





## Solution to Diesel Genset Exhaust Emission by



### SUPPLY, INSTALLATION AND COMMISSIONING OF RECD RETROFITTED EMISSION CONTROL DEVICE & DUAL FUEL CONVERSION KITS FOR DIESEL GENSETS BY INNOVA DIESEL GENERATORS PVT LTD.

Air Pollution poses a grave threat, Particulate Matter, PM 10, PM 2.5 are found responsible for major diseases outbreak in India & other countries.

<p><b>Threat of air pollution is a real and grave issue.</b></p>	<ul style="list-style-type: none"> <li>→ 4th leading cause of death globally</li> <li>→ Causes 3 million deaths per year</li> <li>→ 88% of these deaths occur in developing nations.</li> </ul>
<p><b>... and PM 10, PM 2.5 are the key culprits of ambient air pollution</b></p>	<p>Particulate Matter PM 10 and PM 2.5 responsible for Major Scares.</p> <ul style="list-style-type: none"> <li>→  <b>Respiratory diseases:</b> incl. Asthma and Chronic Obstructive Pulmonary Disease.</li> <li>→  <b>Cardiovascular diseases:</b> includes Stroke and Ischemic Heart Disease</li> <li>→  <b>Cancer:</b> PM2.5 from diesel exhaust is a Class I carcinogen (WHO) pre-term births -18% higher likelihood. Global warming potential for PM</li> <li>→  <b>Global warming potential for PM is:</b> 460 times that of CO2.</li> </ul>

**Diesel Generators - used for power backup**  
A major contributor to PM 2.5 in metropolitan cities

- Telecom Towers            · Hospitals
- Residential Areas        · Industries
- Construction sites      · And many more
- Malls & Multiplexes

~16% of PM 2.5 in the NCR comes from Diesel Generators

~25% of PM 2.5 in Bangalore is from Diesel Generators

~9% of PM 2.5 in Chennai is from Diesel Generators



**Source Reference :**

1. Global burden of diseases, World Health Organization, 2015;
2. Guttikunda S., Goel R., 2013, Health impact of particulate pollution in a megacity – Delhi, India;
3. Air pollution affects preterm birthrates globally, 2017, The Washington Post

**Indian Government has mandated the use of Retrofit emission control technologies for Diesel Gensets.**

**National clean Air plan by MoEFCC (Ministry of Environment Forest and Climate Change) released on 31st Dec 2018.**

Sl.No	Component / activities	Level for implementation	Agencies
1.8.9	For the DG set already operational ensure usage of either of the two options (i) Use of retrofitted emission control equipment (RECD) with a minimum specified Pm-capturing efficiency of at least 70% type approved by one of the five CPCB- recognized labs set already operational ensure usage of either of the two options (ii) Shifting to gas-based generators by employing new gas-based generator or retrofitting the existing DG sets for partial gas usage (i.e., Fitment of Dual Fuel Conversion Kits)	City/state	State Pollution Control Board, Central Pollution Control Board,

**National Green Tribunal (NGT) order dated 6th Aug 2019 O.A No. 681/2018**

2.0.	We note that the air pollution caused by DG Sets need to the part of the action plans which may if necessary, require retrofitting of emission-control devices on generator* already in use. CPCB may consider this aspect
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**The NCAP (NATIONAL CLEAN AIR PROGRAMME) itself provides following action point for Diesel Gensets**

For DG Sets already operational ensure usage of either of the two options, (a) use of retrofitted emission control equipment having a minimum specified Pm capturing efficiency of at least 70%, type approved by one of the 5 CPCB recognized labs; or (b) shifting to gas-based generators by employing new gas-based generators or retrofitting the existing DG sets for polluting industries gas usage

Nine states have mandated the state-wide use of retrofit emission control technology.

The states wise notification dates for implementation of Retrofitted Emission Control Device (RECD) for Diesel Genset above 125 kVA capacity issued by the respective State Pollution Control Board are as follows:

**Karnataka (17th Sep'21) & (25th May' 2023)**

**Goa (6th Jan'21) & (28th March' 2023), Tamil Nadu (10th Jun'20), Andhra Pradesh (5th Nov'20)  
 Jammu & Kashmir (7th Feb '20), Haryana (25th Jun'20), Kerala (9th Dec'20), Delhi (2nd Jul'21)  
 Gujarat (27th Aug'21)**

### **About chakr innovation**

At Chakr Innovation is a team of graduates from IIT Delhi who have developed the world's first technology to reduce Particulate Matter emissions stationary diesel generators. Our technology is also the first type approved/ certified by the International Center for Automotive Technology in Manesar which is one of the 5 national labs recognized by CPCB and Ministry of Environment, Forest, and Climate Change.

Are working with some of the leading companies in India like HPCL, India Oil Corporation, Tata Group, ICICI Bank, Titan, etc. where over 450+ of these RECD devices have been running successfully since the last 5.5 years.

### **Description of Product**

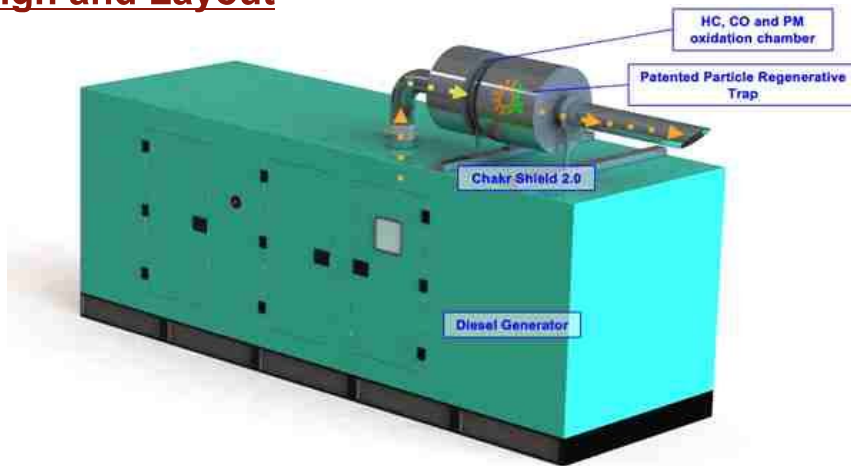
Retrofit Emission Control Device (RECD) is a retrofit solution designed especially for the reduction of pollution generated from the diesel generators. It promises a massive reduction in harmful constituents of the diesel exhaust, i.e., Particulate Matter (PM), Hydrocarbons & Carbon Monoxide with an efficiency of 70-90%, **without causing any adverse impact on the Genset. Along with the reduction of pollution**, it also provides attenuation of flow induced noises. Retrofit Emission Control Device (RECD) supplied by us consists of catalyst coated contours & meshes made up of heterogeneous non-metal alloy in which particulate matter will be trapped and gets passively reduced along with gaseous Components such as HC & CO.

Retrofit Emission Control Device (RECD) Supplied by Innova Diesel operates passively with negligible parasitic losses and causes minimal backpressure on Genset. Since there are no moving parts in the system and no by-products are formed, very less maintenance is required which ensures long life, i.e., 8-10 years. The operation of the unit is automatically controlled and zero to minimal manual intervention is needed for the operation of the system to ensure proper operation and safety.

The exhaust from the Diesel generator enters the filtration unit via the diverter valve. There are two parts of the filtration unit, first is the oxidation unit which ensures reduction of PM, HC and CO.

The partly cleaned exhaust gas now enters the second part of the filtration unit which is the regenerative particulate trap. The remaining PM is further reduced by 70 % or more, resulting in a PM reduction by 70 % or more.

## 1. Product design and Layout



## 2. Working principle of the system

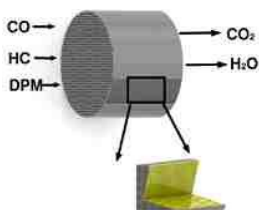
Working Principle of Retrofit Emission Control Device (RECD)

The exhaust from the DG set enters the filtration i.e., Dual Oxidation Flow Filter. There are two stages of filtration in the system.

1. Oxidation Stage
2. Regenerative stage

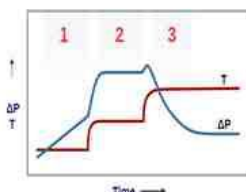
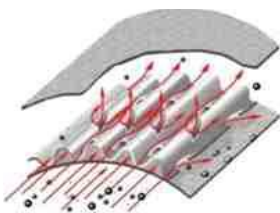


### OXIDATION UNIT

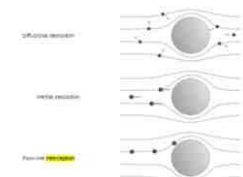


This unit comprises of a flow through media, ensuring maximum interaction of the exhaust gas with the linings of the oxidation unit without causing adverse back pressure.

### PASSIVE REGENERATIVE TRAP



This unit is primarily responsible for the capturing of the Particulate Matter i.e., Carbon Black. It is a filter-type arrangement having the required mean pore size to ensure the entrapment of all the particles having a size more than that, which includes PM 2.5 and PM 10. Filtration Mechanism is based on three phenomena:



Ensures that no back pressure is generated as the pores are continuously getting cleaned. If the metal sites are absent, then these reactions will happen at a temperature of 600 °C, instead of 150 °C which can never be achieved from DG exhaust.

### Special Features of **chakr RECD** supplied & installed by **INNOVA DIESEL™**

- The Chakr Shield 2.0 is tested by CPCB recognized labs and it is having a PM capturing efficiency of 70-90%.
- Multiple layers of heterogeneous non-metal alloy meshes for different sizes of particulates (both fine & coarse) Efficiency is independent of the operating temperature.
- Special contours designed for providing maximum surface area
- Chemical coating of anisotropic diffused rare-earth metal catalyst having cage like structure  
Chemical coating with high stability with life span of 10-12 years
- No consumable or chemical dosing required Special contours & material designed for noise reduction capability
- Automatic regeneration of filter activates at 150°C (approx. 20-25% Load)
- No external power requirement for regeneration of filters.
- Regeneration Type – Continuous
- Product patented in India with multiple additional patents filed in India and US.
- No adverse impact on the engine performance as we maintain the back pressure in the OEM defined limits.
- There are no rotating parts involved in the device and hence no consumables involved which leads to very less operating expenses
- **VERY COMPACT DESIGN, NO ADDITIONAL SPACE / LESS SPACE REQUIRED, EASY TO MAINTAIN, ECONOMICAL,** when compared to other Suppliers



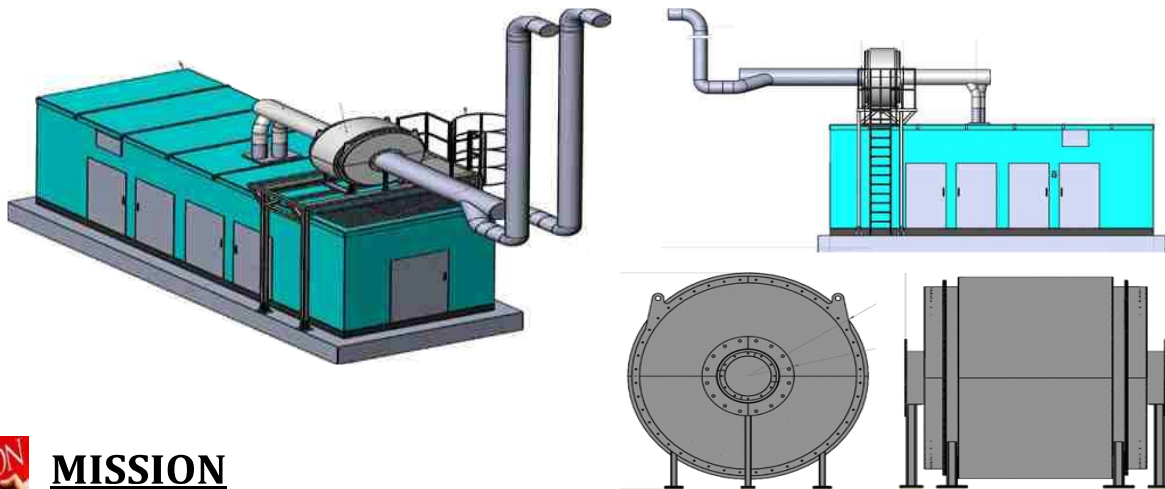
### Operating procedure of **Chakr 2.0 RECD** supplied by **Innova Diesel**

As the Retrofit Emission Control Device (RECD) supplied by us will passively regenerates itself, there are no moving parts or consumables required for the operation of the system.

**No manual intervention** is required for the normal operation of the retrofit on the diesel generator.

### Power Consumption at various load conditions of DG sets

**Electric Power : 230 Volts - AC Single Phase 50 Hz, 1.5 Amps (approx.)**



**MISSION**

To Manufacture & Supply Diesel Generators & Other allied Products from our chosen business line which meets & exceeds the expectations of our customers.

**Please contact M/s. Innova Diesel Generators Pvt Limited Bangalore for Supply, Installation & Commissioning Retrofitted Emission Control Device & Dual Fuel Conversion Kits for your Diesel Gensets 125 kVA and above Rating.**

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Dual Fuel Conversion Kit