TECHNO ECONOMIC FEASIBILITY REPORT

FOR

GRAIN BASED DISTILLERY UNIT

(60KLPD ENA/RS AND 6 KLPD MALT SPIRIT ALONGWITH 3.0 MW CO-GENERATION POWER PLANT)

AT

MANGLAM DISTILLERS & BOTTLING INDUSTRIES,
VILL- PACHARIA (CHANGSARI), DISTT. KAMRUP, ASSAM

PREPARED FOR:

MANGLAM DISTILLERS & BOTTLING INDUSTRIES

Admn. office: 17, Chitra Lekha Lane, Usha Nagar, Dispur, Guwahati – 781006, Assam.
Tele Fax: +91-361-2603454,
E-mail: rajesh_jalan1@yahoo.com.

PREPARED BY:

S-74, Satellite Complex, Vastrapur, Ahmedabad-380015
EXECUTIVE SUMMARY OF THE PROJECT

INTRODUCTION
M/s Manglam Distillers & Bottling Industries has proposed to set up Grain Based Distillery 60 KLPD and Malt Spirit Plant (6 KLPD) along with Co-Generation Power Plant (2.5 MW) at VILL- PACHARIA (CHANGSARI), DISTT. KAMRUP, ASSAM. Main products of the proposed Distillery are 60 KLPD Extra Neutral Alcohol/Rectified Spirit & Technical Alcohol.

<table>
<thead>
<tr>
<th>SR. NO.</th>
<th>PRODUCTION FACILITY</th>
<th>PROPOSED</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Extra Neutral Alcohol /Rectified Spirit &amp; Technical Alcohol</td>
<td>60 KLPD</td>
</tr>
<tr>
<td>2</td>
<td>Malt Spirit</td>
<td>6 KLPD</td>
</tr>
<tr>
<td>3</td>
<td>Co-Generation Power Plant</td>
<td>3.0 MW</td>
</tr>
</tbody>
</table>

PROJECT COST
Cost of the proposed project would be Rs. 8600 lacs. Total capital cost for environmental pollution control measures would be Rs. 1000 lacs and recurring cost per annum would be Rs. 80 lacs.

PROJECT LOCATION

| Project Location: | Village Pacharia |
| Nearest Town:     | Changsari at around 5 Km in NE |
| Nearest City:     | Guwahati at around 11 km SE |
| Nearest Dist. Headquarter: | Kamrup at around 12 km in SE |
| Nearest National Highway: | NH 31 – Around 4.5 Km in E |
| Nearest Railway station: | Changsari at around 5.2 KM in NE |
| Nearest Airport: | Guwahati at around 13 km in S |
| Nearest river: | Brahmaputra River at around 5 km in S |
| National park/Reserve Forest, Biosphere, etc.: | Deepor Beel Bird Sanctuary at around 12 km in S |
| Seismicity: | Seismic Zone V |

No defence installation, biosphere reserve, national park/wild life sanctuary, ecologically sensitive area within 10 KM of the project site.

DETAILS OF RAW MATERIAL CONSUMPTION ITS SOURCE, AVAILABILITY & TRANSPORTATION
The main raw material for proposed Distillery is Grains (Broken Rice, Maize, and Sorghum/Bajra/Wheat), Liquefying, Saccharifying and other enzymes, Sulphuric Acid, Sodium Hydroxide, Urea, Antifoam, and Yeast etc. Details of raw material consumption, its source and mode of transportation is given in following table.

<table>
<thead>
<tr>
<th>SR. NO.</th>
<th>RAW MATERIAL</th>
<th>PROPOSED</th>
<th>SOURCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Grains (Broken Rice/ Maize/Sorghum/Bajra/Wheat)</td>
<td>150 TPD</td>
<td>Assam, Meghalaya, Bihar, Jharkhand, Nagaland, West Bengal, Uttar Pradesh.</td>
</tr>
<tr>
<td>2</td>
<td>Malt</td>
<td>60 TPD</td>
<td>Directly from the Chemical Companies</td>
</tr>
<tr>
<td>3</td>
<td>Alpha Amylase</td>
<td>30 Kg</td>
<td>Directly from the Chemical Companies</td>
</tr>
<tr>
<td>4</td>
<td>Amyloglucosidase</td>
<td>30 Kg</td>
<td>Directly from the Chemical Companies</td>
</tr>
<tr>
<td>5</td>
<td>Sulphuric Acid</td>
<td>50 Kg</td>
<td>Authorized Dealers</td>
</tr>
<tr>
<td>6</td>
<td>Urea</td>
<td>60 Kg</td>
<td>Local Market</td>
</tr>
<tr>
<td>7</td>
<td>Nutrients Ammonia</td>
<td>150 Kgs</td>
<td>Local Market</td>
</tr>
<tr>
<td>8</td>
<td>Antifoam</td>
<td>0.3 kg per KL 18 kgs</td>
<td>Local Market</td>
</tr>
<tr>
<td>9</td>
<td>Yeast</td>
<td>As per requirement</td>
<td>Authorized Stockist</td>
</tr>
<tr>
<td>10</td>
<td>Biocides</td>
<td>30 kg</td>
<td>Local Market</td>
</tr>
</tbody>
</table>
**BRIEF PROCESS DESCRIPTION**

ENA will be produced by adopting the following process.

**Milling:**
Sifted and cleaned Grains will be milled to flour using dry milling process in Hammer Mills.

**Slurry Preparation & Liquefaction:**
Here, Grain flour will be mixed with water for slurry preparation. The slurry so formed will be cooked in a steam jet cooker and the cooked mash will be transferred to flash tank. This process will loosen up the mash to enzyme attack. The gelatinized mash will be liquefied in the final Liquefaction tank with the help of liquefying enzyme. This process initiates the formation of sugar.

**Saccharification & Fermentation:**
The liquefied starch slurry will be transferred into the fermentation tank where active yeast together with Amyloglucozydase and other nutrients will be added. Yeast will initiate fermentation rapidly and CO₂ will be released during the process. The Alcohol shall be stripped from the CO₂ by CO₂ scrubber.

**Multi Pressure Distillation:**
The alcohol will be distilled in Multi pressure distillation system. Distillation is achieved by utilizing Analyser, Degassifier, Pre-Rectifier Column Stripper, Rectifier cum exhaust, Extractive distillation column, Recovery column and Simmering column. The ENA & Technical alcohol formed shall be stored in storage tank.

**REQUIREMENTS FOR THE PROJECT**
Industrial land has been acquired for the proposed project. There shall be no any rehabilitation and resettlements are involved.

**Water:** Total fresh water requirement of the proposed project is 720 KLD, which shall be met through ground water it will be sourced from Deep Bore Well. Necessary permission will be taken from competent authority.

**Land:** Around 12 acres (4.856235 ha) land area is required for the proposed project. Industrial land of

**Electrical Energy:** The estimated power requirement for the proposed project will be 2.0 MW. Power requirements will be full filled by proposed co-generation power plant (3.0 MW). For initial start up and emergency purpose, two D. G. Sets of 860 KVA capacity will be installed.

**Fuel:** Coal about 80 TPD or Biomass (Agricultural waste, Rice Husk, etc.) about 100 TPD will be required to run 30 TPH Boiler, while Diesel (300 lit/hr) will be required to run stand by D. G. Set. Diesel will source from the nearest petrol pump. Coal will be sourced from Assam & Biomass from nearby area.

**Manpower:** The proposed project will have great employment potential providing employment to approximately 80 full time persons.

**SOURCES OF POLLUTION AND CONTROL MEASURES**

**Source of Air pollution and its control measure**

**Process Emission:** During the fermentation process, CO₂ will be liberated. The released carbon dioxide contains traces of alcohol. Alcohol shall be stripped using a Scrubber.
Utility Emission: Due to operation of Co-generation power plant (3.0 MW) SPM, SO₂ & NOₓ will be emitted from its stack. To control emissions from this trima cyclone will be installed as pollution control equipment to comply with the norms of CPCB / SPCB & MOEF. 02 D. G. set of 860 KVA shall be utilized to fulfil power requirement in case of power failure. Emission from this source will not be continuous as the D. G. sets will be used during emergency or in case of power failure.

Fugitive Emission: The fugitive emissions from the proposed plant would be significant and the sources will be (1) Storage of chemicals, (2) Storage of alcohol etc. & to control fugitive emission following control measures are proposed:
- All reactors, treatment vessels, distillation vessel, agitator and process pumps shall be mechanically sealed.
- All process pumps shall be provided trays to collect probable leakage.
- More weightage on selection of MOC of piping shall be given to avoid leakage/spillage.
- Condenser will be provided to avoid vent of alcohol storage tanks.
- Condenser on vessels shall be provided for better handling.
- Maintenance of air pollution control equipments will be done regularly.
- The sprinkling of water will be done along the internal roads in the plant in order to control the dust.
- Green belt will be developed around the plant to arrest the fugitive emissions.

Waste Water Generation and its management:
The company proposes a zero discharge plant. The wastewater generated from the process shall be treated and reused for the process and other purposes. Slops spent wash from the distillation plant will be treated using decanter and integrated Steam tube dryer. The permeate shall be reused in process after undergoing neutralization and polishing treatment. Balance water shall be used for gardening. The domestic waste water generated shall discharged using Soak pit/Septic tanks.

Noise Pollution and control measures:
The noise levels near the sources such as Motors, D. G. Set, material handling, Loading unloading, etc. will be higher during the operational phase but general noise levels within plant are expected to remain below 75 dB(A). In order to mitigate the noise levels during the operational phase effective noise control measures like Encasement of noise generating equipments, a thick greenbelt will be developed all around the plant boundary to act as noise attenuator. Proper and suitable acoustic barrier will also be provided around areas generating high noise and Effective preventive maintenance and vibration measurement of all rotating equipment will be taken.

Solid waste generation and its disposal method:

<table>
<thead>
<tr>
<th>SR. NO.</th>
<th>TYPE OF WASTE</th>
<th>SOURCE</th>
<th>WASTE MANAGEMENT DETAILS (FINAL DISPOSAL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Grains residue (DDGS/DWGS)</td>
<td>Process</td>
<td>Approx 120 MT as DWGS or approx 42 MT as DDGS</td>
</tr>
<tr>
<td>2.</td>
<td>Fly ash</td>
<td>Boiler</td>
<td>Approx 10 MT</td>
</tr>
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</table>
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<td>CAPITAL COST ESTIMATE &amp; MEANS OF FINANCE</td>
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<td>FINANCIAL ANALYSIS</td>
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CHAPTER - 1:

INTRODUCTION

The word “Alcohol” is derived from an Arabic expression “Al-kuhul” and is applied to the many members of the family of alcohols. The use of alcohol as a drink is an age-old story in India and it appears that the technique for fermentation and distillation was available even in the Vedic times. It was then called “Somarasa” and was used not only for its invigorating effect but also in worship. Till date, not only has the consumption of alcohol been continued but it is an integral part of the Ayurvedic system of medicine.

1.1. ALCOHOLIC BEVERAGES

Alcoholic beverages are drinks containing ethanol or ethyl alcohol and are the result of the natural process of fermentation of fruits, grains, vegetables, plant matter, and even dairy products. Depending upon what fermentable material is used, and the method by which the materials are processed, alcoholic beverages are mainly classified as being Wines, Beers & Distilled Spirits. Other classifications abound and are often related to culture, content, production method, and legality.

The production and consumption of alcohol occurs in most cultures of the world, from hunter-gatherer peoples to nation-states. Alcoholic beverages are often an important part of social events in these cultures. In many cultures, drinking plays a significant role in social interaction — mainly because of alcohol’s neurological effects.

Alcoholic beverages have a lower alcohol content (beer and wine) are produced by simple fermentation of sugar- or starch-containing plant material. Beverages of higher alcohol content (spirits) are produced by fermentation followed by distillation.

Many countries in which they are produced regulate the production of most spirits, beer, and wine and carefully control taxation of these alcoholic beverages.

Distilled alcoholic Beverages are made from fermented grain mash or fermented fruit juice. During the distillation process, the mash or juice is heated, giving off vapours of alcohol. Distillers collect the vapours and cool them to form liquid. The flavour of spirits depends on the kind and how much grain, fruits and yeast are used. Other factor that affect the flavour are the fermentation, distillation and aging process. Alcohol percentage in distilled beverages is called “proof”.

1.2.1. KINDS OF DISTILLED ALCOHOLIC BEVERAGES:

1. Whisky - Alcoholic liquor distilled from grain, such as broken rice, corn, rye or barley.

‘Most whisky’ is a mixture of different kinds of whiskies made from different grains. It is aged from 6 years or more. Flavour and colour (amber colour) develops through aging process. In Whiskies alcohol content ranges from 80 to 100 proof. It can be served straight, on the rocks (with ice), or mixed with water, carbonated water and cocktails.

‘Scotch Whisky’ is famous for its smoky flavour. Scotch whisky is made from a mash that consist primarily of barley. and containing approx 40 to 50 percent ethyl alcohol by volume.

‘Bourbon’ is a whisky that is made in USA, it is made from a mash consisting primarily of maize and rye.
2. **Vodka** - alcoholic liquor distilled from fermented wheat, rye, corn or potatoes mash. Its alcohol content ranges from 80 to 100 proofs. Vodka is not aged, has no colour, odour and taste. Vodka is usually mixed with cocktails and other beverages.

3. **Liqueurs** - a sweet alcoholic beverage often with a brandy base, it is also called ‘cordial’. It comes with different colours and flavours like blackberry, orange, chocolate, peach etc. Liqueurs contain at least 2 1/2 % sugar. Alcohol content ranges from 25 to 110 proofs. Liqueur are served neat, on the rocks, or mixed with cocktails.

4. **Gin** - strong alcoholic beverages made from distilled rye or other grains flavoured with juniper berries. Alcohol content ranges from 80 to 94 proof. Gin can be mixed with wine called Vermouth to make 'Martini'. It can also be mixed with lime juice, tonic water, or other beverages.

5. **Rum** - is distilled from fermented molasses or sugar cane. Rum colour depends on the aging process, colour is white or amber. Alcohol content is at least 80 proof. It is usually mixed with orange juice, lime juice, cola and other beverages.

6. **Brandy** - distilled from wine or from fermented fruit juices. Brandy is aged from 2 – 8 years. Brandy made from grape wine is at least 80 proof and flavoured brandies made from fruit juices are at least 70 proof. Brandy is usually served neat, or mixed with another spirits like liqueur.

7. **Tequila** - a drink famous in Mexico, is distilled from fermented juice of the maguey plant.

8. **Aquavit** – a strong clear Scandinavian liquor made form potatoes or grain mash and flavoured with caraway seeds.
CHAPTER - 2:

ABOUT THE COMPANY & THE PROJECT

THE COMPANY & ITS PRESENT ACTIVITY:

M/s Manglam Distillers & Bottling Industries is a Partnership firm incorporated on 17th day of April 2008 and promoted by Mr. Rajesh Kumar Jalan (Director) with its Admin Office at 17, Chitra Lekha Lane, Usha Nagar, Dispur, Guwahati – 781006, Assam and Factory/Works at VILL- PACHARI (CHANGSARI), DISTT. KAMRUP, ASSAM. The Company is incepted with the object of carrying on the business of Distillers, Bottlers, and Canners Etc.

BRIEF INTRODUCTION OF THE PROMOTERS

The Brief bio-data of the promoters are given below:

1. MR. RAJESH JALAN:

<p>| | | |</p>
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<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Name</td>
<td>Mr. Rajesh Kumar Jalan</td>
</tr>
<tr>
<td>2</td>
<td>Pan No.</td>
<td>ACGPJ 4247L</td>
</tr>
<tr>
<td>3</td>
<td>Fathers Name</td>
<td>Late Shri Lakshmi Narayan Jalan</td>
</tr>
<tr>
<td>4</td>
<td>Age/Date of Birth</td>
<td>46 Years</td>
</tr>
<tr>
<td>5</td>
<td>Qualification</td>
<td>B.Com</td>
</tr>
<tr>
<td>6</td>
<td>Address</td>
<td>Hijuguri, Tinsukia, Assam.</td>
</tr>
<tr>
<td>7</td>
<td>Bank details</td>
<td>State Bank of India and Canara Bank, Hijuguri</td>
</tr>
</tbody>
</table>

8. Experience:
Mr. Rajesh Jalan aged around 46 years is a permanent resident Hijuguri, Tinsukia, Assam is graduate by qualification. He is one of the prominent businessmen of Assam and is financially very sound. He is proprietor of Gayatri Distillers & Bottling Industries, which is an IMFL manufacturing unit at Tinsukia, Assam is also having bonded warehouse. He is presently director/partner in following concerns:

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</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>M/s Manglam Distillers &amp; Bottling Industries, a bottling unit,</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Arunodaya Tea Industries, a tea manufacturing unit</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Maruti Nandan Bonded Warehouse,</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>M/s. M.P. Jalan, a petrol pump,</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Rangkattu Tea Company Private Limited, a Tea Estate</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>M/s. Master India Breweries, Beer Manufacturing,</td>
<td></td>
</tr>
</tbody>
</table>

All the units are running successfully and earning good profits. Mr. Rajesh Jalan is hard working, sincere in his efforts and reputed businessman.

9. Net Worth as on 31-3-2013 (as per B/S.) | Rs. 3477.52 Lakh

ASSOCIATES CONCERNS DETAILS

THE PROJECT:

The Promoters of the Company propose to install **60 KLPD ENA and Malt Spirit Plant along with 3.0 MW cogeneration power plant** at the location in Vill. Pacharia where a Bottling Plant of Liquor has been already running under the banner of the same Company, i.e., **M/s Manglam Distillers & bottling industries.**

The major activities of the Company will include:

1. Production of grain based ENA. It aims to cater to the eastern and north eastern region of the country as the demand prospects are good. There are several bottling plants in the north eastern region of India who can be the prospective customers to whom the Company can supply ENA.
2. The company is already running 200,000 cases per month IMFL bottling plant with expandable capacity. With regard to the bottling plant it proposes to do the bottling for all the major brands in the country. The Company also foresees introduction of IMFL under its own Brand.

3. The Company shall sell the residues also know as spent grain as cattle feed.

4. In order to ensure self sufficiency, along with the ENA production and bottling plant, the Company also proposes to set up a 3.0 MW co-generation power plant Of which after self consumption the Company will be left with about 1.00 MW of power which will be sold to the grid.

The Total Project cost is Rs. 8600.00 Lacs financed by a mix of Equity of Rs. 3050.00Lacs and Debt of Rs. 5550.00 Lacs. The project is to be set up in an area of 15 acres of Land which is sufficient for proposed project. Presently the Company plans to use grains as the main raw material for their ENA project. Grains are available sufficiently in North East region and adjoining states of West Bengal and Bihar.

As a combined entity, the promoters are a blend of youth and experience possessing the necessary technical qualifications as well as the financial resources required for successful implementation of the project. The overall business and investment climate as well as the outlook at the present moment of time are also fairly conducive to the success of the project.

In conclusion it can be said that in terms of their financial capability, entrepreneurial background as well as the proposed business model and strategy the promoters have the capacity to successfully implement the present project.
CHAPTER - 3 : SITE ANALYSIS

3.1 ABOUT THE LOCATION

The Project is situated near INDUSTRIAL AREA, CHANGSARI, KAMRUP DISTRICT IN THE STATE OF ASSAM. The Company has an existing surplus land of approx. 12 acres on which the proposed project shall be established. The acquired land falls under the category of industrial land and hence no conversion problems are to be faced by the promoters. The selection of this site has been highly influenced by location factors. The site enjoys maximum location advantages with respect to availability of input materials, market proximity and infrastructural facilities as set out elsewhere in the report.

3.1.1 THE MAIN ADVANTAGES OF THE LOCATION ARE AS UNDER

The climate, temperate and the humidity are favourable for the Distillation process.

Pacharia is well connected by roadways which shall enable convenience in the movement of raw material and finished products. The Government of Assam is encouraging the entrepreneurs and Industrialists for setting up industries in the State with a view to promote economic development of the region and is therefore offering various incentives and subsidies.

The unit will be in close proximity to the source of raw material.

Spent Grains and press Mud (Fertilizer), the By-products of this Company, would be taken as fuel and fertilizers by the local farmers.

The land selected for the proposed project has many natural advantages. It is away from locality and free from pollution. The land is undiluted and the gradual slope of the land can be used for flow of liquid material in process under gravity.

3.2 A BRIEF NOTE ON NORTH-EAST INDIA

The North East India comprises of the eight sister states of Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura. They form part of the East Himalayan region, which extends from Sikkim eastwards and embraces the Darjeeling Hills of West Bengal. The location of the region is strategically important as it has international borders with Bangladesh, Bhutan, China, Myanmar and Tibet. The area is characterized by rich bio-diversity, heavy precipitation and high seism city. It is endowed with forest wealth and is ideally suited to produce a whole range of plantation crops, spices, fruits and vegetables and flowers and herbs. The rich natural beauty, serenity and exotic flora and fauna of the area are invaluable resources for the development of eco-tourism. The region has a high concentration of tribal population. The states of Arunachal Pradesh, Meghalaya, Mizoram and Nagaland are mostly inhabited by a number of native tribes. Each tribe has its own distinct tradition of art, culture, dance, music and life styles. The numerous fairs and festivals celebrated by these communities and their friendly nature are irresistible attractions for the visitors. Economic reforms in North East India, with its urban bias and overemphasis on the industrial sector have raised the demand for the Real Estate Construction and such like keeping in mind the progress of the Entire Region. The growing demand for such construction is crucial not only for encouragement of industrialization of an economy, but for the overall growth and development. Besides agriculture, the strength of the industrial sector contributes towards the growth of the economy to some extent depending on the construction margin.
3.3. KAMRUP DISTRICT OF ASSAM

1. GENERAL INFORMATION
   i) Geographical area (sq.km) - 2740 Sq.km.
   ii) Administrative Divisions (As on 2008)
       • No. of Tehsil/Block - 02
       • No. of Panchayat/villages/ward - 162/991
       • No. of Panchayat Unit - 42
   iii) Population (as on 2011 Census) - 1,517,202
       • Rural population - 9,68,818
       • Urban Population - 3,53021
   iv) Average Annual Rainfall (mm) - 1500 mm to 2600 mm

2. GEOMORPHOLOGY
   □□Major Physiographic units Hill, Valley, Slope - rocks
   □□Major Drainage System - Brahmaputra River

3. LAND USE
   □□Forest area - 116694 ha
   □□Net area sown - 434500 Ha
   □□Cultivable area - 181608 Ha

4. MAJOR SOIL TYPES Mountain meadow, brown-red & yellow soil and lateritic soil.

5. AREA UNDER PRINCIPAL CROPS

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Name of the Crop</th>
<th>Area (ha)</th>
<th>Cultivated</th>
<th>Production per ha (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Rice</td>
<td>2340</td>
<td>1400</td>
<td></td>
</tr>
<tr>
<td>02</td>
<td>Wheat</td>
<td>1500</td>
<td>1300</td>
<td></td>
</tr>
<tr>
<td>03</td>
<td>Maize</td>
<td>13,400</td>
<td>1380</td>
<td></td>
</tr>
<tr>
<td>04</td>
<td>Finger millet</td>
<td>1010</td>
<td>950</td>
<td></td>
</tr>
<tr>
<td>05</td>
<td>Barley</td>
<td>200</td>
<td>1500</td>
<td></td>
</tr>
<tr>
<td>06</td>
<td>Buck wheat</td>
<td>580</td>
<td>800</td>
<td></td>
</tr>
</tbody>
</table>

SCOT ANALYSIS

STRENGTHS
1. No such plant is operating in the close vicinity
2. All the infrastructural facilities and utilities are available.
3. Subsidies and incentives are available for setting up the project in this region.
4. The climate and temperate are favourable for undertaking the manufacturing process.

CONSTRAINTS
1. The project site is located in area which is prone to earthquakes etc.

OPPORTUNITIES
1. No similar plant would come up in the close vicinity as no licenses are being given by the government.
2. Existing Rail Line & National Highway from would make the transportation easier for both raw materials and finished goods.

THREATS
1. There is always a threat of militancy in the region.
2. Any changes in the benefits provided by the government to the region.
3.4 ABOUT PACHARI – THE PROPOSED PROJECT SITE
The Project is proposed to be set up at Industrial Area, Changsari, Kamrup District, ASSAM. The site is a 45 minute drive and is approximately 20 Km from Guwahati city.

The main advantages of the location are as under:

1. Surface transport is easily available from the National Highway.
2. The industry is located within the industrial zone as per the regulations of the state government.
3. The climate and temperate are favourable for undertaking the manufacturing process.

The choice of the location near Changsari in the state of Assam has been based on considerations of ready infrastructure in the form of availability of suitable land readily accessible by metal road, electricity, water and manpower, marketing network is also readily available through the regular business set up of the Promoters and their associates.

The Transportation Utilities available are:

1. Railways: - The existing nearest major railway station is Rangia, which is 25 km approx. away from the location. The facilities for transportation of the goods to different parts of the country are available since this railway head is connected to different parts of India.

2. Roadways: - The site is located about 25 kms from Guwahati and is connected by good roads. Surface Transport communication is easily available from the National Highway.

3. Airport: - Guwahati airport, situated at a distance of approx 13 km from the factory and is linked to all metropolitan cities also to International segments through regular flight services operated by the Indian Airlines, Jet Airways and other.

To obviate the problems of prospective entrepreneurs in acquiring site for industries; Industrial Estates, Industrial Areas and Export Promotion Industrial Park (EPIP) and Growth Centres have been created and more are likely to come in the near future.

Thus, the project location at Industrial area, Changsari District Kamrup of Assam is a very strategic one as Changsari has been acknowledged as an Industrial Area by the Government and moreover it is situated close-by Guwahati, the major city of North-east India.
CHAPTER - 4 :

AVAILABILITY OF INFRASTRUCTURAL FACILITIES & UTILITIES IN ASSAM

A conglomeration of eight sister states, the North-eastern Region of India (NER) is on the threshold of a new boom with the Government of India’s Look East Policy. The strategy and approach of the State Governments have been to provide the basic infrastructure requirements of the people such as roads, water supply, power supply, school, hospitals, etc. Among the other North-eastern States, Assam has been by and large successful in this and a large part of the infrastructure is now in place. Surface transport is the main method of transportation in this land-locked hilly State. Assam has a reasonably good Road Network; it has a National Highway passing through this state.

4.1 AVAILABILITY OF INFRASTRUCTURAL FACILITIES & UTILITIES:
The Unit being located in the Industrial Area of Changsari is therefore in an advantageous position as the unit shall be able to avail the major infrastructural facilities like power, water, technology, manpower etc.

The location of an Industry is considered based on availability of infrastructural facilities and careful evaluations of other inter-related factors. The location is supposed to be most favourable, where the following facilities are already available or can be developed at minimum cost:-

1. Sources of Raw materials
2. Power
3. Water Supply
4. Technology
5. Transportation & Telecommunication facilities
6. Manpower availability
7. Marketing facilities
8. Pollution Control Measure; &
9. Social Infrastructure

1. Source of Raw Materials:-
The major raw material and inputs for the Ethanol Plant are Grains, Yeast, Alfa Amylase, Amyloglucosidase, Urea, De-foam Agent and Water. Besides, Nutrients, chemicals are also required for the process.

Raw Material Sources
Grains - Assam, West Bengal Jharkhand & Bihar
Additives - Directly from the Chemical Companies
Nutrients/Ammonia - Directly from the Chemical Companies
Alfa Amylase - Directly from the Chemical Companies
Amyloglucosidase - Directly from the Chemical Companies

GRAINS
The most important raw material for ENA/Ethanol production is either Grains or Cane Molasses. Grains have starch content, which can be converted to fermentable sugar. Before use for the process Grains first has to be prepared. The preparation of the grains follows two fundamental purposes. Increase the volume of feeding towards the mills; this is possible by increasing the density of the preparation product.
Use
The preferred grains for use in ENA & Ethanol Plant are those which have higher amount of sucrose value in it and are healthy grown. The main search will be for the particular genetic grains which yields higher starch content in it.

Availability
Indian Distilleries use almost exclusively Grains/Cane Molasses. The Grains/Cane Molasses is available in the free market at a competitive rate all over India. However the biggest concentrations of grains suppliers are found in Meghalaya, Assam, Uttar Pradesh, Karnataka, Tamil Nadu & Maharashtra, West Bengal and Bihar. The promoters have since established contact with some of the important grains suppliers. The annual requirement of grain has been estimated at 55000 metric ton per annum.

Distillery Yeast: Yeast for Distillery may be propagated from single cell culture (pure cultures) but it usually is recovered after fermentation is complete and then used over again for many generations after wash.

Availability
Yeast is required to be imported from abroad, which are available in plenty at a competitive rate from multi-sources.

2. Power:-
The power required for proposed project which is around 1.5 MW will be meet through the proposed 2.5 MW co-generation power plant.

3. Water Supply:-
The ground water will be taken out with the help of bore well/pumps

4. Technology:-
The Company shall be employing the multi pressure distillation Technology for achieving the quality and desired output on the capacity utilizations. This technology is widely accepted for its quality produce. The promoters of the proposed project have appointed M/s Praj industries Ltd, Pune to provide the above mentioned process technology for their project. This technology is a proven and widely used technology in India and abroad. The technical consultants Praj industries Ltd. will make sure that the technology is properly absorbed in the project.

5. Transportation & Telecommunication Facilities:-
Railways: - The existing nearest major railway head is Guwahati, which is 25-km approx. away from the project site. The facilities for transportation of the goods to different parts of the country are available since this railway head is connected to different parts of India. Regular mail/express train links the site with important places like Punjab, Rajasthan, Maharashtra, U.P and other parts of the country.

Roadways:- The site being situated by the side of national highway is well connected to different parts of the country. The site is located about 25 kms from Guwahati and is connected by good roads. Surface Transport communication is easily available from the National Highway which is being converted to 4 lane. Road connection would help the Transportation of equipments during construction phases. It would also help operation of the plant providing facilities for transportation of input material and distribution of finished product.

Airport: - Guwahati airport, situated at a distance of 35 km from the project site and is linked to all metropolitan cities also to International segments through regular flight services
operated by the all national carriers. This would help movement of personnel and air liftmen of spares and other essential equipment as and when necessary.

Telecommunication facilities:--
All telecom facilities are widely available in the proposed area for the project. The company proposes to use the ERP system to link all its establishments. Use of V-Sat is also proposed by the unit.

6. Manpower availability:--
Technically skilled manpower is readily available in the area for establishment of the project. Qualified engineers from neighbouring states and other colleges of rest of Northeast would provide the manpower support for civil, electrical, mechanical and chemical engineering stream. Besides above, industrial training institution and degree colleges of science, arts and commerce stream would also provide personnel. It is expected that there will be no dearth in availability of the required personnel for the proposed unit. There are Institutes like IIM and IIT in the region. The Company can target these students of these institutes for employment and research purposes.

7. Marketing Facilities (The Company’s Marketing Strategy):--
ENA being the products of Industrial consumption, the Company’s targeted customers shall be the Bottling plants in the region and also Breweries & Distilleries in the country which require additional ENA. There are about 40 bottling plants in and around the North east region. The Company shall be receiving the Letter of Intents with a commitment from the companies. The Company shall be approaching them as and when they begin the production. The Company shall be having the marketing and selling team which shall be looking after this function.

8. Pollution Control Measures:--

Water Pollution:--
In the proposed scenario to treat the 600 m3/day of spent wash generated, company has provided centrifugal decanter followed by Evaporator & steam tube dryer to meet the zero discharge norms prescribed by pollution control board. The domestic wastewater will be collected and discharged to the soak pit without further treatment.

Air Pollution:--
To control the air pollution from the proposed 25 TPH boiler Latest APCS technology will be install with proper height of stack & for proposed expansion.

<table>
<thead>
<tr>
<th>SR. NO.</th>
<th>TYPE OF WASTE</th>
<th>SOURCE</th>
<th>WASTE MANAGEMENT DETAILS PROPOSED</th>
<th>(FINAL DISPOSAL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Grains residue (DDGS/DWGS)</td>
<td>Process</td>
<td>Approx 120 MT as DWGS or approx 42 MT as DDGS</td>
<td>Use as cattle feed</td>
</tr>
<tr>
<td>2.</td>
<td>Fly ash</td>
<td>Boiler</td>
<td>Approx 10 MT</td>
<td>Trapped and sold to nearby cement plant &amp; brick manufacturers</td>
</tr>
</tbody>
</table>

Solid Waste:

9. Social infrastructure:--
Social infrastructures like medical treatment facilities, education facilities, and recreation facilities. Shopping facilities are available in Guwahati, which is the proximity of the proposed site of the project. The locational analysis carried out by the project team reveals the following Strengths, Weaknesses, Opportunities, and Threats from various technical and economic angles, which is summarized below:-
Strengths:
1. The area is pollution free and at a distance from the residential locality.
2. The climate such as temperate and humidity are most favourable for Distillation process.
3. The distribution network is strong since Changsari is well connected with road, railway and air. The government is encouraging entrepreneurs and offering various incentives.
4. The other input materials like Grains will be available locally; Chemicals etc are available from the various places in India.

Weaknesses:
No important weaknesses are found.

Opportunities:
The project will have the first mover advantage as no such plant exists in the North east region.

Threats:
Militancy has been a threat to industrialization in North east in the past. But today it is on the verge of subsidizing and it can no longer be considered as a great threat.

4.2. SUBSIDIES / INCENTIVES:-
The Industry being located at Assam is liable to avail a package of State and Central subsidies, incentives and assistance under "The Assam Industrial Policy, 1997" and “North East Industrial Policy, 2007” of Government of India.

A. Subsidies/Incentives under "The Assam Industrial Policy, 1997":-
Government of Assam shall provide a package of subsidies, incentives and assistance to the small scale as well as medium and large categories of industries in Assam under "The Assam Industrial Policy, 1997". The proposed unit being a large scale unit shall have the following benefits:

**PACKAGE SCHEME OF INCENTIVES 1997 - LARGE & MEDIUM SCALE INDUSTRIES:-**

1. State Capital Investment Subsidy:-
State Capital investment Subsidy will be provided at the rate of thirty percent of the fixed capital investment subject to a ceiling of Rs. 20 Lacs.

2. Subsidy for the Cost incurred on preparation of Feasibility Study and preparation of Project Report:-
Subsidy will be provided at ninety percent of the cost of preparation of feasibility/project reports subject to a ceiling of Rs.2 Lacs provided that the report is prepared by a Government approved agency. ("Suvidha" is a approved agency by the Government of Assam.)

3. Interest subsidy:-
3.1. A subsidy on interest payments to Banks/Financial institutions will be provided at the rate of four percent on term loans (excluding working capital loans) availed by an entrepreneur for setting up of approved industrial units. This is subject to a maximum of Rs.20, 000/- per month for 3 years from the date of disbursement of the loan and to be applicable only for new units.

3.2 This subsidy will be in the form of re-imbursement of the actual repayments made.
4. Local Employment Promotion Grant:-
4.1. Government will reimburse annually up to thirty percent of the realistic wage bill for local tribal employees over and above the stipulated number of local tribal employees in the industrial policy as specified in the eligibility criteria. This would be for three years from the date of entertainment. The maximum limit of such subsidy is Rupees One lac annually.

4.2. Twenty percent of the cost incurred on training of local tribal employees will be reimbursed subject to the following:
   a. Such trained person being absorbed in the unit, failing which the unit will refund the subsidy amount paid for the same.
   b. Training is conducted in an Institute approved by the State Government.

5. Subsidy on Power:-
5.1. Subsidy on power tariffs will be provided at the rates of thirty percent and twenty five for loads up to 2 MW and loads above 2 MW respectively, for a period of five years from the date of commercial production and the maximum limit of such subsidy is Rs.7 Lacs annually. Power subsidy will only be allowed on actual consumption of power for the manufacturing process substantiated withal requisite details and diagrams etc. Provided that in case of a Tourism unit, the power subsidy will be allowed on actual consumption of power by such a unit

5.2. Drawal of Power Line:-
In case a project is located in an area which required the drawal of a power line of 33 KV and above, then State Government will reimburse the cost incurred on the drawal of such power, including the cost of transformer, subject to a ceiling of Rs.5 Lacs an provided that the location has been approved by State Government.

6. Subsidy on cost incurred on quality control measures:-
Cost of Laboratory equipment for the purpose of quality control and ISI certification, subject to a maximum of Rs. 40,000/- per unit will be reimbursed in cases where it does not form part of the project cost.

7. Subsidy on cost incurred on Pollution Control Measures:-
Fifty percent of the cost of approved pollution control measures will be reimbursed upto a maximum of Rs.75,000/- per unit.

8. Special incentives for Export Oriented Units:-
a. 100 % Export Oriented Units (EOUs)
   i. An additional 5 % capital investment subsidy subject to a maximum of Rs. 5 Lacs.
   ii. Sales Tax exemption for an additional period of one year.

b. Other Units with an export commitment of 25% and above of the total turnover.
   i. An additional 5% capital investment subsidy subject to a maximum of Rs. 5 Lacs. Provided that in case of a Tourism Unit, the export commitment shall be replaced by “commitment to earn Foreign Exchange”

9. Pioneer Units Scheme:-
9.1. A new industrial unit with fixed capital investment exceeding Rs.3 Crores set up in district where there are no medium/large scale industries will be given pioneer status. A pioneer unit will be entitled to an additional capital investment subsidy of five percent, subject to a ceiling of Rs.15 Lacs.

9.2. Only the first three units for any district will be eligible for the pioneer unit status.

B. Subsidies/Incentives under “The North East Industrial & Investment Promotion Policy, 2007”:–
The Government approved a package of fiscal incentives and other concessions for the North East Region namely the ‘North East Industrial and Investment Promotion Policy (NEIIPP), 2007’, effective from 1.4.2007, as per which Incentives will be available to all industrial units, new as well as existing units on their substantial expansion, located anywhere in the North Eastern Region.

Central subsidies, incentives and assistance under “The North East Industrial & Investment Promotion Policy, 2007” of Government of India are:

- Central Excise Refund (i.e. amount paid from PLA in excess of MODVAT credit availed):

  100% Excise Duty exemption is given, on finished products made in the North Eastern Region. And in cases, where the CENVAT paid on the raw materials and intermediate products going into the production of finished products (other than the products which are otherwise exempt or subject to nil rate of duty) is higher than the excise duties payable on the finished products, such overflow of CENVAT credit will be refunded.

- Central Capital Investment Subsidy

  Capital Investment Subsidy is enhanced from 15% of the investment in plant and machinery to 30% and the limit for automatic approval of subsidy at this rate will be Rs.1.5 Crores per unit, as against Rs.30 lacs as was available under NEIP, 1997. Such subsidy will be applicable to units in the private sector, joint sector, cooperative sector as well as the units set up by the State Governments of the North Eastern Region. For grant of Capital Investment Subsidy higher than Rs.1.5 crore but up to a maximum of Rs.30 Crores, there will be an Empowered Committee Chaired by Secretary, Department of Industrial Policy & Promotion with Secretaries of Department of Development of North Eastern Region (DONER), Expenditure, Representative of Planning Commission and Secretary of the concerned Ministries of the Government of India dealing with the subject matter of that industry as its members as also the concerned Chief Secretary/Secretary (Industry) of the North Eastern State where the claiming unit is to be located.

  Proposals which are eligible for a subsidy higher than Rs.30 Crores are placed by Department of Industrial Policy and Promotion before the Union Cabinet for its consideration and approval.

- Income Tax Exemption: 100% income tax exemption is given under Section 80 IE of the Income Tax Act, 1961 for a period of 10 years from the year of commencement of commercial production.

- Transport Subsidy: The Transport Subsidy Scheme continues on the same terms and conditions as mentioned in the Transport Subsidy Scheme (TSS), 1971. The Scheme provides for subsidy up to 90% of the cost incurred on transportation of raw material and finished goods, for a maximum period of 5 years.

- Interest Subsidy: Interest Subsidy is made available @ 3% on working capital loan under NEIIPP, 2007 as was available under NEIP, 1997.

- Comprehensive Insurance Subsidy: New industrial units as well as the existing units on their substantial expansion will be eligible for reimbursement of 100% insurance premium. however barring income tax benefits under tax holiday no other Government incentives have been considered for preparation of financials for the project report. Thus the incentives as and when received will be an added advantage for the unit.

In order to study assess the impact of subsidies on the projected financials of the company, the following two subsidies have been considered namely:
1. **Central Capital Investment subsidy:** Capital Investment Subsidy is 30% of the investment in plant and machinery. It is estimated to be approximately Rs. 4200.00 Lacs.

2. **Interest Subsidy:** Interest Subsidy is made available @ 3% on working capital loan under NEIIPP, 2007 as was available under NEIP, 1997.

**The effect of both these subsidies on the financial projections will be as under:-**

**Particulars Without taking the subsidies into consideration**

**Taking the subsidies into consideration**

**DSCR**
The average Gross DSCR will be 2.00 and average Net DSCR will be 2.53. If subsidies are considered the average Gross DSCR rises to 3.10 and average Net DSCR will be 4.37.

**Equity IRR**
The Equity IRR is projected at 54.04% The inclusion of subsidies raises the IRR to 60.16% IRR The IRR expected is 19.58%. The effect of subsidies is that it rises to 25.95%.

**Return on capital Employed**
The Return on Investment is expected at 15%. Considering the subsidies would improve it to 17.25%.

**Break even Point**
Average Break Even Sales (as % of current year sales) is 49.46% and The Average Break Even Sales (as % of capacity utilization) is expected at 42.94%.
The Average Break Even Sales (as % of current year sales) will decrease to 44.32% and The Average Break Even Sales (as % of capacity utilization) will come to 38.38%.

**Payback period**
The projected payback period is 4 Years and 11 Months. The payback period decreases to 3 years 8 months.

**Therefore, the availability of infrastructural facilities & utilities and also the subsidies/Incentives in the location shall keep the Promoters in an advantageous position.**
CHAPTER - 5 :

PRODUCT DESCRIPTION

5.1 PRODUCT DESCRIPTION OF EXTRA NEURAL ALCOHOL & ETHANOL AND ITS USES

5.1.1 EXTRA NEUTRAL ALCOHOL

Extra Neutral alcohol (ENA) or Neutral spirit (NS) is Ethanol which is refined by removing most of the impurities in rectified spirit by further distillation. ENA usually contains about 96% by volume ethanol. Alcoholic beverages like spirits, liquors are made using ENA, by dilution with water to about 25 to 43% by volume. As a standard practice all Multinational Brands and Indian Premium Liquor Brand manufacturers, bottling their products in India make use of only Extra Neutral alcohol for blending all their Regular and Premium Brands.

To name a few, Seagram's, United Distillers, McDowell’s, Shaw Wallace, Bacardi, UB Group, Herbert sons, Allied Dominguez etc.

SUPERFINE EXTRA NEUTRAL ALCOHOL SPECIFICATIONS:-

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COMPONENT</th>
<th>UNIT</th>
<th>ENA GRADE LIMIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ethanol @ 15 deg C</td>
<td>% v/v</td>
<td>96 Minimum</td>
</tr>
<tr>
<td>2</td>
<td>Aldehydes as Acetaldehyde</td>
<td>PPM</td>
<td>3 – 4 Maximum</td>
</tr>
<tr>
<td>3</td>
<td>Methanol</td>
<td>PPM</td>
<td>3 – 4 Maximum</td>
</tr>
<tr>
<td>4</td>
<td>N-Propanol &amp; Iso –Propanol</td>
<td>PPM</td>
<td>4 – 5 Maximum</td>
</tr>
<tr>
<td>5</td>
<td>Butanol</td>
<td>PPM</td>
<td>2 – 3 Maximum</td>
</tr>
<tr>
<td>6</td>
<td>Acids as Acetic acid</td>
<td>PPM</td>
<td>3 – 4 Maximum</td>
</tr>
<tr>
<td>7</td>
<td>Esters as Ethyl Acetate</td>
<td>PPM</td>
<td>3 – 4 Maximum</td>
</tr>
<tr>
<td>8</td>
<td>Furfural</td>
<td>PPM</td>
<td>Nil</td>
</tr>
<tr>
<td>9</td>
<td>Lead</td>
<td>PPM</td>
<td>Nil</td>
</tr>
<tr>
<td>10</td>
<td>Copper</td>
<td>PPM</td>
<td>Nil</td>
</tr>
<tr>
<td>11</td>
<td>Dry extract</td>
<td>PPM</td>
<td>Negligible</td>
</tr>
<tr>
<td>12</td>
<td>Permanganate Test Time</td>
<td>Minutes</td>
<td>30 to 40 Minimum</td>
</tr>
<tr>
<td>13</td>
<td>Suitability characteristics</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In addition to the above limits and specifications, the Superfine Extra Neutral Alcohol will have best organoliptic characteristics and it is ideally suitable for potable use.

5.1.2 IMFL

With a size of over 78.7 Million cases (each case has 12 bottles, each containing 750 ml of liquor); the IMFL industry can be broadly classified into products based on Extra Neutral Alcohol (ENA) and Rectified Spirit (RS). ENA-based products, which are of better quality and have a longer shelf life, are the focus of main players like the UB Group and Shaw Wallace.

The low-priced RS segment is quite price-sensitive and characterized by the presence of a number of small players.

The IMFL market is categorized primarily into whisky, brandy, rum, vodka and gin, with market share heavily skewed towards whisky.

IMFL Categories: Market size (in %)

IMFL sales in different States, classified on the basis of the distribution channel accessible to the manufacturer, are given below:

Open Market - Maharashtra, West Bengal, J & K, Goa, Assam, Meghalaya, Tripura, Arunachal Pradesh

Auction Market - UP, Rajasthan, MP, Bihar, Punjab, Chandigarh, Haryana
Government controlled - Tamil Nadu, Delhi, Kerala, Andhra Pradesh
Prohibition States - Gujarat, Manipur, Mizoram, Nagaland

South India is the largest consumer in the Indian liquor market, with Andhra Pradesh showing the highest consumption, at 15 million cases, and a growth rate of 100%. In Kerala too, the consumption of liquor is high. Consumption in South India has been growing at a very high rate, compared to North India, which grew at 2% last year. The respective growth rates for different regions are:
Source: myiris.com

The State-wise consumption of liquor is:
Andhra Pradesh : (15 million cases),
Bengal : (1.7 million),
Assam : (1.5 million),
Bihar : (2 million),
Mumbai : (2 million),
Maharashtra : (2 million),
Delhi : (2 million),
Haryana : (2 million),
Punjab : (2 million),
Rajasthan : (3 million).

The above analysis show that eastern region of India is among the highest growing region with Assam as one of the largest consumers of IMFL. In order to cater to the growing demand, the Project is also setting up a Plant for bottling liquor termed as “Indian Made Foreign Liquor” (I.M.F.L.) by the Excise Authorities in India. The Products that are proposed to be bottled are Whisky, Rum, Gin, Brandy and Vodka. The Products may be of the “Premium” or “Regular” segments.

The Company will blend and bottle the liquor i.e. whisky, rum, gin, brandy and vodka named as Indian Made Foreign Liquor in various sizes of bottles such as 750ml, 375ml and 180ml for all the major brands in the country. The total installed capacity is 60,000 cases per month.

5.1.3. Absolute Alcohol
Absolute Alcohol (Ethyl alcohol, grain alcohol, ETOH) is a clear, colorless liquid with a characteristic, agreeable odor. In dilute aqueous solution, it has a somewhat sweet flavor, but in more concentrated solutions it has a burning taste. Ethanol, CH3CH2OH, is an alcohol; a group of chemical compounds whose molecules contain a hydroxyl group, -OH, bonded to a carbon atom. The word alcohol derives from Arabic al-kuhul, which denotes a fine powder of antimony produced by distilling antimony and used as an eye makeup. Alcohol originally referred to any fine powder, but medieval alchemists later applied the term to the refined products of distillation, and this led to the current usage. Ethanol melts at -114.1°C, boils at 78.5°C, and has a density of 0.789 g/mL at 20°C. Its low freezing point has made it useful as the fluid in thermometers for temperatures below -40°C, the freezing point of mercury, and for other low-temperature purposes, such as for antifreeze in automobile radiators.

Absolute Alcohol has been made since ancient times by the fermentation of sugars. All beverage ethanol and more than half of industrial ethanol is still made by this process. Simple sugars are the raw material. Zymase, an enzyme from yeast, changes the simple sugars into ethanol and carbon dioxide. The fermentation reaction, represented by the simple equation C6H12O6 + O2 + H2O = 2CH3CH2OH + 2 CO2 is actually very complex, and impure cultures of yeast produce varying amounts of other substances, including glycerine and various organic acids. In the production of beverages, such as Whiskey and Brandy, the impurities supply the flavor. Starches from potatoes, corn, wheat, and other plants can also be used in the production of ethanol by fermentation. However, the starches must be first broken down into simple sugars.
CHAPTER - 6:

DESCRIPTION OF THE TECHNOLOGY & THE MANUFACTURING PROCESS

6.1. TECHNOLOGY & PROCESS DESCRIPTION

The technology of making ENA is highly sophisticated process, which involves the crushing, fermentation and distillation process. The distillers worldwide have developed the processes over years. The developed processes have been passed on from generation to generation within the family members over the last hundred years. Now quite a few Indian distillers are available who are in a position to absorb and adopt the technology suitable under Indian condition. One such group is M/S. Praj Industries LTD., Pune who has agreed to provide the required process technology to M/S. Manglam Distillers & Bottling Industries. Diagram showing, the process flow is enclosed in this Report. The detailed outline of the process has been set out in the following paragraphs:

The Indian Alcohol Industry is mostly dependent on sugar factories for molasses as raw material. This is a major issue relating to the production of alcohol. Till recent past there has been no thrust on the use of non-molasses substrates. However, with the present alcohol scenario in India, the need to use other substrates has become necessary due to increased demand. In view of above, the use of the equivalent amount of cane juice (especially secondary juice) directly & milled grains, for the fermentation and production of ENA & Absolute Alcohol seems to be the most economical and value-added concept. In addition to the synthetic ethanol production from ethylene, there are three groups of raw material:
1. Beet, sugar cane, sweet sorghum and fruits
2. Starchy materials such as corn, milo, wheat, rice, potatoes, cassava, sweet potatoes, etc.,
3. Cellulose materials like wood, used paper, crop residues, etc. Ethanol production from cellulosic material is not yet commercialized.

DETAIL OF PLANT SUMMARY (Proposed)

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Parameters</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-</td>
<td>Plant capacity</td>
<td>60,000 litres / day total 96 % v/v alcohol.</td>
</tr>
<tr>
<td>2-</td>
<td>Main products</td>
<td>60,000 litres / day of Superfine Extra Neutral Alcohol OR Export Quality Rectified Spirit OR Industrial Alcohol Plus 6,000 liters per day Technical Alcohol at 94 % v/v.</td>
</tr>
<tr>
<td>3-</td>
<td>Efficiency &amp; alcohol yield at 45 % w/w Fermentable sugars</td>
<td></td>
</tr>
</tbody>
</table>

i). EFFICIENCY

Fermentation efficiency – 90 % (91% for FS more than 45%)
Distillation efficiency – 98.5 %

ii). YIELD

410 litres 96 % v/v alcohol per Ton grains.
265 litres 96 % alcohol per Ton molasses at 45 % Fermentable Sugars.
252 litres of 99.8% v/v Alcohol per Ton of molasses at 45 % Fermentable Sugars.

iii). FORMULA FOR CALCULATION OF YIELD

\[
\text{Alcohol Production in Liters / kg of Molasses/Grains} = \frac{\text{FS} \times 0.511 \times \text{Eff F} \times \text{EffD}}{0.795 \times \text{Alcohol Concentration in v/v}}
\]

Where,
FS – Fermentable Sugar in % w/w
EffF – Fermentation Efficiency in %
EffD – Distillation Efficiency in %

4- Steam consumption
- Superfine Extra Neutral Alcohol production– 2.7 to 2.8 kg per litre
- Export Grade Rectified Spirit production – 2.0 to 2.1 kg per litre

5- Electricity usage - 1.6 MW maximum
6 -Water consumption 620 m³ per day maximum including cooling towers.
7 –Chemical consumption
1. Sulphuric Acid – 0.8 kg per KL
2. De-foam agent – 0.6 kg per KL
3. Nutrients (fertilisers Urea & DAP)–1 kg per KL each
4. Biocides – 0.5 kg per KL.
5. De-scaling agents – Negligible
For proposed expansion the same additional will be required.

SECTION WISE DESCRIPTION – PROCESS

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Section</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-</td>
<td>Batch Fermentation</td>
<td>Suitable for 120,000 litres / day capacity. 500 m³ X 5 number Fermentors. All tanks are in Carbon steel with plate Heat Exchangers for cooling, Automatic chemical / acid dosing system, Yeast culture vessels and pre fermentors. Sludge settling system. Grain broth mixers with magnetic flow-meters, Special culture and know-how.</td>
</tr>
<tr>
<td>2-</td>
<td>Multi Pressure Distillation</td>
<td>Suitable for 60,000 litres / day proposed capacity comprising 6 distillation columns.</td>
</tr>
<tr>
<td>3-</td>
<td>Cooling towers for fermentation</td>
<td>Suitable for 60,000 litres / day capacity. 200 m³/hour 20 deg C delta T with pumps &amp; piping</td>
</tr>
<tr>
<td>4-</td>
<td>Cooling towers for Distillation</td>
<td>Suitable for 60,000 litres / day capacity. 200 m³/hour 10 deg C delta T with pumps &amp; piping</td>
</tr>
<tr>
<td>5-</td>
<td>Yeast chillier with pump and piping</td>
<td>Suitable for 60,000 litres / day capacity.</td>
</tr>
<tr>
<td>6-</td>
<td>PRDS, steam flow meters &amp; air compressor</td>
<td>Suitable for 60,000 litres / day capacity.</td>
</tr>
</tbody>
</table>

6.2. MANUFACTURING PROCESS OF ENA

6.2.1. BREWING PROCESS
ENA production involves the extraction and Saccharification of starchy and their conversion into alcohol by fermentation process. To achieve the best results it has to be channeled through the following process:

a) Grain Milling.
b) Cooking
c) Fermentation.
d) Distillation.

1. Grains Milling: - The process of converting grains to alcohol is by the single continuous fermentation process. This process offers benefits such as a very high yield of alcohol per MT of grain milled and a very low quantity of effluent generated from the plant.

- High efficiency of fermentation to the tune of 90%
- Savings in sugar due to yeast recycling
- Reduction in water consumption by stillage recycling
Massive reduction in the spent wash generation to the tune of 3 liters per liter of ENA produced, without using any additional energy
Distillation efficiency of 98.5 %
Ultimately higher yields/recoveries to the tune of 380 ltrs/ton of grain mill

The incoming cereals are usually inspected upon receipt. The distiller will check the grain for bushel weight, moisture content, mold infestation and general appearance. If the cereal complies with the quality control standards, it will be unloaded into silos in preparation for milling. The purpose of milling is to break up the cereal grains to as small a particle size as possible in order to facilitate subsequent penetration of water in the cooking process. A wide variety of milling equipment is available to grind the whole cereal to a meal. Normally, most distilleries use hammer mills, although some may use roller mills, particularly for small cereal grains.

2. **Cooking**: - Cooking is the entire process beginning with mixing the grain meal with water through to delivery of a mash ready for fermentation. The key to cooking is to simply liquefy the starch so it can be pumped. The source of alcohol from cereal grains is the glucose polymer known as starch. The purpose of cooking and saccharification is to achieve hydrolysis of starch into fermentable sugars. In order for the \(-\)amylase to bring about hydrolysis of the starch to dextrin\'s, the granular structure of the starch must first be broken down in the process known as gelatinization. When the slurry of meal and water are cooked, the starch granules start to absorb water and swell. They gradually lose their crystalline structure until they become large, gel-filled sacs that tend to fill all of the available space and break with agitation and abrasion. The peak of gelatinization is also the point of maximum viscosity of a mash. This mash contains 65% convertible sugar.

3. **Fermentation**: -The batch fermentation technology has many advantages like continuity of operation, higher efficiency and ease of operation. Batch fermentation also results into consistent performance over a long period. Most modern ethanol production plants adopt fermentation technology. Considering all the above advantages, we have proposed to adopt the efficient fermentation in the distillery. In fermentation, yeast consumes glucose and releases ethanol, carbon dioxide, and heat. For each pound of glucose consumed, 0.489 lb of carbon dioxide, 0.511 lb of ethanol, and 170 Btu are generated .The process can be characterized by three phases:
1. The lag phase – the yeast cells become acclimated to their new environments
2. The exponential growth phase – the yeast cells propagate most rapidly
3. The death phase – the alcohol concentration is high, and the available sugar for yeast metabolism is low. Most of the alcohol is produced during the exponential phase and decreases during the death phase. The following Figure shows approximate yeast and alcohol concentrations throughout the cycle:-

**Figure Yeast Population and Alcohol Concentration throughout Fermentation**: -
Typical fermentation processes convert about 90% of the fermentable sugars to ethanol. Yeasts consume about 5% of the fermentable sugars to produce new cells and minor products such as glycerol\'s, acetic acid, lactic acid, and fusel oils. The fermentation process employs a special yeast culture, which can withstand variations in the quality, temperature and other shock loads. Fermentation plant consists of five to six numbers Fermenters tanks connected in series with all the accessories like plate heat exchangers for cooling, spargers, broth mixers and air blowers etc. The yeast is immobilized using special media and it remains in the fermentation plant throughout and hence it gives tremendous advantages in maintaining the yeast population and in combating the bacterial infection. The Saccharified slurry from Saccharification section is pumped into Fermenters and is diluted to appropriate sugar concentration by adding water. It is, then inoculated with required quantity of suitable yeast. The assimilable nitrogen is added in the medium in the form of urea and dap. Temperature in the Fermenters is maintained with the help of plate heat exchanger. The
Fermented mash is reticulated continuously through PHE. Recirculation also helps in proper mixing of fermented mash. The rate of fermentation reaction gradually increases and after 50 to 55 hours, fermentation completes. After completion of reaction the fermented mash is delivered to mash holding tank. The fermented mash collected in the Clarified Wash Tank is then pumped to Mash or Primary columillion for distillation.

The CO2, which is liberated, is scrubbed in water, with the help of CO2 Scrubber. This CO2 contains ethanol, which is recovered by collecting CO2 Scrubber water into Sludge Trough. The diluted sludge is pumped into Sludge Settling clarifier. The traces of ethanol present in diluted sludge are separated at the supernatant, which is collected into BWT through overflow, and washed sludge from bottom is drained off. A closed loop cooling tower system with an induced draft-cooling tower with circulation pumps is also provided to ensure higher cooling efficiency and to minimize water wastages.

4. Hydro-Extractive Vacuum Distillation:-

The vacuum distillation has many advantages over conventional distillation atmospheric distillation plants like lower energy requirement, very good quality alcohol and less scaling of the distillation trays due to sludge. The vacuum distillation produces ethanol of international quality standards and there is a lot of demand of ethanol from the vacuum distillation process. “The Extra Neutral Alcohol produced from this latest technology will meet most of the international quality standards for ethanol like US Pharmacopoeia, British Pharmacopoeia and Japanese standards.” The vacuum distillation approximately requires 50% less steam as compared with the conventional old distillation technologies. The vacuum distillation consists of distillation columillions with high efficiency columillion trays, condensers, Reboiler, vacuum pumps and reflux pumps. A closed loop cooling tower system with an induced draft-cooling tower with circulation pumps is also provided to ensure higher cooling efficiency and to minimize water wastages.

In this vacuum distillation ethanol is separated and concentrated using principal of fractional distillation. This is based on difference in boiling points of volatile compounds in mixture. There are six columillions in the system Primary columillion also called Mash columillion, Rectifier columillion, Hydro extractive distillation columillion, Refining columillion, Aldehydes Columillion and Defuse Columillion.

The Primary or Mash columillion is operated under vacuum and it is heated using the vapors from the Rectifier columillion, which is operated under a slightly higher pressure. The vacuum operation of the Primary columillion will help in reducing the overall energy requirement and also improve the product quality. Due to vacuum operation of the Primary columillion the scaling of the columillion trays is minimized and plant can be operated without stoppage for a longer duration as compared with atmospheric plant. The fermented mash is preheated using a beer heater at the top of the Primary columillion and followed by a plate heat exchanger and finally delivered to the top of Primary columillion. The pre heating of mash in two stages recovers energy and saves steam required for the distillation. The mash runs down the Primary columillion trays from tray to tray, while vapour goes up in the columillion contacting the mash at each tray. As a result of this contact and boiling, ethanol and other impurities along with some water are stripped in the form of vapors and remaining mash in the form of vinasse (effluent) is disposed off from the bottom of the Primary columillion for ETP. When the vapors of ethanol and other volatile compounds reach the top, they are separated out from the top of Primary columillion and are then condensed in beer heater and other Primary condensers. The heat is supplied by the Rectifies vapors from the Reboilers provided at the bottom of the Primary columillion. Two Reboiler are provided at the bottom of the Primary columillion to facilitate the heat transfer from Rectifier columillion vapour to Primary columillion. The vapours from Primary top condensed in the above condensers are collected and fed to the Hydro extractive distillation columillion for purification. The ethanol streams from other columillions are also diluted with soft water and are fed to Hydro extractive distillation columillion via a feed pre heater (plate heat exchanger). A Reboiler is installed at the bottom of the Hydro extractive distillation columillion. Impurities such as Aldehydes and Fusel oil are removed from the top of the
Hydro extractive distillation column and are fed to Fusel oil concentration column, while dilute ethanol along with fewer impurities, are taken from the bottom of the Hydro extractive distillation column and fed to Rectifier column middle. Steam is fed to Hydro extractive distillation column through Reboiler. A Reboiler is installed at the bottom of the Rectifier column, which heats the process liquid i.e. alcohol and water received from the Hydro extractive distillation column, indirectly with the help of steam. In the Rectifier column, the ethanol is concentrated to 96 % by refluxing the Rectifier reflux liquid. Extra neutral ethanol (ENA) is tapped from the top of Rectifier column, which is directly sent to Refining column for removal of other low boiling impurities. While the bottom product of the Rectifier column called spent lees is drained off. The higher alcohols also called light and heavy fusel oils are removed from the middle portion of the Rectifier column. Light and Heavy fusel oil from Rectifier column and top cut from Hydro extractive distillation column plus ester cut from Hydro extractive distillation column is fed to Fusel oil concentration column. The steam is delivered from the bottom of the Defusel Column to allow the desired separation. Fusel oil consisting of higher alcohols viz. amyl alcohol, Iso amyl alcohol, n-propenol etc. are concentrated near middle portion of Fusel oil concentration column and can be removed and separated in the Fusel Oil Decanter in sufficient higher concentration. While the bottom product called spent lees is drained off. The top product from the Defusel Column is cooled in the cooler and sent to storage as Technical Alcohol. The Refining column is fed with the ENA from the Rectifier column, which is boiled off in the Refining column to remove the low boiling impurities like methanol and mercaptants. Extra Neutral Alcohol (ENA) is tapped from the bottom of the Refining column, which is cooled upto 30 0C, by passing through ENA cooler. The impure ethanol, which contains many impurities, is drawn from the top of the Refining column and cooled in the cooler and sent to storage as Technical Alcohol. Alternatively diluting with soft water in Aldehydes Column as and when required can further purify some of these Technical Alcohol streams. Both fermentation and distillation are operated with PLC computer controls system. This will help in maintaining the parameters consistent and without any fluctuations. Most modern distillery plants use computer system for controlling their parameters.

6.2.2. SPECIFICATIONS OF INPUTS

1. Grains:
   - Starch content in Raw Material: 60 % to 70 % w/w
   - Raw material requirement (65 % w/w of starch content): 150 MT / day for 60 kl
   - Conversion efficiency: 96 to 97 %
   - Yield of Alcohol (65 % w/w of starch content): 410 litre of Alcohol
   - Alcohol concentration in fermented Mash: 9.0 (% v/v)

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 32'C maximum with a total hardness of 5 ppm maximum & Total Dissolved solids of 30 ppm max.

4. Alpha Amylase: 0.6 kg / Ton of Starch

5. (AMG300L):- 1.2 kg / Ton of Starch

6. Sulphuric Acid:- Concentrated, Commercial Grade, Composition as below value in % W/W:-
   - Sulphuric Acid : 98 MIN
   - Lead : 0.001 MAX
   - Arsenic : 0.0001 MAX
   - Iron : 0.03 MAX
   - Moisture : 2 MAX
7. **Urea:** In the form of pills or pellets with total Nitrogen not less than 46% W/W

8. **Ammonium Phosphate (D A P):** In the form of granules, Composition as below: *(Values in % w/w)*
   - a P2O5 : 50 MIN
   - b Nitrogen : 20 MIN
   - c Arsenic : 0.0001 MAX
   - d Iron : 0.01 MAX.
   - e Lead : 0.001 MAX

9. **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 -

10. **Steam:** Dry, saturated should be provided at the inlet of steam header in fermentation plant and the pressure required shall be 3 kg/cm2 (g) at the steam header.

11. **Steam for Cooking:** Dry, saturated should be provided at the inlet of steam header in cooking area and the pressure required shall be 3.0 kg/cm2 (g) at the steam header. The maximum variation in the steam pressure shall not be more than +/- 0.1 kg/cm2.

12. **Yeast:** Imported Yeast is taken into consideration.

6.3. **Manufacturing process of IMFL liquor**

The Project envisages an installed capacity of 60,000 cases per month of Spirit in its various sizes and segments and is based on the capacity of bottling lines. The Process is divided into two sections i.e. **Blending and Bottling.**

1. **BLENDING:**
   The process of Blending begins with acquiring Raw Neutral Alcohol or Grain Spirit having strength of 68 op from distilleries. The “Spirit” is stored in Spirit Storage Tanks. The “Spirit” is transferred, through pipe lines to the Blending Vat where is prepared in the DM Plant Adding flavours as required for the product and colours as desired follows this process and the mix is chummed through compressed air in the Blending Vat. The product is held in Blend Holding Tanks for maturation for 48 hours. The product is Whisky / Rum / Gin / Brandy / Vodka and is ready for Bottling.

2. **BOTTLING:**
   The Bottling Process begins with transfer of Whisky / Rum / Gin / Brandy / Vodka from the Blend Holding Tanks to the Bottling Plants for filling. The Project proposes to install two semi-automatic and one automatic plant. The Blend is filled in the bottles which thoroughly and hygienically cleaned before filling. The filled bottles move automatically on the lines for capping and thereafter for labelling. The product is packed in carton and the cartons are removed for storage pending dispatch to the customer for the Premium Products the filled in and capped bottles are first packed manually in mono cartons and these mono cartons are packed in the bigger cartons.

6.3.1. **Technical Know-how:**
   The Blending and bottling of liquor is a conventional process and do not require and specific Technical Know-how. The machines will be installed under the technical supervision of the machine suppliers. However to monitor the project well-trained and experienced operator will be recruited.
CHAPTER - 7 :

RAW MATERIALS FOR PRODUCTION

7.1. RAW MATERIAL FOR ENA PRODUCTION:
The major raw material and inputs of for the Ethanol Plant are *Grains, Yeast and Water*. Besides, Nutrients, chemicals are also required for the process. The estimated annual consumption of important items is shown in Table below.

The function of each important raw material and their usage and availability has been outline below:

<table>
<thead>
<tr>
<th>Annual Raw Materials consumption</th>
<th>Consmn. for Level 60KLPD</th>
<th>Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grains</td>
<td>150 MT</td>
<td>Assam, Meghalaya, Bihar, Nagaland, West Bengal, Uttar Pradesh.</td>
</tr>
<tr>
<td>Additives</td>
<td>120 Kgs</td>
<td>Directly from the Chemical Companies</td>
</tr>
<tr>
<td>Nutrients Ammonia</td>
<td>150 Kgs</td>
<td>Directly from the Chemical Companies</td>
</tr>
<tr>
<td>Alfa Amylase</td>
<td>30 Kgs</td>
<td>Directly from the Chemical Companies</td>
</tr>
<tr>
<td>Amyloglucosidase</td>
<td>30 Kgs</td>
<td>Directly from the Chemical Companies</td>
</tr>
</tbody>
</table>

7.1.1. GRAINS: -
The most important raw material for ENA/Ethanol production is either Grains or Cane Molasses. Grains have starch content, which can be converted to fermentable sugar. Before use for the process Grains first has to be prepared. The preparation of the grains follows two fundamental purposes. Increase the volume of feeding towards the mills; this is possible by increasing the density of the preparation product.

1. Use: - The preferred grains for use in ENA & Ethanol Plant are those which has higher amount of sucrose value in it, healthy grown. The main search will be for the particular genetic grains which yields higher starch content in it.

2. Availability: - Indian Distilleries use almost exclusively Grains/Cane Molasses. The Grains/Cane Molasses is available in the free market at a competitive rate all over India. However the biggest concentrations of grains suppliers are found in Meghalaya, Assam, Haryana, Punjab, Uttar Pradesh, Karnataka, Tamil Nadu & Maharashtra state. The promoters have since established contact with some of the important grains suppliers. The annual requirement of grain has been estimated at 75000 metric ton per annum.

7.1.2. DISTILLERY YEAST
Yeast for Distillery may be propagated from single cell culture (pure cultures) but it usually is recovered after fermentation is complete and then used over again for many generations after wash.

Availability: - Yeast is required to be imported from abroad, which are available in plenty at a competitive rate from multi-sources.

7.1.3. WATER
Quantitatively the most important raw material is water. Of the water required, only a small fraction will be utilized for process, while the far large quantity is used for cleaning and flushing, as well as for condensers. The source and treatment of water is of particular importance for the distillery, since it strongly affects alcohol quality. The water consumption of a Distillery may vary between 10 and 12 ltr/ltr of Ethanol, depending on the Ethanol production level per annum. It is a fact that the distillery water has great influence on the character of the alcohol and, likewise, that the hardness of the water manifests itself as greater or lesser alkalinity towards the weak acids of the mash; accordingly, it is a question
on pH. Conclusively, we can say that most of the abovementioned inputs are Agri-products, which are available in plenty (surplus in the market) at competitive rates. The supplies of the input material can be arranged on long term basis to avoid day-to-day market fluctuation peculiar to agro-products. A short supply chain network would go a long way to produce the right quality and qualities of input material at right price to keep the bottom line comfortable. It will be further observed that there would be no shortage of input material in any of the production cycle.

7.2. RAW MATERIAL FOR IMFL PRODUCTION:
The major raw material is Extra Neutral Alcohol (ENA) for producing Grain Spirit or Rectified Spirit. ENA is not available in abundance within the Northeastern region but since the Company has planned to manufacture ENA also, therefore its availability is not an issue. Packing Material in the form of Glass Bottles, Metal Caps, Labels cartons and Mono cartons are readily available in and around the local market as well as within the State.
CHAPTER - 8 :

MARKET POTENTIAL

8.1. Indian LIQUOR industry – an overview

Alcohol is one of the commonly consumed intoxicating substances in India. It has traditionally been drunk in tribal societies, although it has won increasing social acceptance among other groups, urban males being the prime example. It is easily available and widely used, especially at festivals such as Deepawali and Holi. At the moment the use of alcohol is infrequent among women who also tend to resist the habit among male family members.

More than two-thirds of the total beverage alcohol consumption in the region of South-East Asia is in India, according to figures in the newly compiled “Alcohol Atlas of India”. Between 15 and 20 per cent of Indian people consume alcohol and, over the past twenty years, the number of drinkers has increased from one in 300 to one in 20. According to The Hindustan Times, it is estimated that of these 5 per cent can be classed as alcoholics or alcohol dependent. This translates into about five million people addicted to alcohol.

The Hindustan Times says that 65 per cent of the Indian liquor market is controlled by whiskey manufacturers. The state of Kerala stands first in per capita consumption of liquor at 8.3 litres, followed by Punjab 7.9 litres. The prevalence of alcohol use is still low in India according to some studies done across the country. The consumption is 2 litres per person a year. However, patterns of consumption vary. Kerala, Punjab, Andhra Pradesh, Goa and the North-Eastern States have a much higher proportion of alcohol consumption. Alcohol consumption is much more in Assam, Arunachal Pradesh, Sikkim, Madhya Pradesh, Chhattisgarh, Orissa and Andhra Pradesh than their counterparts in the rest of the country. Studies by Alcohol & Drug Information Centre (ADIC)-India shows an alarming increase in alcohol consumption among adolescents and youth during the last 20 years. The average age of initiation to alcohol in Kerala, which was 19 years in 1986, has come down to 14 years in 2006. The statistics show an extreme gender difference in consumption patterns. Prevalence among women has consistently been estimated at less than 5 percent but is much higher in the North-Eastern States.

The First distillery in the country was set up at Cawnpore (Kanpur) in 1805 by Carew & Co. Ltd., for manufacture of Rum for the army. The technique of fermentation, distillation and blending of alcoholic beverages was developed in our country on the lines of practices adopted overseas particularly in Europe. As of now, there are 325 distilleries in India, with an installed capacity of about 3.58 billion litres of liquor. The Indian distillery/liquor industry today consists broadly of two parts, one potable liquor and the industrial alcohol. The potable distillery producing Indian Made Foreign Liquor and Country Liquor has a steady but limited demand with a growth rate of about 7-10 per cent per annum. The industrial alcohol industry on the other hand, is showing a declining trend because of high price of Molasses which is invariably used as substrate for production of alcohol. The alcohol produced is now being utilized in the ratio of approximately 52 per cent for potable and the balance 48 percent for industrial use. Over the years the potable liquor industry has shown remarkable results in the production of quality spirits. Indian Liquor industry is today exporting a sizable quantity of India Liquor products to other countries.

Some of the well-known Indian players in the field of Liquor are:
- United Spirits Ltd, Mohan Breweries & Distilleries Ltd, Jagatjit Industries Ltd, Empee Distilleries Ltd, The Rampur Distillery of Radico Khaitan Ltd. - Producing whiskies, rum, gin, brandy and vodka
- Indus Wine, Premier Distilleries Pvt. Ltd., Bharat Distilleries Ltd. - Producers of whiskies, gin and rum
- DCM Sriram Industries Ltd., Daurala, Uttar Pradesh. - Producing neutral spirits and a range of distilled beverages.
- McDowell & Co Ltd. - Producers of malt whiskies, brandies and neutral spirits
- Sikkim Distilleries Ltd. - Producers of whiskies, rums, brandies, etc
- South Seas Distillery and Breweries Pvt. Ltd., Bombay. - A grain-alcohol distillery, producing whisky, vodka, gin, rum Vindhyachal Distilleries Ltd.,
- Pilukhedi, Madhya Pradesh.- With a production capacity of 9 million litres of rectified spirit and extra-neutral alcohol, etc. to name a few. With over 50 per cent of the total population of the country, averaging the age of just over 24, India has become one of the largest liquor consuming crowds in the world. Though concerns exist, analysts and industry people seem convinced that the domestic liquor sector is slated to grow substantially from the current levels. The main growth driver for the industry will be the country's demography. "We are slated to witness a boom in consumption quantities given the young population in India," says stock broker Ramesh Damani who is gung-ho about liquor stocks in a long-term horizon.

The country's per capita consumption is just about 0.6 litres per annum, which is among the lowest in the world. This leaves tremendous scope for growth in the industry. The sector, which recorded sales of 112 million cases last year (organised segment), is growing at an average rate of 8 per cent per year. Analysts peg the size of the market at Rs 3,600 crore (Rs 36 billion) of which the organised market constitutes around 70 per cent (McDowell & Co commands a share of 31 per cent, Shaw Wallace 22 per cent, Radico Khaitan 9 per cent and other players the remaining 8 per cent). Of the total IMFL (Indian-made foreign liquor) consumers in the country, 55 Per Cent consume whisky, 28 per cent rum, 12 per cent brandy and the remaining 5 per cent gin, vodka and other liquor variants. As the Indian spirits market is growing the big players shall be looking for consolidation apart from regular entry of new entrants with tie ups with foreign brands.

8.1.1. Regulatory hiccups:-
In India, excise duty on alcohol is levied at the state level. Hence, states control the excise duty structure and the distribution system of potable liquor. Moreover, inter-state sale of IMFL attracts export duty in the state of manufacture and import duty in the state of sale. This results in high prices at the consumer level and acts as a big trade barrier. Therefore, a manufacturer who wants to sell liquor in a particular state should have a manufacturing facility there. This leads to huge capital expenditure. State level levies prevent economies of scale, increase costs and hamper growth.

Distribution of IMFL is also regulated in some states through either auction (as in Haryana, Rajasthan and Punjab) or government procurement agencies (as in Tamil Nadu and Andhra Pradesh). These regulations create a monopolistic environment, stifle the spirit of entrepreneurship and hamper growth. However, things are changing for the better. Since the present distribution system is affecting collection of revenues, state governments have been forced to liberalize distribution. Uttar Pradesh, where the distribution system was de-regulated two years ago, has seen a rise in excise revenues. Madhya Pradesh has also de-regulated the IMFL distribution system recently to improve collection of revenues. Besides, there have been talks about introducing uniform excise duty across states and revenue-sharing agreements for inter-state sales. Though not much progress has been made on this front, analysts argue that the industry is in for better times ahead "Regulations, once put in place, will provide a stimulus for the growth of the domestic liquor industry," In India the main companies in the liquor trade are UB Group, Mc Dowell & Co., Shaw Wallace, Radico Khaitan, Seagram’s etc growing regional players. All these companies are regularly expanding their capacities and this is owing to a spurt in the demand. Thus considering the growth pattern in the country the demand for ENA is expected to look up as well.
MARKET
Alcohol has assumed a very important place in the country’s economy. It is vital raw material for a number of chemicals. It has been a source of revenue by way of excise duty levied by the State Government on alcoholic liquors. It has a potential as fuel in the form of power alcoholic for blending with petrol in the ratio of 20:80. Alcohol by fermentation process has a great demand in countries like Japan, United States, Canada, and Sri Lanka etc. The synthetic alcohol produced by these countries from Naphtha or petroleum crude is not useful for beverages. Large quantities of alcohol have been exported out of country during last few years. There are about 290 distilleries in the country with a total installed capacity of 3198 million liters per annum. In spite of such abundant licensed and installed capacity and not with-standing the fact that there is a great demand for alcohol both for chemical industry and potable purposes, alcohol production in the country is lagging behind and is varying only around 1400 – 1450 million liters per annum.

Demand for alcohol
Ethyl alcohol is basically used for three purpose i.e.
1. Industrial alcohol for production of downstream chemicals
2. Potable Alcohol for manufacture of alcoholic beverages Country Liquor and IMFL
3. Fuel ethanol or Anhydrous Alcohol, which can be blended with Petrol

Industrial Alcohol:
Ethyl alcohol is an important feedback for the manufacture of chemicals. These chemicals are primarily the basic carbon based products like Acetic, Butanol, Butadiene, Acetic Anhydride, Vinyl acetate, PVC etc. The existing plants such as synthetic rubber requiring large quantities of alcohol will grow to a larger capacity. Acetic acid and Butanol, which are needed in pharmaceuticals, paints and other areas, are important industries as they are value added products. Ethylene, Ethylene oxide and monoethylene glycol are also produced from petrochemical route. However, with latest technological development and taking into account The increasing cost of basic petrochemical raw material, it is now possible to produce Ethylene oxide, Mono-ethylene glycol etc. starting from ethanol. Petrochemical route needs designing of plant in the mega range whereas; alcohol has an advantage of setting up of plants in the mini and the mid range. During the last 5-6 years a number of alcohol-based industries have come up and the existing has marginally expanded. The raw material needs of the alcohol based chemical industry have to be met to facilitate maximum capacity utilization of these units in order to meet the domestic demands for the end products. The shortage of alcohol is widespread and it has hit most of the chemical, drugs and other industries. The drug industry is also bedevilled by the scarcity of industrial alcohol. Procedures of insulin, antibiotics, tonics and several other essential bulk drugs and finished formulations are unable to obtain their quota of industrial alcohol at cheaper rate which is a vital raw material for them. Thus it follows that the supply of industrial alcohol to chemical and drug units in the country will remain below normal for some more time. In order to maintain proper rate of growth of industries, production of alcohol must be increased.

Potable Alcohol:
The use of alcohol for the purpose of potable liquor is as higher as its use for industrial purposes. Alcohol is used for manufacture of country liquor consumed by common masses. This is manufactured by diluting Rectified sprit with water to different grades of 25 deg U.P strength. Different varieties are produced by addition of flavors and are called spiced liquors.

Good quality liquors are manufactured in a synthetic way to imitate Foreign Liquors like Whisky, Brandi, Rum and Gin, which are called as Indian-Made-Foreign Liquors (IMFL). These require alcohol of high purity. For this purpose, separate distillation plant to redistill and purify Rectified Sprit is necessary. This alcohol is called as Extra-Neutral-Alcohol. It is also useful for manufacture of cosmetics and perfumes. As a source of income to the
Government, the potable liquor units get an assured quota of alcohol. Manufacture of alcoholic beverages from alcohol is also attractive diversification. It would therefore be seen that the demand for alcohol will be ever increasing and there would not be any problem of marketing alcohol, which would be produced by distilleries.

**DEMAND OUTLOOK OF ENA and IMFL**

The prices of ENA are market driven and the regulations on it less stringent compared to IMFL, but the prospects of ENA marketers are dependent upon IMFL manufacturers and the control exercised on alcohol sale. Hence it would be susceptible to any adverse regulatory changes affecting the liquor industry. The sector under the Constitution is a State subject and accordingly each State/Union Territory has its own policies and taxation regime.

The IMFL segment, comprising 52.5% of the Indian Alcoholic Beverages Industry, is estimated to be over 190 million cases, with whisky accounting for approximately 60% of IMFL, whereas other spirits (Brown -- Brandy, Rum; White -- Gin, Vodka, Rum) constitute the rest. The growth in both the segments is driven across smaller towns and cities by rapid urbanization, increased consumerism and adoption of trendier lifestyles. Brandy represents the second largest share in the IMFL at 18%. The consumption of brandy in India is growing steadily, clocking around 15-20% growth every year. Industry growth in various segments (million cases) is:-

<table>
<thead>
<tr>
<th></th>
<th>Year 2012-13</th>
<th>2013-14</th>
<th>% Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whisky</td>
<td>93.00</td>
<td>100.50</td>
<td>8.06</td>
</tr>
<tr>
<td>Brandy</td>
<td>32.20</td>
<td>37.10</td>
<td>15.21</td>
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<tr>
<td>Rum</td>
<td>41.00</td>
<td>44.30</td>
<td>8.05</td>
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<tr>
<td>Vodka</td>
<td>6.30</td>
<td>8.80</td>
<td>39.68</td>
</tr>
<tr>
<td>Gin</td>
<td>3.60</td>
<td>3.80</td>
<td>5.55</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>176.10</strong></td>
<td><strong>194.50</strong></td>
<td><strong>10.52</strong></td>
</tr>
</tbody>
</table>

**Demand in Eastern region:**

In the East and North-Eastern region the Volume of Alcohol consumption is around 10% of the total Alcohol consumption in the country with a growth of around 11%. The Key growth driver are Increase in purchasing power resulting in up gradation to IMFL from country liquor. The future prospect is an Expected volume growth of 6% CAGR from the year 2010-2013.

The Company proposes to produce grain based ENA and also set up a 60000 cases IMFL bottling plant. It aims to cater to the eastern and north eastern region of the country as the demand prospects are good. There are several bottling plants in the North east, to name a few Gayatri Distillery and bottling plant, North east bottling (P) Limited, Milestone beverages (P) Limited etc. who purchase ENA from other states like Uttar Pradesh and pay a high transportation cost. The Company proposes to sell ENA to such other bottling companies. With regard to the bottling plant it proposes to do the bottling for all the major brands in the country.

The Company also foresees introduction of IMFL under its own Brand, once the Company introduces its own Brand the income from bottling is expected to jump up many folds. The Company is only mulling introduction of own brands and the effects of the proposed branding has not been considered in the financial projections made by the Company. However in case the branding is undertaken the effect on the Company’s Financials will be as under:-

**Particulars Without Taking the bottling plant into consideration / Taking the bottling plant into consideration**

**DSCR:** The average Gross DSCR will be 2.00 and average Net DSCR will be 2.53.
If the bottling plant is considered the average Gross DSCR rises to 2.06 and average Net DSCR will be 2.61. Equity IRR The Equity IRR is projected at 54.04%.
The inclusion of bottling plant raises the IRR to 55.62% IRR The IRR expected is 19.58%
The effect of settling up bottling plant is that it rises to 20.36% Return on capital Employed
The Return on Investment is expected at 15% Considering the bottling plant would improve it to 15.30%

Breakeven Point Average Break Even Sales (as %of current year sales) is 49.46% and The Average Break Even Sales (as % of capacity utilization) is expected at 42.94%/
The Average Break Even Sales (as % of current year sales) will decrease to 48.30% and
The Average Break Even Sales (as % of capacity utilization) will come to 41.91%

Payback period The projected payback period is 4Years and 11 Months./ The payback period decreases to 4 years 9 months.

DEMAND OUTLOOK OF SPENT GRAIN
Most of the waste is spent grain that still has lots of useful protein and fiber. From a business perspective that spent grain is potential revenue that most brewers are either giving away or paying to have removed as refuse. By far the most common use of spent brewer’s grain is as animal feed, primarily for cattle, but also for pigs, goats, fish and just about any other livestock. In a 2003 survey of 45 breweries, 38 said their spent grain was used as animal feed, mostly for beef cattle and dairy cows.
The Company also proposes to sell the spent grain as cattle feed.

DEMAND OUTLOOK OF POWER
In order to ensure self sufficiency, along with the ENA production and bottling plant, the Company also proposes to set up a 3.50 MW co-generation power plant. Of which after self consumption the Company will be left with about 0.75 MW of power which will be sold to Grid. India is a power deficit nation and there shall not be any problem in selling this surplus power
CHAPTER - 9 :

MANPOWER REQUIREMENT & ORGANIZATIONAL STRUCTURE

9.1. MANPOWER REQUIREMENT FOR ENA PLANT

9.1.1. PLANT ORGANISATION MANPOWER REQUIREMENT

Efficient management of the unit requires judicious manpower planning selection of Qualified and experienced personnel and appropriate organizational structure, clearly defining the functions and responsibility of the managerial and supervisory staff. The manpower requirement in accordance with the targeted production of plant operation has been estimated on the following consideration:

1. The estimated production and productivity level which is achievable in various section of the plant with the proposed plant and machinery.
2. The total number of personnel required to perform various duties associated with the different processing steps leading to blending and bottling of liquor.

A preliminary estimate of the manpower requirement allowing for leave, absenteeism, sickness and holidays for smooth and efficient operation of various sectors of the plant has been prepared purely on technical and managerial grounds primarily to indicate the order of manpower requirement. It would be emphasized that the manpower requirement will have to be reviewed at the time of commissioning of the plant. Further, the implementation industrial laws and regulations and locational factors of labour employment will also have to be considered.

ENA production is a state of the art process demanding skilled and experienced manpower highly motivated to their jobs. The sophisticated plants also require skilled manpower to achieve the best results. Since availability of manpower is one of the Critical Success Factors (CSF) for making the project viable a detailed study has been undertaken by the consultant to assess the optimum complement of management staff and factory staff and other support staff. Based on experience and industry benchmarks a total compliment of 89 nos. of management, factory & other staffs has been estimated to run the plant on threeshift basis. A detailed category-wise break-up of the complement has been set out in Table below:-

**Manpower Requirement Table:**

<table>
<thead>
<tr>
<th>TOP MANAGEMENT</th>
<th>MIDDLE MANAGEMENT</th>
<th>WORKERS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Particulars</strong></td>
<td><strong>Nos.</strong></td>
<td><strong>Particulars</strong></td>
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<tr>
<td>Manager- Accounts</td>
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<td>Accountant</td>
</tr>
<tr>
<td>Marketing Manager</td>
<td>1</td>
<td>Lab Chemist</td>
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<tr>
<td>Distillery Manager</td>
<td>1</td>
<td>Shift in charge</td>
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<tr>
<td>Dy. Manager</td>
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<td>Clerks</td>
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<tr>
<td></td>
<td></td>
<td>Excise Staff</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Purchase</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Stores</td>
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<tr>
<td></td>
<td></td>
<td>Maintenance Engg.</td>
</tr>
</tbody>
</table>

The skill set required for each category of staff member has been indicated in Table – below considering the criticality of the issue it is understood that the promoters have taken special efforts to recruit the 1st tier of key management staff with immediate effect. The recruitment drive has been undertaken by the promoters through a reputed employment agency firm to recruit the second tier of management staff mentioned in Table. It is understood that quite a few technical hands would be available locally, for which application for employment is
expected when the advertisement for jobs would be published through newspaper. Some of the technical personal can be recruited directly i.e. from campus interviews undertaken in local Institutes/local Technical Institutes/University/Institutions. It is understood that the freshers would be trained up on the job to meet the additional requirement of the plant for the third tier category of staff.

*Given the plant equipment process as set out in the earlier section it appears that the manpower requirement of the proposed unit could be met in full and in time so that there is no operation problem when the unit will be running in full strength.*

9.1.2. ORGANISATION STRUCTURE & OPERATION MODEL
The organization structure of the proposed unit has been framed after considering the industry requirement. The recruitment and training of personnel shall be an ongoing process till it reaches the optimum capacity utilization level.

The Board of Directors shall manage the entire Company. The Managing Director who will be assisting the General Manager and other professionals would look after the day-to-day operations of the Company.

The proposed organization structure has been set out in the Figure below:-

**HIGHLY SKILLED**

**PROPOSED ORGANISATION STRUCTURE:-**
BOARD OF DIRECTORS  
MANAGING DIRECTOR  
GENERAL MANAGER  
FACTORY MANAGER  
MARKETING & COMMERCIAL  
MARKETING OFFICERS  
SKILLED WORKERS  
UN-SKILLED WORKER
## CHAPTER - 10 :

### CAPITAL COST ESTIMATE & MEANS OF FINANCE

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<td>2</td>
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<td>Plant &amp; Machinery</td>
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<td>Miscellaneous Equipment</td>
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### Means of Finance

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## CHAPTER - 11:

**FINANCIAL ANALYSIS**

### PROJECTED BALANCE SHEETS

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## PROJECTED PROFIT & LOSS A/C

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