



Test & Data Analysis in the Automotive Industry

Summary

A major international automotive manufacturer implemented the Viviota Time-to-Insight™ software Suite addressing inefficiencies in its Model Based Design Process. The manufacturer was able to:

- Eliminate redundant data preparation activities carried out by many engineers: locating, acquiring, managing, and standardizing test data for analysis. This allowed engineers to focus on their core responsibilities, not these data management activities. Each engineer in the process eliminated five or more hours of data prep activities per week.
- Improve test data quality: consistent, more complete, and more accurate data was assured for all engineers in the process. This led to reaching insights faster in the automotive manufacturer's Model Based Design (MBD) process. This can reduce the number of MBD cycles involved in the design and development process for these engineers.
- Find and retrieve centrally stored and shared data more quickly using an intuitive user interface and search engine technology.
- Utilize Viviota server-based parallel processing, data filtering, data reduction, and work distribution techniques, to significantly reduce data analysis, and reporting processes.
- Reduce analysis reporting time from 10 hours to 7 minutes improving work cell capacity utilization. The work cell had slack time of 10 hours per testing cycle, essentially leaving the work cell idle for one day per cycle.

Data Problem

A major automotive manufacturer's Model Based Design (MBD) process was bogged down by inefficient test data preparation, analysis, and reporting processes. In MBD, data from physical testing is combined with data from model-based simulations and then analyzed. Whereas MBD's purpose is to build better products faster, the data prep and reporting process was sabotaging any time savings MBD could afford.

The manufacturer found engineers were spending several hours each week finding, managing, and standardizing test data before they could even begin analyzing and reporting test results. In addition, the analysis and reporting process was taking significant time—one particular test report took upwards of 10 hours.

The test data was not managed or shared centrally. As a consequence each engineer who needed the data analysis for their specific area of expertise, had to gather large amounts of data from multiple sources, file types, and physical locations. Then each prepped data for their own analysis purposes. The prepped file formats were not consistent across the enterprise and data files were often stored locally. Historic data was nearly impossible to access, and the historic data which could be accessed was not always reliable due to deficient storage policies and poor descriptive techniques.

Once each engineer located, cleansed, and managed the data they could then begin their analysis processes. However, analysis processes were also inefficient; one test report took approximately 10 hours to complete. Because of the tight feedback loop between analysis and test, a 10-hour data analysis time meant a test cell sat idle for a full day.

Objective

The manufacturer wanted to eliminate the engineers' redundant activity of locating, cleansing, and managing the same data. To do this, the manufacturer proposed the data be processed once and held in a central repository



accessible to all engineers involved in the process. The company also wanted to ensure that complete and reliable data was available to all engineers, so the MBD process would truly result in building better products faster.

Additionally, the manufacturer aimed to reduce time for analysis and reporting, thus improving design and development cycle-times and increasing capacity utilization of test cells.

Defining the Solution

Viviota assisted the automotive company in identifying the following goals for their data management and analytics project.

- Reduce R&D model iteration-time to obtain optimal fuel economy, emissions, and power
- Cut time to analyze powertrain engineering data from 10 hours to 20 minutes
- Eliminate data duplication while increasing data quality in all phases of development
- Improve time to find relevant data to promote wider consumption
- Increase visibility and reliability of historic data by enhancing raw sensor data with descriptive meta-data

Solution—Viviota Time-to-Insight™ Software Suite

To start, the solution was applied to a single work cell, with the intent to replicate the solution across enterprise work cells based on the success of the proof of concept. The powertrain work cell was selected for the implementation.

The solution targeted three areas for efficiency improvement:

- Cleanse and standardize data to provide a consistent format and labeling system for all data
- Index cleansed data by a powerful search engine, allowing engineers to find their data easily
- Provide a server-level analysis engine and interface in order to centralize and speed up data analysis

These three targets were achieved using the Viviota Time-to-Insight™ Software Suite. This software was easily integrated in the manufacturer’s existing computing environment (Figure 1 below).

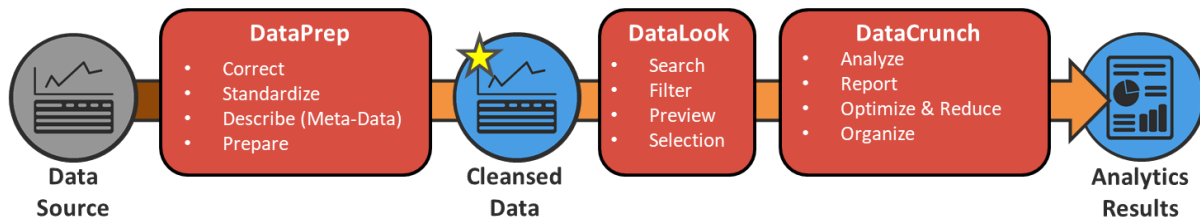


Figure 1. Viviota Time-to-Insight™ Software Suite

The Viviota software solution moved the processing of more than 1,000 data files from individual engineering systems to a server-class machine (32 cores). Previously, processing was performed on multiple clients, tying up engineers’ workstations for several hours at a time. The Viviota software utilizes parallel processing, data filtering, data reduction, and work distribution techniques to perform processing on 32 files simultaneously. With these optimizations new insights came to light quickly, while multiple users could easily access and use the findings simultaneously.



The Viviota solution provides an extendible framework which can support other analysis applications and processes from several industry-standard environments. Engineers can add new or existing analysis processes to the Viviota framework for central management and server-level processing capabilities.

Previously, data preparation and reporting was duplicated by several individuals. Viviota provided a universal client GUI for these engineers to access data, search results, and run additional analysis applications. Today, analysis is performed once and results are shared with any person needing this information. To increase flexibility Viviota Time-to-Insight will soon feature tablet and smart phone access.

Results

Before the Viviota implementation, engineers in a single test cell typically spent five hours per week locating data and five hours processing and analyzing the data. Viviota Time-to-Insight software cut the time to locate and analyze data from 10 hours to seven minutes, beating the target time of 20 minutes. This is a 90X processing time reduction.

With the Viviota solution, engineers can now focus on solving engineering challenges rather than spending time managing, searching, and waiting for time-consuming analysis procedures to complete.

While this initial project was aimed at one automotive work cell (Powertrain). The target is to replicate this success in additional work cells such as engines, brakes, transmissions etc. As additional cells are brought online, the data can be fed from an edge computer to a cloud or HPC server for further analysis. The Viviota dashboard will provide consolidated and drill-down views of the complete automotive MBD analytics process.
