

**USED OIL RE-REFINING UNIT  
PRESENTATION FOR 400 MTPA  
CAPACITY**

by

**GADGIL & COMPANY**

**PUNE**

# USED OIL RE-REFINING PLANT 400 MTPY

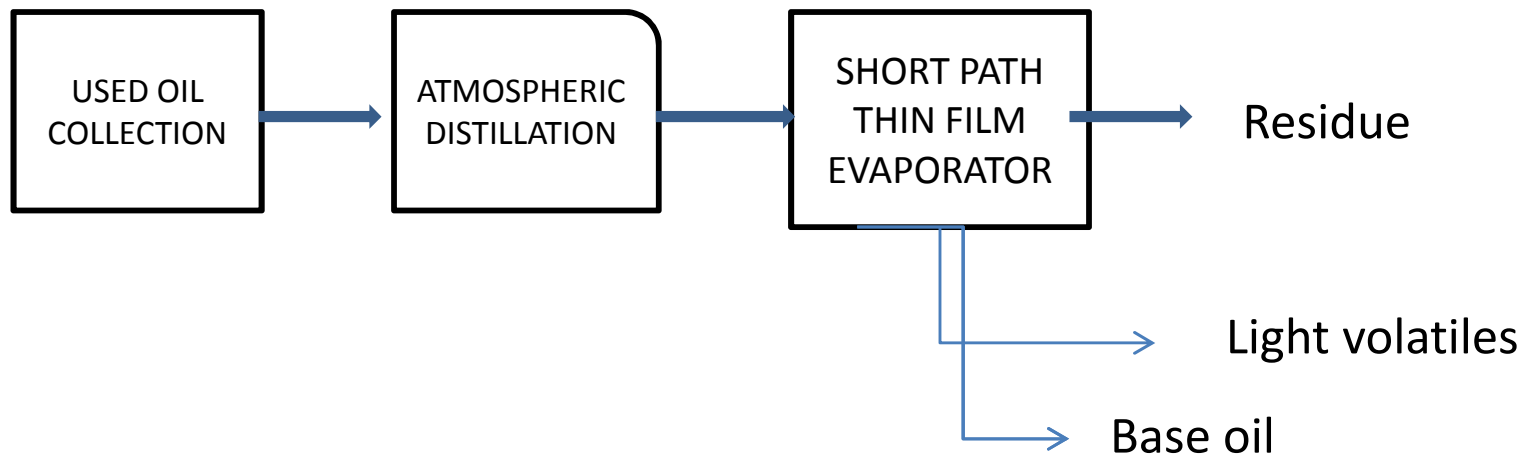
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# USED OIL RE-REFINING PLANT 400 MTPY

## FOREWORD

THE PROPOSED MODULAR USED OIL RE-REFINING PLANT IS A COMPLETE SKID MOUNTED FACILITY READY FOR IMMEDIATE INSTALLATION. THESE PROPOSED MODULAR UNITS ARE PARTICULARLY ADVISABLE FOR SMALL REFINING CAPACITIES .

THEY FULFILL THE REQUIREMENT OF ENVIRONMENT FRIENDLY TECHNOLOGY OF SHORT PATH THIN EVAPORATION AS PROPOSED BY CPCB FOR GRANTING CONSENT TO RECYCLERS, RE-REFINERS OF USED OIL



# USED OIL RE-REFINING PLANT

## 400 MTPY

### UNIT DESIGN

THE REREFINING UNITS ARE DESIGNED TO OBTAIN HIGH QUALITY BASE OIL  
WE USE SPECIAL ENTRAINMENT SEPERATORS (PATENT PENDING) FOR  
SEPERATION OF CARBON IN OIL FROM VAPOURIZED DISTILL PHASE.

### **WASTE /USED OIL CHARACTERISTICS**

THE TYPICAL COMPOSITION OF THE FEEDSTOCK ARE  
COMPONENTS

WATER & LIGHT ENDS	15-25 %
LIGHT OIL	6-8 %
LUBE OIL FRACTION	70-75 %
RESIDUE	5 -7 %

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CHARACTERISTICS	INPUT USED OIL
COLOUR AS PER ASTM D1500	8
WATER	15%
DENSITY	0.85 TO 0.95
KINEMATIC VISCOSITY Cst at 100°C	1 to 32
DILUTENTS	15% VOL
NEUTRALISATION NUMBER	3.5 mg KOH/g
SAPHONIFICATION NUMBER	18 mg KOH/g
TOTAL HALOGENS	4000 ppm
POLYCHLORINATED BYPNENYLES	BELOW DETECTION LIMIT
LEAD	100 PPM
ARSENIC	5 PPM
CADMIUM+NICKEL+CHROMIUM	500 PPM
POLYAROMATIC HYDROCARBONS	6%

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**FINISHED PRODUCT PRODUCED WILL MATCH THE SPECIFICATION FOR RAW MATERIAL (OIL) FOR BELOW DEFINED STANDARDS AND WILL BE FURTHER USED BY REGISTERED OIL COMPANIES HAVING ISI CERTIFICATE MARK**

<b>SR.NO</b>	<b>ISI SPECIFICATION AS SPECIFIED</b>
1	IS 9048:1982 SPECIFICATION OF RE-REFINED AUTOMOTIVE INTERNAL COMBUSTION ENGINE LUBRICATING OIL (FIRST REVISION)
2	IS 13656 : 1993 INTERNAL COMBUSTION ENGINE CRANKCASE OILS (GASOLINE AND DIESEL)
3	PLEASE REFER ATTACHED ECOMARK SPECIFICATION DOCUMENTS FOR OTHER OIL SPECIFICATION

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### **EFFULANTS**

#### **LIQUID WASTE EFFULANTS**

CONSISTS OF DISTILLED EVAPORATED WATER FROM ATMOSPHERIC DISTILLATION .

THIS WATER CONDENSED & STORED IN CONDENSOR STORAGE TANK & THEN TRANSFERRED TO WATER CIRCULATION TANK AFTER IT COOLES TO AMBIENT. EXCESS WATER GENERATED OVER & ABOVE THE TOPUP WATER IS USED FOR GARDENING.

THE SPECIFICATION OF WATER WILL BE CHECKED AT REGULAR INTERVALS FOR :

IRRIGATION &  
INDUSTRIAL COOLING

WATER  
CLASS E

PH BETWEEN 6 TO 8.5

Electrical Conductivity at 25oC micro mhos/cm Max.2250

Sodium absorption Ratio Max. 26

Boron Max. 2mg/l

### **AIR POLLUTION**

THE UNIT DOES NOT PRODUCE ANY GASEOUS EFFULENTS AS ELECTRICAL POWER IS USED FOR HEATING . THE VOCS COMING OUT OF ROTARY OIL SEALED PUMP DISCHARGE IS PASSED THROUGH THERMAL OXIDISER AND BAFFLE TRAP BEFORE DISCHARGE TO ATMOSPHERE.

**HAZARDOUS WASTE GENERATED** (MAX 2% OF INPUT CAPACITY) IS

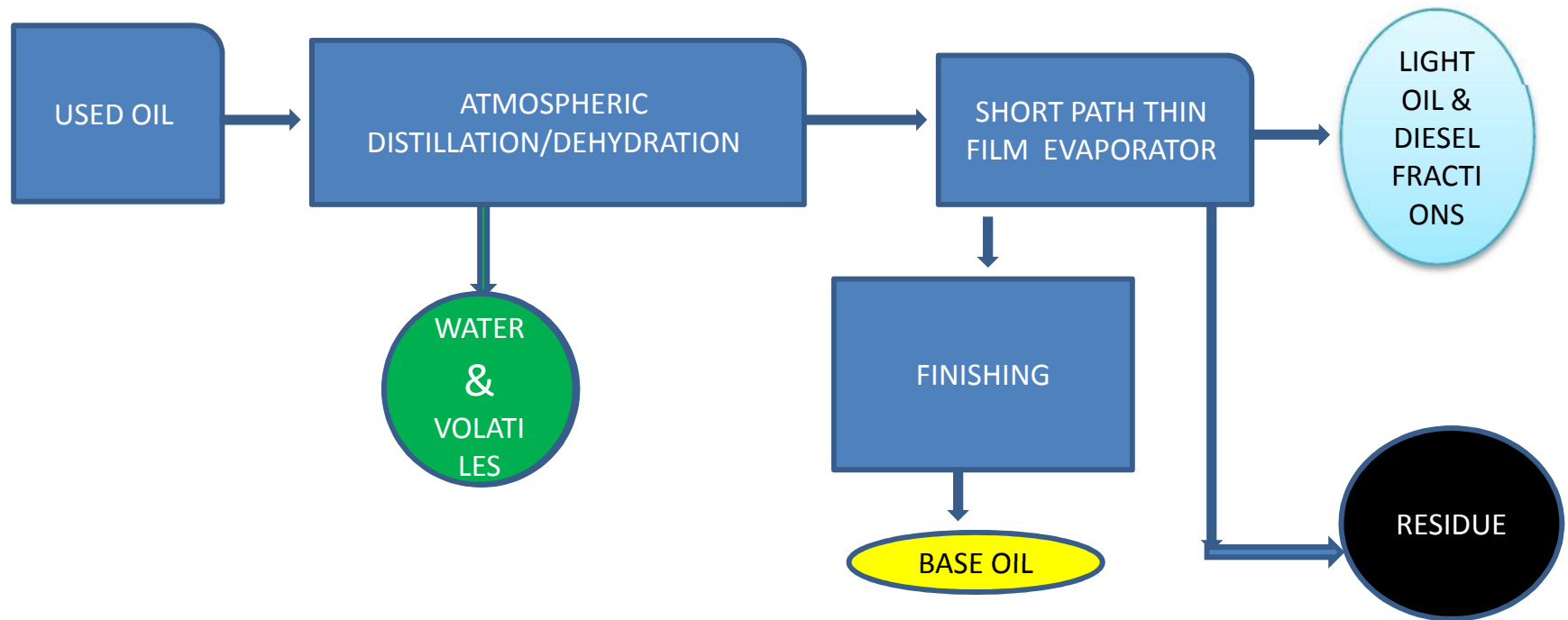
CARBON RESIDUE TRAPED IN ENTRAPMENT SEPERATOR

METALLIC BURR TRAPED IN INLET FILTER

**MEMBERSHIP OF CHWTSDF FACILITY IS TO BE TAKEN** WHERE THIS HAZARDOUS WASTE WILL BE DISPOSED.

**THE HAZARDOUS WASTE WILL BE STORED IN M.S DRUMS IN ENCLOSED SHED & SENT TO CHWTSDF FACILITY**

# USED OIL RE-REFINING PLANT 400 MTPY



**BLOCK DIAGRAM OF RE-REFINING  
SETUP**



# ATMOSPHERIC & MODERATE VACUUM DISTILLATION TO REMOVE WATER & LIGHT VOLATILES

THE OIL IS SUCKED INTO TOP TANK NO 1 OF 225 LITER CAPACITY  
THE OIL IS ALSO SUCKED IN TOP TANK OF 225 LITER CAPACITY UNDER VACUUM USING A 40 NB HYDRAULIC HOSE  
AFTER COMPLETE FILLING OF OIL IN THE TANKS VACUUM IS RELEASED & SYSTEM IS TAKEN TO ATMOSPHERIC PRESSURE

THE OIL IN TOP TANK IS HEATED TO  $>95^{\circ}\text{C}$ . THE WATER EVAPORATES & CONDENSES INTO THE CONDENSOR .

THE INTERNAL CIRCULATING WATER OF CONDENSOR OUTLET IS CIRCULATED THROUGH TANK NO 1 TO LET THE OIL SOAK UP  
THE HEAT OF RETURN LINE HOT WATER.

THIS RETURN LINE HOT WATER HEATS UP THE INPUT OIL TO  $95^{\circ}\text{C}$  IN 45 MINUTES AFTER START OF INITIAL BATCH.

THE TOP TANK AFTER REACHING  $95^{\circ}\text{C}$  IS FURTHER HEATED TO  $150^{\circ}\text{C}$  UNDER VACUUM OF 120 TORR. ALL TRACES OF  
DILUTENTS, WATER, PAH ARE REMOVED & CONDENSED IN CONDENSOR.

THEY ARE SEPERATED BY GRAVITY SEPERATION IN TANK.

THE DEHYDRATED & MODERATELY DISTILLED OIL IS STORED IN MIDDLE TANK NO .2 FOR FURTHER SUPPLY TO SHORT PATH THIN  
FILM EVAPRATOR

THE DEHYDRATED/DEGASSED USED OIL SEPERATES OUT INTO LIGHT OIL, BASE OIL, RESIDUE OIL.

**THE TOTAL CYCLE TIME OF PROCESS IS 1 HOURS FOR PROCESSING 60 LITERS OF OIL**

**THE HEATER POWER PROVIDED IS 25 KW WITH WATER RING PUMP OF 200 LPM CAPACITY & ROTARY OIL SEALED PUMP OF 600 LPM CAPACITY.**

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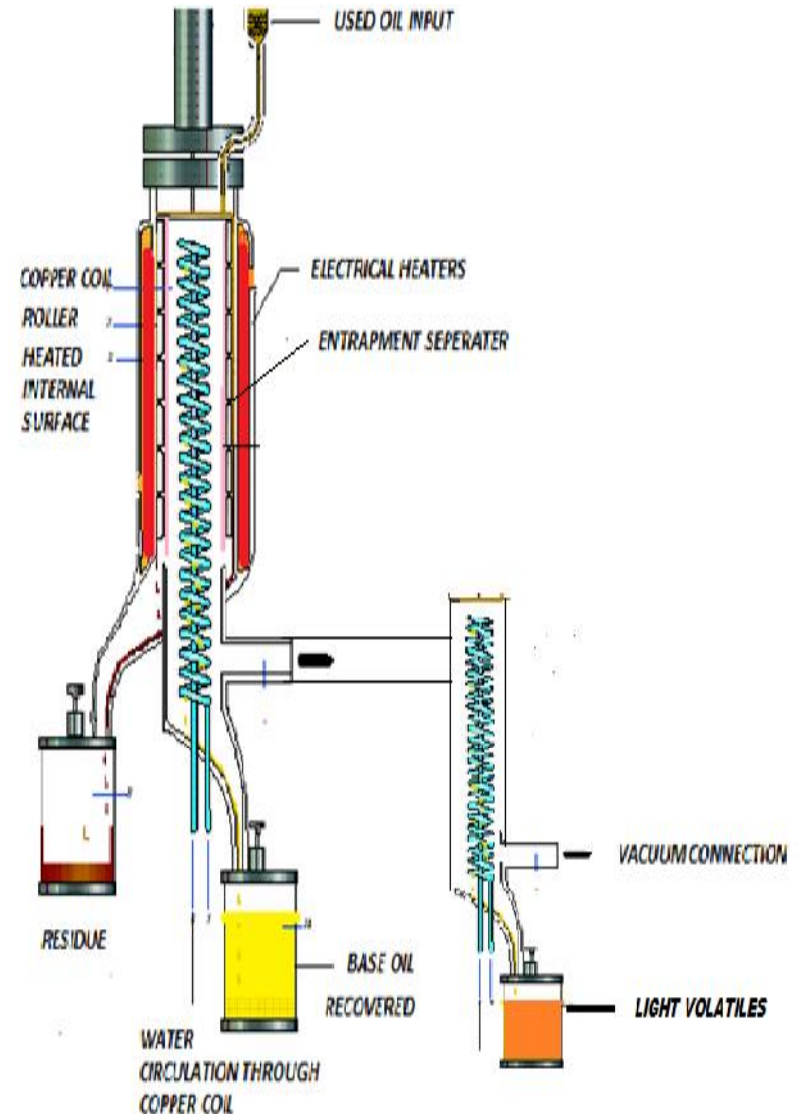
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THE THIN FILM EVAPORATOR CONSISTS OF VERTICAL CYLINDRICAL SURFACE ENCLOSED BY HEATERS & INSULATION JACKET AND AN INTERNAL ROTOR WHICH DISTRIBUTES A THIN LAYER OF OIL ON THE HEATED WALL ,BY MEANS OF ROTATING BLADES.

BY THE ACTION OF ROTOR ( ELECTRICALLY DRIVEN) AN HIGH TURBULANCE & BACK MIXING OCCURS IN THE THIN LAYER OF OIL FILM.

THE MAIN FEATURES OF THE EVAPORATOR ARE :

- SHORT RESIDENCE TIME ( IN THE ORDER OF 10 SECONDS) BY MECHANICAL AGITATION OF OIL ON THE HEAT TRANSFER SURFACE
- HIGH HEAT TRANSFER RATE THROUGH THE FILM
- EFFECTIVE & REGENERATIVE CLEANING OF THE CONTACT SURFACE



# **SHORT PATH THIN FILM EVAPORATOR WITH VACUUM DEHYDRATOR/DEGASSIFIER**



## **EVAPORATOR TYPE SPTFE-40 WITH DEHYDRATOR/DEGASSIFIER**

EVAPORATOR AREA	0.48 M2
CONDENSOR AREA	1.0 M2
VACUUM	
ATMOSPHERIC	
HEATER POWER	25 KW
INPUT CAPACITY	30 -60LPH
WATER CIRCULATION AT WATER	
TEMPERATURE 15 ^C	300 LPH
LEAKRATE TESTED	
POSITIVE PRESSURE	4 KG/CM2
NEGATIVE PRESSURE	
LEAKRATE FOR EMPTY DRY	
CHAMBER	1.2 TORR /HR
DIMENSIONS IN MM	
L X B X H	2200 X 1000X 3000
WEIGHT IN KG	1500



- **SHORT PATH THIN EVAPORATOR WITH DEHYDRATOR/ DEGASSIFIER.**

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### MATERIAL BALANCE

THE MATERIAL BALANCE OF THE REREFINING UNIT DEPENDS FROM WASTE/USED OIL COMPOSITION.

FEED STOCK	TONS/YEAR
USED OIL	400
PRODUCTS	
WATER & VOLATILES	20
LIGHT OIL	60
BASE OIL	300
RESIDUE	20
UTILITIES	
ELECTRICAL POWER,Kwh	25
COOLING WATER ,M3	3
CHEMICAL FOR WASTE WATER TREATMENT	0.18
ACTIVATED ALUMINA/CARBON	1.5