The new developed Ashok Leyland BSVI aftertreatment system

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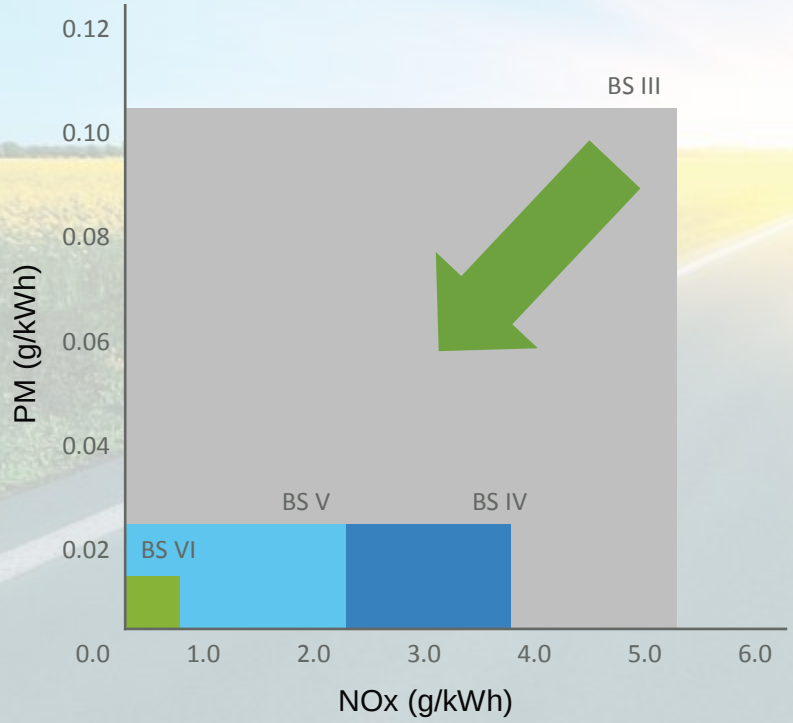
BS 6 will create a significant reduction in PM and NO_x Emission of Trucks

A drive towards Cleaner Future



BS VI **X 36** trucks

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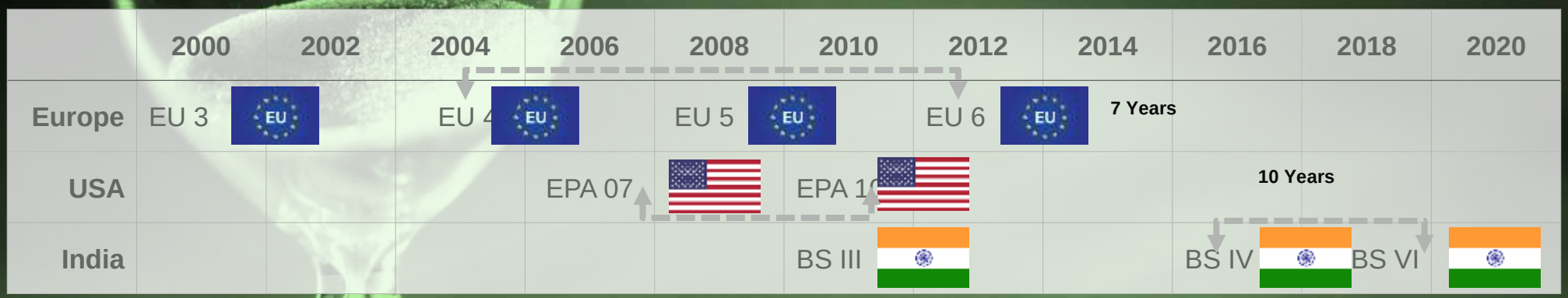
BS I **X 1** truck

**considering PM*

India moved directly from BS 4 to BS 6 in much shorter time than EU or US



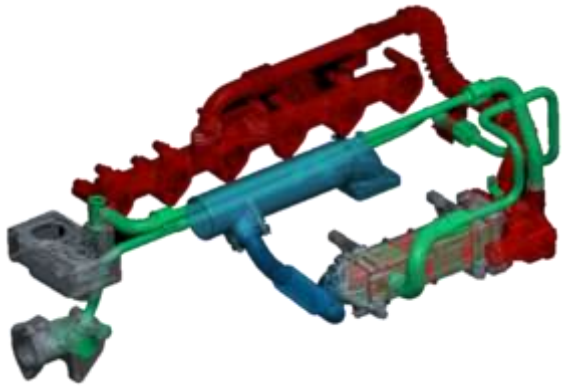
Ready for Global Markets

- Fastest Development
- Right Strategy
- Exhaustive Validation
- Mass Production

BS VI Level – Emission Reduction Technology

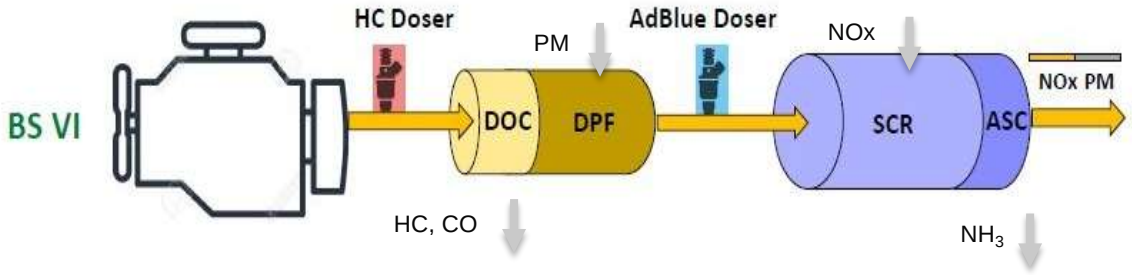
Emission Control

- in-cylinder

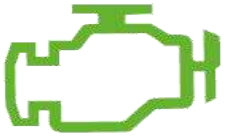


iEGR

- exhaust aftertreatment



BS 6 Approach



SCR Efficiency

Massive EGR

High EGR + DPF + Low SCR

0-60%

60-92%

Suitable only till BS IV

Low EGR + DPF + Medium SCR

92-95%

Medium NOx Strategy

✓

High SCR

High Thermal Requirement

Less suited to Indian Condition

✓ Better TCO

✓ Future Proc

✓ Less Ad Blue

✓ High Durability

✓ More Robust Choice

✓ Low Maintenance Cost

A Proven Synergy

ASHOK LEYLAND

Aapki Jeet. Hamari Jeet.

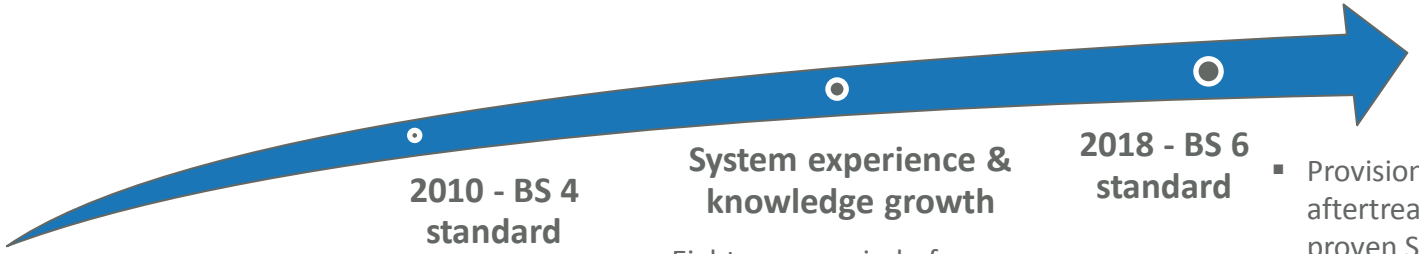
EGR

SCR

over 2.2 Lakh Vehicles Domestic

over 1 million kits globally

Gradual development of emission technologies by Ashok Leyland to meet increasingly stringent Bharat Stage emission standards in India



2010 - BS 4 standard

- Intelligent EGR system & SCR based aftertreatment to fulfill BS 4 emission standard

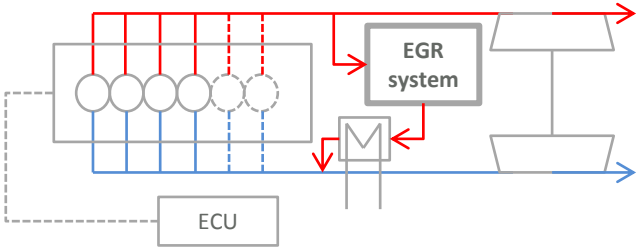
System experience & knowledge growth

- Eight years period of ever-expanding knowledge & experience within BS 4 & upcoming BS 6 emission standard

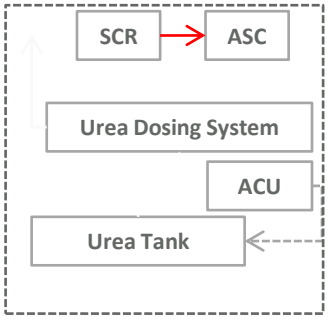
2018 - BS 6 standard

- Provision of an innovative aftertreatment system based on proven SCR technology including DOC & DPF system to fulfill following emission standard BS 6. Contribution of Albonair Euro 6 experience for BS 6

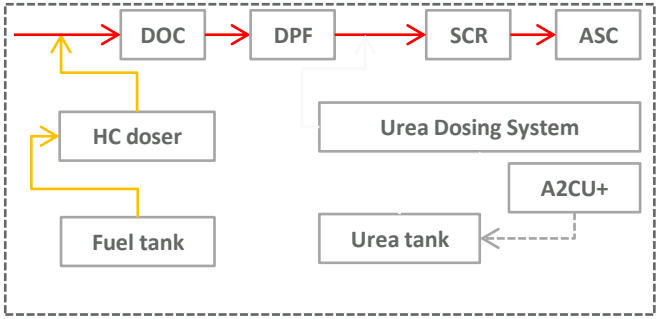
BS 4 with EGR system



BS 4 with SCR based ATS



BS 6 system with EGR and ATS with SCR , DOC & DPF



Aftertreatment Control Unit

Modular, stand-alone aftertreatment control unit used for all engine variants

Aftertreatment control unit

- Dosing module actuation
- Dosing strategy module
- DOC strategy
- System monitoring functions
- HC doser actuation
- DEF heating strategy
- Functional safety
- Regeneration strategy

BS 6 project scope – common parts for all versions

UDS (dosing unit)

control unit

nozzle

HC doser

Level/Q-sensor

Delta-P sensor

PM sensor

NOx sensorchange

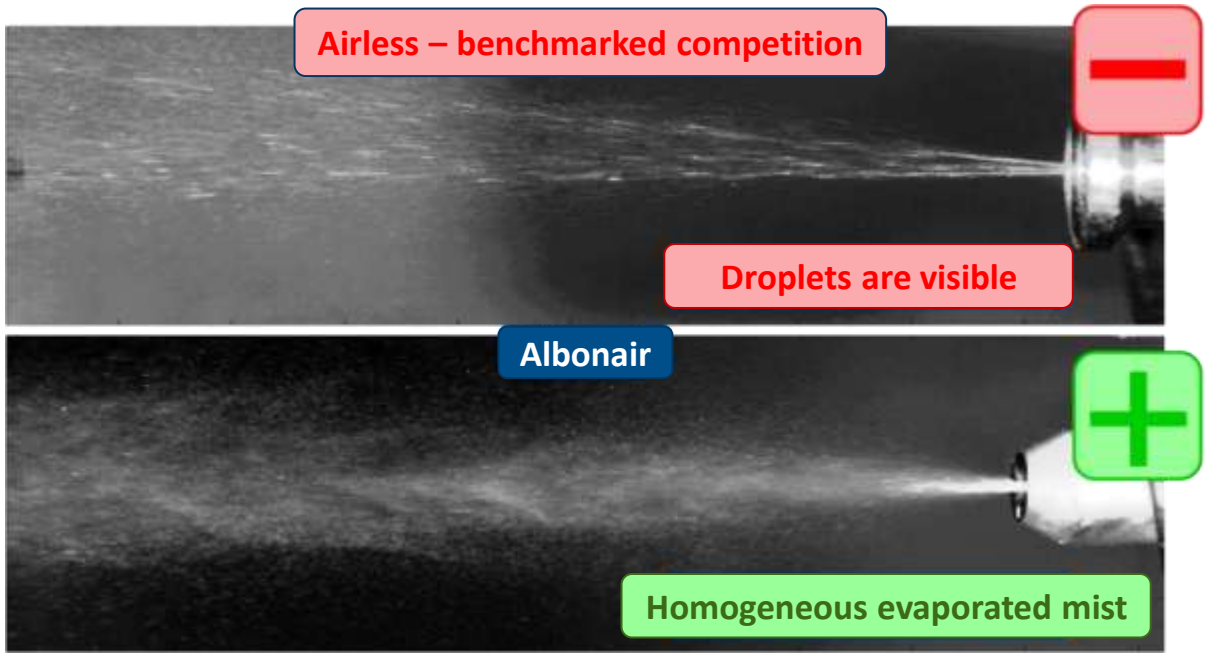
Temp. sensor

Patented Albonair dosing nozzle with superior spray quality compared to airless systems allows flexible positioning of the system

Albonair Dosing Nozzle

- Spray Quality of < 15 µm SMD – much finer spray quality than of airless systems
- Extremely heat resistant dosing nozzle (up to 800 °C) without cooling
- Suited for close coupled position
- Very Compact design (110 g) with great installation flexibility
- No mixer for droplet decomposition required
- Avoiding DEF deposit formation
- Spray angle: 20 °

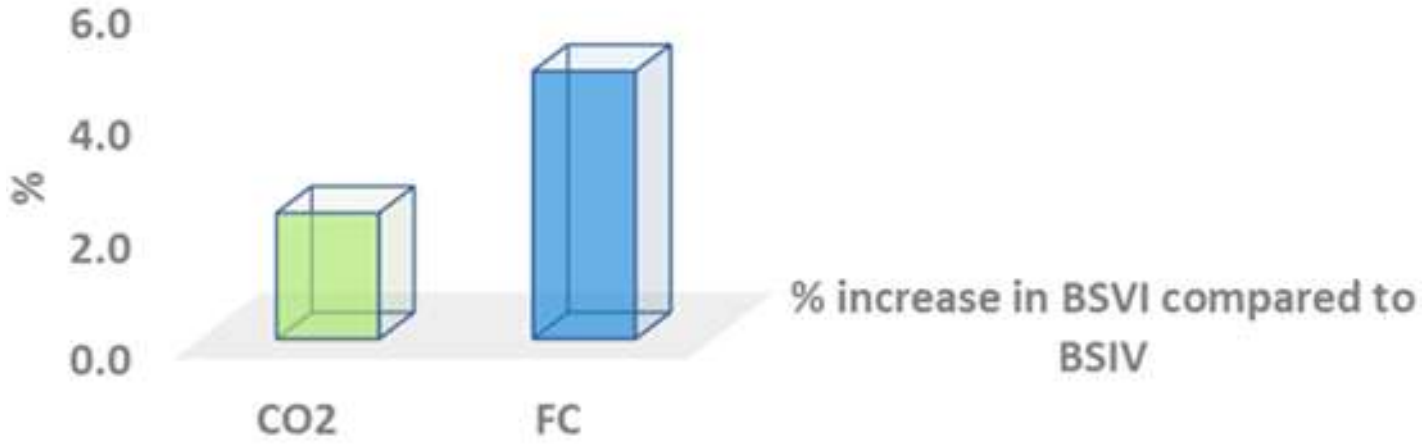
Comparison of spray quality



On-road trials

- in total more than 5 million km with test vehicles up till now
- in total more than 10.000 hours on the engine test bench

BS 6 will increase fluid fuel consumption only 2 % fuel plus 3 % AdBlue®



- The fluid economy of B 6 compared to BS 4 is higher by 5 %. This is due to Engine Fueling + HC dozer + Urea Dosing, whilst in BS 4 it was only engine fueling (iEGR for after treatment)
- CO_2 increase of 2.5 % is seen in BS 6 compared to BS 4

Localized production

- local for local approach
- Albonair UDS and tank assembly production in Ennore
  - automated UDS production line
  - clean room to fulfill cleanliness requirement
  - experienced and creative management team
  - modern professional equipment

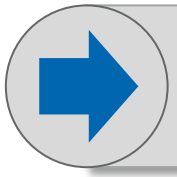
DPF Service will be established

- Diesel engine emissions contains ashes
- Source for ashes is mainly the engine oil
- For BS 6 a low ash oil is mandatory
- DPF will need cleaning after 300.000 km to 500.000 km
- The design of the exhaust aftertreatment system is suited for easy exchange of the DPF
- The DPF will be cleaned by Albonair and AshokLeyland service
- Professionally cleaned Albonair DPF will again have the full warranty

Conclusion

- BS 6 system is a combination from EGR system and SCR system used by Ashok Leyland for BS 4
- Experiences of Euro 6 were transferred to BS 6.

  NOx emissions in BS 6 compared to BS 4 are greatly reduced
- Exhaust Emission Systems have good reliability and performance (more than five million kilometres of testing)



Albonair and Ashok Leyland are ready for BS 6