Retrofit of Aftertreatment for Improvement of Exhaust Emissions from In-use Vehicles

Options for India

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Agenda

- Introduction
- Retrofit for in-use emissions control Globally
- Basics of Emissions Control Strategies
- Options for Retrofit
- Appropriate solutions for India
- The importance of precautions

Introduction

- As emissions regulations become more and more stringent for new vehicles, the issue of pollution from the older vehicles becomes relevant for the overall improvement in the quality of ambient air.

- Globally, apart from the phase-out of old vehicles. retrofit of older vehicles with new engines or fitment various aftertreatment devices has been practiced with some success

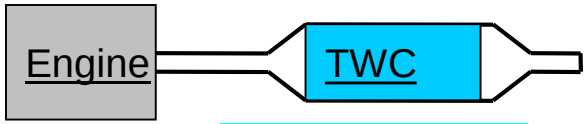
- These have almost always been implemented with financial incentives coupled with penalties for pollution to persuade in-use vehicle owners for the change

- In India while retrofit has often been talked about this has not yet been implemented as a means to clean up the environment. While a lot of time, effort and finances are spent on improving new vehicles , the retrofit option has as yet, remained unexplored…

Aftertreatment for Vehicle and Engine

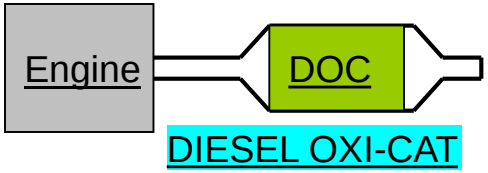
Light Duty (Passenger Cars)

Using gasoline fuel

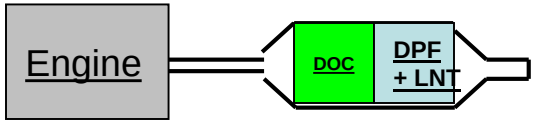


THREE WAY CAT

Using Diesel fuel



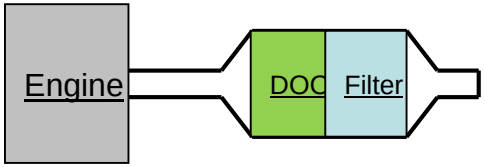
DIESEL OXI-CAT



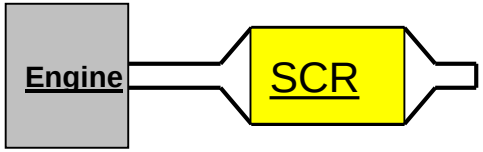
DIESEL PARTICLE FILTER+ TRAP

Heavy Duty (Buses and Trucks)

Using Diesel fuel

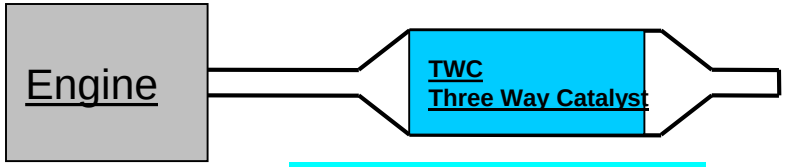


DIESEL OXI-CAT+ TRAP



SELECTIVE CATALYTIC REDUCTION

Using CNG/LPG



THREE WAY CATALYST

Considerations for Aftertreatment Vehicle and Engine

OEM Production vehicles

- Made to specification
- All parts are Quality checked
- The manufactured vehicle or engine is tested at different stages of manufacture and has to comply at every stage

The result is a product which Confirms to COP procedures with vehicle raw emissions within boundaries

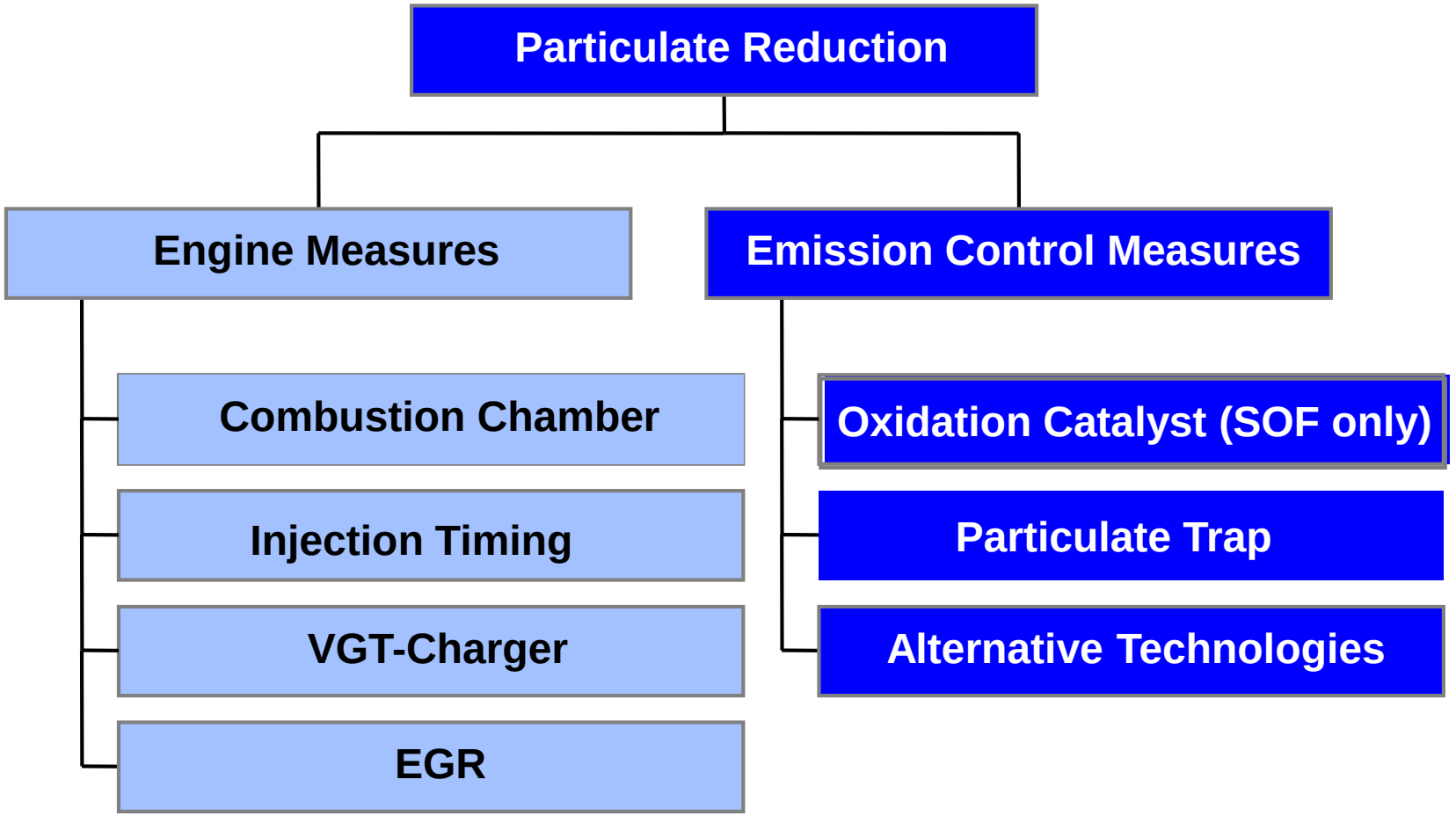
In-use Old vehicles

- Have been subject to wear and tear
- Fuel injection parts and calibration may have been disturbed
- EngineOil consumption an important parameter in particulate emissions and control may be high

The result is vehicle and engine raw emissions which are unpredictable

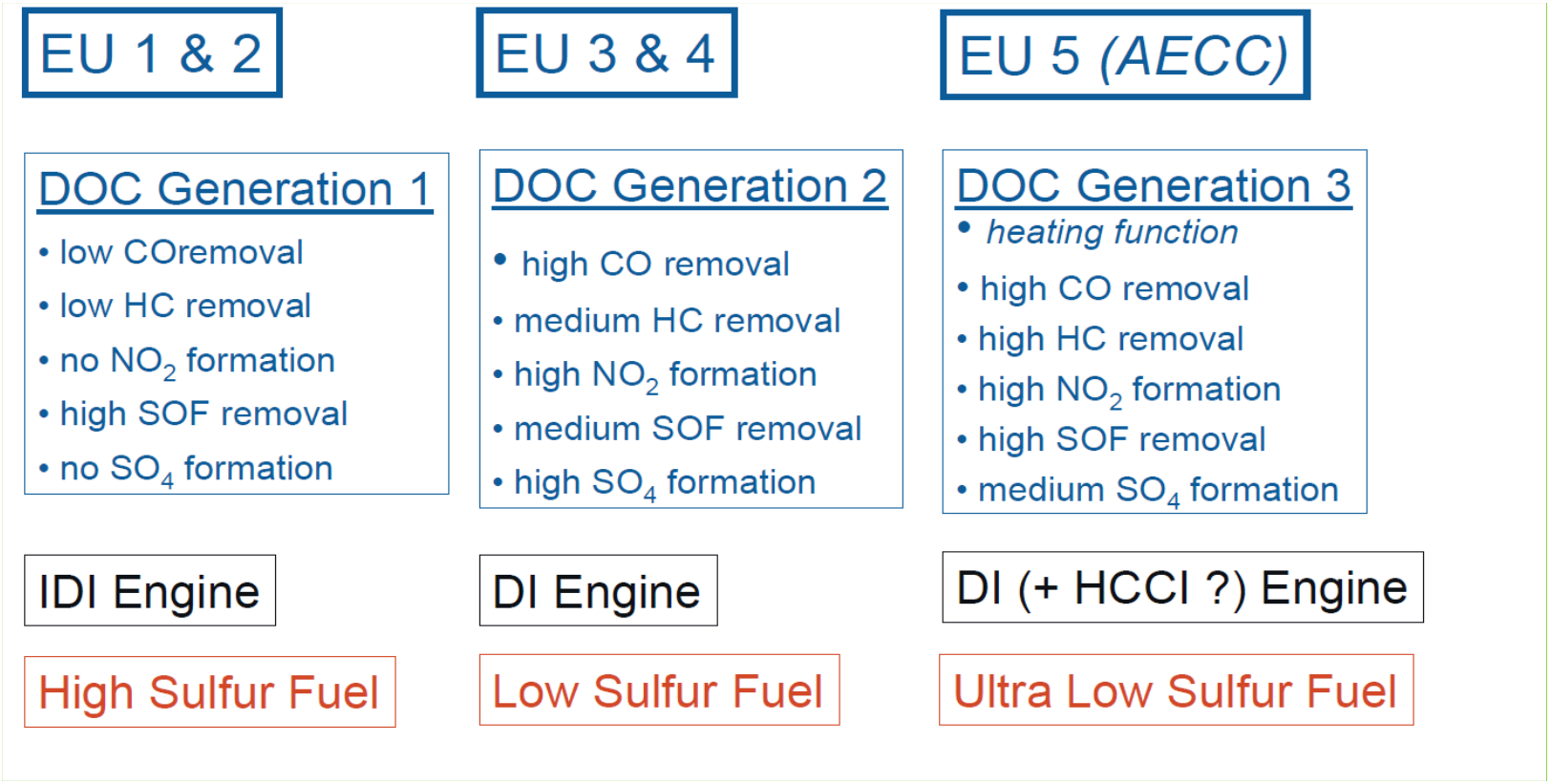
- ❑ This means that aftertreatment solutions for in-use vehicles have to be engineered considering the condition of the vehicle
- ❑ This can only be done effectively with a OEM / OEM service stations and experienced catalyst manufacturers, working together

Particulates and Strategies for Control
Old Vehicles/Engines



Evolution od Aftertreatment Over the Years for Vehicle and Engine (Diesel)

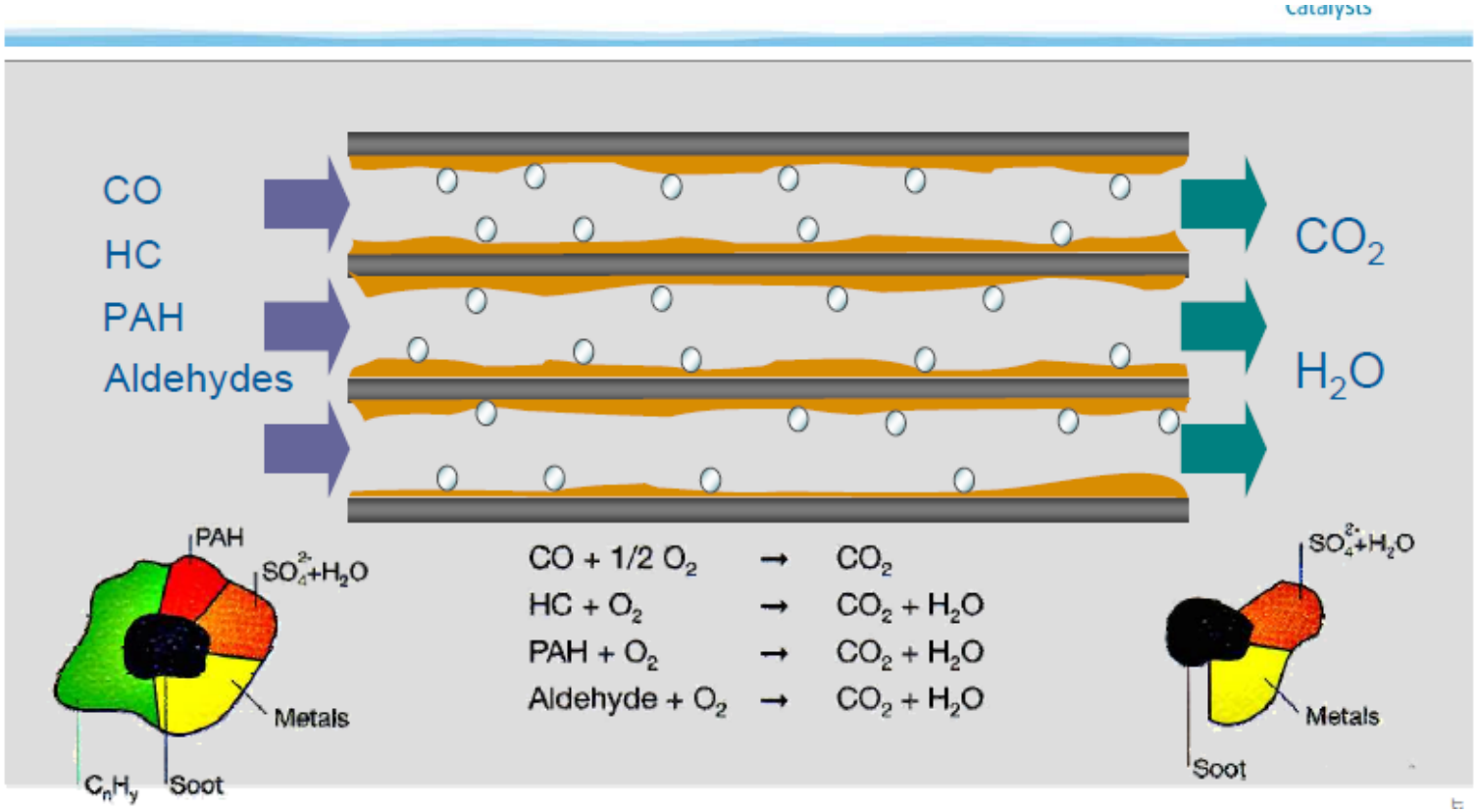
Different generations of Vehicles require aftertreatment tailored to parameters that have changed over the years



PARTICULATE CONTROL
FOR IN-USE VEHICLES/ENGINES

- Particulates are the principal visible irritant from old in-use vehicles
- They Comprising soot and solid particulates
- They could be reduced to some extent by Diesel Oxidation Catalysts and Particulate Filters and Traps

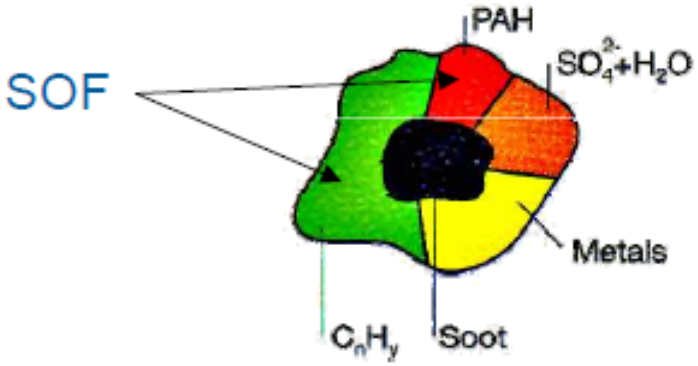
Diesel Oxidation Catalyst - 1



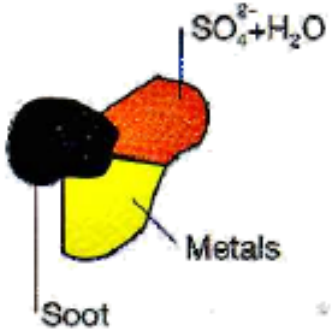
Diesel Oxidation Catalyst - 2

Change of PM by an Oxidation Catalyst

Oxidations Catalysts usually remove more or less the soluble organic fraction



Before DOC

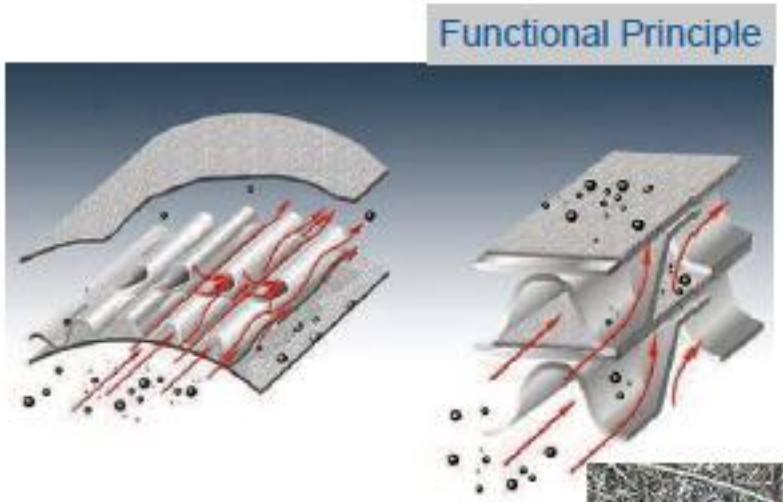


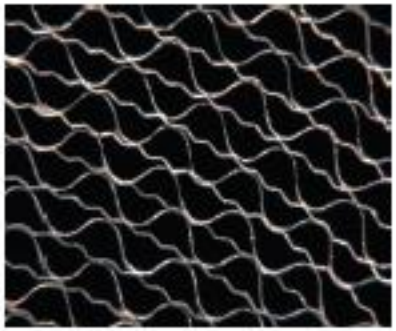
After DOC

Diesel Oxidation Catalyst has the potential to reduce upto 30% % of particulate mass

Filters and Traps for retrofit Particulate control - 1

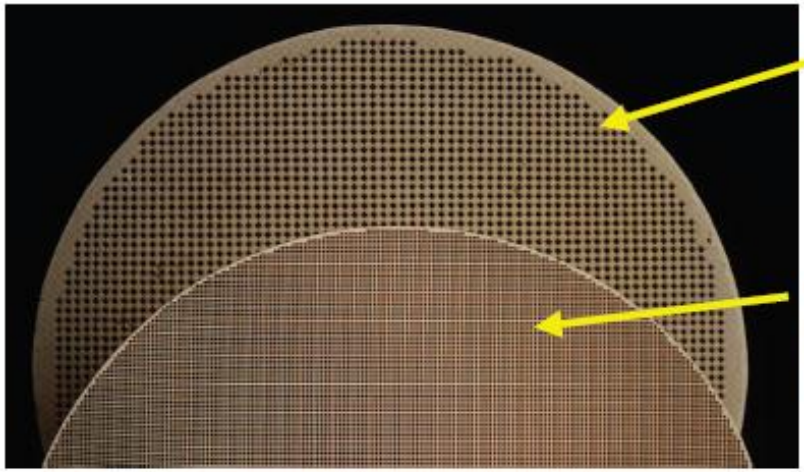
Properly engineered, traps have the potential to reduce 30%to 60% of Particulates





Two different finenesses of metal fleece

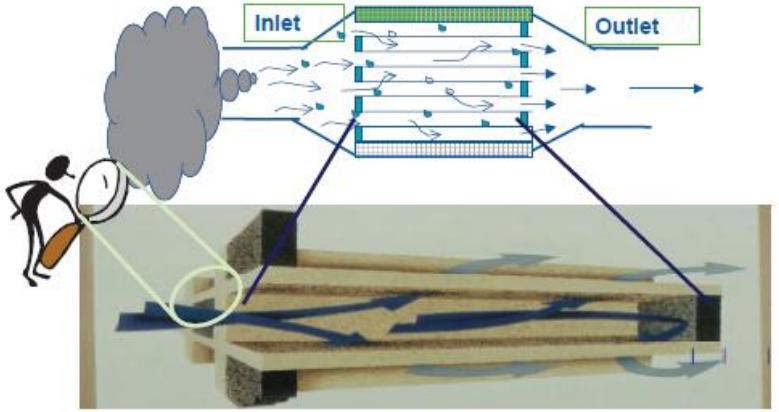
Filters and Traps for retrofit Particulate control - 2



DPF-Substrate: alternating plugged channels

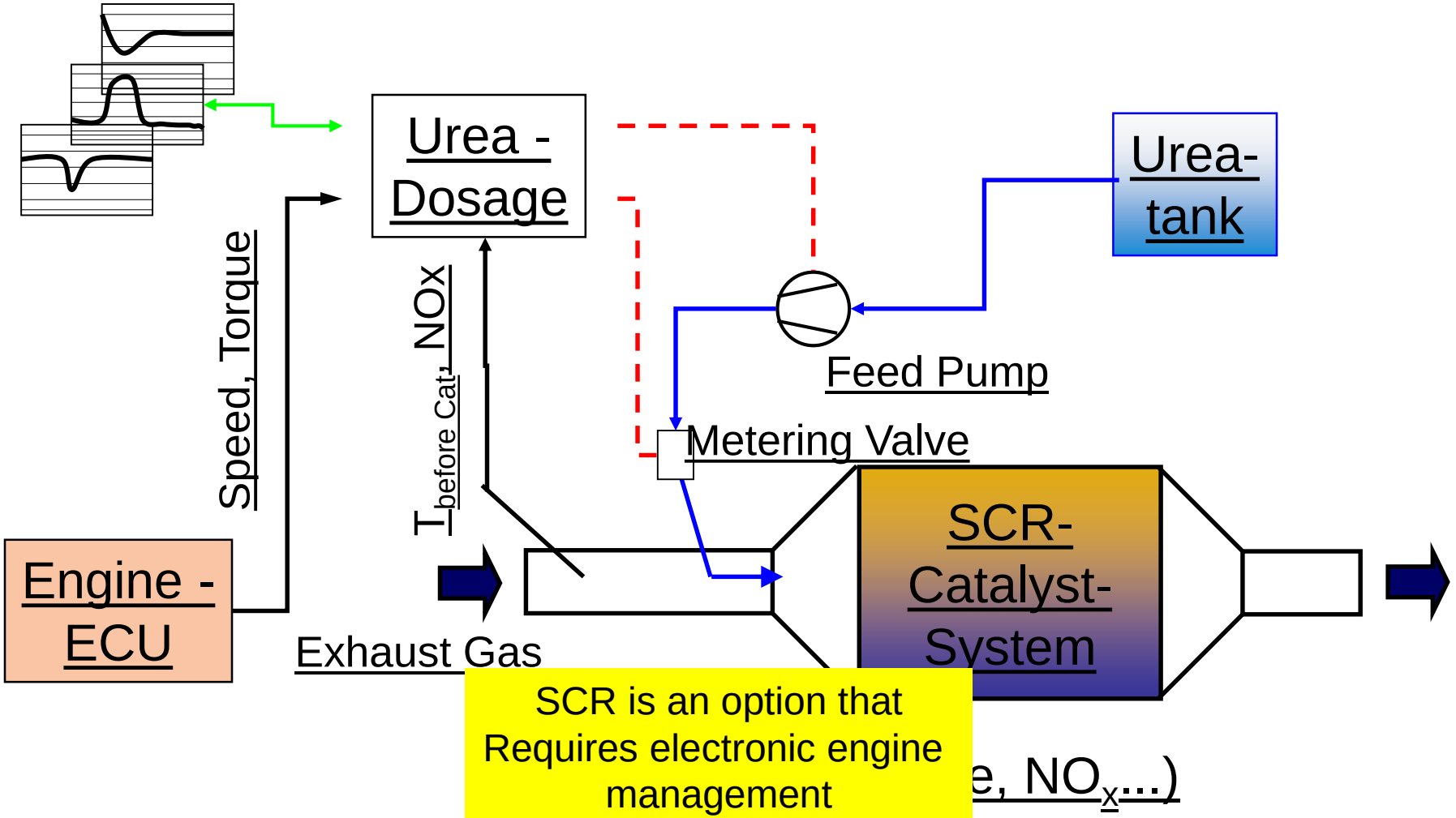
Catalyst-Substrate: open channels over entire length

Filters are efficient, but need Regeneration which will require engine calibration(ECU) and is an expensive option



Urea SCR-system for Nox Control

For BS IV Urea SCR is an alternative to DOC+Open Filter



SCR is an option that
Requires electronic engine management
either internal or external

Appropriate Solutions for India

- The Indian automotive market is different as apart from PUC, there is no check on the condition of in-use vehicles and no I&M.
- This implies a large difference in the condition of the vehicles on the road making it difficult to make vehicles comply to a definite jump from one stage to another
- The quickest and most easily implementable solution is the fitment of DOC on Trucks and Buses running on Diesel (prominent polluters)
- While this may only give an improvement of 20% to 30%, more efficient solutions such as open traps (filters) can be implemented but with caution as poorly engineered solutions may pose a safety hazard
- The use of SCR either with retrofit ECU (internal or external) along with DOC would give the best conversion but is complex and expensive to implement and sustain on road

Precautions in the fitment of Retrofit

- It is important to have Emission Control manufacturers work closely with OEM and agencies to select and authorize the proper fitment of the aftertreatment device
- There needs to be a mechanism for testing and qualifying retrofitted vehicles in order to ensure the quality and monitor performance
- For retrofits with traps and open filers or even DPF a regeneration regime needs to be built in as otherwise, accumulated soot would pose a fire hazard
- The use of SCR retrofit would need to an appropriate maintenance and support system to be instituted by he supplying agency to ensure proper functioning

Emission Controls Manufacturers Association

- Non-profit association representing 17 emission control solution providers for mobile & stationary applications

- ECMA works closely with the industry, government regulators, oil companies and general public by being a credible source of knowledge on emission control technologies

- ECMA organized seminars/conferences on the latest technologies being adopted globally to counter the menace of pollution act as ideal platforms for networking for the various stakeholders

Promotes the State of the Art Emission Control Technology Solutions through a Single Window

THANK YOU