

# Waste to Wealth







**Waste**

**to**

ENVIRONMENT FRIENDLY PROCESS

PROLYSIS TECHNOLOGY



**ZERO WASTE**

**Wealth**



**Steel Wires**

Ready Raw Material  
for Steel Mills



**Carbon Black**

Ready Raw Material for  
Various Chemical & Pigment Industries



**Green Fuel**

Green Industrial Oil

The New Era of : **RESURGENT ENERGY**



# About us

Radhe Renewable Energy Development Pvt. Ltd., a flagship company of Radhe Group of Energy founded by Dr. Shailesh Makadia is India's fast growing private enterprise with core focus on Renewable Energy Sector. Radhe is constantly thriving on efforts to develop environment-friendly technology which will be helpful to the society and in long terms for the sustainable growth.

Equipped with a well-organized and Central Government approved R & D centre, Radhe has come up with new hydrocarbon division with a specific and global solution to burning issues of hydrocarbon waste.

The greatest challenge to the 21<sup>st</sup> century is recycling the ever-increasing multiple solid waste like tyres, plastic, rubber, electronic and municipal waste and converting them into preciously high level of latent energy. Despite the development of innovative technologies and green energy projects we all fail to manage the daily generation and piling up of waste hydrocarbons ,which has become a formidable enemy of our environment.

Being always passionate about human values for the clean and green Earth we solidly take firm steps forward with innovative and responsible mission.

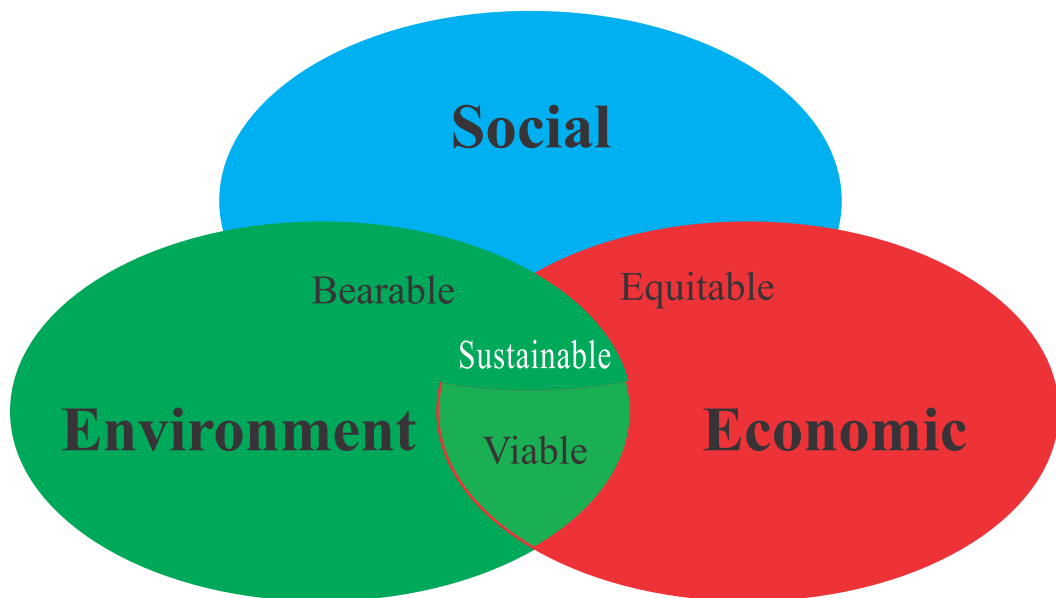
As a result of our constant endeavour, Radhe's Hydrocarbon Division emerged with RESERGENT technology named Waste Hydro Carbon Recycling and Pyrolysis Technology

This cutting edge technology offers totally green and clean solution to Waste Hydro Carbon not only by disposal of Waste Hydro Carbon but conversion into valuable product without residue.

With business as a part of Social Responsibility we declare a MISSION-  **Infinite Green Resurgent (IGR)**



# Sustainable Growth



Blend of Renewable & Resurgent Energy  
will definately lead us to  
Sustainable Growth





# Mission : Infinite Green Resurgent (IGR)

New Era of **RESURGENT ENERGY** is a landmark after long and successful journey of Renewable Energy.

What is **RESURGENT ENERGY**?

Modernization has brought great developments and simultaneously ever-increasing colossal waste of hydrocarbons. As our modern lifestyles generate such a Waste Hydro Carbon and it has become a menace. Waste Hydro Carbon can either be tyres, e-waste, plastic rubber or Municipal Solid Waste. Though Waste Hydro Carbon has become deterrent to prosperity

we find it impossible stop the generation of Waste Hydro Carbon.

Though we fail to stop the generation of Waste Hydro Carbon but WE CAN definitely succeed by converting it into WEALTH.

Waste generation per capita has increased and is expected to grow immeasurably with the global population and modern lifestyles expanding wealth and consumerism.

It is an incarnation or new life of Waste Hydro Carbon into valuable Hydro Carbon in the form of green and clean fuel with other valuable products, useful in various industries of the 21<sup>st</sup> century.

The process of re-birth of this Waste Hydro Carbon into valuable Hydro Carbon is called RESURGENT and energy we are able to generate from this process is called **RESURGENT ENERGY**. Radhe has declared this mission as, '**Infinite Green Resurgent**'.

We invite all countries, states, governments, NGO's, institutions and finally individuals to join this mission of **RESURGENT ENERGY**, not for valuable products but also to give great satisfaction and feeling to be a part of ultimate revolution to make our mother earth in real sense **RICH, GREEN and SUSTAINABLE**.

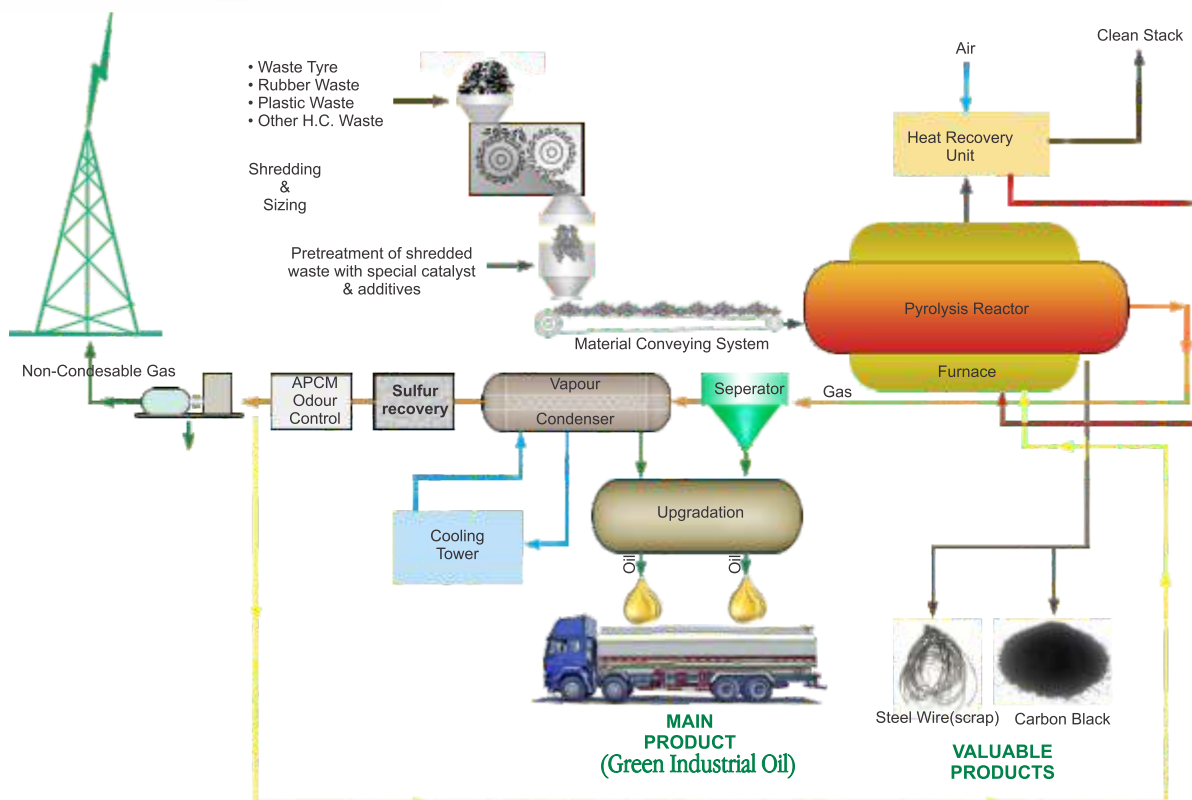






# About Technology

- ★ Continuous Process
- ★ Environment Friendly Process
- ★ Safety - as per International Standard



Pyrolysis of Waste Hydro Carbon (WHC) is not a combustion it is 100% conversion of Waste Hydro Carbon into valuable Hydro Carbon. Technically it is thermal degradation of waste material in the absence of Oxygen ( $O_2$ ), causing it to break down into materials that they were made of:- Generally WHC breaks into main Three Products.

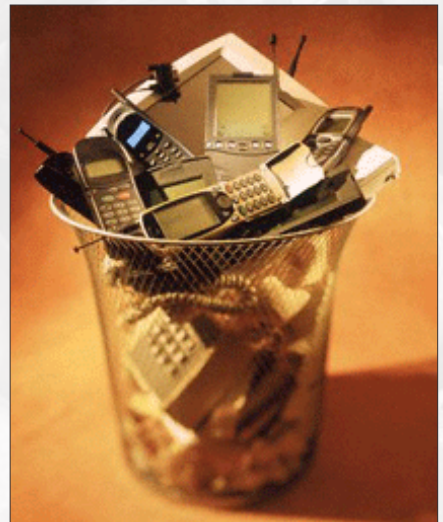
- 1) Green Industrial Oil** (Resurgent Oil)
- 2) Carbon Black.**
- 3) Steel Wires or Metal Wires.**
- 4) Non Condensable High C.V. Gas** (May Be Utilize for Process Heat)

Above all are highly valuable products.

The pyrolysis method for recycling of waste tyre, plastic and e-waste (WHC) is an innovative technique that use special process plant to heat the waste material up to  $400-600^{\circ}C$  depending on types of waste in air-tight close reactor.



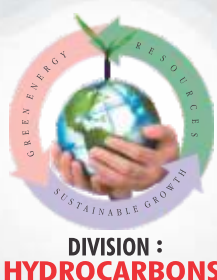






# Raw Material

- ☞ Billions tones of huge waste tyre piles are available in every country.
- ☞ Millions of tones of waste tyre, plastic and e-waste generation are continuous...(700 Million waste tyres are generating every year worldwide) With following facts:-
  - ★ Big environmental hazards
  - ★ Tyres are almost immune to biological degradation
  - ★ Dumping millions of tyre into landfill make land unavailable for cultivation
  - ★ Piles of tyres provide breeding sites for mosquitoes and rodents
  - ★ Such piles presents big issues of fire and health hazards
  - ★ Fires are difficult to contain because of the tyres high flammability and pocket of air present in the piles
  - ★ Dumping in seabed pose serious threat to marine life
  - ★ Burning of tyres as a fuel in boiler and cement industries also pose great environmental hazards and creates lots of green house gas emissions
  - ★ A terrible waste of a valuable resource containing a high level of latent energy
- ☞ There is such a high influx of waste tyre that there is never a problem of procurement of raw material for this cutting edge technology.
- ☞ Availability of raw material is never a problem in any country. In fact one falls short of space to store them.
- ☞ Millions of dollars are being invested in the search for alternative fuel. On the other hand, the disposal of waste tires from automotive vehicles is being more and more complex.





### Quality standard specification for Furnace Oil.

Sr. No.	Characteristics	Test Methos Ref to [P:] of IS : 1448	Specifications
1	Acidity, inorganic	P-2	NIL
2	Ash, % wt. max.	P-4	0.1
3	Density at 15°C, g/ml, Max	P-32	0.99
4	Flash point, (PMCC) °C, Min.	P-21	66
5	Kinematic viscosity in centistokes at 50°C, max	P-25	180
6	Sediment, % wt. max.	P-30	0.25
7	Sulphur, total, % by wt., max.	P-33 or P-35	3.5
8	Water Content, % by vol., max.	P-40	1.0
9	Pour Point, °C, max	P-10	30
10	Condarsen Carbon residue/micro carbon residue, % by mass	P-8	20

### Resurgent Oil

Technology offer  
by Radhe

NIL  
0.004%  
0.91  
25  
4.778  
0.03%  
0.85  
0.25  
below -42  
1.04







## The Product : Green Industrial Oil (Resurgent Energy)

# SGS



SGS Oil, Gas and Chemicals  
SGS HOUSE,  
A-77,  
WAGLE INDUSTRIAL ESTATE,  
ROAD NO. 16,  
NEAR PASSPORT OFFICE,  
400604

Date : 23/09/2011  
Radhe Renewable Energy Development Pvt. Ltd.  
Plot No-2621 & 2622, Gate No. 1, Road D/2,1  
Lodhika G.I.D.C., Kalawad Road, Po-Metoda,  
Tal-Lodhika, Dist-Rajkot. INDIA  
360201

### Certificate of Analysis TH11-02446.001

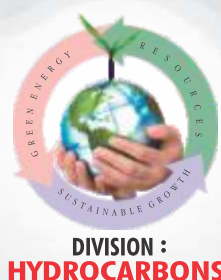
PRODUCT DESCRIPTION : Oil Sample  
SAMPLE SOURCE : As Supplied  
SOURCE ID : Nil  
LOCATION : Gujarat  
SAMPLE TYPE : As submitted

CLIENT ID : Tyre Pyrolysis Oil  
SAMPLE RECEIVED : 13/09/2011  
SAMPLE ANALYSED : 16/09/2011  
SAMPLE BY : Client  
DATE SAMPLED : Not available

SAMPLE COMMENT : Sample Qty-1000 ml.  
Sample Type - Tyre Pyrolysis Oil  
Sample Type - Liquid  
Sample Container - Plastic Bottle.

METHOD	PROPERTY	RESULT UNITS
ASTM D4868	Gross Calorific Value	44.07 MJ/kg
ASTM D482	Ash Content	0.004 % (m/m)
ASTM D1298	Density at 15°C	919.4 kg/m <sup>3</sup>
ASTM D93 (Method A)	Flash Point by PMCC - Procedure A	25.0°C
ASTM D445	Kinematic Viscosity at 400C	4.778 cSt
ASTM D4294	Sediment By Extraction Content	0.03 % (m/m)
ASTM D95	Total Sulphur Content	0.850 % (m/m)
ASTM D97	Water Content	0.25 % (v/v)
ASTM D189	Pour Point	below -42°C
pH	Conradson Carbon	1.04 % (m/m)
IS 1448 [P:2] Method C	pH	8.70 pH
	Inorganic Acidity (Lead Content - (IP-501) = 1 PPM)	0.00 mg KOH/g

\*\*End of Analytical Results\*\*



## USES OF CARBON BLACK

- ★ Rubber
- ★ Tyre Industries
- ★ Pigment Industries
- ★ Hose & Belts
- ★ Printing Ink
- ★ Activated Carbon Industries
- ★ Chemical Industries



- ★ Worldwide market around 10 million tons approx value around \$10 billion.
- ★ Most of all producers of carbon black using furnace oil and gas from refinery as a raw material with conventional process & it creates huge amount of CO<sub>2</sub> emission, it causes serious environment hazard & process consumes valuable fuels.



## The Product : Carbon Black

**SGS**

### CERTIFICATE OF QUALITY

SOT07-02449.001

Order Number : OGCSH075605  
Sample : Carbon Black  
Containers : 1 X 1000g plastic bag  
Sample No. : SOT07-02449.001  
Date Received : 12/11/2007  
Date Tested : 13/11/2007  
Date Reported : 29/11/2007

Sample : Details  
Sample Type : For information  
Source : Sent by Client

The above sample was tested and the following results have been obtained :

Analysis	Unit	Results
Iodine Absorption Number	mg/g	55
Heat Loss	%	0.50
PH Value (1% Solution)		7.50
PH Value (5% Solution)		8.06
Sulphur Condition (145Deg)	min	10 30
Elongation at break	%	667 637
Tensile Strength	MPa	24.1 22.9
300% Modulus	MPa	5.63 6.23
Net Calorific Value (arb) Kal/kg	ASTM D 5865-07	7188
Total Sulphur as S %,w/w (abd)	ASTM D3177-02	3.4

The above reflects our findings at time, date and place of above mentioned only and does not refer to any other matters.

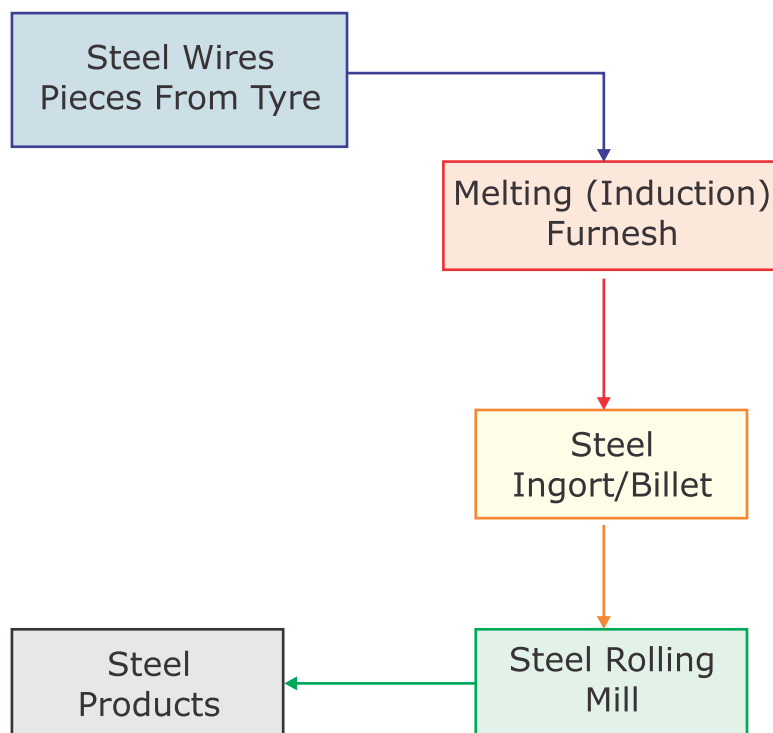








## The Byproduct : Steel Wires



- ★ Gurder
- ★ Plates
- ★ Channels
- ★ Bars
- ★ TMT Bars
- ★ Steel Parts
- ★ Wires



**DIVISION :  
HYDROCARBONS**











# Radhe

## Pyrolysis

# Technology : Overview

**25 / 50 / 100 Tons per Day**

(Continuous Process Plant)

Worlds first  
**100 Tons/DAY**  
(Tyre pyrolysis plant)  
in continuous  
operation since last  
**7 YEARS**

Fully Automated,  
Environment Friendly  
&  
Continuously Upgraded  
Mature Technology

## RADHE TYRE PYROLYSIS MODELS

**RTP - 1000**  
(25 Tons/Day)

**RTP - 2000**  
(50 Tons/Day)

**RTP - 4000**  
(100 Tons/Day)

### The Product: -

- **Green Industrial Oil - 40-45%**
- **Carbon Black - 30-35%**
- **Steel Wire - 0-10% (depends on raw material)**
- **Non Condensable Gas (NCG) - 10-15% (used for process heat & excess NCG can be converted into Power - Green Electricity)**

- Single process plant with capacity of 25 / 50 / 100 TONS per Day.  
(You can multiple 200TPD or 300 TPD or upto 1000's of Ton / Day)
- Continuous process — 24 Hrs / 365 Days
- 100% conversion of Waste Hydro Carbon. No any residues left. Totally conversion into valuable product.
- Practically Zero waste.
- Plant Built up with Sulfur Recovery system.
- Fully Automatic Control & Monitor remotely (SCADA)
- Plant complied with all international environment & safety standards.



**DIVISION :  
HYDROCARBONS**







# Global Oil Scenario



The World Energy Outlook has projected that, by 2030, India will be consuming 5.6 million barrels of oil per day, of which 94% will be met through import. At that stage, India would have become a major importer in the global oil market.

## World Crude Oil Production and Consumption, Million Barrels Per Day

Year	2003	2004	2005	2006	2007	2008	2009
Total Production	76.9	80.4	81.3	81.6	81.4	82.0	79.9
Total Consumption	79.4	82.3	83.5	84.4	85.6	85.2	84.1

Source:- BP Statistics Review

## Demand forecast

Year	Petrol Demand (MT)	Diesel Demand (MT)
2010	11.25	66.07
2020	20.56	111.92
2030	39.94	202.84

India is heavily dependent on petroleum as a primary energy source, especially transport sector. The country's current import dependence on petroleum is to the tune of 70%, spent 18.36 billion dollars (842.36 billion rupees) on importing more than 90 MT (million tones) of crude oil.

	2002/3			2006/7			2024/25		
Fuel	Demand	Supply	Gap	Demand	Supply	Gap	Demand	Supply	Gap
Oil (MT)	97.7	33.0	-64.7	134.5	34.0	-100.5	256.7	80.0	-176.7

Ref:- Biofuels – P.P.Bhojvaia

## Supply/Demand-Petroleum Products (in MMT)

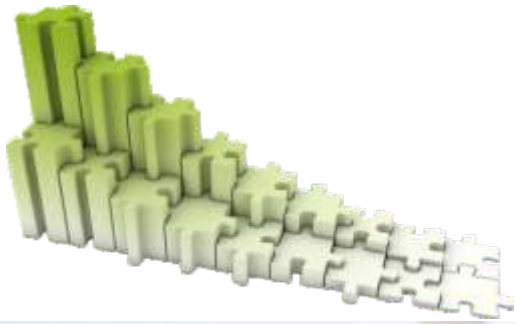
Year	Demand (without meeting gas deficit)	Demand (with meeting gas deficit)	Estimated refining capacity	Estimated crude requirement
1989-1999	91	103	69	69
2001-2002	111	138	129	122
2006-2007	148	179*	167	173
2011-2012	195	195**	184	190
2024-2025	368	368	358	364

\*\* Assuming that by 2012, adequate gas is available through imports and domestic sources.









## Special Backup from Radhe For

### Mission : Infinite Green Resurgent (IGR)

- ★ Fully Automatic total plant & process operations.
- ★ Total control by single control room through "SCADA" remote control.
- ★ Central control through internet facility 24 Hrs by Head Office control room facility provided for this Green Mission.

Note:- Total plant and all process parameters can be monitored and can be changed from Rajkot Head Office control room & production can be optimize through 24 Hr proper monitoring by Radhe's senior process expert. This innovative technology can operate for any number of plants located anywhere across the globe.

- ★ All standards of equipments are as per International Standards.
- ★ There is no generation of any waste water or any solid waste. Practically the process ends with a zero waste.
- ★ Stack is as per European standards it including sulfur recovery before stack to atmosphere.
- ★ Process is flexible to utilize Biomass (Natural Green Fuel) instead of NCG or Product Green Oil to produce process heat.
- ★ Plants includes Tyre Waste De Beader & Shredding Facilities (For steel removal from tyre)
- ★ Process plant also equipped with all necessary safety equipments
- ★ Total Turnkey – Solution offers worldwide.

#### Turnkey Includes:-

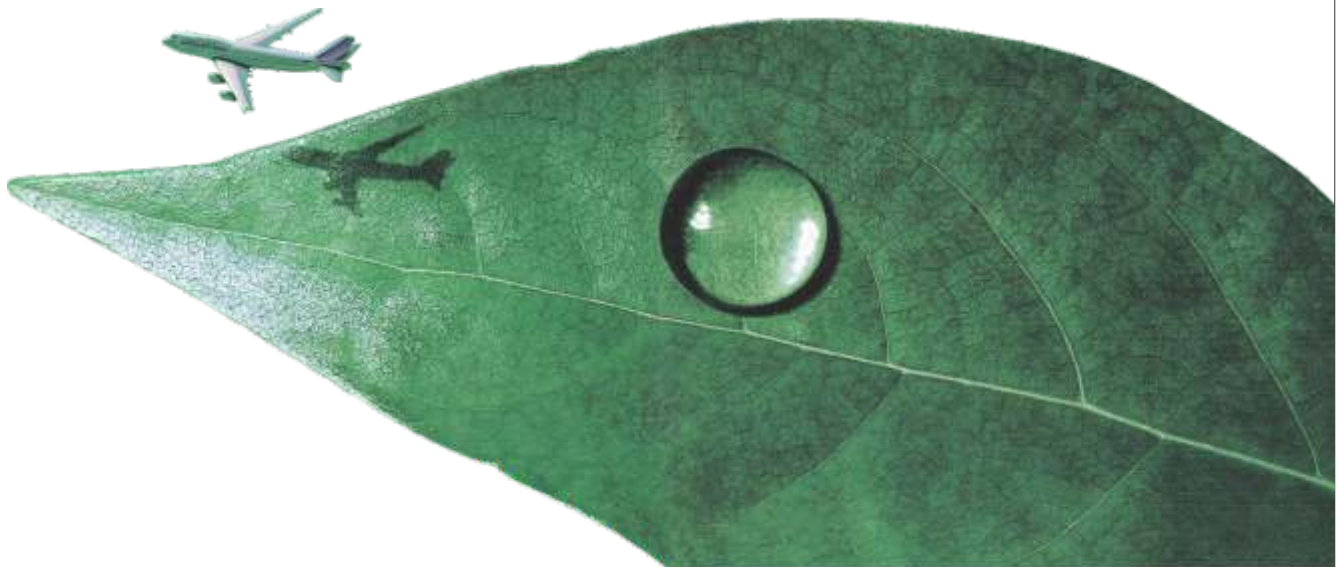
Site selection, Building Layouts, Foundation Details, Civil Designs, Site Selection, First End Engineering, Detail Engineering, Piping Design, Manufacturing, Erection, Supervising, Commissioning, Training, Optimization, After Sales, Safety and all necessary license procedure.



**DIVISION :  
HYDROCARBONS**



the  
**Green** Journey with **Resurgent Energy**  
Our march wouldn't have been what it is, without our united endeavour.







# Key Notes

- ★ It is continuous new green source of **Resurgent Energy** from waste.
- ★ Reduces plastic, tyre & e-waste land pollution.
- ★ Eco-friendly way of recycling.
- ★ Highly commercial viable process.
- ★ End product green oil is substitute of Liquid Diesel Oil / Furnace Oil.
- ★ End product green oil can be further upgrade into petrol-diesel and valuable chemicals.
- ★ Perfect and Ultimate solution of Waste Hydro Carbon.
- ★ Decrease dependency on fossil fuel.
- ★ Save millions of dollars foreign exchange by reducing import of oil.
- ★ Zero emission process :- No harmful to environment.
- ★ Less reaction time and highly energy efficient process.
- ★ Generation of employment chain:- in Procurement, sizing, processing and distribution of products.
- ★ Plant is energy self sufficient and even surplus in energy in both liquid fuel and power.



LET'S JOIN THE MISSION

**Infinite Green Resurgent  
(IGR)**





The Dawn of : **RESURGENT ENERGY**





Green Journey with

**RESURGENT ENERGY**



WE

Live Green  
Love Green  
Leave Green



**Radhe**

**Renewable Energy Development Pvt. Ltd.**

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