



**Emission
Solutions**

康明斯排放处理系统（中国）有限公司

Cummins Emission Solutions (China) Co., Ltd.



康
明
斯

技术先锋

驱动绿色未来



Brief Introduction

Cummins Emission Solutions, a wholly owned subsidiary of Cummins Inc., is the largest world integration provider in aftertreatment technology and emission solutions for the commercial on and off highway engine market. It develops and produces various emission solutions and systems for the Light Duty, Midrange, Heavy Duty and High

Horsepower engine. Cummins Emission Solutions can produce and integrate emission systems, such as oxidation catalysts, wall-flow and half wall-flow particulate filters, and selective catalytic reduction, etc. Most importantly, depending on rich practical experience and preliminary developmental ability, Cummins Emission Solutions can provide complete exhaust aftertreatment emission control systems and integration solutions for Chinese and global customers.

Cummins Emission Solutions belongs to Cummins Components Business Unit, with key operations in the United States, China, India, UK, Brazil and South Africa, and serves both OEM and engine first fit and retrofit customers. Cummins Emission Solutions (China) Co Ltd., located in Yizhuang Economic-Technology Development Area in Beijing, China, was founded in August 2007. The company is a wholly owned enterprise of Cummins in China with a collection of development, production and marketing, and dedicated to develop and produce Euro IV, Euro V, NS IV, NS V and above aftertreatment systems. Its factory in Beijing was built in 2008, over 10,000 square meters large, is taking the leadership position now in China. The factory had the official mass production in September 2009. In 2013, CES (China) can reach the 280,000 sets of production capacity. This is the first aftertreatment systems manufacturing base of Cummins in Asia-Pacific region, which marks a new promotion of Cummins' localization manufacturing capacity in China.



Worldwide Locations:

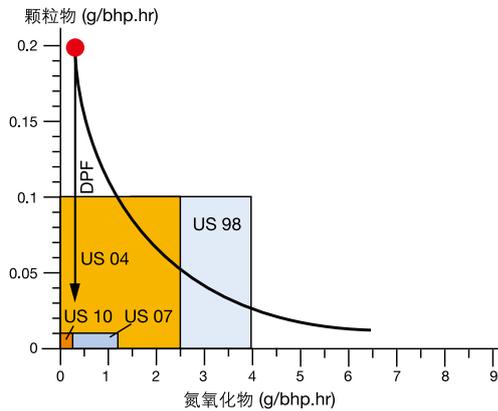
- | | |
|----------------------------------|------------------------------|
| 1 USA: Columbus, IN Headquarters | 6 India: Pune |
| 2 USA: Janesville, WI | 7 China: Beijing |
| 3 USA: Mineral Point, WI | 8 United Kingdom: Darlington |
| 4 Brazil: São Paulo | 9 USA: Stoughton, WI |
| 5 South Africa: Pretoria | 10 Germany: Marktheidenfeld |

With advanced technology and rich global support experience, Cummins Emission Solutions has launched series of emission technology solutions for the different region and customer requirements in order to meet the more stringent emission regulations in the world, and has become the world leader of the emission systems.

Integrated Systems

美国重型柴油机排放法规 (道路车辆)

EPA Emission Standards for HD Diesel Engines (On Road)



Application	Date	In-Cylinder only	Cooled EGR/VGT	Nox Absorber	SCR	Diesel Particulate Filter	Compact Catalyst
Tier 3/EU Stage IIIA	2005	●					
EPA Tier 2>751 hp	2006	●					
Euro 4 On-Highway	2006				●		
EPA 07 On-Highway	2007		●			●	
EPA07/10 Pickup Truck	2007		●	●		●	
Euro 5 On-Highway	2009				●		
EPA10 On-Highway	2010		●		●	●	
Tier 4 Interim/ Stage IIIB	174-751 hp	2011	●			●	
	75-173 hp	2012	●				●
Euro 6 On-Highway	2014	Under development					

Along with the more stringent emission regulations and knowledge of exhaust aftertreatment products, customers expect their commercial vehicles to have a system with reliable operation, high performance and fuel efficiency. With professional system knowledge and unique reliability, also deep understanding to application requirements of customers and rich experiences on vehicles and engine applications, Cummins Emission Solutions will provide complete system integration solutions for our customers.

Why Choose Cummins Emission Solutions

CES experience with engines, controls and aftertreatment integration

- Matching performance with engine systems
- Controls integration with engine and aftertreatment
- Knowledge of component controls

Component innovation and design capability

- Doser (HC and EDF) core technology control and production capacity
- Catalyst performance research and system integration
- Sensor performance research and system integration
- Aftertreatment control module development and products capability

Aftertreatment system integration capability and experience

- Europe: Euro 4/5 → SCR system
Euro 6 → DPF+SCR system
- China: NS 4/5 → SCR system
NS 4 → DOC system
NS 4 → PFC system
NS 4 → OC/TWC system (NG engine)
NS 5 → DPF system
- USA: EPA 2007 → DPF system
EPA 2010/2013 → DPF+SCR system

Local producer

- Leveraging investment in local design and development
- Manufacturing scale – CES +Faurecia
- Purchasing scale through collaboration
- Customized products designed for China market
- Quick response to customer and market requirements

化的系统控制技术

Vehicle, Engine & Aftertreatment



解决方案

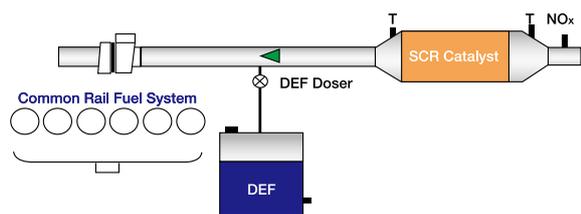
选择性催化还原器 (SCR) - 欧4/欧5/美国2010 后处理解决方案:

选择性催化还原系统利用尿素喷射系统将尿素水溶液喷入排气系统，在废气流中分解为氨气并在催化剂的作用下与氮氧化物发生反应，使之转化为无害的氮气和水。

截至2013年7月，该技术方案在康明斯排放处理系统的全球经验与应用如下：

SCR-100余万套，700亿公里

SCR 应用在 2010-2013 (DPF+SCR) 系统 - 350亿公里



EcoFit Selective Catalytic Reduction (SCR)- For Euro 4/ Euro 5/ EPA 2010 AT Solution

SCR system use urea doser system to inject DEF into exhaust, DEF reacts with heat and converts to ammonia, ammonia reacts with NOx and passes over the catalyst, then converts NOx to harmless nitrogen and water.

Global experience and application in CES by the end of July 2013:

Only SCR-over 1 million units with 70 billion kilometers

SCR application in 2010-2013 (DPF+SCR) system-35 billion kilometers

计量单元 Doser Unit	
喷嘴 Injector	
温度传感器 Temperature Sensor	
氮氧化物传感器 NOx Sensor	
排气处理器 EGP	

Notes: Outlet temperature sensor is optional.
备注：出口温度传感器为可选。

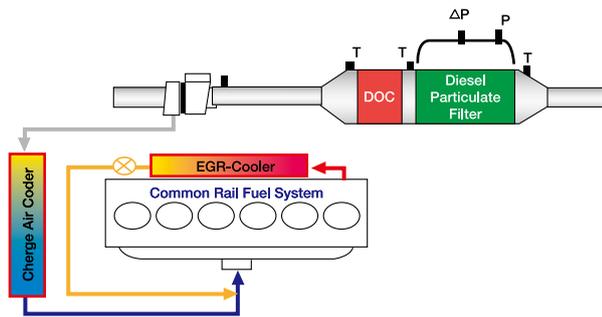
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柴油颗粒物捕集器 (DPF) - 欧5/美国2007/美国2010 后处理解决方案:

柴油颗粒物捕集器通过表面和内部混合的过滤装置捕捉颗粒的排放，例如扩散沉淀、惯性沉淀或者线性拦截。通过加热再生将颗粒从捕集器中连续或者周期性的移除。柴油颗粒物捕集器能有效地控制颗粒物中固体物的排放，效率高于90%。

截至2013年7月，该技术方案在康明斯排放处理系统的全球经验与应用如下：

DPF-129万套，1000亿公里
DPF 应用在 2010-2013 (DPF+SCR) 系统 - 350亿公里



EcoFit Diesel Particulate Filter (DPF)- For Euro 5/ EPA2007/ EPA 2010 AT Solution

Diesel Particulate Filter captures particle emission through a combination of surface-type and deep-bed filtration mechanisms, such as diffusion deposition, inertial deposition or flow-line interception. Collected particulates are removed from the filter through thermal regeneration, continuously or periodically. Diesel filters are very effective in controlling the solid part of PM emission, the efficiency is more than 90%.

Global experience and application in CES by the end of July 2013:

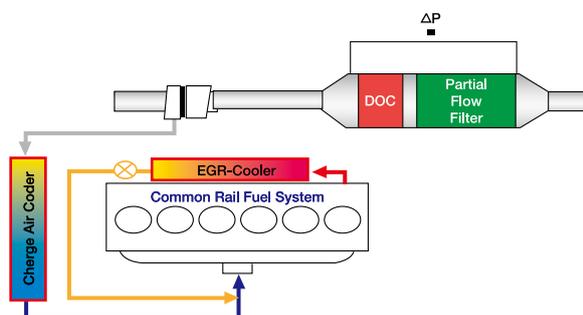
Only DPF-1.29 million units with 100 billion kilometers
DPF application in 2010-2013 (DPF+SCR) system-35 billion kilometers

碳氢喷射器 Hydrocarbon Injector (HCI)	
柴油颗粒物滤清器 DPF	
压差传感器 Differential Pressure Sensor	
温度传感器 Temperature Sensor	

解决方案

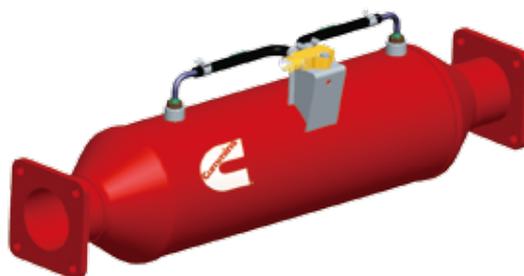
部分流颗粒捕集器 (PFC) - 欧4后处理解决方案:

部分流颗粒捕集器通过表面和内部混合的过滤装置捕捉部分颗粒物的排放, 例如扩散沉淀、惯性沉淀或者线性拦截。通过被动再生将所收集的颗粒从捕集器中移除, 能有效减少50%-60%的颗粒物。



Partial Filter Catalyst (PFC) - For Euro4 AT Solution

Partial Filter Catalyst captures partial particle emission through a combination of surface-type and deep-bed filtration mechanisms, such as diffusion deposition, inertial deposition or flow-line interception. Collected particulates are removed from the filter through passive regeneration with 50%-60% of PM reduction efficiency.



柴油氧化催化器 (DOC) - 欧4 (国4) 后处理解决方案:

柴油氧化催化器主要用于满足欧4和国4整车排放认证的轻型车产品

DOC采用氧化催化转化技术降低柴油机排气污染物中的CO, HC成分

DOC对PM中的SOF成分的去除了也有一定的贡献

DOC技术通常作为采用EGR技术的柴油发动机排放处理解决方案

Diesel Oxidation Catalyst (DOC) is mainly used for light duty vehicles Euro IV and NS4 aftertreatment products which is required for vehicle certification

DOC can reduce CO and HC contents in exhaust gas by catalytic oxidation

DOC can also reduce SOF content in PM to a certain content

DOC technology could be used as an emission solution of EGR engine



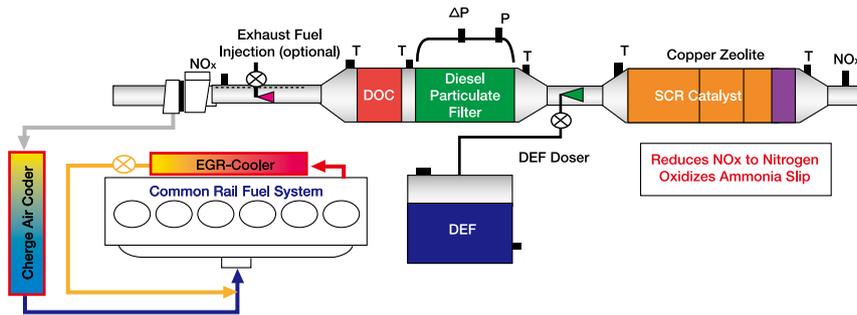
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DPF+SCR集成系统 - 欧6/美国2010后处理解决方案：

为满足欧6或美国2010排放法规，后处理系统将会更加复杂，需要将柴油氧化催化器（DOC）、柴油颗粒物捕集器（DPF）、选择性催化还原器（SCR）等集成为一体来控制排放。通过将DOC/DPF和SCR组合，其被动再生和主动再生能对氧化和清洁过滤器产生更多控制，从而移除超过90%的颗粒物。经过后系统优化以及与发动机匹配，DOC/DPF+SCR后处理系统将颗粒物和氮氧化物同时进行有效处理并大幅度降低，进而达到满足欧6和美国2010排放标准要求。

截至2013年7月，该技术方案在康明斯排放处理系统的全球经验与应用如下：

DPF+SCR 2010-2013 应用 - 350亿公里



DPF+SCR Integrated Systems - For Euro6/EPA2010 AT Solution

In order to meet European 6 or EPA 2010 emission regulation, aftertreatment system will become more complicated, DOC/DPF and SCR will be integrated as one subsystem. By combining a DOC/DPF with a SCR system, can remove over 90 percent of Particulate Matter(PM) using passive and active regeneration to allow more control in oxidizing and cleaning the filter. By engine optimization with after treatment system, DOC/DPF+ SCR can deal with PM and NOx efficiently and reduce their emission substantially, so that to meet European 6 or EPA 2010 emission regulation.

Global experience and application in CES by the end of July 2013:

DPF+SCR application in 2010-2013 -35 billion kilometers



Key Components

EcoFit Hydrocarbon Dosing Systems (for 2007 DPF system and 2010 SCR/DPF system)

This dosing system is designed to inject diesel fuel into exhaust system before DOC/DPF when PM or soot loading in DPF accumulated to such a degree. Then the diesel fuel or hydrocarbon injected will react chemically with NO of exhaust gas in catalyst to create more NO₂ as well as release heat. These NO₂ and heating will react with soot or PM, and so on finish the regeneration. The major components of EcoFit Hydrocarbon Dosing Systems include injector, fuel shutoff valve and air shutoff valve.



EcoFit DEF Dosing Systems

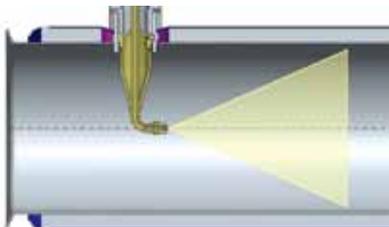
Cummins Emission Solution is no stranger to aftertreatment system integration and subsystem design, which is why we are pleased to introduce our newest innovation - The EcoFit™ DEF Dosing System. This patented design is an essential part of any Selective Catalytic Reduction (SCR) aftertreatment system, accurately designed to reduce oxides of nitrogen (NOx), while providing best-in-class of ownership, performance, and reliability to any diesel engine manufacturer. Our goal is to make you more competitive by providing solution with reduced installation costs and better fuel economy.

■ DEF Dosing Module

The DEF Dosing Module is a high-accuracy unit for injecting DEF dosing into the exhaust aftertreatment system. A control module calculates the exact dosing rate of DEF dosing based on various engine conditions, and the urea mixes with air from the vehicle compressed air system. Atomized DEF dosing is then sent through the Injection Nozzle into the exhaust system, upstream of the SCR catalyst.



■ Injection Nozzle



The Injection Nozzle is a robust component that delivers atomized DEF dosing and air mixture upstream of the SCR catalyst. The design allows injection in the center of the exhaust gas flow, which minimizes the risk of deposits. A relatively large orifice sizing in the nozzle also provides exceptional tolerance to contaminants.

■ Aftertreatment Control Module

The Aftertreatment Control Module translates datalink-commanded dosing rates into supply module inputs to accurately deliver the required dosing quantities. The independent Aftertreatment Control Module can also be used to control other engineered components in the engine or aftertreatment system.



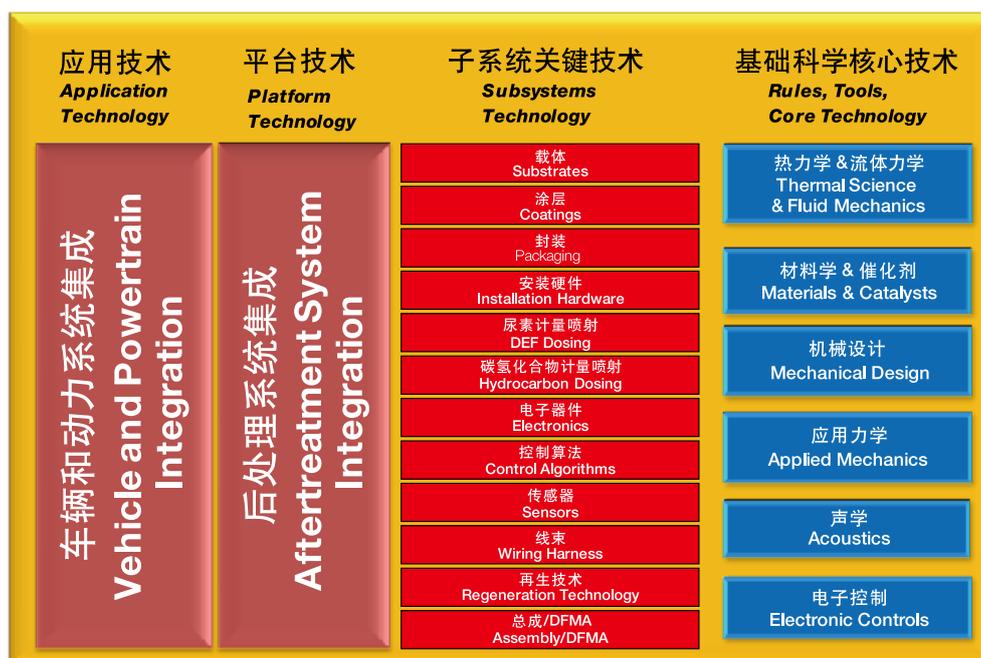
研发与设计

CES在全球拥有6个工程中心、700多名工程师和科学家，掌握多种核心技术研发能力。CES全球的后处理产品开发的实验能力可以完成排放、反应、振动、声学及光学等实验，确保产品的多样性满足不同市场和客户的不同的使用，并有完善的工程团队来确保项目准时交付

CES在中国拥有业内最顶尖的人才。我们的系统工程解决方案包括系统集成和模块化封装，再生和热能管理，排放合规性测试，发动机电子控制模块的标定，催化剂研发（包括载体和涂层），以及全球样件制造。我们拥有以下研发和设计能力：

- 针对涂层和载体的性能研发以及应用方面的经验积累
- 载体性能老化机理的研究
- 针对系统优化的模拟方针能力
- 机械疲劳/可靠性试验验证
- 系统性能测试

技术研发能力 System Technical Capability



Research and Design

CES has 6 engineering centers around the world, with over 700 engineers and scientists. CES global has laboratorial capabilities in emission, reaction, vibration, acoustics, optics and etc., which promotes the diversity of our products to meet the requirements of different markets and customers. Also, the on time delivery of new product projects is well maintained by a strong engineering team.

CES China has top-talents of aftertreatment industry. Our system engineering solutions include system integration and modeling, regeneration and thermal management solutions, emissions compliance testing, Electronic Control Module (ECM) tuning and licensing, catalyst development including substrates and coatings, and global prototyping. We have the capability to perform:

- Coating and substrate performance development and application experience accumulation
- Aging mechanisms research for substrate performance
- Modeling capability for system optimization
- Durability and fatigue test
- System performance testing

生产与制造

保证质量的快速生产

CES在中国拥有先进和快速的生产线，我们设计的将来最大产量可达年产65万套，是目前国内领先的自动化生产线。

为了达到全球排放标准，我们在后处理产品的生产与制造过程中始终采用行业内领先的质量控制流程。公司已通过ISO/TS16949，ISO14001和OHSAS18001管理体系认证。

封装生产线

Canning Assembly Line



Product and Manufacture

Rapid production with quality assurance

CES has advanced and fast production lines in China, and the designed annual capacity will reach 650,000 sets of production in future. It has the leading automatic production lines in China.

In order to achieve global emissions standards, we always adopt the advanced quality control process in the produce and manufacture of aftertreatment products. And CES has past ISO/TS16949/ISO14001/OHSAS18001 certification.

废气处理器生产线

Exhaust Gas Processor Assembly Line



尿素喷射系统生产线 Urea Dosing System Assembly Line



分销与服务

康明斯排放处理系统拥有完备的服务供应商网络，和遍布全国的服务网点。我们已经制定了全面的培训计划，让您对我们的后处理系统拥有十足的信心。

Distribution and Service

Cummins has a completed network of service providers with locations spread all over the country. We are already developing a comprehensive training program so that you can have enough confidence in our aftertreatment system.



12个区域分销服务中心

北京、沈阳、乌鲁木齐、西安、上海、武汉、成都、昆明、广州、深圳、香港、台北

12 Distribution Centers

Beijing, Shenyang, Urumqi, Xi'an, Shanghai, Wuhan, Chengdu, Kunming, Guangzhou, Shenzhen, Hong Kong, Taipei

1个地区零件分拨中心（上海）

1 Parts Distribution Center (Shanghai)

两千多家独资和合资企业授权经销商

2000+ authorized dealers (including JVs)



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