CHAPTER 3

PROJECT DESCRIPTION

3.1 INTRODUCTION

Oil India Ltd. (OIL) is proposing to increase crude oil production capacity from its oil fields in Tengakhat-Nahorkatia-Jorajan (TNJ) Area located in Tinsukia and Dibrugarh districts of Assam. Hence to handle additional production of crude oil and also to maintain the quality of the same at 0.2% and below BS&W content, OIL is proposing to establish Secondary Tank Farm (STF) project in TNJ Area.

3.2 PROPOSED SECONDARY TANK FARM (STF) PROJECT

The salient features of the STF project is briefly given below:

This Rs. 120 crore project, located at Naoholia in Dibrugarh District and approximately 12 km from Duliajan OIL Township, will be constructed to create additional crude oil storage capacity to meet the projected growth in production. For this purpose, the STF will have six numbers of floating roof tanks consisting of two numbers of 10,000 KL tanks and four numbers of 5,000 KL capacity tanks. Additionally, the STF will have Crude Oil Dehydration Facility to meet the requirement of maintaining the quality of crude oil to the desired level of 0.2% and below BS&W content. Also, the installation will have an Effluent Treatment Plant having a capacity to handle 5,400 KLPD of effluent water. Likely date of commissioning of STF is September 2013.

Details of STF project including site location, facilities, plant and equipment are given in **Section 3.4.**

3.3 JUSTIFICATION AND BENEFITS OF STF DEVELOPMENT PROJECTS

3.3.1 Justification

OIL's present production profile and the future production strategy indicate an upward trend in production from oil fields located in TNJ Area. In order to handle the additional production of crude oil and also to maintain the quality of the same at 0.2% and below BS&W content, the STF project as summarized in **Section 3.2** is proposed to be constructed by OIL in TNJ Area. Construction and operation of the proposed STF project at a total cost of nearly Rs. 120 crores will enable OIL to handle increased crude oil production, to maintain quality of the crude oil for its transfer to CTF and formation water for its reinjection in disposal wells by creating additional facilities for storage and processing of crude oil and treatment and disposal of formation water.

3.3.2 Benefits

Increase in production of crude oil on commissioning of proposed STF development project will generate additional revenue both to Assam State and Central exchequer in terms of royalty, Cess, Sale Tax, etc. Furthermore, any increase in crude oil production will be import substitute, would save foreign currency reserves of the Government of India and enhance energy security of the country.

Assam's economy is presently characterized by high rate of poverty, low per-capita income, low capital formation, inadequate infrastructure facilities, geographical isolation and communication bottleneck, inadequate exploitation and use of forest and mineral resources, low progress in industrial field and high unemployment problem. Industrial sector is not able to open sufficient employment opportunities despite government's effort for developing a comprehensive base for industrialization. On the other hand, agriculture sector has become stagnant and not ready to absorb growing demand for employment.

Increase in crude oil production from the TNJ Area will, therefore, assist in the economic development of this less developed area of Assam, due to increase in crude oil revenue as well as generating some direct and indirect employment for unskilled and semi-skilled persons. Increase in crude oil production will also result in additional transport requirement for crude oil processing at the nearest oil refinery which will help in improving the quality of roads, and development of transport, telecommunication and hospitality sectors in the area. Development of ancillary industries for supply of material and consumables requirements is a distinct possibility in the area as a result of increase in crude oil production in TNJ Area. Furthermore, OIL's CSR schemes will also result in direct social benefits in the area, such as, improvement in educational and medical facilities as well per capita income in the TNJ Area and surrounding area.

3.4 SECONDARY TANK FARM (STF), NAOHOLIA

3.4.1 Justification

The present production profile and the future production strategy indicate an upward trend in production from oil fields located in North Chandmari/Baghjan/Makum areas. The satellite installations, located in these areas for handling productions, does not have dehydration facilities to handle and treat the wet crude produced in these areas. Hence, construction of a new Tank Farm with dehydration and formation water treatment facilities near Duliajan but away from the inhabited area in the Nahorkatiya (NHK) field is considered to be techno-economically viable as with this not only additional storage requirement of projected increase in production will be met, but also the STF will help in maintaining quality of crude oil for downstream users and quality of formation water for reinjection in disposal wells.

3.4.2 Site Location

The site of proposed STF is located at Naoholia in Dibrugarh District of Assam and is approximately 12 km from Duliajan Oil Township. The site for

the proposed STF is shown in **Fig. 3.1**. The proposed STF will provide the following advantages:

- The new STF will be constructed by complying with all safety norms of OISD, OMR and DGMS.
- The selected STF site is isolated from the inhabited area and thus will be strategically in a better and safer place than the existing CTF.
- Additional requirement for storage of projected growth in production will be met and hydrocarbons loss due to leakage or evaporation will be reduced.

3.4.3 Description of Facilities, Plant and Equipment

Fig. 3.2 shows an indicative process flow diagram of the proposed STF with dehydration facility. A brief description of the facilities, plant and equipment to be provided in the proposed STF is narrated as under:

- **Crude Oil Storage Tanks:** Six nos. of Floating roof tanks of total capacity 40,000 kl (2 x 10,000 kl + 4 x 5000 kl) will be installed for storage of crude oil.

- **Crude Oil Circulating Pumps:** The pumps will be provided for charging untreated crude oil from receipt tanks to dehydration units and recycle.

- **Crude Oil Dehydration Unit:** The Crude Oil Dehydration Facility will have a design capacity of 10,000 klpd. It will comprise of:

  - Electrostatic Emulsion Treaters of economic size complete with all accessories, instrumentation and control systems.
  - Natural gas fired glycol/water bath type indirect heaters.

- **Gas Engine driven Generating Sets:** 3 numbers of 1MW capacity Gas Engine driven Generating Sets will be installed to meet the electric power requirement of STF. Out of these 3 numbers, 2 numbers. will be in operation and 1 number will remain as stand-by unit.

- **Crude Oil Dispatch Pumps:** These pumps will be installed complete with Suction Charge Pumps for despatch of crude oil from treated crude oil tanks through pipeline network to Nahorkatiya CTF.

- **Effluent Treatment Plant:** The plant will have separate effluent and clarified storage tanks and all other ancillary equipment like inflow pumps, booster pumps, deoiler dozing set-ups, multimedia filters, air blower, backwash pumps, Depurator Floatation Machine, disposal pumps with suction and delivery lines for disposal of clarified water etc. The Effluent Treatment Plant will have a capacity to handle 5400 klpd of effluent water.

- **Steam Generating Units:** Boilers of suitable capacity will be installed for heating the crude oil in the storage tanks. Boilers will be complete

with all mountings and accessories. Suitable water treatment facilities will be provided for boiler feed water.

- **Crude Oil pipeline Network:** 300 mm NB crude oil suction and delivery lines between STF and CTF will be provided for receiving wet crude oil from STF and despatch of dry crude oil to CTF.

- **Flaring System:** Low pressure/ very low pressure gas will be flared in the non-luminous type Ground Flare Pit.

- **Fire Protection:** Fire Protection System will be provided at each installation as per TAC, OISD-117 and 189 norms. All the hazardous area will be covered by water/foam monitors and hydrants with fire water pipeline network pressurized at 7 kg/cm^2. The system will include the following for fire fighting:

  - Hydrant system
  - Water Spray System
  - Foam Pourer System
  - Automatic Fire Detection and Alarm system, etc.

  Based on the above requirement, the following major facilities are envisaged:

  - Over Ground Fire Water Storage Tanks of adequate capacity.
  - RCC Ground Fire water Reservoir of adequate capacity.
  - Diesel Engine/Electric motor driven Fire Pump sets.
  - Electric motor driven Jockey Pumps.
  - Fire water pipeline network.

- **Buildings and Facilities, Roads and Drain:** Sheds, buildings, various plants and non-plant facilities, internal and peripheral roads, green belt, covered impermeable sludge pit, drainages, RCC Ground Fire Water Reservoir, oil/water separators, boundary wall, fencing etc. will be provided as per the functional requirement.

3.4.4 Project Cost

The estimated project cost is nearly Rs. 120 crore.

3.5 PROCESS DESCRIPTION

In this section process descriptions of Dehydration Facility and Effluent Treatment Plant are presented.

3.5.1 Dehydration Facility

Fig. 3.3 shows the process flow diagram of crude Oil Dehydration Facility.

The basic parameters like %BS&W, flow rate, temperature and pressure of wet crude from field will be monitored using Water in Oil Monitor Mass Flow Meter Temperature Transmitter and Pressure Transmitter. Alarm will be

generated in case of deviation of the process parameters reading when detects rise in % BS&W beyond 0.15 & fall below 0.03, fall in temperature below 25^0C and rise in pressure beyond 9 kg/cm^2. Wet crude entering the system will be preheated to intermediate storage temperature of 50^0C first by cross exchange with hot dry crude in PHE and then by two Crude Oil Emulsion Feed Heaters. The temperature at the outlet of Heat Exchanger is sensed by Temperature Transmitter. Alarm will be generated indicating fall in temperature below 35^0C. Temperature at the outlet of the Feed Heaters will be monitored and controlled by Temperature Control Valves. Data acquisition for the parameters like tank level, density and temperature as well as control of crude oil level and temperature in intermediate storage tank is accomplished by Tank Farm Management System (TFMS).

The wet crude will be pumped from intermediate storage using the circulation pump. The discharge pressure and temperature will be controlled within permissible range. The final treating temperature of wet crude will be elevated to 65^0C. The heated crude will flow through horizontal electrostatic emulsion treaters (EETs) where water is separated by action of electrostatic field and gravity settling.

The resultant dry crude from the dehydrator system will be routed through the Plate Type Heat Exchanger where the exchange of heat will take place to preheat the wet crude. In case of non receipt of wet crude, dry crude from dehydrator will be cooled by cross exchange of heat through cooling water.

Dispatch of the Dry Crude Oil will be accomplished by the Suction Charge Pumps which will pump the dry crude oil to the suction of the Crude Oil Dispatch Pump at a pressure of about 4 kg/cm^2. The Dry Crude is pumped to CTF at a pressure of about 75 kg/cm^2.

3.5.2 Effluent Treatment Plant

Fig. 3.4 shows the process flow diagram of Effluent Treatment Plant.

The formation water collected from the Electrostatic Emulsion Treater (EET) of Dehydration Facility will be stored in a Formation Water Holding Tank. Water from Holding Tank will be pumped to cross flow interceptor using pumps. There will be two components in this unit viz Coalescer Pack and Separation Pack. At first stage oil droplets will coalesce to form large droplets at Coalescer Pack and the final separation of oil and water will take place in Separation Pack. 90% of the total separation takes place in this unit.

The oily part separated in CPS will be taken into the slop tank while separated water containing some oil will go to the Induced Gas Floatation Machine (IGFM)/Depurator. After the water enters the Depurator, motor driven rotors induce a re-circulating flow of air or blanket gas into the mixture. This disperses the small bubbles throughout the tank volume and oil droplets and solids will be carried to the surface in a rising gas froth which will be removed by skimming. Treated water will go to Multimedia Filters for the separation of solids. The filter media contains pebbles, filtering sand, activated carbon and carbon. The DPI installed in the Filter will indicate the cleanliness of the filtering medium. From the Multimedia Filter the effluent will go to the

clarified water storage tank. Clarified water will then be sent through clarified water dispatch pumps to treated effluent disposal wells.

3.6 REQUIREMENTS OF LAND, MANPOWER, WATER, POWER, FUEL, STEAM AND TRANSPORT FOR STF DEVELOPMENT PROJECT

3.6.1 Land Requirement

24.447 ha area will be required for establishment of STF project at village Naoholia. This area will have to be cleared for construction of the STF project.

3.6.2 Manpower Requirement

Under normal operation, the project work force will consist of nearly 30 persons at STF.

3.6.3 Water Requirement and Water Balance

Total water requirement at the STF, will be met by installing a tube well at the installation. The break-up of water use and generation/discharge of waste water for the STF is given below:

Use of waste water for Industrial Purpose : 10 KLPD
Use of water for human consumption : 10 KLPD

Discharge of waste water after Industrial & domestic use : 12 KLPD

Generation of waste water from Dehydration of wet crude oil : 5000 KLPD

Discharge of waste water (from Dehydration of wet crude oil) to Disposal wells/ Water Injection wells : 5000 KLPD

3.6.4 Fuel and Power Requirements

The power requirement for electric motors, illumination and other electric ancillaries will be met by captive power generation facilities operating on natural gas for the STF Power requirement and natural gas consumption for power generation are as under:

Installation	**Power Requirement**	**Natural Gas Requirement**
Secondary Tank Farm, Naoholia	2.0 MW will be met from 2 numbers. of 1.0 MW capacity Gas Engine driven Generating Set.	12,850 SCUM/ day of natural gas will be used for generation of 2.0 MW of electric power.

3.6.5 Transport Requirement

2 number of Tata Sumo and 1 number of Venette are likely to be deployed at the STF project.

3.7 NORMAL OPERATIONAL POLLUTION SOURCES

3.7.1 Gaseous Emissions

Exhaust gases generated due to combustion of natural gas in Power Generators, Crude Oil Dispatch Pump Sets, etc. will be discharged through exhaust gas stacks of appropriate heights.

3.7.2 Waste Water Generation

Formation Water

Formation water produced during dehydration process in an EET at STF will be treated to meet the disposal for re-injection in abandoned wells (TSS = 100 mg/l and Oil & Grease = 10 mg/l) and discharged at depth between 1000 to 1500 m in Disposal Wells. Steel tanks of 2500 Kl capacity will be used for storage of formation water. There will be no effluent pits in the proposed installation for storage of formation water.

Domestic Waste Water

Domestic wastewater will be generated by general use by work force of 30 persons at STF. As part of the site preparation stage, a drainage and sewerage system will be constructed for the new installation. The sewerage system will consist of soak pits for the collection and treatment of wastewater from the kitchen, laundry and showers. Soak pits will be constructed in such a manner so as to avoid any seepage in any surface or ground water source.

Sewage from toilets will go into septic tanks from where, after being treated, the wastewater will go into a soak pit and the semi-solid waste will be collected from the septic tanks periodically and transported to a nearest municipal drain, as and when required.

3.7.3 Solid Wastes

Tank bottom sludge will be generated while cleaning of crude oil storage tanks. The cleaning of crude oil storage tanks will be once in five years. Total tank bottom sludge likely to be generated in five years from crude oil storage tanks of STF will be nearly 225 tones. This sludge will be kept in secured, covered impermeable concrete sludge pit located outside the proposed installations at a central place before safe disposal through MoEF/ ASPCB approved registered recycler.

3.7.4 Noise

Noise will be generated due to operation of Generating Sets, Crude Oil Dispatch Pump Sets, Formation Water Pump Sets, etc. at the installation but the same will be limited to 75 dB (A) at the periphery of STF Noise barriers, as required, will be provided at the STF for reducing noise levels within the permissible limit.

3.8 TREATMENT AND DISPOSAL STRATEGY FOR POLLUTANTS

3.8.1 Gaseous Emissions

Exhaust gases generated from combustion of mostly natural gas in engines of power generators, pumps, boilers, etc. will be discharged through stacks of appropriate heights. Only low sulphur (S<0.1%) will be used in vehicles.

3.8.2 Waste Water

Formation Water

Formation water separated in EETs in crude oil Dehydration Units at STF will be stored in 2500 Kl steel tanks, treated in Effluent Treatment Plant (ETP) and treated effluents meeting limits for reinjection in disposal wells will be discharged at depths between 1000 to 1500 m. Details of ETP are given in **Section 3.5.2**.

Domestic Waste Water

Domestic waste water generated from residential facilities will be treated and handled in a well designed drainage and sewerage system at each installation.

Used Oil

Spent oil generated from oil changes or leakage from equipment or diesel storage tanks, used lubricating oil (from engine changes) is designated as hazardous and shall be sold only to MoEF/ASPCB approved recyclers.

3.8.3 Solid Wastes

Tank Bottom Sludge

Nearly 225 tones of tank bottom sludge from clearing of crude oil tanks every five years will be generated at the STF and the same will be stored in a secured, covered, impermeable concrete sludge pit located outside the proposed installations at a central place before the sludge is sold to MoEF/ ASPCB approved recyclers.

3.8.4 Noise

Proper selection of equipment along with good installation practice and regular maintenance procedure will reduce vibration and noise from rotating

equipment to ensure that noise level at the periphery of the installation does not exceed 75 dB (A).

3.8.5 Other Solid Wastes

A number of operational and non-operational solid wastes including domestic garbage, scrap food, packaging materials and special hazardous wastes will be generated at the STF. All solid wastes will be collected and appropriately segregated for proper disposal.

Hazardous wastes may include such items as spent batteries, waste oil, empty drums of oil/chemicals and fluorescent tubing. These will be disposed off in accordance with approved safe procedures.

All biodegradable waste (food and kitchen waste) at the STF will be collected and disposed off into two small humus pits (each of 2 m x 2 m x 1.5 m) within the installation area away from common use by installation personnel. The humus pits will be covered with soil on daily basis to avoid any odour nuisance due to decomposition and check any contact with the flies or insects.

3.8.6 Potential Accidental Events

Due to strict observation of necessary safety requirements, chances of accident occurring at the STF are negligible. However, in all aspects of hydrocarbon production and transportation, there is always a risk of non-routine or accidental events occurring which may lead to an unwanted emission or impact.

Oil spill is likely from a number of sources, such as:

- Storage facilities at the installation; and
- Transfer operations from oil casks (transported by trucks from various oil pits of field locations) to a storage tank.

A brief account of these hazards, risk assessment, general safety measures and disaster management plan likely to be adopted at each installation is presented in **Chapter 6** of this report.

3.9 ANALYSIS OF ALTERNATIVES

3.9.1 Site Alternative

The site of the STF project in TNJ area is selected on the basis of appropriate techno-economic considerations as presented in **Section 3.4.**

3.9.2 Technical Alternatives

The approach to be adopted in executing the new development projects in TNJ area will be cost effective and environment friendly having suitable abatement and control measures.