



# Retrofit Emission Control Device

# Cummins is now introducing RECD!



**Compliant to NGT order O.A 681/2018**

**Greater than 70% PM Reduction**

**No certification applicable for RECDs for  
> 800 KW Genset**

**User-friendly design with self-cleaning  
mechanism**



No  
Manual  
Cleaning



No  
Choking



No  
Replacement



Low  
Maintenance



No Filter



No Water

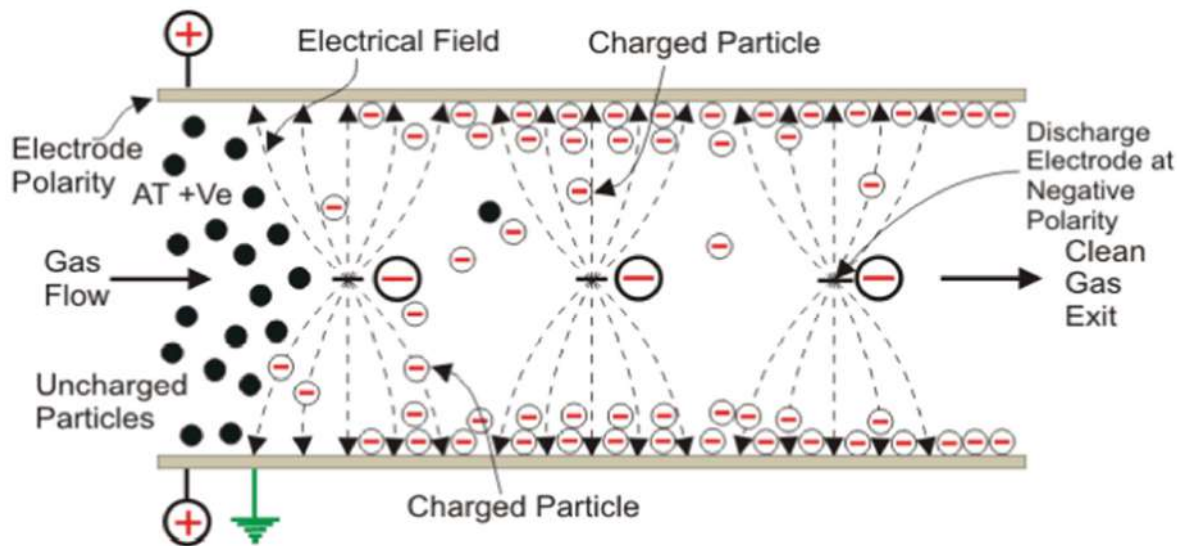


No  
Chemical



No  
Solvent

# Filterless Carbon Cutter Technology



*Single Stage ESP Model*

## How does the Carbon Cutter Work

- The Carbon Cutter is installed after the DG exhaust (muffler/silencer). No modification to the exhaust is required.
- Flue gas enters the Carbon Cutter and is confronted with Corona discharge.
- Due to the contact with high voltage, the surface charge of the PM is nullified and PM gets attracted to electrodes of opposite charge. And the size of the PM increases beyond PM 10.
- The PM agglomerated PM is collected in powder form and is available for reuse.







# Technology Advantages



Technology	PM Capture Efficiency	Initial Cost	Operational Cost	Prominent Failure Mode	Impact on Engine	Ease of maintenance	Robustness to exhaust challenges
Diesel Oxidation Catalyst (DOC)	20-40%	Low	Negligible	Face Plugging	Negligible	Not serviceable	No
DOC + Partial flow Filters or Partial Oxidation Catalyst (PFF/POC)	60-75%	Moderate to High	Moderate (fuel penalty due to back pressure)	Soot load & thermal event	Variable back pressure (>25 kPa)	Not serviceable	No
DOC + Diesel Particulate Filter (DPF)	>90%	High	High (fuel penalty due to back pressure)	Soot load & thermal event	Variable back pressure (>35 kPa)	Ash cleaning Soot removal	No
Water/ Solvent Based Exhaust scrubbers Solution	NA	High	Moderate to High (wash fluid and chemical replenishment)	Fouling and engine hydro-lock	Back pressure due to HE	Complex and frequent service	Probably Yes
<b>Carbon Cutter Machine</b>	80%-90%	Moderate	Negligible	None	Negligible & control parameter	Easy service	Yes

# Product Benefits



-  ***Energy efficient as requires no active regeneration. No dependency on exhaust temperature.***
-  ***Robustness to wide variety and condition of in-use DG sets. Remote installation possible***
-  ***Unmatched and minimal flow restriction compared to conventional technologies.***
-  ***No additional fuel consumption penalty.***
-  ***Simple, efficient and Robust design that gives consistent performance and long operational life.***
-  ***No secondary emissions, face plugging, hydrothermal aging or substrate/filter damage risk.***

# Product Portfolio



*RECD Products for >800 kW*

## *Product Nodes*

1010 KVA

1250 KVA

1500 KVA

1750 KVA

2000 KVA

## *Approximate Dimensions & Weight*

2.3 M (L), 2.6 M (W), 3.1 M (H) / 3.6 Tons

## *Approximate Energy Consumption*

In-use Power 2.1 kW / Stand-by power <10 W



# Installation Photographs



# Customer Communication



**Please ensure the below line is part of all customer communications:**

*“While RECD kits are compliant to NGT order O.A 681/2018, the kits are not certified by any CPCB approved labs since the S&P for RECDs catering to DGs greater than 800 KW is not notified by CPCB”*



# Key Consideration Points



1. It needs to be kept in mind that System and Procedure (S&P) Document for RECD certification is only for RECDs catering to Gensets upto 800 KW (less than 1010 KVA). Hence it is not currently applicable for the products being launched by Cummins however there is significant validation done to ensure that product meets minimum 70% PM reduction as per requirement.
2. Installation of RECD would require manifolds, flanges, expansion bellows, gaskets, fasteners etc., which will have to be procured additionally.
3. The use of RECD does not guarantee any percentage change in gaseous emissions, though a reduction in PM emission upto 70% is expected. The reduction in PM emission is also dependent on the load at which the Genset is running and the distance of the RECD from the Genset. The quantification of emission changes through installation of RECD can be performed through measurements on the installation. Any communication from the Pollution Control Board shall be addressed by the respective customer.

# FAQs



**Q - How much power is required for this unit?**

**Ans** - Voltage applied is 230 V AC 1 Ph, 500 W energy is consumed for the smallest size (320 kVA) device

**Q - How small (2.5 Micron) PM particles get converted to 10 PM size**

**Ans** – Due to high voltage and air charge created/ ionization, smaller PM particles join with larger size particles and cluster of soot is formed inside the cylinder wall

**Q - Due to high voltage (20 ~ 30 kV DC) generated inside the device, does it require any CEIG licence?**

**Ans** – Unit is protected for high voltage short circuit, over current, shock-proof with dual earthing system. As of now there is no licence requirement.

**Q - Can customer collect/ handle soot?**

**Ans** – Yes, possible. All care should be taken like use of all PPEs etc. while handling soot.

**Q - Life of RECD device & maintenance required**

**Ans** - Devices useful Life is about 6000 Hrs OR 12 years. Activities in periodic maintenance are covered in another question.

# FAQs



## **Q - Distance requirement to install RECD device**

**Ans** – Min 3M from muffler outlet, no bar on max distance. Farther the RECD, better is the PM reduction efficiency

## **Q - Care to be taken for installing in Costal area**

**Ans** – Special sacrificial Zink anodes are available/ can be supplied to take care of humid and salty atmosphere. Not as a standard scope of supply.

## **Q - Can certificate be given to customer for reduced carbon footprint/ improved GHG (Green House Gas) effect when RECD device is used**

**Ans** - Reducing carbon footprint is prevention of CO<sub>2</sub> release to atmosphere. RECD device doesn't really control CO<sub>2</sub>, hence no credit is applicable. Cummins will give certificate of appreciation for being environmentally responsible.

## **Q - Any addition of Noise or Vibration during device operation**

**Ans** – No noise increase. In fact, some reduction is observed due to exhaust gas expansion. No self-generated vibrations as well.

## **Q - Guidelines for routing the exhaust pipes To & From RECD device**

**Ans** – Avoid too many bends in the pipe. If not possible, increase the pipe size to reduce the back pressure, Have flexible pipe between engine Exhaust OUT and RECD IN to avoid transmitting Engine vibration

# FAQs



## **Q - Installation guidelines**

**Ans** – Require horizontal solid/ concrete platform/ foundation. Provision for water drainage from the device. Suitable pipes for the device, Power supply of 230 V AC 1 Ph and 24V DC for Controller

## **Q – Periodical Maintenance**

**Ans** – Periodical maintenance include soot removal, checking of control panel to ensure its functionality, lubrication of chain, removing side panels for visual inspection once in six month. Detailed inspection include removal of top panel, removal of ESP Top drum inspection of Electrodes. To be done with “LOTO” and by authorised personnel only once in a year.

## **Q – Time required for annual maintenance activity**

**Ans** – About 4 to 5 hours

## **Q - Documents provided with RECD device by PI Green**

**Ans** - Owner’s Manual, Warranty card, Installation Manual

## **Q - How PM reduction is verified for RECD device?**

**Ans** – Through actual measurement of PM before and after RECD device fitment

# FAQs



## **Q – What is covered in current Warranty / AMC being offered?**

**Ans** – First year warranty being provided covers all the equipment and components except for tampering and misuse such as electrical surges, flooding etc

## **Q – How is transportation of these RECD done?**

**Ans** – Transportation of RECDs is typically done on a tractor-trailer vehicles for multiple RECDs at a go. Individual RECDs can be transported on trucks based on dimensional compliance

## **Q – How much soot will be collected?**

**Ans** – Estimation of soot collected for DG operation with 80% PM capture efficiency is 16.5 kg for a 320 KVA engine working 500 hrs/yr at 70% load factor. Collection box is 145 L that can easily accommodate >2 years' worth of operation. However, it is recommended to take soot out every 500 hrs of operation

## **Q – How will soot disposal happen?**

**Ans** – Cummins Sales & Service Network will collect soot from customer locations to nearest dealership locations

The background of the slide is a photograph of two hands, one light-skinned and one dark-skinned, gently cupping a small globe of the Earth. The globe is centered in the hands and shows the continents. The background is a soft-focus green field with large leaves, suggesting a natural, sustainable environment. A semi-transparent white rounded rectangle is overlaid on the hands and globe, containing the text 'Thank You!'.

**Thank You!**

# NGT Guideline



## **BEFORE THE NATIONAL GREEN TRIBUNAL PRINCIPAL BENCH, NEW DELHI**

7. 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 partial gas usage

NGT August 6<sup>th</sup> 2019

# State PCB Orders / Circulars



Region	Date of Publication	SPCB Order	NGT Order / SPCB Notifications	Timeline of implementation
NCR (Faridabad, Gurugram, Bahadurgarh, Sonipat and Panipat)	Jun'20	>500 kVA and < 910 kVA	Gas Genset <b>OR</b> DF Kits <b>OR</b> RECD Kits with 70% PM reduction efficiency	3 Months from publication
	Entire NCR and Adjoining Areas (Updated)		<b>Usage of Diesel gensets to be restricted to 2 hrs/day</b>	<b>1<sup>st</sup> Oct'22</b>
Adjoining Areas: Areas in states of Haryana, Punjab, UP and Rajasthan where Air Quality is poor	Feb'22 (Updated from Jun'20 one)	All DG Sets <910 kVA	Shift to Gas Genset <b>OR</b> Retrofit <800 kW gensets with DF Kits with 70% Gas substitution <b>AND</b> RECD Kits with 70% PM reduction efficiency	<b>(Till then GRAP to be referred for limited usage of gensets)</b>
Kerala Haryana	Dec'20	>500 KVA	Gas Genset <b>OR</b> DF Kits <b>OR</b> RECD Kits	120 days from publication
	Nov'20	(Upper limit not mentioned)	with 70% PM reduction efficiency	
Gujarat	Sep'21	>125 kVA (Upper limit not mentioned)	Gas Genset <b>OR</b> DF Kits <b>OR</b> RECD Kits	
			with 70% PM reduction efficiency	
TN Maharashtra Andhra Pradesh Karnataka Goa	Jun'20 --> Oct'20		Gas Genset <b>OR</b> DF Kits <b>OR</b> RECD Kits	120 days from publication
	Jan'20	>125 kVA	with 70% PM reduction efficiency	
	Nov'20	(Upper limit not mentioned)	Gas Genset <b>OR</b> DF Kits <b>OR</b> RECD Kits	
	Oct'20		with 70% PM reduction efficiency	
Other Regions	Jan'21			
Other Regions	NA	Nothing separate published		



# State PCB Orders / Circulars



Andhra PCB  
Circular



Delhi PCB



Goa PCB



Gujarat PCB



Kerala PCB



Tamilnadu PCB



Karnataka PCB



J&K PCB