
Solution for wastewater treatment, oil
contamination and Energy waste
problems occurring using conventional
vacuum systems. We recommend for
Oil/Water free Dry Screw vacuum system



**APPLICATION OF DRY SCREW VACUUM PUMPING SYSTEM IN
BIODIESEL PRODUCTION**

Description

Biodiesel is simply a liquid fuel derived from vegetable oils and fats, which has similar combustion properties to regular petroleum diesel fuel. Biodiesel can be produced from straight vegetable oil, animal oil/fats, tallow and waste cooking oil. Biodiesel is biodegradable, nontoxic, and has significantly fewer emissions than petroleum-based diesel when burned.

The most commonly used technology to produce biodiesel is the trans-esterification of triglycerides (oil) with alcohol, yielding fatty acid alkyl esters (biodiesel) as the main product and glycerin as the by-product.

The largest possible source of suitable oil comes from oil crops such as soybean, rapeseed, corn, and sunflower. Methanol is the most commonly used alcohol to produce biodiesel, though other alcohols like isopropanol or ethanol can also be used.

Dry Screw vacuum pump with series of Mechanical Vacuum boosters are used in the separation of biodiesel and glycerin, extracting wet and saturated gases with vacuum. They also work in tank filling and emptying, in Methanol recovery and Glycerin purifying. In the biodiesel washing and drying processes, several filter processes also operate under vacuum, Everest Make Dry Screw Vacuum pumping systems work reliably in all stages of biofuel production. They are extremely rugged, efficient and insensitive to liquid carry-over.

Dry Screw vacuum pumps are successfully running this process and if we compare with Steam ejectors and Liquid ring vacuum pumps, no water contamination occurs as no sealing fluid is required that makes the process economical and keeps the environment clean.

Biodiesel Production Process

In transesterification reaction, three moles of methanol react with one mole of triglyceride. The transesterification process is a reversible reaction and carried out by mixing the reactants – fatty acids, alcohol and catalyst. A strong base or a strong acid can be used as a catalyst. At the industrial scale, mostly sodium or potassium methanolate is used. The end products of the transesterification process are raw biodiesel and raw glycerol. In a further process these raw products undergo a cleaning step. In case of using methanol as alcohol FAME (fatty acid methyl ester) biodiesel is produced. The purified glycerol can be used in the food and cosmetic industries, as well as in the oleochemical industry. The procedure of making biodiesel follows several steps.

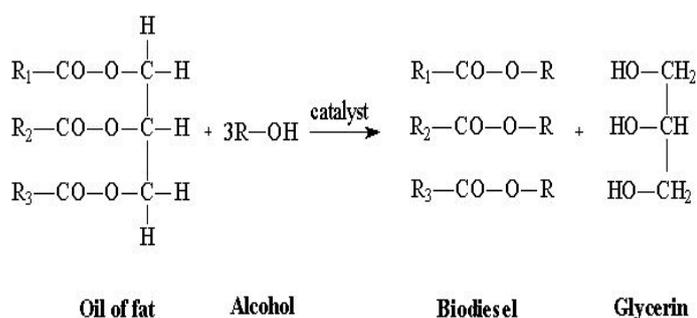
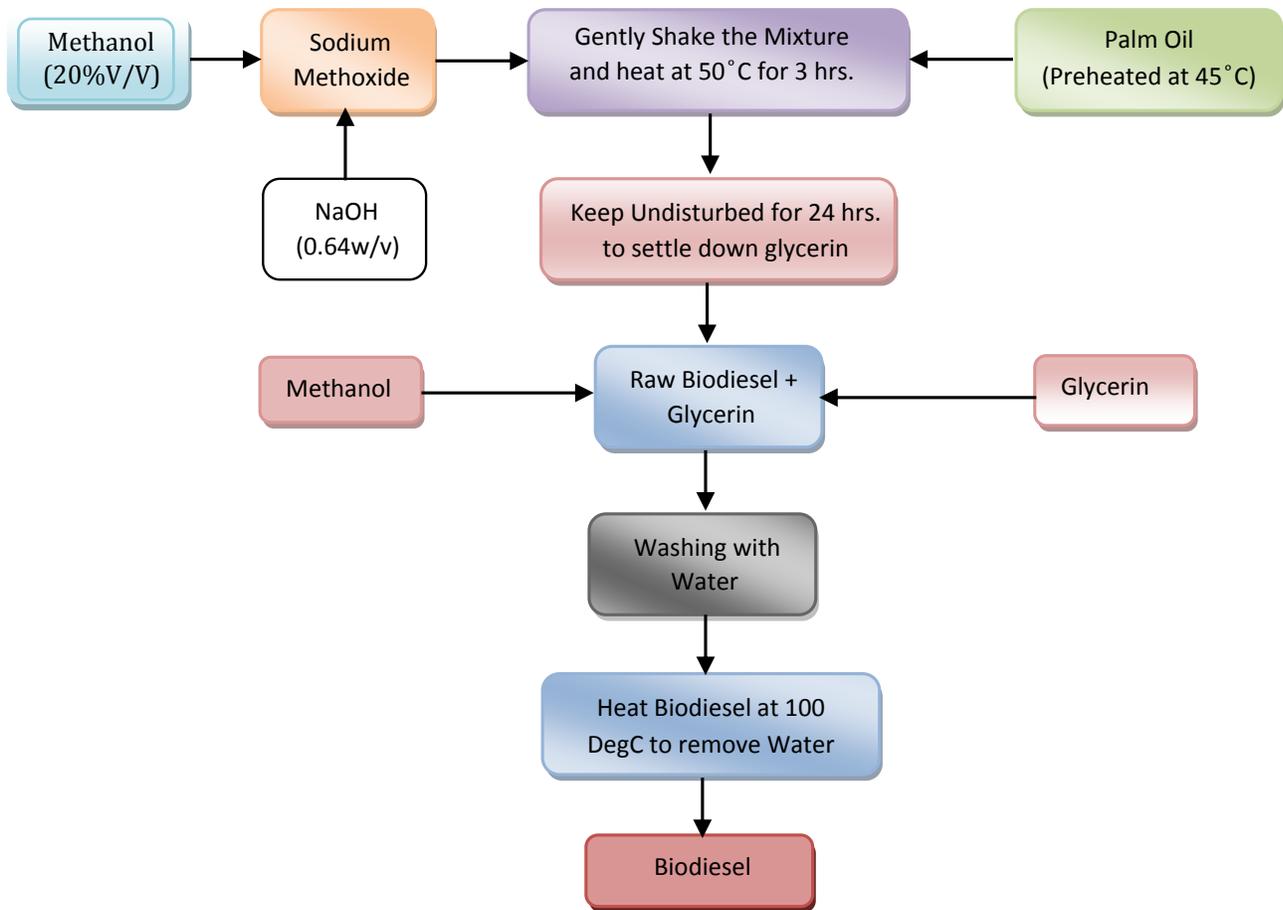


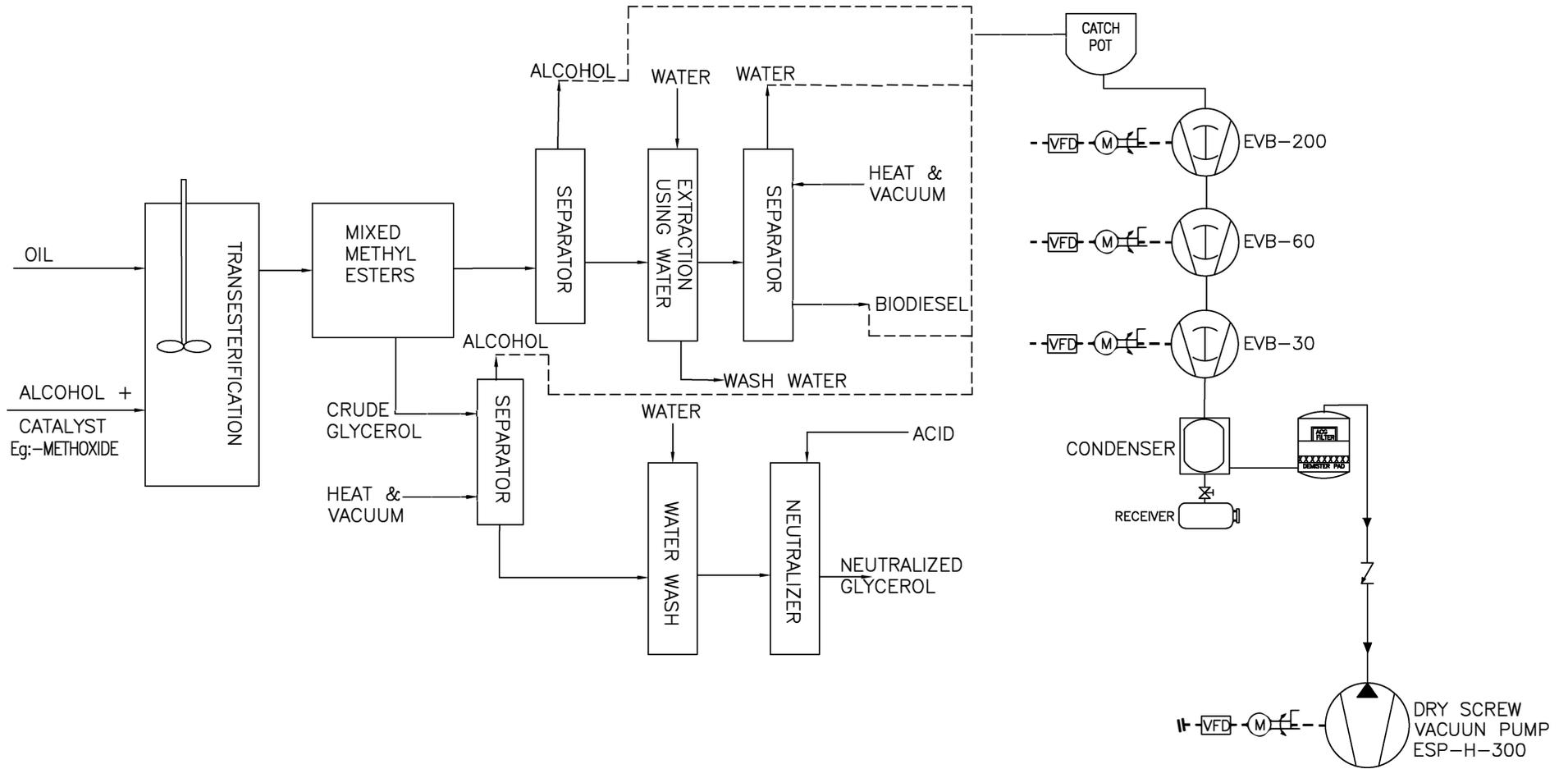
Fig. (a) Raw biodiesel and glycerin (b) Washing of biodiesel (c) Pure palm Biodiesel.



APPLICABLE SYSTEM COMPARISON

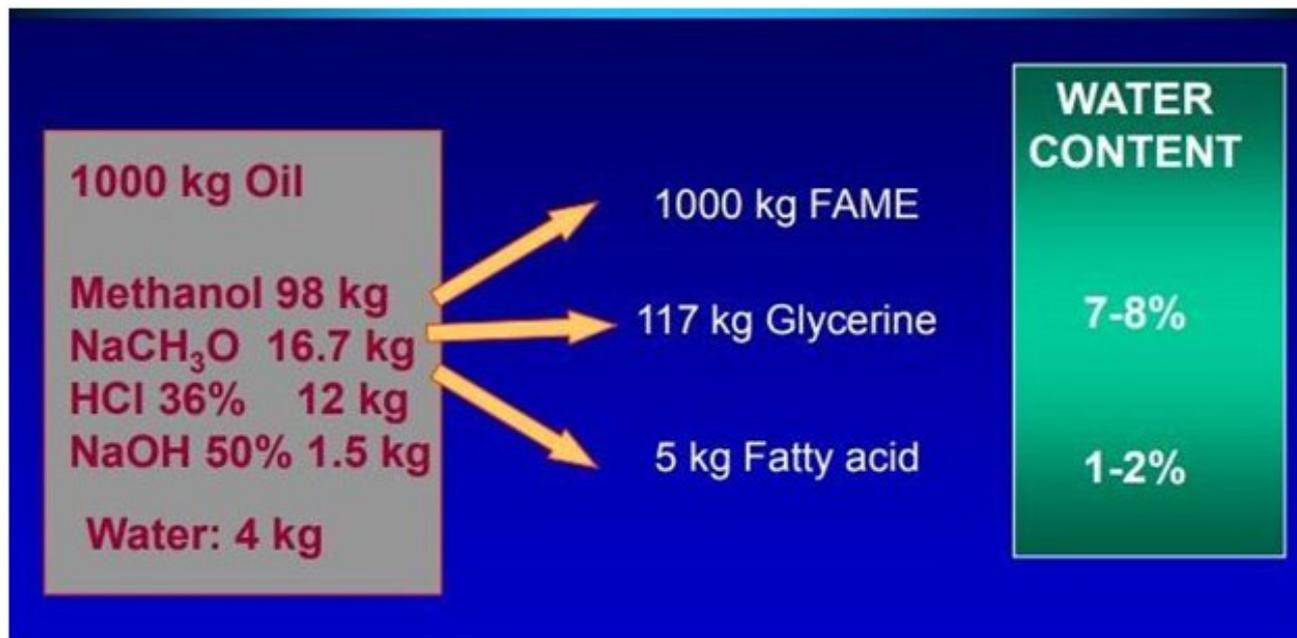
BEFORE IMPROVEMENT	AFTER IMPROVEMENT
Steam Ejectors with Liquid Ring vacuum pump	Dry Screw Vacuum Pump

TYPICAL PROCESS SET UP FOR BIODIESEL PRODUCTION PROCESS



Process Parameters:

Biodiesel (FAME: Fatty acid methyl Ester) Production Process



Bio-diesel Production and Refining

Operation time: Batch and Continuous Process.

Working Temperature Range: 70-250 DegC

Working vacuum: 100 torr to 0.5 torr

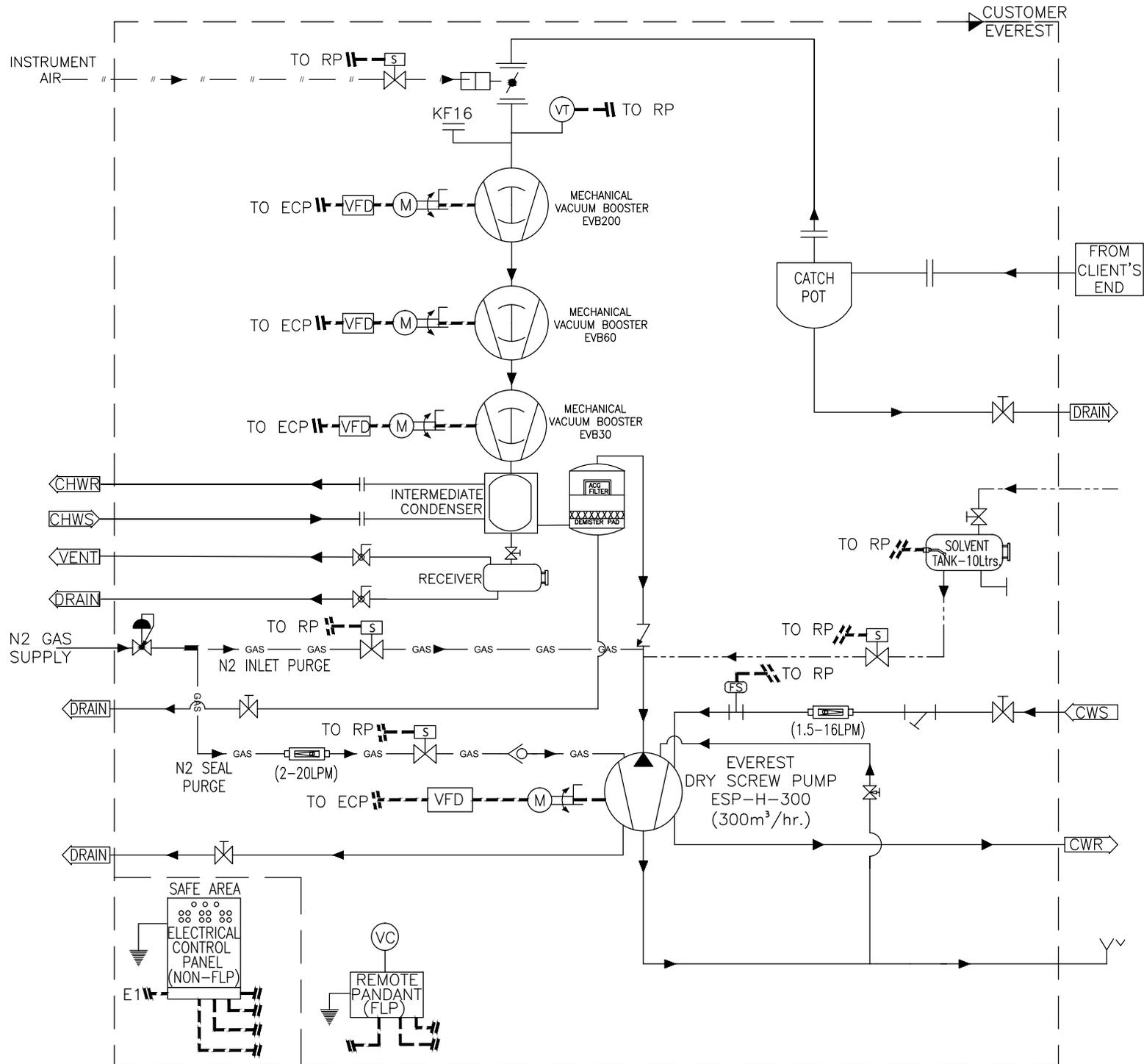
Pump Capacity: 10400.4680.1670.300 m³/hr.

Steam Ejector with Liquid Ring vacuum pump is being replaced with Dry screw vacuum pumping System.

Pre-condenser to vacuum system are important for the condensation of vapors.

Specially designed trap is installed at suction of vacuum pump for trapping Methyl Ester carryover from the process chamber.

Typical Vacuum System P&ID for Biodiesel Plant



APPLICATION

Description	Applicable Plant	End User
Biodiesel Production	Biofuels	Matrix Fine Sciences, Devi Lal Kutir Soap

RESULT

Before Improvement (Wet Type)	After Improvement (Dry Type)
Water gets contaminated due to vapor mixing with Steam/water	No Contamination of water as it works on dry technology.
Operation cost is high	Saves consumables cost that result in lower operational cost.
Unstable vacuum due to contamination of Pump sealing fluid.	Constant vacuum level as no sealing fluid is required.
Vacuum fluctuation increases process operation cycle.	Shorten process cycle due to constant vacuum level throughout process.
Mean time between failure (MTBF) is less	MTBF is very much high.
	Desired vacuum can be achieved by regulating RPM through VFD.

OPERATIONAL COST COMPARISON

Description		Before Improvement(Steam jet Ejector)	After Improvement (Everest Dry Vacuum Pump)
Basic Specification		Process Cycle: Continuous Vacuum: 0.5torr Vacuum Pump: Steam jet ejectors3 stagesback up with LRVP	Process Cycle: Continuous Vacuum:0.5 torr Vacuum Pump: Dry Screw vacuum Pump, 10400.4680.1670.300 m3/hr.
Steam	Consumption	~700kg/hr	None
	Yearly	700 kg/hr * 20hr/day*250day*INR1.25/kg=INR 4375000	
Cooling Water	Consumption	700kg/hr * 650kcal/kg /7DegC= 65m3/hr	Flow rate:1 m3/hr
	Yearly Cost Water Treatment	65m3/hr * 20hrs * 250Days*INR 10/m3.= INR 3250000	No Cost, Recycle
Consumables	Consumption	None	Gear oil replacement after 1000 hrs., 2.5liter, Cost-INR1500/month
	Yearly		INR 18000
Power	Consumption	Water Sealed Vacuum Pump 7.5KW *20 (hrs./day)*250days: 37500kW	# 1 M/B : 18.5 Kw # 2 M/B : 11.2 Kw # 3 M/B : 5.6 Kw Dry Screw Vacuum Pump : 7.5 Kw Total : 42.8 Kw 42.8 KW *20(hrs./day) *250 Days: 214000 Kw
	Yearly	INR375000	INR2140000
Service and Maintenance	Yearly	INR55000	INR72500
Total Cost	Yearly	INR8055000	INR2230500
Direct Cost Saving	Yearly	INR5824500	
Indirect Cost Saving		Pollution, Water Control	



Everest Blower Systems Pvt. Ltd. is an ISO 9001:2015 certified manufacturer of Mechanical Vacuum Boosters, Dry Screw Vacuum Pumps, Industrial Vacuum Systems & Roots Type Mechanical Vapour Recompessors. Everest Group was established in 1980 & is a pioneer in design and manufacturing of Positive Displacement Blowers with over 1,50,000 installation till date. Blowers are manufactured under name and style of Everest Blowers Pvt. Ltd. - Pressure Division of Everest Group. Everest Blower Systems Pvt. Ltd. is a sister concern of Everest Blowers Pvt. Ltd. and designated as Vacuum Division of Everest Group. EBSPL was established in 2007 and is your one stop shop of all solutions related to vacuum.

EBSPL is established in HSIIDC Industrial Area at Bahadurgarh, Haryana, India spread over 40,000 Sq. Ft. and employees over 140 people including 40 graduate engineers. Facilities include in-house design & development, manufacturing, assembly & testing of high end vacuum pumps and systems. This facility also houses a DSIR approved R&D center which has won national award for energy efficient vacuum pumps.



For Energy Efficient Pumps and Research & Development

We don't just offer **Blowers, Boosters and Systems** we offer **SOLUTIONS !!**

Our technology is so flexible, we can custom manufacture **Special Blowers, Vacuum Pumps & Systems** by alloying and cross linking diverse designs to suit individual requirements and import substitutes.



Corporate Office B-44, Mayapuri Industrial Area, Phase I, New Delhi 110 064, India | Tf: +91 11 4545 7777 | E: vacuum@everestblowers.com

Group Companies Everest Blowers Private Limited | Everest Blower Systems Private Limited     www.everestblowers.com