFICATIONS**

The turnkey ethanol project will be designed and constructed in strict compliance with the international standards and brands of equipment.

**Design codes:**

The following are the design standards used for the equipment for design.

1. Pressure Vessels and distillation columns as per ASME
2. Storage tanks as per API
3. Heat Exchangers as per TEMA
4. Piping and valve as per DIN/JIS
5. Instruments as per ISA.

**SECTION 6**
**PLANT AND MACHINERY LIST**
**(EQUIPMENT LIST IN ABCD FORMAT)**

## APPENDIX- A (RECTIFIED SPIRIT SECTION)

| Sr. No. | Technical Data | Analyser Column | Degasser Column | Rectifier Column -I | Heads Conc. Column |
|---|---|---|---|---|---|
| 1 | Total height of Column (m) (Dish end to Dish end) | 16.500 | 5.200 | 16.750 | 10.700 |
| 2 | Outer Diameter of Column (mm) | 3712 | 2200 | 3212 | 2480 |
| 3 | Inner Diameter of Column (mm) | 3700 | 2190 | 3200 | 2470 |
| 4 | Material Of Construction | SS 304 | SS 304 | SS304 | SS 304 |
| 5 | Thickness (mm) | 6 | 5 | 6 | 5 |
| 6 | Total No. Of Plates | 20 | 6 | 60 | 45 |
| 7 | Plate Spacing (mm) | 750 | 4 | 250 | 200 |
| 8 | Design Details of Trays | Tunnel | Tunnel | Bubble Cap | Bubble Cap |
| 9 | Material Balance | NA | NA | NA | |
| 10 | Location & Design of Feed Plate | NA | NA | 21/23 | 15/16/17 |
| 11 | Capacity Of Column in terms of Litres of | | | | |
| 11. a | Feed ($m^3$/hr) | 90.15 $m^3$/hr | 91.85 $m^3$/hr | 12.05 $m^3$/hr | 3.15 $m^3$/hr |
| 11. b | Output ($m^3$/hr) | $m^3$/hr | 91.85 $m^3$/hr | 6.04 $m^3$/hr | 3.15 $m^3$/hr |
| 12 | Percentage of alcohol in Feed and Output | | | | |
| 12. a | Feed % V/V | 7.0 % V/V | 7.0 % V/V | 45 % v/v | 94 % AND 55 % AL |
| 12. b | Output % V/V | 45 % V/ V | 55 % V/V | 96 % V/V | 95 % |
| 13 | Base and Top Pressure of column (Bar) | 0.6/0.45 | 0.45/0.42 | 2.5/1.8 | 0.385/0.29 |
| 14 | Pressure Drop across Tray mm WC | 65 | 65 | 40 | 40 |

| | | | | | |
|---|---|---|---|---|---|
| 15 | Vapour velocity (Superficial Velocity) m/sec | Proprietary Item | Proprietary Item | Proprietary Item | Proprietary Item |
| 16 | % Of Alcohol in reflux, reflux ratio | N.A. | NA | 95-96 % V/V | 94-95 % V/V |
| 17 | Efficiency | 98.5 % | 98.5 % | 98.5 % | NA |

**(EXTRA NEUTRAL ALCOHOL SECTION)**

| Sr. No | Technical Data | Hydro Extractive Column | Fusel Oil Column | Refining Column |
|---|---|---|---|---|
| 1 | Total height of Column (m) (Dish end to Dish end) | 13.5 | 11.500 | 11.500 |
| 2 | Outer Diameter of Column (mm) | 2330 | 1200 | 1088 |
| 3 | Inner Diameter of Column (mm) | 2320 | 1190 | 1080 |
| 4 | Material Of Construction | SS304 | SS 304 | Copper |
| 5 | Thickness (mm) | 5 | 4 | 4 |
| 6 | Total No. Of Plates | 45 | 50 | 50 |
| 7 | Plate Spacing (mm) | 250 | 200 | 200 |
| 8 | Design Details of Trays | Bubble Cap | Bubble Cap | Bubble Cap |
| 9 | Material Balance | | | |
| 10 | Location & Design of Feed Plate | 17/29 | 21/23,25/27 | 31/31 |
| 11 | Capacity Of Column in terms of Liters | | | |
| 11.a | Feed ($m^3$/hr) | 26.823 $m^3$/hr | 0.175 $m^3$/hr | 6.05 $m^3$/hr |
| 11.b | Output ($m^3$/hr) | 26.823 $m^3$/hr | 0.175 $m^3$/hr | 6.05 $m^3$/hr |
| 12 | Percentage of alcohol in Feed and Output | | | |
| 12. a | Feed % V/V | 95 % | ------ | 95 % |
| 12. b | Output % V/V | 96 % | 94 % | 96 % |

| | | | | |
|---|---|---|---|---|
| 13 | Base and Top Pressure of column (Bar) | 1.20/1 | 1.20/1 | 0.63/0.4 |
| 14 | Pressure Drop across Tray mm WC | 40 | 40 | 40 |
| 15 | Vapour velocity (Superficial Velocity) m/sec | Proprietary Item | Proprietary Item | Proprietary Item |
| 16 | % Of Alcohol in reflux, reflux ratio | 95-96 % V/V | 94-95 % V/V | 95-96 % V/V |
| 17 | Efficiency | 98.5% | 98.5 % | NA |

| **Sr.No** | **Technical Data** | **Rectifier Cum Exhaust column** |
|---|---|---|
| 1 | Total height of Column (m) (Dish end to Dish end) | 19.5 |
| 2 | Outer Diameter of Column (mm) | 2950 |
| 3 | Inner Diameter of Column (mm) | 2940 |
| 4 | Material Of Construction | Copper |
| 5 | Thickness (mm) | 5 |
| 6 | Total No. Of Plates | 72 |
| 7 | Plate Spacing (mm) | 250 |
| 8 | Design Details of Trays | Bubble Cap |
| 9 | Material Balance | NA |
| 10 | Location & Design of Feed Plate | 21/23 |
| 11 | Capacity Of Column in terms of Litres of | |
| 11.a | Feed ($m^3$ /hr) | 42.83 $m^3$/hr |
| 11.b | Output ($m^3$ /hr ) | 42.83 $m^3$/hr |
| 12 | Percentage of alcohol in Feed and Output | |
| 12. a | Feed % V/V | 20 % v/v |
| 12. b | Output % V/V | 95 % V/V |
| 13 | Base and Top Pressure of column (Bar) | 2.5/1.8 |

| | | |
|---|---|---|
| 14 | Pressure Drop across Tray mm WC | 40 |
| 15 | Vapour velocity<br>(Superficial Velocity) m/sec | Proprietary<br>Item |
| 16 | % Of Alcohol in reflux,<br>reflux ratio | 95-96 % V/V |
| 17 | Efficiency | 98.0 % |

**ABSOLUTE ALCOHOL PLANT**

| Sr. No | Technical Data | Recovery Column |
|---|---|---|
| 1 | Total height of Column (m)<br>(Dish end to Dish end) | 8.700 |
| 2 | Outer Diameter of Column (mm) | 2070 |
| 3 | Inner Diameter of Column (mm) | 2060 |
| 4 | Material Of Construction | SS 304 |
| 5 | Thickness (mm) | 5 |
| 6 | Total No. Of Plates | 35 |
| 7 | Plate Spacing (mm) | 200 |
| 8 | Design Details of Trays | Sieve Tray |
| 9 | Material Balance | NA |
| 10 | Location & Design of Feed Plate | 26/27 |
| 11 | Capacity Of Column in terms of Liters of | |
| 11. a | Feed ($m^3$/hr) | 6.65 $m^3$/hr |
| 11. b | Output ($m^3$/hr ) | 6.25 $m^3$/hr |
| 12 | Percentage of alcohol in Feed and Output | |
| 12. a | Feed % V/V | 94.68 % |
| 12. b | Output % V/V | 99.9 % |

| | | |
|---|---|---|
| 13 | Base and Top Pressure of column (Bar) | 3.0/2.8 |
| 14 | Pressure Drop across Tray mm WC | 40 |
| 15 | Vapor velocity<br>(Superficial Velocity) m/sec | Proprietary Item |
| 16 | % Of Alcohol in reflux,<br>Reflux ratio | 99 % V/V |
| 17 | Efficiency | 98.7 % |

## APPENDIX- B

| Sr. no | Technical Data | Rectifier Vent Condenser | Primary Column Reboiler | Mash Preheater | Degasser Column Condenser I & II | DealdehydeCondeser I &II | Rectifier Vent Condenser | Hydro Extractive Condenser I | Rectifier Column Reboiler |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Area $m^2$ | 40 | 480 | 144 | 40/12 | 80/12 | 400/48 | 40 | 560 |
| 2 | Tube Length m | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 3 | Tube Diameter MM | 25.4 | 25.4 | 25.4 | 25.4 | 25.4 | 25.4 | 25.4 | 25.4 |
| 4 | No. Of Tubes | 168 | 2016 | 604 | 168/50 | 336/50 | 1680/200 | 168 | 1882 |
| 5 | No. Of Pass | 4 | 1 | 12 | 4/2 | 4/2 | 4/2 | 4/2 | 1 |
| 6 | Tube Side Fluid temp. IN/OUT | 32/42 | 128/105 | 32/45 | 32/45 | 32/40 | 32/45 | 32/45 | 128/128 |
| 7 | Shell side Fluid Temp. IN/ OUT | 92/92 | 140/128 | NA | 72/72 | 50/50 | 96/96 | 78/78 | 140/128 |

| Sr. no | Technical Data | Fusel Oil Vent Condenser I | Refining Column Condenser I & II | Refining Column Reboiler | Main Product Cooler | Technical Alcohol Cooler | Fusel Separator | Fusel Oil Cooler | Mash Preheater Using PHE | Water Preheater PHE |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Area $M^2$ | 32 | 144/12 | 200 | 80 | 6 | NA | 5 | NA | NA |
| 2 | Tube Length m | 3 | 3 | 3 | 3 | 3 | NA | 3 | NA | NA |
| 3 | Tube Diameter MM | 25.4 | 25.4 | 25.4 | 25.4 | 25.4 | NA | 25.4 | NA | NA |
| 4 | No. Of Tubes | 134 | 604/50 | 840 | 336 | 26 | NA | 22 | NA | NA |
| 5 | No. Of Pass | 2 | 4/2 | 1 | 1 | 1 | NA | 1 | NA | NA |
| 6 | Tube Side Fluid temp. IN/OUT | 32/45 | 32/40 | 68/67 | 32/45 | NA | NA | NA | NA | NA |
| 7 | Shell side Fluid Temp. IN/ OUT | 78/78 | 57/57 | 96/68 | 78/32 | NA | NA | NA | NA | NA |

## ABSOLUTE ALCOHOL PLANT

| Sr. no | Technical Data | Mol. Sieve Condenser | Weak Alcohol condenser | Recovery column Reboiler | Superheater | Feed Preheater | Absolute alcohol cooler |
|---|---|---|---|---|---|---|---|
| 1 | Area $m^2$ | 74 | 96 | 64 | 54 | 74 | 80 |
| 2 | Tube Length m | 3 | 3 | 3 | 3 | 3 | 3 |
| 3 | Tube Diameter MM | 25.4 | 25.4 | 25.4 | 25.4 | 25.4 | 25.4 |
| 4 | No. Of Tubes | 310 | 404 | 268 | 226 | 310 | 336 |
| 5 | No. Of Pass | 4 | 4 | 1 | 1 | 1 | 1 |
| 6 | Tube Side Fluid temp. IN/OUT | 32/45 | 32/40 | 68/67 | NA | NA | NA |
| 7 | Shell side Fluid Temp. IN/ OUT | 78/78 | 78/78 | 96/68 | NA | NA | NA |

## PUMPS For Distillation

| S.N | Discription | Type | Capacity | Head | Material | Quantity |
|---|---|---|---|---|---|---|
| 1 | Reflux Pumps | Centrifugal<br>Centrifugal | 35 $m^3$/hr<br>32 $m^3$/hr | 40 MWC<br>30 MWC | With SS internals<br>With SS internals | 1+1<br>1+1 |
| 2 | Spent wash pump | Centrifugal | 100 $m^3$/hr | 30 MWC | With SS internals | 1+1 |
| 3 | Spent Lees hot water pumps | Centrifugal | 30 $m^3$/hr | 25 MWC | With SS internals | 1+1 |
| 4 | Vacuum pump | Water ring type | -------- | --------- | With SS internals | 1+1 |
| 5 | Alcohol pumps | Centrifugal | 50 $m^3$/hr | 25 MWC | With SS internals | 1+1 |
| 6 | HydroExtractive Transfer pumps | Centrifugal | 35 m3/hr | 35 MWC | With SS internals | 1+1 |
| 7 | Rectifier reflux pump ENA | Centrifugal | 35 m3/hr | 40 MWC | With SS internals | 1+1 |
| 8 | HCC Reflux IS Feed Pumps | Centrifugal | 10 m3/hr | 25 MWC | With SS internals | 1+1 |
| 9 | FO Reflux Transfer Pump | Centrifugal | 3 m3/hr | 35 MWC | With SS internals | 1+1 |
| 10 | Air Compressor | | --------- | --------- | ---------- | 1 |
| 11 | Pump for rect. column | Centrifugal | --------- | --------- | Flame Proof | 1+1 |
| 12 | Pump for reflux to Recovery column | Centrifugal | --------- | --------- | Flame Proof | 1+1 |

TANKS For Distillation

| **S.N** | Discription | Type | Capacity | Material | Quantity |
|---|---|---|---|---|---|
| 1 | Gas Liquid Separator | Cylindrical type | ------ | SS 304 | 1 |
| 2 | Alcohol Continuous Diluter | Static Mixer type | ------ | SS 304 | 1 |
| 3 | Reflux Collectors | Cylindrical type | ------ | SS 304 | 9 |
| 4 | Water & Steam Header | Cylindrical type | ------ | Carbon Steel | 1 |
| 5 | Over Head water tank | Cylindrical type | 40 $M^3$ | MS | 1 |
| 6 | Alcohol Buffer tanks | Cylindrical type | 2 $M^3$ | SS 304 | 2 |

## APPENDEX-C

| Sr. NO | Service | Material Of Construction | Service Temperature ($^0$C) |
|---|---|---|---|
| 1 | Alcohol-Water liquid | MS/SS304 | 30-80 $^0$C |
| 2 | Alcohol-Water liquid | MS/SS304 | 80-120 $^0$C |
| 3 | Product Alcohol | SS304 / COPPER | 30-80 $^0$C |
| 4 | Cooling Water | MS | 32-40 $^0$C |
| 5 | Steam | CS | 170-125 $^0$C |
| 6 | Instrument Air | GI/SS 304 | 32-40 $^0$C |
| 7 | Steam Condensate | CS | 80-95 $^0$C |

## APPENDIX –D

| **A** | **EXCISE DOCUMENT** | **Quantity** | **Capacity** | **Height (meters)** | **Diameter (meters)** |
|---|---|---|---|---|---|
| **Sr. NO** | **Equipment List** | | | | |
| 1. | Molasses Storage | 2 | 10,000 MT | 10.5 | 30 |
| 2. | Molasses Receiving Tank | 1 | 50 $M^3$ | 6.5 | 3.2 |
| 3. | Molasses Weighing Tank | 1 | 50 $M^3$ | 6.5 | 3.2 |
| 4. | Pre-fermentor | 5 | 30 $m^3$ | 6.785 | 2.5 |
| 5. | Fermentor | 5 | 600 $m^3$ | 10.95 | 7.5 |
| 6. | Stabilizer Tank | 1 | 300 $M^3$ | 7.5 | 7.1 |
| 7. | Buffer Tank | 1 | 300 $m^3$ | 7.5 | 7.2 |
| 8. | Settler Tank | 1 | 50 $M^3$ | 3.75 | 4.12 |
| 9. | Aldehyde Column Receiver | 1 | 1 $M^3$ | 1.5 | 1 |
| 10 | Rectification Column Receiver | 1 | 2 $M^3$ | 1.8 | 1.2 |

| | | | | | |
|---|---|---|---|---|---|
| 11 | Fusel oil Decanter | 1 | 1 $M^3$ | 1.5 | 1 |
| 12 | Fusel Oil Receiver | 1 | 1 $M^3$ | 1.5 | 1 |
| 13 | Vent Scrubber | 1 | 1 $M^3$ | 1.5 | 1 |
| 14 | Vent Scrubber Separator | 1 | 0.2 $M^3$ | 1 | 0.6 |
| 15 | Molasses Diluter | 1 | 1 $M^3$ | 1.5 | 1 |
| 16 | R.S & ENA Daily Receiver | 6 | 200 $M^3$ | 7.5 | 5.85 |
| 17 | Ethanol Receiver | 3 | 200 $M^3$ | 7.5 | 5.85 |
| 18 | Technical Alcohol Tank | 1 | 10 $M^3$ | 3.75 | 3.2 |
| 19 | Solution Tank | 1 | 1 $M^3$ | 1.5 | 1 |

| **A** | **EXCISE DOCUMENT** | **Quantity** | **Capacity** | **Height (meters)** | **Diameter (meters)** |
|---|---|---|---|---|---|
| 20 | Fusel Oil Storage Tank | 1 | 30 $M^3$ | 3.75 | 3.2 |
| 21 | Absolute Alcohol Bulk Storage | 2 | 900 $M^3$ | 12.0 | 9.8 |
| 22 | R.S. Bulk Tank | 3 | 900 $M^3$ | 12.0 | 9.8 |
| 23 | E.N.A. Bulk Tank | 4 | 300 $M^3$ | 10.0 | 6.2 |

## SECTION 7

## EFFLUENT TREATMENT PLANT

Effluent discharged from the distillation process, commonly known as Spent Wash, is one of the most polluting effluents with very high values of BOD and COD. It is first treated in a Bio-methanation System, which not only reduces the effluent load, but also produces methane rich biogas. Biogas is a high calorific value fuel and is used to produce power, by feeding into biogas based power plant. The production of extra power from biogas improves the economics of the ethanol project. The effluent after bio-methanation is converted into bio-manure in a bio-composting plant. The basic motive of waste management is –

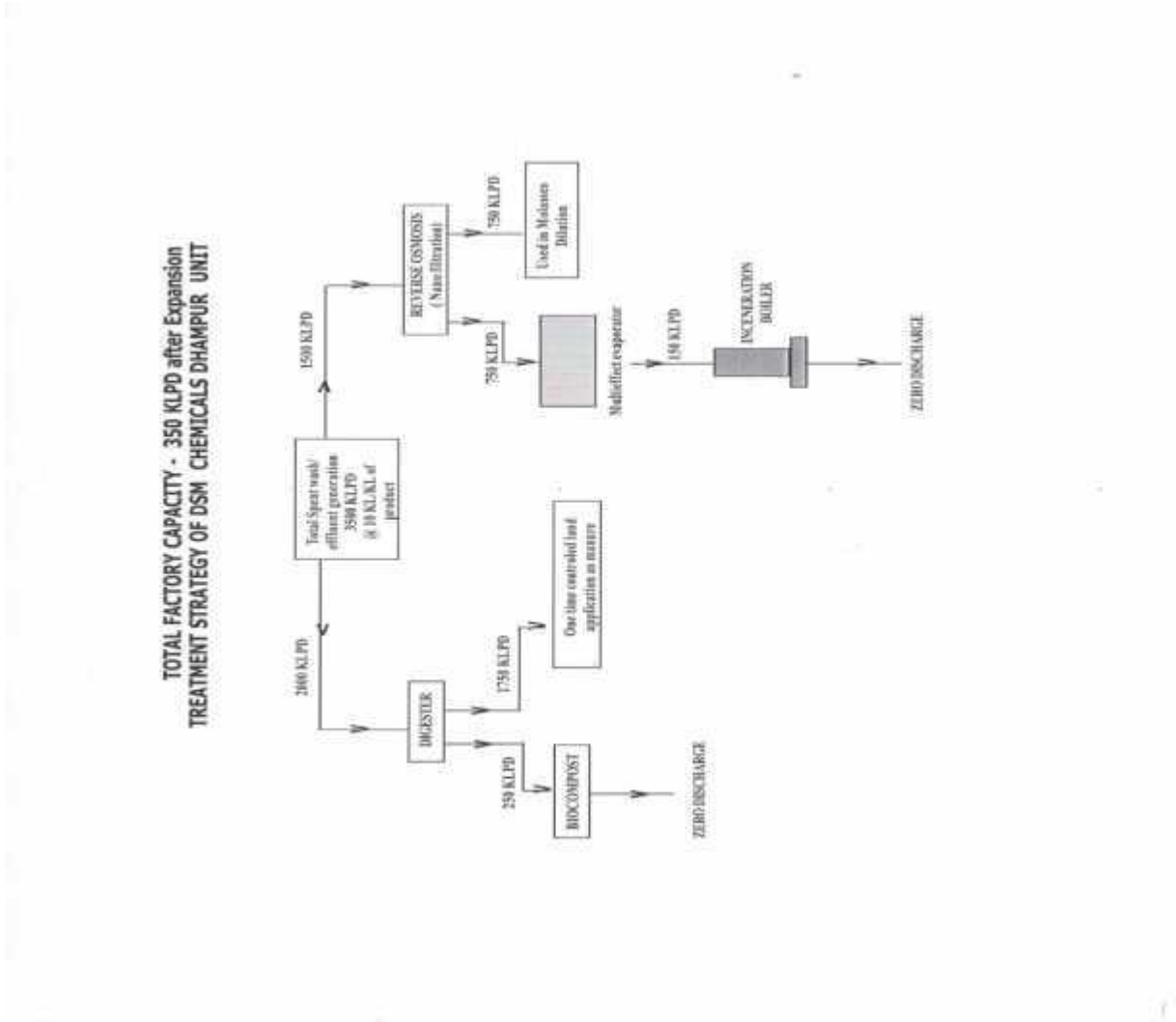
- To utilize all the available technology for distillery waste management with their limitations to the fullest use at Dhampur.
- To convert the waste into useable product/energy for effective utilization to the industry
- To reduce the harmful effect of any waste to the society and preserve the land and river
- To save and protect animals and creatures in general.
- To follow the guidelines of environment protection rules & regulations.

**Keeping in view the above DSM Chemical has opted for-**

- Mud settling and its separation and utilization in Bio-compost
- Bio-methanation process to generate bio gas and utilize it in boiler
- One time land controlled land application of Bio-Methanated wash(max.50% of the total).
- Nanofilteration for concentrating the bio methanated spent wash and permeates reuse in the Industry
- Spent wash concentration to reduce the water load and mixed it with bagasses and reuse the heat value of the concentrated mass.

- Balance liquid effluent use in bio compost and its effective application to the field.
- For the present expansion it is proposed to consume 50% of the Bio-Methanated wash to ferti –irrigation, and to install a balancing the system with R.O., spent wash concentration(MEE), Slop boiler and Bio-compost for left of spent wash.
- The combind liquid effluent treatment flow diagram is given below-

**Flow Diagram of Waste Management at DSM Chemical -Dhampur**




**Waste Management at DSM Chemical -Dhampur**

## 7.1 Biomethanation Process:

Biomethanation involves conversion of organic compounds present in the effluent, using a consortium of bacteria under anaerobic conditions. During their life cycle, the bacteria break down these organic compounds into methane and carbon dioxide.

The bacteria, being living organisms, require specific conditions to prosper. This is achieved by controlling the following parameters:

- Temperature
- Acidity
- Organic Loading
- Nutrient Balance

There are various biomethanation systems available for treating various types of waste water, using different processes.

The proposed biomethanation system uses a specially designed Mixed Tank Reactor (MTR) or CSTR (Completely Stirred Type Reactor) Bio-Digester, to convert organic matter into useful energy in the form of biogas. The biological process of conversion takes place at mesophilic temperature in a controlled atmosphere, ensuring maximum conversion efficiency and production of biogas.

Following are the salient features of the process:

**a. Buffer Tank:**

Before entering the biodigester, the spent wash from the distillery unit is received into a spent wash pit to enable settling of suspended solids. The system ensures consistent operation by reducing the solid build up in the biodigester. The settled solids are removed periodically from the pit for further disposal.

**b. pH Control:**

Spent wash pH is adjusted to 6.5-7.0 by recycling part of the treated effluent.

**c. Mixing in Biodigester:**

Mixing is done by recirculation of biomass, using a specially designed mixing system and is further enhanced by gas propagation. Efficient mixing helps micro organisms to reach fresh nutrients in a favourable living condition and convert organic matter into methane and carbon dioxide. Various sample points are provided in the biodigester to measure the concentration of sludge. Drain points are provided to drain the sludge from the biodigester.

The sludge is settled in the parallel plate clarifier, which is recycled to increase solid retention time in the biodigester. Supernatant liquid from the clarifier is sent for further treatment. Excess biomass and sludge is removed from the bottom of the biodigester regularly and sent to sludge drying beds for disposal.

**d. Gas Collection & Handling:**

Biogas produced in the biodigester is collected from the top of the digester and flows to the gas holder. The gas holder acts as an intermediate gas storage and pressure control device. Biogas is transferred to a biogas power plant to produce power. A flare unit is provided for excess gas burning.

**e. Safety System:**

For safe operation, flame arresters are provided on gas lines to protect the biodigester from backfire & pressure relief valves are provided on biodigester to protect from excess pressure or vacuum.

**f. Control System:**

Controlling pH ensures the smooth and safe operation of the system. Temperature, volatile acidity and alkalinity are also controlled, using various control features provided.

**g. Type of Bacteria:**

Anaerobic digestion of organic compounds is carried out, using different bacteria. Three main groups of bacteria, used in the process are indicated below:

- Hydrolyzing bacteria ( Solubilising bacteria)

- Acetogenic bacteria ( Acetate forming bacteria)
- Methanogenic bacteria ( Methane forming bacteria)

### 7.1 .1 Performance Parameters of Bio-methanation Plant(After Expansion-350 KLPD distillery)

**a: Input (Spent Wash) Characteristics:**

- Spent wash generation per litre of alcohol : 10 litres
- Spent wash generated : 3500 m3/day
- Spent wash solid : 10-14% w/w
- Digestive COD in spent wash : 1,20,000- 1,40,000 mg/lit
- Digestive BOD in spent wash : 50,000- 55,000 mg/lit
- TSS in spent wash : 5000 mg/lit (max)
- Spent wash temperature : 80-85 deg C
- Spent wash pH : 4.0-4.5

**b. Performance Parameters:**

- Biogas produced : 0.50-0.55 m3/Kg of COD reduced
- Digestive COD reduction : 65.00%
- Digestive BOD reduction : 85.00%
- Expected biogas composition : Methane 50 to 55%

### 7.2 One time Controlled Land application of Bio-Methanated Wash

In spite of the recalcitrant nature of spent wash and the enormous damage, which may be caused as a result of uncontrolled discharge of untreated spent wash into water bodies and lands, many authors have classified it as a dilute organic fertilizer with 7 to 9% solids and 90 to 93% water. More than 75% of the solids are organic in nature and about 25% are inorganic. The occurrence of nitrogen in a mostly colloidal form allows it to behave as a slow release fertilizer and better than any inorganic source of nitrogen. The presence of phosphorus in the organic form has also enabled a better availability. In a study comparing spent wash to farm yard manure, it

has been observed that spent wash solids contained more ether soluble, alcohol soluble and hot water soluble fractions than farm yard manure and a total potassium content almost 12 times higher than farm yard manure.

Organic compounds extracted by alkaline reagents have been found to be humic in nature and similar to those in soil. They also do not contain any toxic elements or compounds and the highly acidic nature and rich calcium and magnesium contents make them a good agent for reclamation of non salinesodic soils.

Because of its high organic matter, the spent wash is also a potential source of bioenergy. If this energy is trapped, distilleries producing 3.2 billion litres of alcohol can generate 5 trillion kilo calories of energy annually, apart from the post-methanated effluents providing 2,45,000 tonnes of potassium, 12,500 tonnes of nitrogen and 2,100 tonnes of phosphorus. One year's effluent has been estimated to meet the potassium requirements of 1.55 million hectare land, nitrogen requirement of 0.13 million hectare and phosphorus requirement of 0.025 million hectare of land if two crops are taken in a year.

Estimates also point out to the fact that the 40 billion litres of effluents generated from distilleries have at least Rs 500 crores of macronutrients (N, P, K and S) and Rs 50 crores worth of micronutrients and organics. The environmental costs of these effluents is put at Rs 800 crores, which includes Rs 100 crores to fisheries, 500 crores to water treatment, 100 crores on public health and 100 crores on landscape.

It has been widely recognized that there is a need of utilizing the nutrient capacity of spent wash to recharge the soil in order to maintain its continued productivity.

In Australia spent wash is blended with additional crop nutrients and sold as manure. CSR Ethanol is the second largest Australian producer of fuel ethanol. CSR Sugar produces 40% of Australia's sugar. Ethanol products and Fertilizer products are the two main product streams at CSR's Sarina Distillery in Mackay near North Queensland. The distillery is marketing Bio-dunder, a process co product which is value added into a complete liquid fertilizer. Bio-dunder is certified as organic and

has been granted “Beneficial Use” status by the E.P.A. The key advantages of using Bio-dunder are the recycling of nutrients back into the soil. In Australia Bio-dunder fertilizer is now precision applied using variable rate application technology. The fertilizer returns are positively supported by projections in agriculture outputs. The Australian Government has recognized that CSR’S Sarina Distillery has changed into an environmental pariah in the local community into a welcome industry. Apart from process innovations, they have turned a pollutant into a saleable, import replacing product and improved its business position through an increased community acceptance. The communities complaints have also ended. Conversion of Spent wash into Biodunder also resulted in the

Use of Biodunder as a cane field potassium fertilizer.
Elimination of odour and contamination of water bodies.
Increased plant productivity
Improved quality of ethanol production.
Reduction in steam usage within the plant by 30%.
Reduction in water consumption by 70%.

Bio-dunder has been accepted by Cane and other farmers as a valuable potassium-rich fertilizer and 100% of the Bio-dunder product at the Sarina distillery is now recycled into this market. Previously only imported fertilizers were used. In 1992, the Australian Chemical Industry Council awarded its annual Environment Award to CSR employees who had been instrumental in developing the Biodunder concept.

Dunder (or concentrated spent wash) from the Sarina Distillery is also blended with Nitrogen, $H2SO_4$ and Phosphorous and converted into another product called “Liquid One Shot” for application as fertilizer in cane and other crops. Nitrogen volatilization is reduced in liquid One shot products, uptake by plants is more rapid and it is cost competitive.

Spent wash could also be utilized for composting the trash in the field. In Brazil, the accumulated trash material in the sugarcane harvested field is sprayed with spent wash to facilitate the accelerated composting of the trash in the field itself. Brazilian experience suggests that efficient application technologies and spray

applications reduce the damage to soil and prevent ground water pollution. Up to 70% crops are being irrigated by spent wash.

### 7.3 RO System (Membrane Filtration)

The Biomethanated Spent wash from the Bio-digester after recovering the BIOGAS is being fed to REVERSE OSMOSIS Membrane Filtration system and leads to two streams of Permeate and Reject @ 50% of the feed (each). Permeate is recovered as clear and reusable water, which is recycled back to the process. While reject is sent for Bio-composting. Major advantage of this unit is to reduce the water consumption in process and less liquid effluent handling.

### 7.4 Bio- Composting Plant:

The composting process consists of converting the spent wash into useful manure. This is done with the help of specialized microbial culture or using fresh compost as seed for the micro-organisms. The raw materials required for composting are spent wash, bacterial culture and a filler material. The most common filler material is press mud obtained from the sugar factory. Other filler materials are agricultural residues, such as bagasse, segregated municipal solid waste and ash.

Composting is a biological oxidation process for decomposing organic material by a mixed microbial population in a suitably warm and moist environment under aerobic conditions. The degradation converts the material to a stable organic fertilizer which is also a soil improver.

The aerobic composting process involves arranging the press mud (filler material) in 150 to 200 m long windrows of triangular section of about 1.5 m height by 3.0 m. width on impervious ground usually with the help of front end loaders. The windrows are sprayed with a measured quantity of spent wash, in the ratio of 3.0:1 (spent wash to press mud). The ratio will vary depending on the moisture content of the filler materials. The spraying of spent wash is done when the moisture content of the press mud drops to 50%. The moisture content is not allowed to exceed 65% as

at that moisture anaerobic condition start prevailing which is detrimental to the composting process.

The windrows are inoculated with the seed material after the first spray. About 1 Kg. of bio culture is required per ton of press mud. From ambient temperature at start up the temperature rises to 65 Deg. C. by the second week and continues up to the $7^{th}$ week. The total duration for completion of the reactions is about 8 weeks by which time the temperature returns to ambient. A further 2 weeks is allowed for curing. Carbon to nitrogen ratio is the deciding factor to determine the completion of the bio composting process. It should be 20 or below.

Specialized mixing machines called aerotillers, traveling along the length of the windrows are used to mix and aerate the decomposing mass, about once in three days. This results in increased spent wash absorption, oxygen supply for proper growth of micro-organisms and dissipation of heat, which is liberated due to metabolic activity of micro-organisms. The moisture content during composting is maintained at 50-60% by periodic spraying of the spent wash.

Adequate holding capacity (min. 30 days) is to be provided for the spent wash in lined lagoons to cater to any demand mismatch. The lagoons should be duly lined with 250 micron HDPE and pitched by stone/bricks with cement mortar to prevent leachate.
Composting is to be carried out on a raised impervious floor protected by bunds with provision for leachate collection and surface runoff and it's pumping to the holding lagoon. Pipe network is laid for automatic spraying of spent wash.

### 7.4.1Compost Quality

Typical compost quality will conform to the following specifications:

- Moisture content : < 35%
- Organic carbon : 20-25%

- Phosphorous : 1.5-2%
- Nitrogen : 1.5-2%
- Potassium : 2-3.5%
- C : N ratio : < 17

### 7.4.2 Advantages of Bio Compost

The importance of recycling organic wastes is being increasingly recognised. Bioearth compost provides early nitrogen, enhances nutrient availability, increases water retention, and provides colloidal nitrogen, phosphorus, potassium, calcium, sulphur and micro-nutrients. It energizes the soil micro organisms.

Humus provides slow release of all the nutrients which is essential for crops. It absorbs the nutrient elements from leaching and thus nutrients are utilized efficiently.

It is non-pathogenic. High temperature decomposition process (60°C to 70°C) assures the elimination of disease causing organisms. Compared to raw press mud, the bioearth compost application has following advantages:

- Very little quantity of bioearth compost is sufficient for crops and thus input and transport cost could be reduced.
- Improved fertility value.
- Provides early nitrogen.
- Humus rich, very slow release of nutrients which is essential for crop growth.
- Immediate usage of compost for crops without allowing extended period of decomposition.
- Increases water holding capacity of soil.
- Improved yields of cane have been reported worldwide after using this bio compost.

## 7.5SPENT WASH CONCENTRATOR/DRYER

Bio-methanated spent wash from Bio-digester is fed to concentrator which is a combination of Multi Effect Evaporation concentrating upto 45% to 50% solid level and a concentrator concentrating the above material form 50% to 70% . There are two type of Multi Effect Evaporators. First type uses falling film Evaporation technology and the second type uses forced circulation system. Advantage of first type falling film Evaporator body is less steam consumption and less power consumption. While it is having a disadvantage of choking of the tubes and daily down time of 4-6 hrs. for CIP Cleaning. This problem has been minimized in the forced circulation system. But there is more power consumption in the unit due to high flow of effluent in the tube. A degasification unit in it is mandatory to avoid contamination of process condensate. We have selected forced circulation system to avoid choking of the tubes and better performance with continuity. Here in the unit bio methanated wash is concentrated from 7% to 50% TSS level.

The concentrated mass from the MEE is taken to the concentrator where with the help of the steam the effluent is further concentrated upto 70% level. 70% concentrated mass will be taken to our bagasse area where it will be mixed with bagasse and used as mixed fuel to 40TPH& 32kg/cm2 co-gen boiler. By doing this the effluent of the distillery will be consumed. The process condensate will be utilize for the process water to our chemical complex for various applications e.g. molasses diluation, cooling tower, make up water, fire hydrant, U/G tank etc.

**SECTION 8**

**MAN POWER REQUIREMENT**

| Sr. No. | Designation | Numbers |
|---|---|---|
| 1. | General Manager/ Unit Head | 1 |
| 2. | Manager – Production | 1 |
| 3. | Asst. Manager – ETP | 1 |
| 4. | Asst. Manager – Maintenance/ Dy. Chief Engineer | 1 |
| 5. | Asst. Manager – Stores & Purchase | 1 |
| 6. | Asst. Manager – Q.C. & Q.A. | 1 |
| 7. | Asst. Manager – Utilities | 1 |
| 8. | Blending Officer | 1 |
| 9. | Microbiologist | 1 |
| 10. | Q.C. Chemist | 1 |
| 11. | Shift Officers & Shift Chemists (Including ETP) | 8 |
| 12. | Account Officers | 1 |
| 13. | Liaisons Assistant | 1 |
| 14. | Account Assistants | 2 |
| 15. | Stores Assistants | 2 |
| 16. | Plant Operators | 4 |
| 17. | Yeast Men | 4 |
| 18. | ETP Operators | 5 |
| 19. | Boiler Operators | 4 |
| 20. | Turbine Operators | 4 |
| 21. | D.M. Plant Operators | 3 |
| 22. | Bottling Supervisors | 4 |
| 23. | Electricians | 5 |
| 24. | Fitters | 5 |
| 25. | Helpers (Unskilled) for main Plant | 8 |
| | **TOTAL** | **70** |

**SECTION 9**

**PROJECT IMPLEMENTATION SCHEDULE**

Systematic and well planned scheduling is a very important aspect for the implementation of the project. Proper planning and monitoring of the project is essential for the commissioning of the plant within the stipulated time frame and also for preventing substantial financial drain on pre- operative expenses. Considering these factors, a bar chart has been prepared and various activities have been discussed below:

**9.1 Site Development:**

After land is acquired, site development work will be started. This will include leveling, laying of roads, construction of boundary walls, gates etc. Also activities, such as contour plan of site, soil testing and preparation of plot plan are expected to be carried out during this period. This activity will take about 7 weeks time.

**9.2 Process Engineering:**

The process engineering will consist of preparation of process flow diagrams, material and energy balance, equipment data sheets, plant layout, P&I diagrams etc. This activity will take about 4 weeks time.

**9.3 Detailed Engineering:**

Detailed engineering will be started after completion of process engineering. This activity will consist of civil design and Mechanical, Electrical and Instrumentation engineering. Total time required for completion of detailed engineering has been estimated at 8 weeks.

**9.4 Procurement:**

Procurement activity will be initiated, after data sheets of equipment have been prepared during detailed engineering. Based on data sheets, enquiries will be sent to various suppliers, starting from $4^{th}$ month. Quotations received from suppliers will be evaluated and orders will be placed. Equipment deliveries are expected to be completed at the end of $8^{th}$ month.

**9.5 Civil Construction:**

Civil construction will be started after the release of basic civil drawings in the 4th month and major work will be completed at the end of 4th month.

**9.6 Erection:**

Erection of equipment will be started in the 8th month, after major equipments have been received at site. Fabrication of equipment will proceed in parallel with the civil construction, so that their installation can also be taken up along with the bought out equipment. After equipment erection; piping and cabling installation will be taken up. Erection activity will be completed at the end of the 7th month.

**9.7 Trial Runs:**

During trial runs; first, no load and load trials of equipment will be conducted and thereafter trial runs for the complete plant will be started. This activity will take about 1 month time and plant is expected to start production at the end of 8th month, from the starting date of the project.

**SECTION 10**

**ESTIMATED PROJECT COST FOR 150 KLPD DISTILLERY PROJECT**

**(Rs. In Lacs)**

| Sr. No. | Description | Estimated Cost | Remarks |
|---|---|---|---|
| 1 | Land | | Available in existing area |
| 2 | Main Plant & Machinery | | |
| | Fermentation and distillation plant suitable to produce 150 KLPD total spirit, based on multi-pressure distillation plant. Molecular sieve based alcohol dehydration plant of 150 KLPD capacity | 4400.00 | |
| 3 | Infrastructure for Ferti-irrgation | 150.00 | |
| 4 | Bio-digester(600m3/day)&piping network for water reuse and recycle | 800.00 | |
| 5 | Molasses Storage including transfer pumps | 175.00 | |
| 6 | Spirit Storage( RS, ENA, Anhydrous) Including transfer pumps | 350.00 | |
| 7 | Steam boiler for spent wash concentrate incineration along with bagasses facility suitable for Capacity:40 TPH, Pressure:32 Kg/cm2 with Turbine | 1200.00 | |

| | | | |
|---|---|---|---|
| 8 | Water supply and treatment Plant: Tubewell, pumps, storage tanks, piping and softening plant of 65 m3/hr capacity | 150.00 | |
| 9 | Cooling towers for Distillation and Fermentation along with pumps & pipe | 150.00 | |
| 10 | Electricals, comprising of PCC, MCC, Cables, lighting etc | 150.00 | |
| 11 | Automation including control system, panel, hardware and software | 100.00 | |
| 12 | Civil and structural work<br>• Main plant building<br>• Cooling tower basin<br>• Equipment foundations<br>• Boiler sections<br>• Spent wash concentration plant<br>• Boundary wall | 700.00 | |
| 13 | Miscellaneous cost like packing and forwarding, transit insurance, excise duty, sales tax and transportation | 500.00 | |
| | Sub Total | 9760.00 | |
| (i) | Working Capital margin | 490.00 | |
| (ii) | Pre-operative Expenses @2% | 195.00 | |
| (iii) | Contingency @ 3% | 292.00 | |
| | **Total Cost of Project** | **10737.00 Lakhs** | |