Fleet Analytics using MATLAB to build strategies for BS VI Development

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Air pollution in India is at all time high, so life in Indian Cities is getting worse and risk of health hazards like respiratory and skin problems are increasing at an alarming rate, one of the contributors for this scenario are Automobiles.

Considering this situation Government has decided to implement stringent emission norms by leapfrogging from BSIV to BSVI skipping BSV Emission norms.

Honda being a responsible company is determined to deliver its low emission products as per by government policies. Therefore we have used latest technology of DPF Systems to deliver cleaner vehicles as per our environmental commitment of “Blue skies for our children “.
**BSVI Emission norms for Diesel Vehicle**

- **DSM/SCR**
- **EGR Tradeoff line**

**DPF Schematic**

- PM collection
- Exhaust gas (with PM)
- Exhaust gas (without PM)

**DPF Regeneration Flow**

- PM collection
- Regeneration
- PM removal

**DPF Regeneration Control**

- When estimated PM amount is over the threshold, DPF system will burn PM by increasing exhaust gas temperature.

- **High vehicle speed** is the desired condition for regeneration as the Exhaust temperature is high.

DPF is required to meet BS VI 2020 emission norms in Diesel vehicles.
Indian Customers driving data was analyzed to finalize DPF strategy for Indian Market.

**Traffic condition**

Heavy traffic: Exhaust temp cannot rise to desired value to trigger regeneration due to low vehicle speed and frequent start stops.
Indian Market Study
Process Flow For Indian Market Study

1. DATA Acquisition (Indian Market)
2. DATA Analytics
3. Results Interpretation
4. DPF Strategy Development
DATA collected from the Market Survey was huge, conventional tools like excel were inefficient so MATLAB was used.
Data Pre-processing

Raw Data
Import to MATLAB
Data Categorization
Filtering Noise from data
Target Data (Ready to be Analyzed)

- Initially the Raw Data was not categorized in the desired format.
- Using MATLAB this raw data was Categorized and filtered in the Desired format.

Program to segregate customers from raw data
Program to segregate Driving cycle of each customer

Raw data needs to be Categorized and filtered before it can be used for feature extraction.
Domain level expertise and MATLAB programming was used to extract all mentioned and not mentioned features from the limited target parameters.
Data Analytics

3 Challenges

i. **Data processing time was very long** due to the huge amount of data, Hence Code optimization and parallel-processing tools were required.

**Solution**

- **Parallel Computing**
  This toolbox allows the desktops to use their multicore processing capability by executing applications on workers that run locally.

- **MATLAB Distributed Computing Server (MDCS)**
  Allows to run programs on computer clusters, and then scale up to many computers by running it on MDCS.

The **Processing time was considerably reduced using these toolboxes and in future also we can easily scale up to Terabytes of data through Honda internal servers and MathWorks tools.**
ii. MATLAB Coding: As per our Development goals, Advance MATLAB Coding Skills were required to be attained in limited time to meet project timelines. Through trainings and multiple trials, required coding skills were developed with the support of MATLAB team which was useful for our Project Completion and future developments.
Results Interpretation

Customer Results were analyzed on the basis of different parameters like average speed, average mileage, etc for
- Individual Customer
- Region (City)

For deciding Final DPF Strategy and Calibrations for Indian Market.

These results were necessary in determining Honda’s strategy for BSVI Development.
CONCLUSION

- Indian Customer’s Driving Pattern and Indian Traffic Conditions were analyzed using MATLAB which were used to decide Honda’s BSVI strategy.

- MATLAB tools were found very effective for this type of analysis and the support from MathWorks engineers is appreciated.

- Through this project Honda have developed know how and infrastructure to handle big data, so in future this type of analysis will be used for further development of research models.

FUTURE SCOPE

- Honda will continue Big data Collection and Analysis for development of Hybrid & Electric Vehicles

- MATLAB GUI for fleet analytics will be prepared to reduce testing and development time
THANK YOU