SYSTEM FOR TREATMENT OF EXHAUST GASES OF DIESEL ENGINES

IITM Technology Available for Licensing

Problem Statement

- Current Selective Catalytic Reduction (SCR) systems suffer from various limitations including **incomplete conversion of urea into ammonia, non-uniform ammonia distribution, ammonia slipping, and solid deposit formation due to spray-wall interaction**, leading to reduced efficiency and increased maintenance costs.
- Solid deposition on the duct walls is evident even at higher temperatures of exhaust gases, indicating the need for a solution that addresses this issue efficiently.
- There is a critical need for the development of an affordable exhaust treatment system that overcomes the shortcomings of conventional SCR technology (Fig. 1).

Intellectual Property

- IITM IDF Ref. **2457**
- **IN 528761 - Patent Granted**

TRL (Technology Readiness Level)

TRL - 4: Technology validated in lab scale.

Technology Category/ Market

Category- Green Technology
Applications- Automotive, Heavy-Duty Vehicles,
Industry- Automotive Manufacturing, Industrial Machinery, Transportation

Market - Global automotive selective catalytic reduction market size is projected to grow from $13.85 billion in 2023 to $20.90 billion by 2030, at a **CAGR of 6.1%.**

Research Lab

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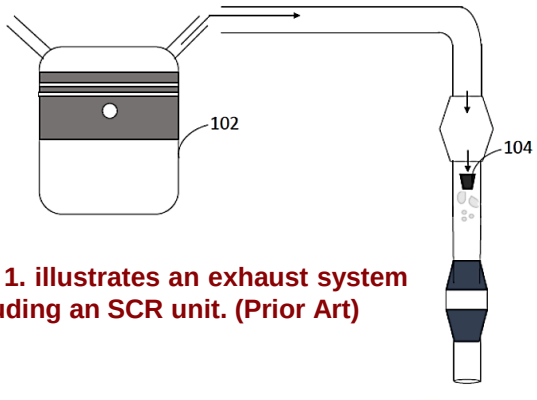

FIG. 1. illustrates an exhaust system including an SCR unit. (Prior Art)

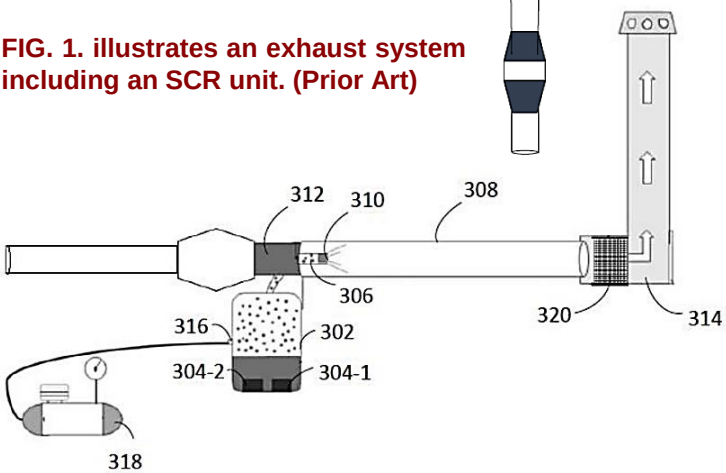

FIG. 2. illustrates a schematic of a system (300) for treatment of exhaust gases. (Present Invention)

Technology

1. **The system (300) utilizes ultrasonic atomizers (304) to generate a fine mist of Urea Water Solution (UWS) with droplets ranging from 5 µm to 10 µm, enhancing evaporation efficiency and minimizing solid deposition. (Fig. 2)**
2. **By connecting the injector (310) to the exhaust duct via a mist delivery tube (306), the system prevents direct exposure of the injector to hot exhaust gases, preventing damage and promoting faster droplet evaporation within the tube.**
3. **The finer size of the UWS mist facilitates better mixing of ammonia with the exhaust gases near the injector tip, leading to more uniform spatial distribution at the catalyst entrance and significantly reducing solid deposition, thus enhancing overall performance.**

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Key Features / Value Proposition

1. Efficient Exhaust Gas Treatment

- Offers a highly efficient system for treating exhaust gases from diesel engines, reducing nitrogen oxides (NOx) emissions and improving air quality.

2. Minimized Solid Deposition:

- Utilizes ultrasonic atomizers to generate fine Urea Water Solution (UWS) mist, minimizing solid deposition on duct walls and reducing maintenance requirements.

3. Enhanced Evaporation Efficiency:

- Connects the injector to the exhaust duct via a mist delivery tube, promoting faster evaporation of UWS mist and ensuring optimal performance.

4. Cost-Effective Solution:

- Provides a cost-effective solution for exhaust gas treatment, offering improved performance and reduced environmental impact compared to conventional methods.

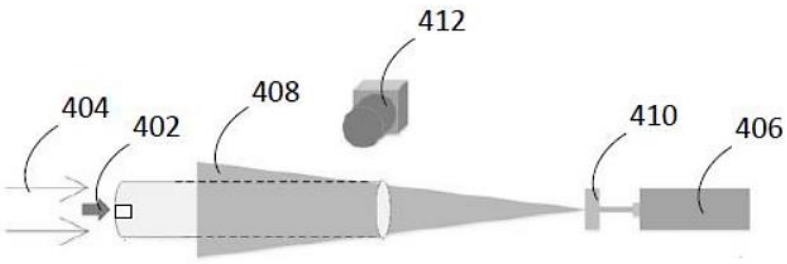

FIG. 3. illustrates a setup for performing Laser Sheet Imaging (LSI).

- **UWS mist 402 and airflow 404 were passed through the conduit.**
- **A Continuous Wave (CW) laser 406 of 3.5W was deployed to form a laser sheet 408.**
- **Laser beam from the CW laser 406 was converged using a cylindrical lens 410 to illuminate a cross section of the UWS mist 402 to be imaged.**
- **Charge Coupled Device (CCD) camera 412.**

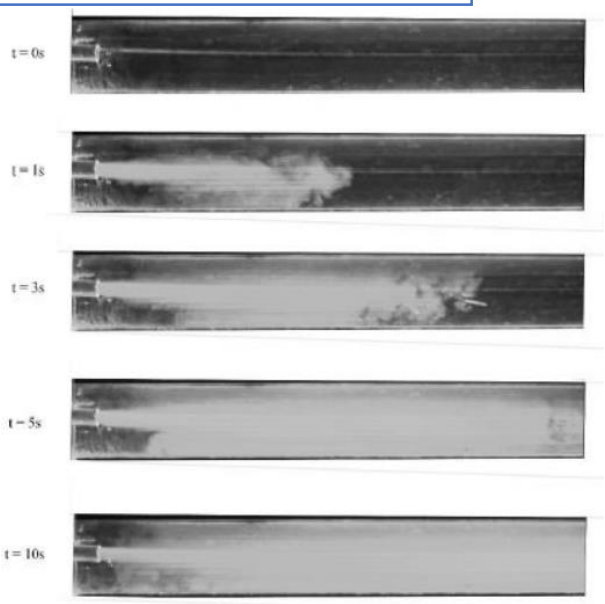

FIG. 4. illustrates images showing release and movement of Urea Water Solution (UWS) mist inside the conduit in absence of airflow.

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