Measurement System Experts

„The topic, data analysis, is now on solid footing. X-Frame is restricted to the right places, however at the same time it allows us to adapt and extend the analysis system without major effort"

Dr. Michael Röbel, Director Test Facility Support – Invest & Test Bench Construction, DEUTZ AG

Project Profile

Customer:	DEUTZ AG
Sector:	Diesel engines
Project:	DEUTZ Evaluation Tool (DET)
Task:	Replacement of the previous, DEUTZ-specific analysis program, provision of a uniform, future-safe standard for measurement data analysis, fast retrieval of test data
Solution:	Custom analysis system based on established standard software, optimized data organization, multi-level support and training concept
Software:	measX X-Frame and National Instruments DataFinder Server Edition
Key indicators:	More than 60 engine test benches, approximately 50,000 tests per year

Tool Box for the Engineer

DEUTZ AG – Flexible Analysis System for Engine Test Data

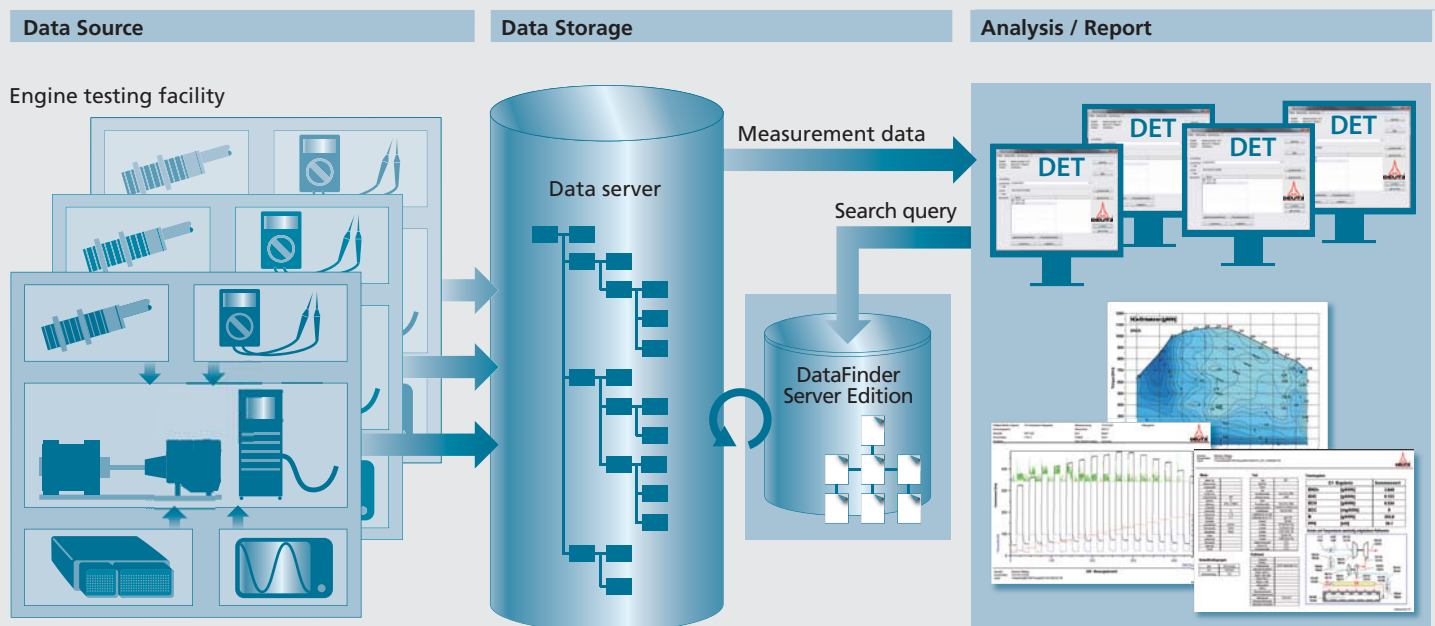# The Right Analysis for each Engine Test

The Starting Situation

DEUTZ AG is one of the world's leading, independent manufactures of diesel engines for commercial vehicles and engine-driven devices. In the area of research and development at the Cologne-Porz location, more than 60 different engine test benches from different manufacturers are used to test engines and their components. Not least, due to new, legally-prescribed environmental standards, the test requirements have significantly increased over time. Today, approximately 50,000 tests are executed in the DEUTZ engine testing facility each year. Previously, the measurement data obtained was analyzed with a variety of different software tools and an internally developed analysis program. However with these resources the requirements imposed by ever more complex analysis tasks and the constantly increasing flood of data could no longer be satisfied.

The Task

For analysis of test data a uniform, powerful, and future-safe system was sought for all technical departments. This software should cover all the functions of the old system as well as take new requirements into account. It was desired, that DEUTZ could maintain the analysis tool on its own, and that the measurement data once obtained, could also be quickly and easily retrieved, even after longer periods of time.

DEUTZ Evaluation Tool – Structured Data Organization and Convenient Analysis Possibilities

Data Source	Data Storage	Analysis / Report

Engine testing facility

Data server

Measurement data

Search query

DataFinder Server Edition

DET

Practice-oriented solution for the DEUTZ engine testing facility:

- x Uniform organization and analysis of large quantities of data
- x Individual analyses and reports
- x Central maintenance
- x Flexible extension
- x Future-safe

powered by
XFrame

Our Solution

The DEUTZ Evaluation Tool (DET) was developed in close collaboration with the customer. The core of the system is the measX software X-Frame, which is based on DIAdem from National Instruments. Diadem is an established, powerful tool for management and analysis of measurement data, and X-Frame supplies the platform, from which DIAdem is adapted to individual requirements and boundary conditions. X-Frame already provides all the basic functionalities; then parameters are assigned on a customer-specific basis for the algorithms of the analysis, dialogs, user interface, and program control. The basic DET system with a newly organized data repository and a base stock of DEUTZ-specific functions was set up in a few months. The pilot users were instructed and were able to create the department-specific formulas and layouts themselves, supported by measX as needed. The extensive formula repository, which had grown over decades, and consisted of approximately 800 formulas, was cleaned. Functions of the old system that were still required were taken over, formulas were summarized, and new functionalities and types of analyses were integrated in a requirements-oriented manner.

**Parameter Assignment instead of Programming**

With the DET system, for each test users can freely assign parameters for all formulas and analyses without special programming effort. In this regard X-Frame offers an extensive formula library and additional functionalities, including a formula editor and a special formula debugger. The formula debugger graphically presents the calculation method and all intermediate results so that even complex formulas can be conveniently and quickly analyzed. New formulas are commented directly in the source code, and from the source code a detailed help function is generated automatically.

Efficient for Custom Evaluations

Custom-tailored entry screens and menus support the typical work procedures of the engineers in the Research and Development organization. After selecting data, analysis type, and layout, the desired analysis processes run automatically. Whether an initial fast view of the data, or analysis of predefined tests – only the measurement channels, formulas, and attributes are loaded or calculated that are actually required, so that results are quickly present.

System Structure Guarantees Security

DET is started from a central network drive. Thus it is not just the system maintenance that is extremely easy. The system also ensures that every user automatically works with the up-to-date, tested version and that only reports are generated that are uniform and in line with corporate design requirements.
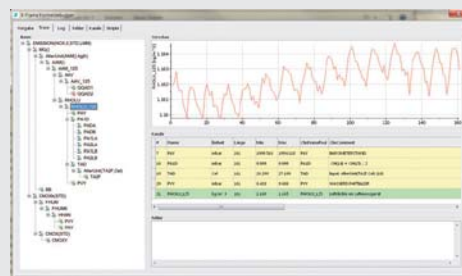
The formula debugger makes calculation steps and intermediate results visible.

In addition to the central application, for each user there are also personal work areas for defining custom formulas and layouts. If these analyses are interesting for a larger group of users, they can be made available – as a new tool for everyone – easily and centrally.

Report layouts as desired: For example, for the analysis of a standards-conformant C1 test.
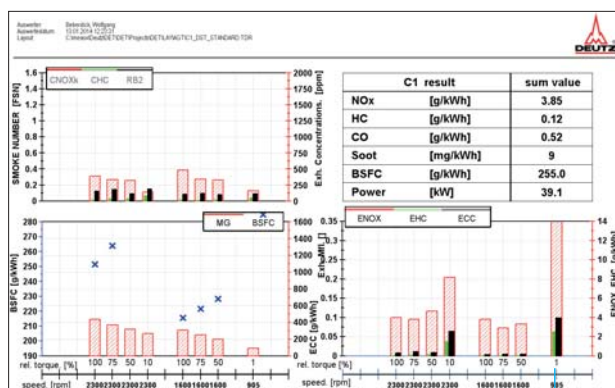
Open for all Data

The DEUTZ development testing facility is extremely heterogeneous: Data do not only come from the test benches, but also from engine control units, exhaust measuring systems, free temperature sensors, pressure sensors, and differential pressure sensors, as well as from additional measurement devices from diverse manufacturers. Depending on the test bench and test setup, a variety of different measurement data formats and structures occur. Data drivers developed especially for DET ensure that all data formats can be read and can be contiguously further processed.

Ordered Data Storage

Convenient data management has been implemented on the basis of the Data-Finder Server Edition from National Instruments. All test data is now stored in an orderly manner on a central file server. The DataFinder server monitors its directories and forms a "table of contents" for all data records with the respective associated descriptive information. For example, this includes information concerning the test bench, the units that must be used, or information concerning the test procedure. Via this metadata, specific measure-

ment data can be retrieved from DET. As part of the system introduction, more than 600,000 existing data records were integrated and were retroactively supplemented with metadata, to the extent possible.

In Practical Use

Today DET is the central analysis software of the Deutz Engine Development organization and is successfully used by more than 70 engineers. The level of acceptance is particularly high because the system significantly facilitates the day-to-day work.
Now users can quickly and specifically access more than 1.5 terabytes of measurement data. DET is a well thought out "toolbox"

for a wide variety of analyses. Even extensive formulas and layouts can be created and maintained in-house, and the documentation is automatically updated in the process. The software flexibly adapts to new boundary conditions and requirements, and thus becomes more and more effective. The analysis system is also future safe, due to its software architecture: As an established platform with a broad user base X-Frame will be continuously further developed.
To permanently assure the quality of DET, DEUTZ relies on a multilevel support and training concept. For more complex tasks, issues, and special training requirements measX supports the Development Department as a competent, trustworthy partner.
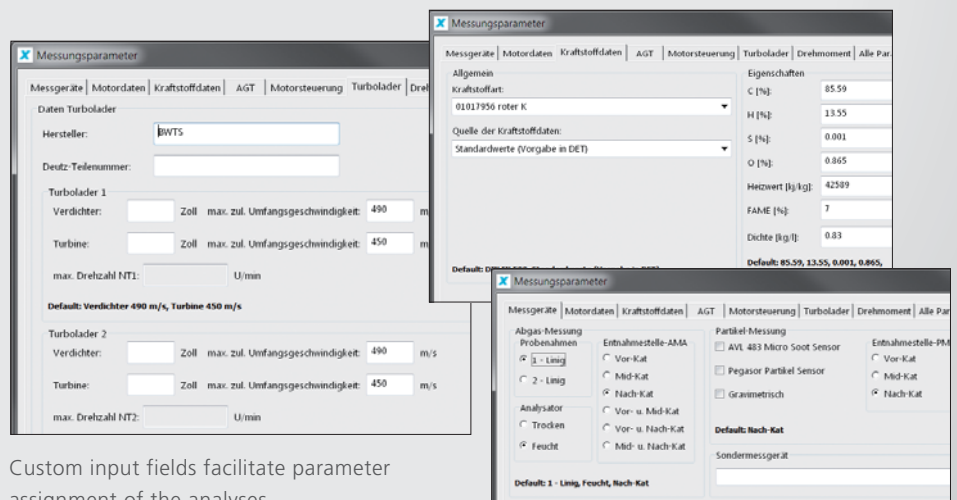
Custom input fields facilitate parameter assignment of the analyses.

measX GmbH & Co. KG

Moenchengladbach Headquarters
Trompeterallee 110
D-41189 Moenchengladbach

Tel.: +49 (0) 2166 9520-0
Fax: +49 (0) 2166 9520-20

info@measx.com
www.measx.com

Aachen Office
Pascalstrasse 26
D-52076 Aachen

South Office
Martin-Luther-Strasse 55
D-71636 Ludwigsburg