Escorts Kubota Limited

Tractor Application – Challenges of DPF implementation in off road segment

Shakti Kumar Singh,
Escorts Kubota Limited
Faridabad

Agenda

1. Escorts Kubota Limited (EKL) Overview
2. Off road Emission : Overview
3. Indian Tractor Industry : Volume and Power wise distribution
4. **Challenges of DPF implementation in off road segment**
5. Summary
6. Thanks

Escorts Kubota Limited (EKL) Overview

Our Current Businesses

Escorts Kubota Limited

Revenue **FY24: ₹ 8,776.7 Cr.**

Agri Machinery

Advanced agri-machinery solutions to enhance agricultural productivity and add value to farmer's life

69.7%

Construction Equipment

Vast range of construction & material handling equipment to support India's infrastructure growth

19.5%

Railway Equipment Division

Wide array of products to modernize Indian Railways

10.8%

Standalone numbers

Agri Machinery

Powering The Dreams Of Farmer

Escorts Kubota Limited (EKL) Overview

Construction Equipment

1) Material Handling

2) Earth Moving

3) Road Construction

Escorts Kubota Limited (EKL) Overview

Escorts Kubota Limited

Railway Equipment Division

Escorts Kubota Limited (EKL) Overview

Kubota
Escorts Kubota Limited

Engine Application Business

Variable Speed Engines

25-110 HP

Fix Speed (Genset) Engines

7.5-125 KVA (18-156 BHP)

Escorts Kubota Limited (EKL) Overview

Kubota
Escorts Kubota Limited

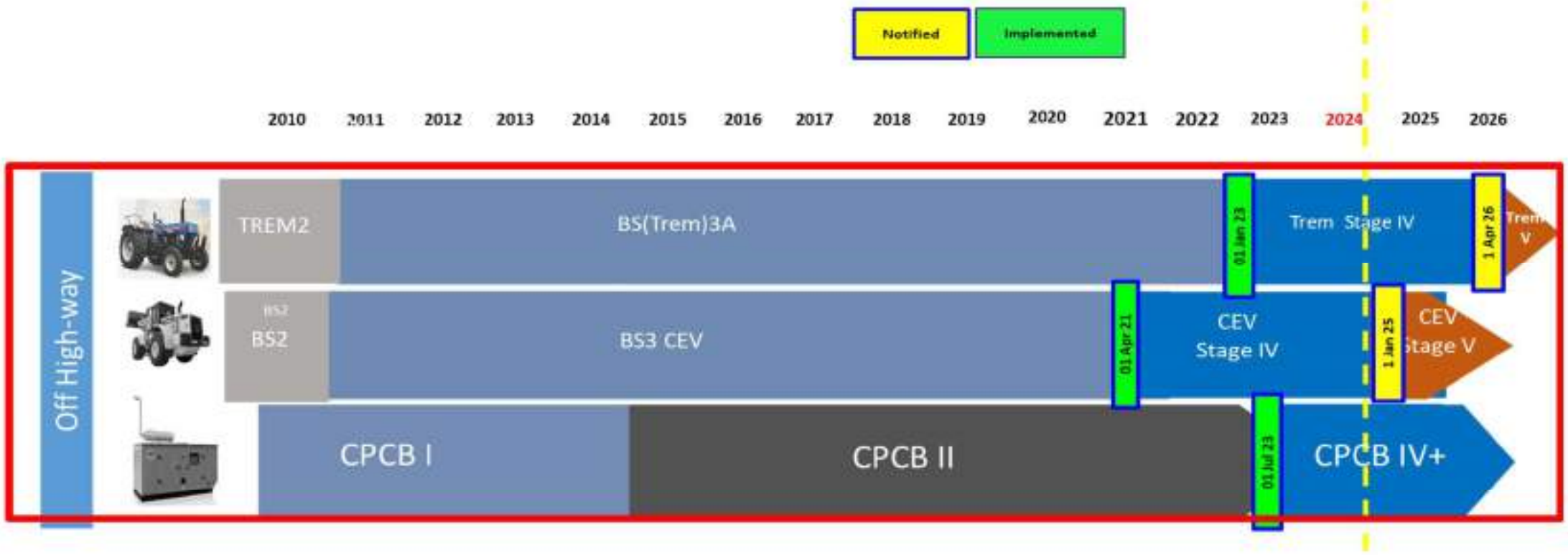
Our Global Presence

TRACTORS PRESENT IN

70 COUNTRIES

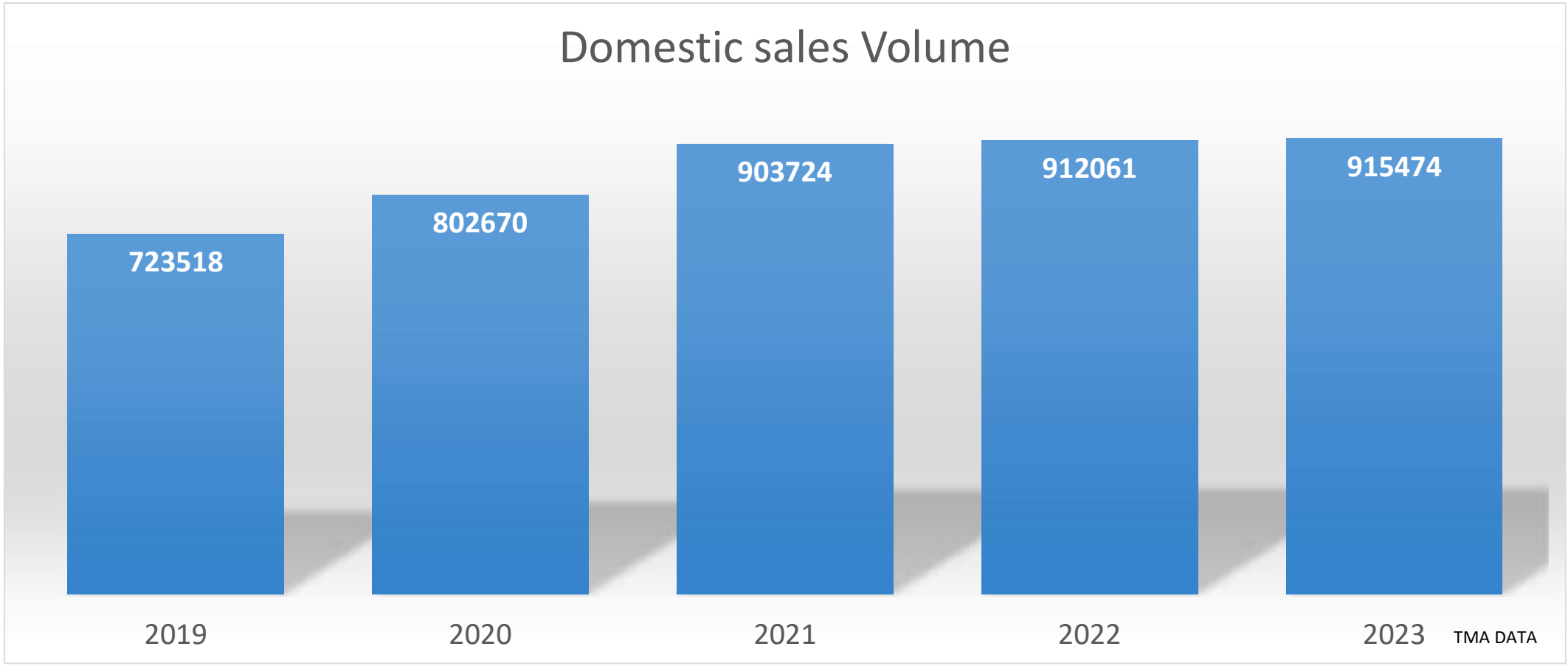
Emission Roadmap | NRMM | India

Escorts Kubota Limited



Indian Tractor Industry

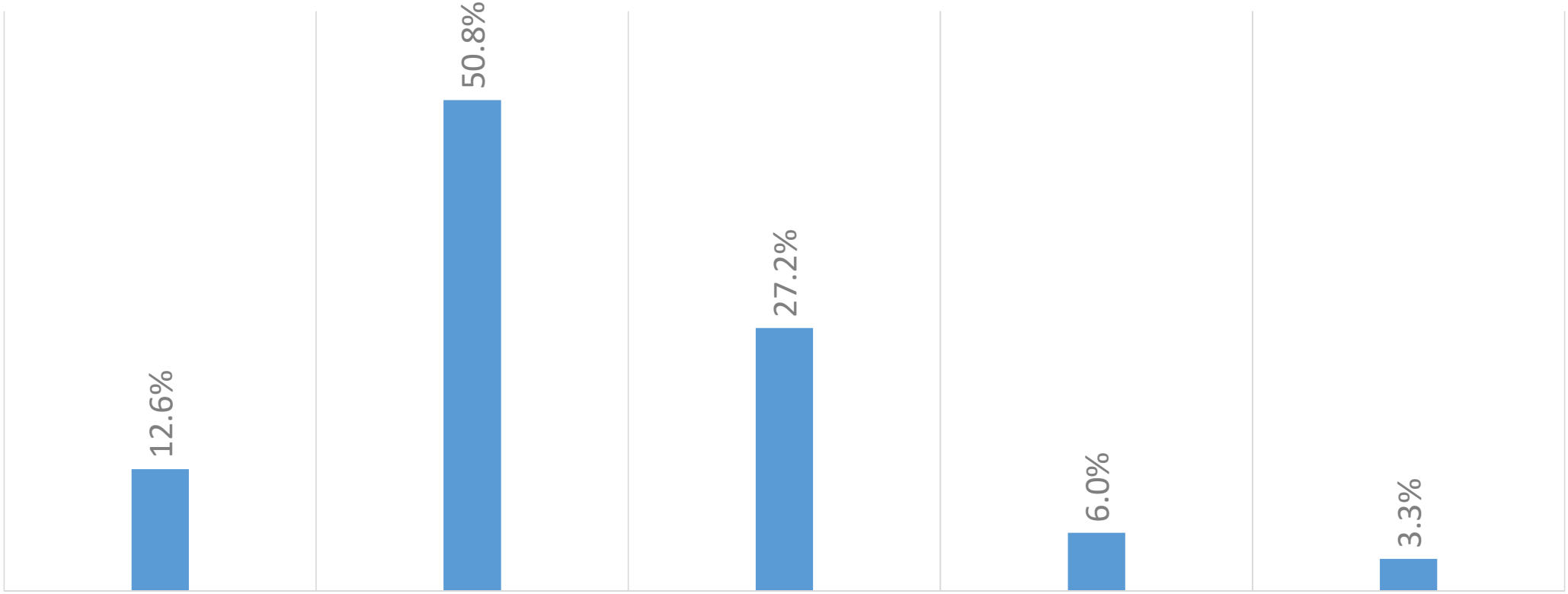
Escorts Kubota Limited



Indian Tractor Industry

Escorts Kubota Limited

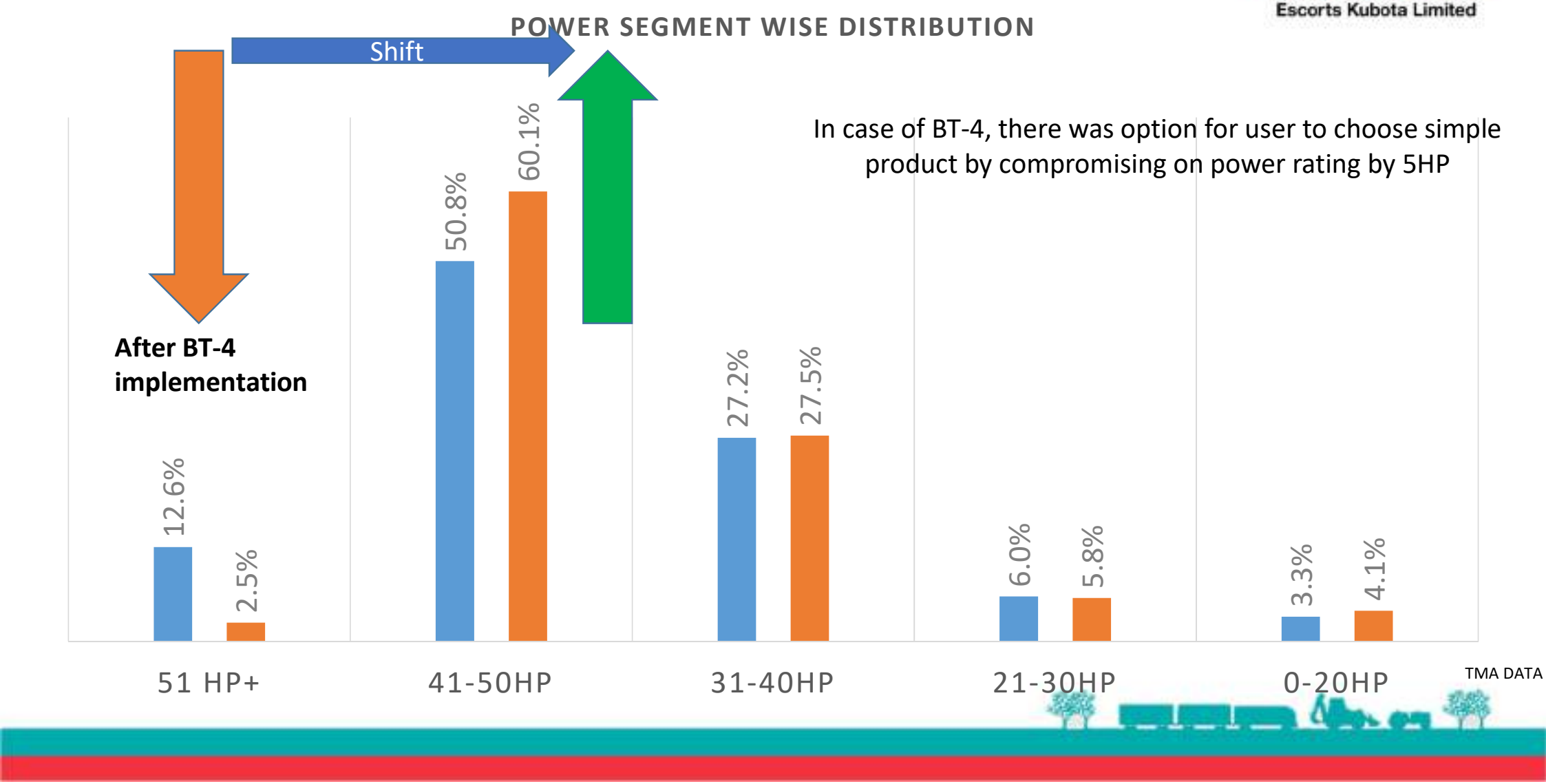
POWER SEGMENT WISE DISTRIBUTION



TMA DATA

Indian Tractor Industry

Escorts Kubota Limited

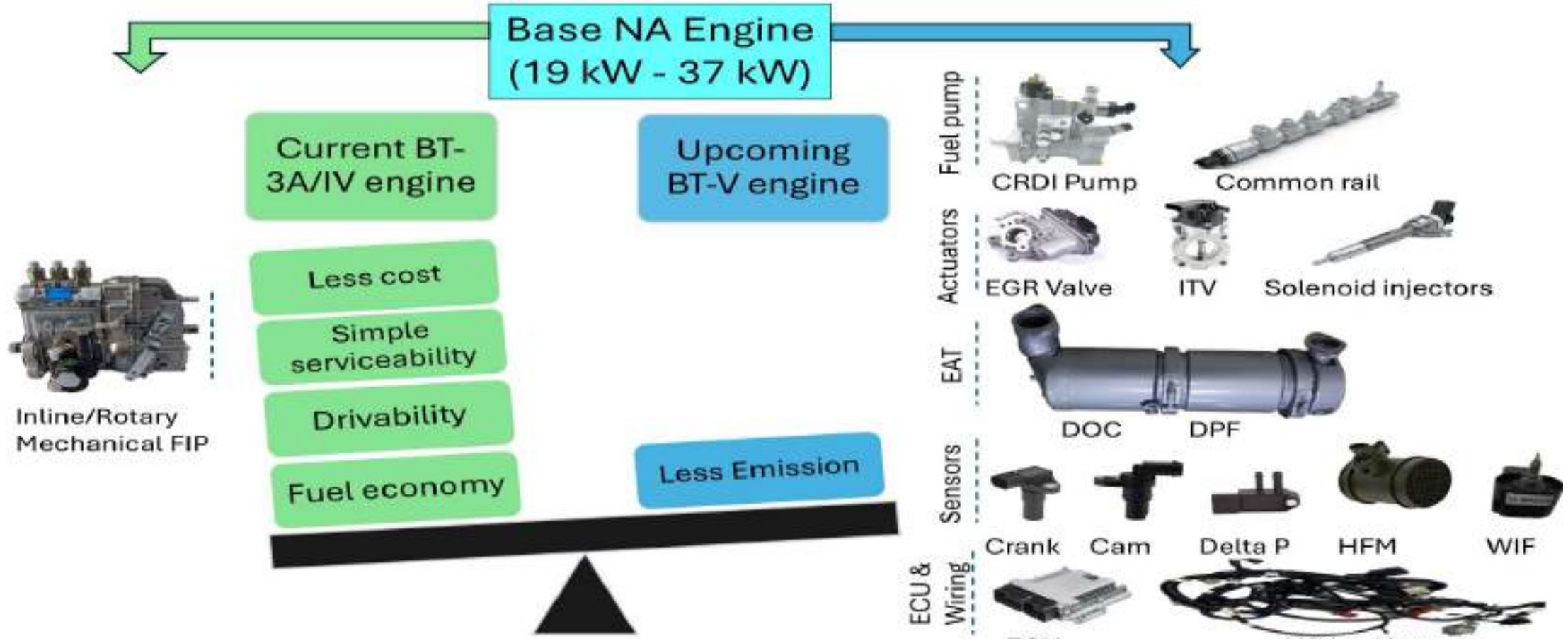


In case of BT-4, there was option for user to choose simple product by compromising on power rating by 5HP

TMA DATA

Change Content to meet BT 5 from BT3A Engine

Escorts Kubota Limited



After TREM V

All ~90% engines will be updated with DOC+DPF for PM and PN control and there is no such option to choose simple product even by compromising 10-20HP w.r.t. expectation.

Indian Tractor Industry

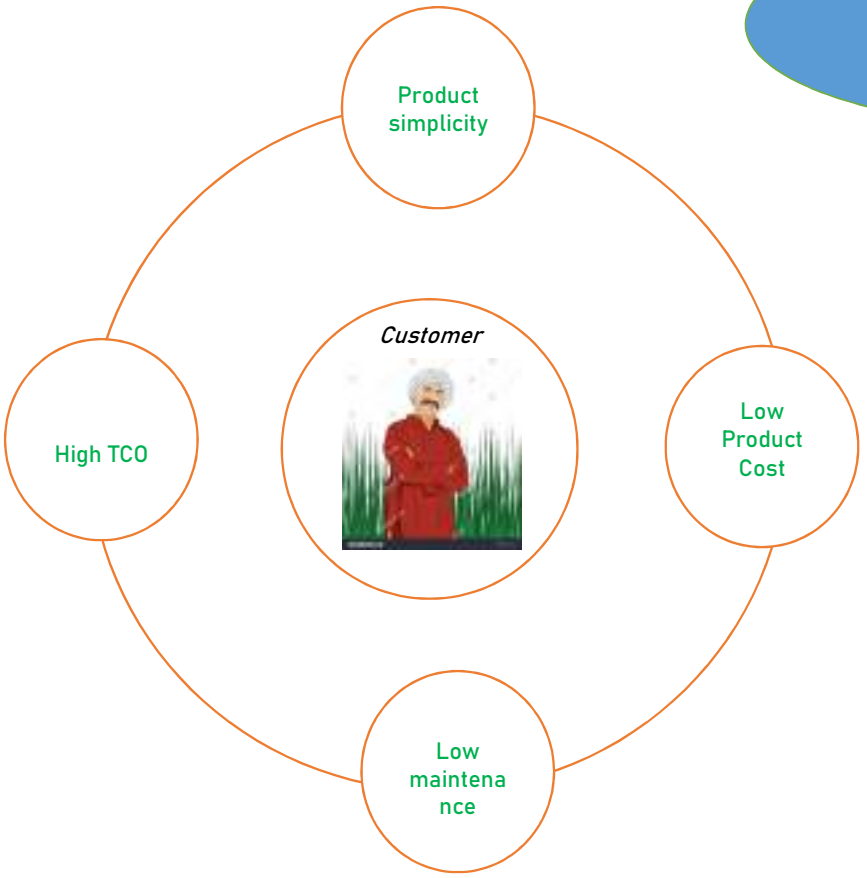
Escorts Kubota Limited

50+ Implements being used in India having different Duty cycle w.r.t. Soil condition, weather conditions and user

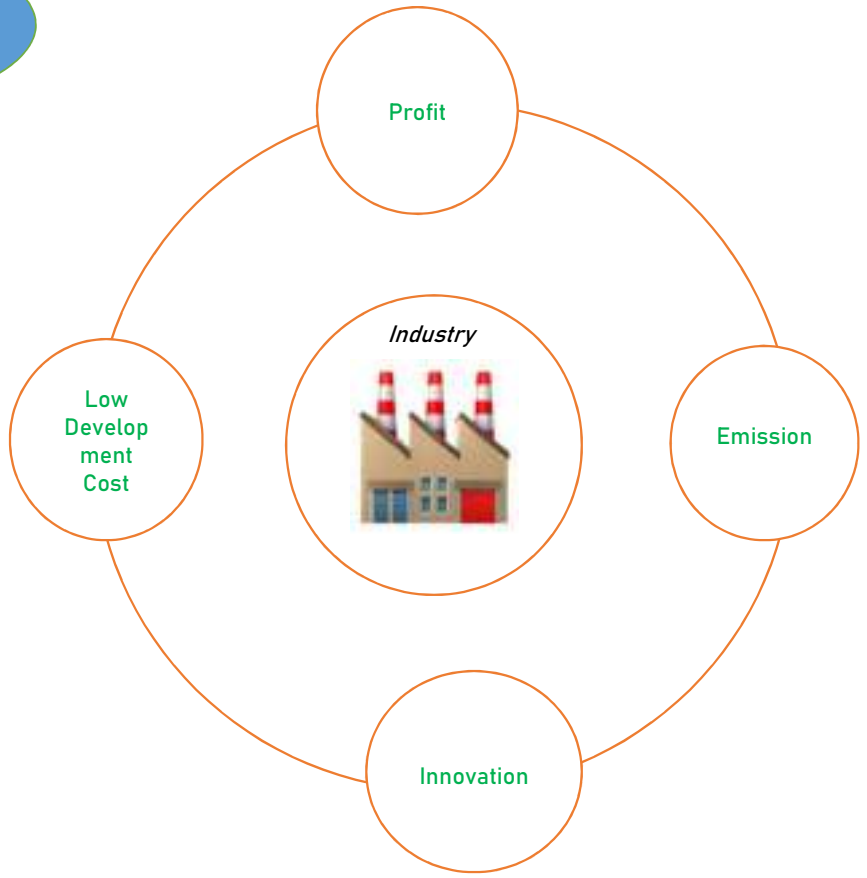
Bharat Trem V – Development Philosophy overview

Escorts Kubota Limited

Bharat TREM V Development Goals



- *Happy Customer & Profitable Industry will ensure Successful TREM V implementation in India*



Bharat Trem V –Conflicting Development Targets between Engine & EAS Development

Escorts Kubota Limited

Engine Set up for BT V

Product simplicity

Profit

Customer

Industry

High TCO

Low Product Cost

EAS System

Low Development Cost

Emission

Optimized combustion & FE Improvement

Engine Component robustness (cyl head, EGR Valve, T/C)

Low maintenance

Innovation

- *A Proper Optimization approach is mandatory for Engine & EAS development, to balance customer satisfaction & Business profitable*

Introduction of Advanced diagnostics will cause major shift in Customer behaviour

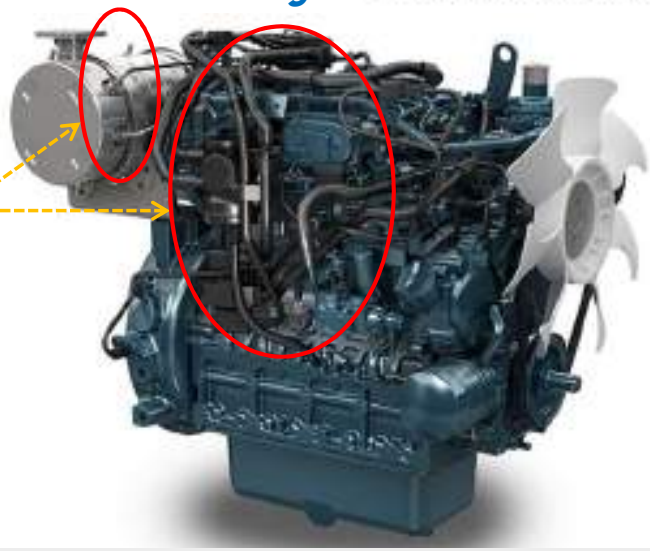
Escorts Kubota Limited

BT IV – Engine

Major Changes

1. ***EAS***
2. ***More Complex Wiring set up***
3. ***Introduction of extra Sensors for DPF Monitoring & Performance Assessment***

BT V – Engine + EAS



Customer Probable Concerns

- ***Frequent Breakdowns***
- ***Low Productivity***
- ***Derated engine***

- *Robust Systematic Validation of added complexity in Real Operating Conditions can Mitigate Customer Concerns largely , a strong Service support can help to ease customer life further*
- *On highway segment faced similar problem during BS IV to BS VI Migration but successfully overcame the same*

Introduction of EAS (DOC + cDPF) introduces more variables in daily operation

Escorts Kubota Limited

New parameters to be monitored

1. Errors on cluster

2. Regeneration indications in Clusters

Customer Probable Concerns

- ***Too much monitoring***

" I want a error free system "

- *Optimized EAS Sizing with 100 % passive regeneration system can be a way forward*

Or

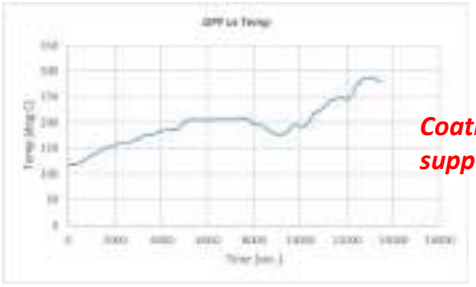
- *Optimized EAS Sizing with robust Automatic Regeneration can be another way forward*

EAS (DOC + cDPF) Optimization Challenges for OEM's – to support Customers

Escorts Kubota Limited

A system wise Optimization approach is mandatory for Engine & EAS development, isolated development will result in sub optimal Performance which will results in failing of BT 5 Products

- Regeneration Free/High Regeneration Frequency – EAS systems
  - 100 % Passive or Robust automatic regeneration (Cost vs Calibration effort)
  - Challenge of Low Temp Duty Cycles



Coating technology improvement to support Passive Regeneration & Exotherm in Less than 250 degC ??

- High Ash Cleaning Interval
  - This involves new development of Robust Engine Hardware to mitigate this service activity
- Optimum EAS sizing
  - This is critical for regen frequency, Ash cleaning interval
- Slow ageing & deactivation of catalyst
  - Critical aspect for ensuring B10 targets in different duty cycles and temperature profiles

Escorts Kubota Limited

In-service monitoring

Bharat Stage (CEV/TREM) IV and V emission regulations notified vide GSR 201 (E) dt. 5 th March 2018. As per GSR, In-service conformity check will be mandatory for all Bharat Stage V engines from April 2026

Actual duty cycles will differ from NRSC and NRTC test cycles. So, similar to automotive applications, monitoring of real driving emissions (RDE) by using Portable Emission Measurement systems (PEMS) will be required

Escorts Kubota Limited

In-service monitoring

PEMS installed on a car (Source : Bosch)

PEMS installed on Compact Tractor (Source : Kubota)

Clear Indication of ISC (CF) implementation is Not available ?
Significant Impact on EAS & Engine Development expected due to ISC Implementation

Summary

We as EKL Engine R&D Team have developed all the capability inhouse to meet TREMV challenges. EKL is equipped with state of the art engine testing facility, design facility and simulation facility inhouse.

EKL in past have developed BT-3A, BT-4, EU Stage V engines and geared up for developing TREMV engines now. EKL R&D inhouse capability, manufacturing setup are improving day by day after our association with Kubota Corporation.

As Kubota is No-1 industrial engine manufacturer in up to 100HP power segment having >100 yrs of Diesel engine design and development experience. Annual production of Kubota Engines were ~ 1.1 million last year and now after EKL joining to Kubota Corporation all the technology, learning and experience transfer will be applicable for EKL Engine R&D.

This is opportunity for all the suppliers, technology partners, service provider and Engineers to develop reliable, cost effective TREM V engines for Indian tractor as well as off road Market.

For Tractor Industry : we are going to experience Transformational Change in Technology as well as culture and would be an experience in itself.

THANK YOU

Escorts Kubota Limited