



AVL  
Application  
Services

› CASE STUDY

# New Approaches in Development and Testing

@ Ford Motor Company, Dunton

## SUMMARY

Today's OEMs need to adapt new approaches in development and testing to fulfil market requirements as well as react in terms of cost, quality and time pressure. Looking at FORD Motor Company, Dunton, AVL supported through Application Services to increase testing output and to specify an optimized approach for reaching engine performance as well as emission targets in a diesel calibration project.

## CHALLENGE

The main drivers in today's powertrain development are:

- Decrease in costs
- Shorter development time
- Increase in quality (first time right)

These can in the same way be applied to the operation of testing facilities which represent a big asset and need to be appropriately utilized to justify the investments made by OEMs.

Driven by market and legislative demands, the complexity of the powertrain is steadily increasing. This forces the development to apply latest development methodology,

Fast Facts	
Customer/ Department	FORD Motor Company, Dunton
Country	UK
Challenge	Increasing test output and specifying an optimized approach to reaching performance and emission targets in diesel calibration.
Solution	<ol style="list-style-type: none"> <li>1. Advanced automation</li> <li>2. Standardized test procedures/library</li> <li>3. A model based calibration approach to show the potential and limitations of customer engines</li> </ol>

testing strategies and equipment which represents a raise of complexity in itself.

In the following example the challenge for FORD Motor Company, Dunton, was on the one hand to increase test output with at least the same or higher quality level and on the other hand to specify an optimized approach to reach performance and emission targets in diesel calibration.



Allan Mulally, President and CEO of FORD, congratulates the project team on their success.  
Source: Ford Paper 4<sup>th</sup> International Symposium on Development Methodology, 2011.

THE ACHIEVED IMPROVEMENT EXCEEDED EFFORT REDUCTION BY 50% IN THE PILOT TEST ROOMS, CORRESPONDING TO MORE THAN 100% EFFICIENCY IMPROVEMENT IN TESTING.

Source: Ford Paper 4<sup>th</sup> International Symposium on Development Methodology, 2011.

## SOLUTION

The solutions proposed by AVL Application Services experts on site concentrated on two main areas:

### 1. Advanced automation / standardization

To increase the testing output various measures can be implemented. In this case, the focus was put on maximizing the utilization and data collection rate. An optimized set up of the overall system was used. This includes all available equipment and emphasizes the possibilities of combined functionality.

As part of this solution, custom specific subroutines and standardized testing procedures have been developed. Examples of such are the following:

- On demand handling of various measurement devices in parallel, such as calibrating, purging, zeroing to allow extended unmanned operation with consistent data quality
- Advanced limit handling to prevent test abortion during automatic running
- Customer specific library of standardized tests for gasoline and diesel testing using advanced methodology and functionality of PUMA Open and CAMEO
- Online data quality checks

### 2. Optimized approach to reach performance and emission targets

At the same time, a model based calibration approach was taken in a specific diesel calibration project to master the development targets fulfilling actual European emission limits. Within this, AVL demonstrated the potential of model based calibration covering the individual steps from:

- DoE test design
- Test execution
- Raw data analysis
- Modeling and optimization
- Result verification

## RESULT

The result of the above mentioned measures was published by FORD Motor Company.

Using the entire testing equipment to its full capability led to an increase of utilization by 100%. The delivered library of standardized testing procedures significantly reduced test preparation time and in combination with advanced automation techniques sustainably ensured high data quality and first time through rate (>97%).

The result of the model based approach shows:

- The real potential of the engine towards EURO emission levels and uncovered limitations due to engine hardware
- A significant decrease in calibration time by more than 50% (from 9 weeks to 4 weeks)
- High quality of measurement and result data

In addition to the achievements mentioned above, AVL's Application Services gave the customer the possibility to understand the full capabilities and opportunities of all systems involved. Necessary steps for integration into development process and the customer environment have been shown.

## OUTLOOK

The previously described project had been delivered on four testbeds and a single diesel and a single gasoline project.

Possible and logical next steps for a comparable project would be a discussion on how to rollout the proven concepts to all testbeds and all calibration projects.

This would have to take into account organizational necessities and would need to involve the qualification of personnel as well as creating acceptance for these new approaches and trust in the tools provided.

Reference Paper: Ford Dunton Powertrain Test & Development Efficiency Pilot, 4<sup>th</sup> International Symposium on Development Methodology, 2011, Wiesbaden, Germany, ISBN 978-3-00-032670-7, [www.avl.com/Application-Services](http://www.avl.com/Application-Services)

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