



ADVANCED

TEST & AUTOMATION

Systems and Software for a Complex World in Motion



Project Overview



Electric Power Steering Module

End-of-Line Test Stand



Who We Worked With

- ATA was approached by a new client with a need for an end-of-line test stand for an electric power steering module



- The client was among world leaders in the design of off-road vehicles, with a large interest in bringing innovative technologies to the market

- The client was after a flexible and expandable test system capable of conducting end-of-line testing for the EPS (electric power steering) unit

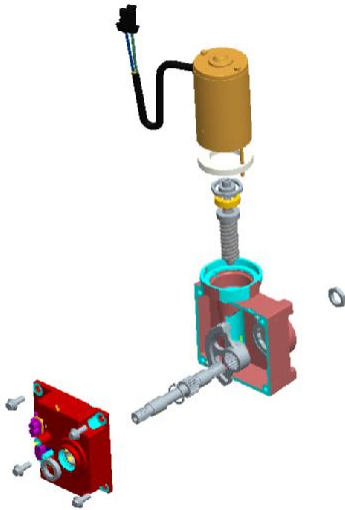


- In addition to testing the functionality of the existing design, the solution had to be designed to accommodate future versions and test procedures



Tailored To Specific Needs

- The unique design of the EPS unit prompted ATA to invest a significant amount of resources to understand the operating modes of the unit, and how to best configure it for end-of-line testing



- Some of the client's criteria included minimizing the footprint of the test stand, along with simplifying the loading & unloading procedure for quick part changes
- Considerations also needed to be made to ensure that the test bench was expandable in terms of added functionality, as well as supporting a layout that would be compatible with newly designed EPS models
- ATA was able to propose an architecture to accomplish the client's needs for an end-of-line test bench, with test procedures conforming to custom OEM specifications



Key Design Elements

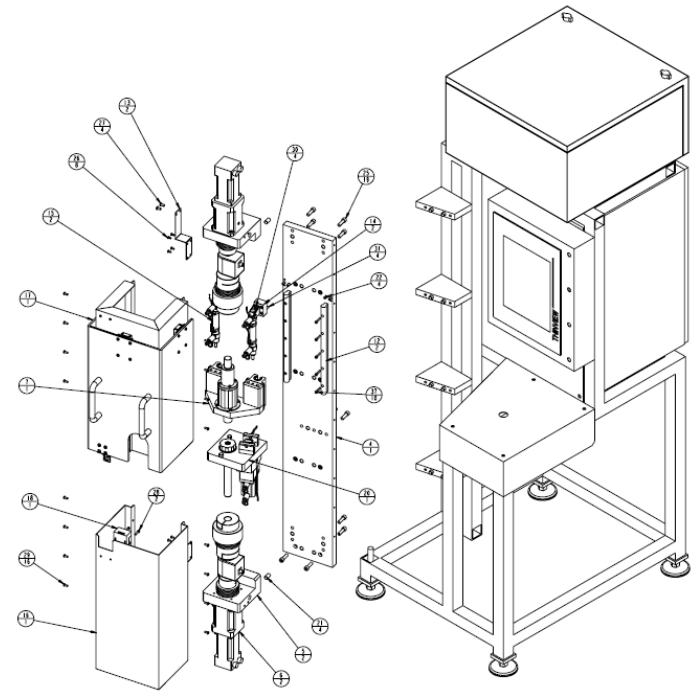
- The first step of the design process was sizing all major test bench components specifically to client's product requirements, such as:
 - selection of drive and load motors by analysis of available torque vs. speed profiles
 - gearbox sizing of output shaft for higher load torque
 - inline torque measurement and safety torque-limiting clutch to protect equipment from over-torque conditions
 - mounting fixture considerations to accommodate current EPS unit
- Input and output shaft interface design, coupled with pneumatically operated linear slides, resulted in automatic part loading and unloading
- For technical info regarding the test bench, see datasheet





Productivity & Expandability

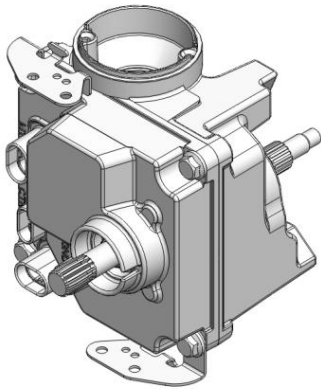
- The client was involved throughout the entire design process, and had significant input in terms of providing mechanical drawings and electrical overview plans
- ATA's experience in this field allowed for a large number of test scripts to be transferred onto the machine with very little programming required
- Prior to performing end-of-line testing on each EPS module, each one had to be calibrated for proper functionality
 - in order to calibrate each unit, a specific CAN Bus security protocol had to be used to flash the unit's internal memory





Superior Efficiency

- Built in software features such as PID control of load torque, and position and speed control of input shaft, managed to simplify the design engineer's tasks and reduce time spent supervising tests
- Automatic test script execution, data collection and final report generation, in addition to powerful graphing elements, produced a high level of test script automation



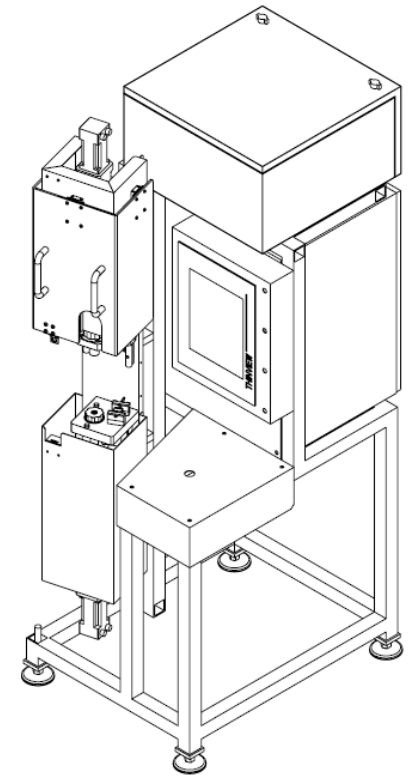
- Added flexibility was given to the test engineers by being able to control the test bench in manual mode
- The test stand was designed as a low maintenance item by using proven and reliable technologies, as well as maximizing the use of off-the-shelf components that were easy to replace

Making Sense Of The Data

- Through the use of ATA's rotational component software, the interpretation and analysis of all tests was fully automated, such as:
 - CAN Bus security protocol and memory flashing automation
 - steering limit calibration by learning end-stop positions
 - maximum input and back-driving torque comparison
 - PWM current draw at various input speed conditions
- Engineering-level analysis was done on the fly as the tests were executed, providing real-time feedback to the user in terms of pass/fail analysis, measuring rates of change, curve fitting, etc.
- Main final report included only pass/fail indicators for 13 different steps that made up the custom OEM test specification
 - client was also able to retrieve more detailed reports that included actual readings, min & max limits, standard deviations, etc.

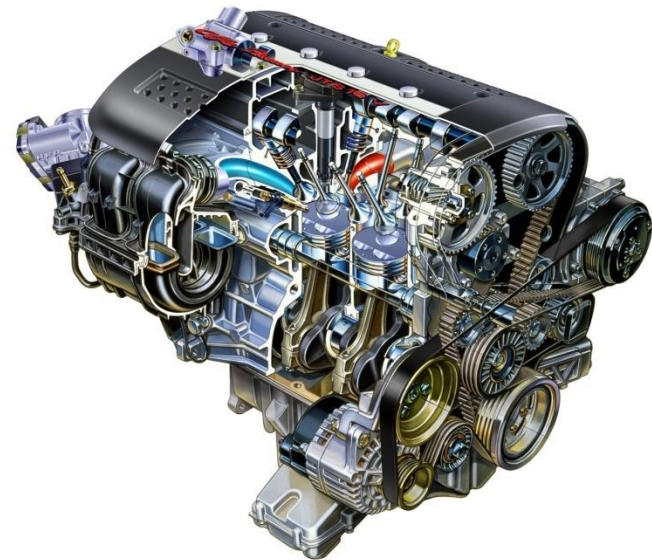
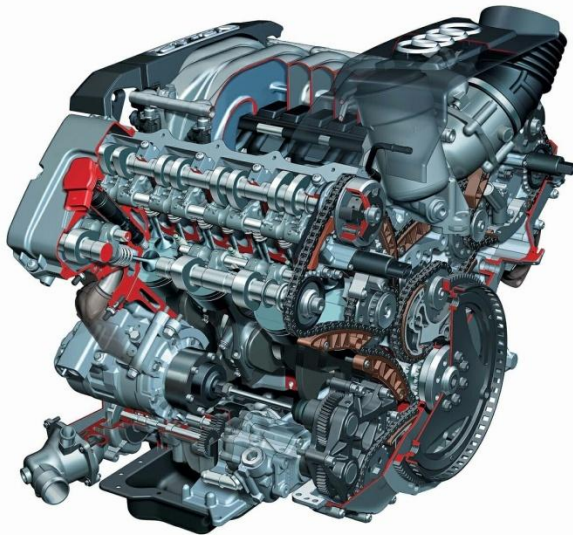
Project Milestones

- The project was delivered on-time and on-budget, with ATA continuing to support the client during test stand operation and results analysis, especially during the early stages of adaptation
- Upon project completion, all documentation needed for maintenance of the test stand was released:
 - electrical, hydraulic and pneumatic drawings
 - mechanical drawings of custom & spare parts
 - detailed test stand and software manuals
- Proposal to full design time: 1 months
- Design to approval time: 1 week
- Build & commissioning time: 1.5 months
- On-site setup time: 1 week



Facts About ATA Inc.

- Certified Engineering Firm
- Specialized in Complex Rotating Components
- Formalized Project Management & Delivery Process
- Internal Design, Integration and Commissioning Team



ATA Inc.

Your Partner in Test

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