

CASE STUDY

United States of America

Automotive, Aerospace

Assembly Technology & Test, Inc.

Assembly and Test Solutions for the Automotive Industry

PULSE, Transducers

Assembly Technology & Test, Inc. (ATT) is a major worldwide supplier of equipment for development, assembly and test applications on a variety of automotive items including engines, complete transmissions, transfer cases, axles, differentials and components. ATT's customers include many of the world's leading automotive manufacturers and their sub-suppliers.

PULSE™ is incorporated into many of ATT's test stands, and the company uses a 4-channel PULSE system in its own laboratory, as well as a range of accelerometers and microphones.



The Company

ATT has been involved in component testing since the mid 1930s. Originally known as Hartridge, the UK company developed to the point where, by the late 1980s, it was recognised internationally as a leading test equipment supplier of fuel systems. In the USA, ATT's wealth of engineering experience began with the founding of Wilson Machine at Saginaw. The Livonia operations of ATT began with the formation of Advanced Technology & Testing. This company was subsequently purchased by Lucas Industries and integrated with Lucas Hartridge, and additional facilities in Germany, to form Lucas Assembly and Test Systems.

Today

DT Industries Inc., based in Dayton, Ohio purchased the company in 1997, and it became Assembly Technology & Test. In addition to having direct access to the engineering expertise of the DT Group, ATT's own qualified and experienced staff are strategically located in Michigan, USA, Buckingham in the UK, and Neuwied-Friedrichshof, Germany. ATT employs about 400 people.

Success

ATT is a leading worldwide designer, manufacturer and integrator of assembly, test and material handling systems serving international automotive, aerospace and component OEMs and their tier-one suppliers.

Automotive powertrain has a special focus and ATT is a supplier of state-of-the-art equipment for development, assembly and test applications on a wide variety of engine, transmission and automotive component applications and associated systems including:

- Total Manufacturing Cells (TMC)
- Transmission assembly and test equipment (transfer cases, axles, differentials, etc.)
- Control and analysis systems
- Engine assembly and test systems

Typical applications include both in-process verification and final test systems, and vary from entirely manual to fully automated processes. Users of ATT assembly and test systems include:

- DaimlerChrysler
- BMW
- Rover Group
- GM
- Ford
- Cummins
- Iveco
- Fiat
- Daewoo
- Caterpillar
- Toyota
- KHD
- Perkins
- Saturn
- Hyundai
- Mahindra & Mahindra

Combining Expertise

ATT works closely with its customers throughout all stages of projects. Experience has demonstrated the benefit of combining the customer's product expertise and ATT's process and equipment experience at the start – the most critical point. Over a period of years, ATT has developed a structured set of tools and techniques that optimises the planning and design stages of the project and then follows on through system implementation to continuous improvement.

Working with a multi-disciplined team of engineers from the customer, ATT engineers will usually manage the development of the complete assembly and test strategy. Some of the key techniques include:

- Functional Analysis – all the parts necessary for the assembly to function
- System Simulation – to ensure the system functions as designed
- Design for Assembly – design the product to allow efficient assembly
- Design for Test – design the product for docking with automation?
- Process Failure Mode and Effect Analysis – ensure that the investment is spent to obtain the highest possible product quality

Control Systems

CAPAC is an advanced PC-based control system designed by ATT to provide a standard solution platform. It is easy to configure, user friendly, and provides effective control systems, not only for current applications but is easy to upgrade and modify.

Fig. 1
The operating console of an ATT test system



It is compatible with a wide variety of proprietary data collection and analysis devices and can work with, or in place of, standard PLC applications. It is also easily integrated with OSCAR – ATT's own recommended analysis system.

OSCAR is a PC-based software solution which will provide users with the capability to analyse assembly, test and in-process verification data. Statistical analysis data can be gathered from a range of control equipment to provide off-line graphical and tabular displays. The out-

put from its powerful industry standard databases can be configured for customised displays. OSCAR has an integral report write or users may elect to use System Query language (SQL). OSCAR runs as an open architecture, client/server system.

Standard Solutions

In order to optimise cost and lead-time considerations, ATT has created a number of standard solutions. These can be easily configured to combine specific customer needs into a fully integrated production system for both assembly and test requirements.

These standard systems can address in-process verification and end-of-line, final test requirements. Typical examples include:

- Short block torque-to-turn
- Long block mechanical or electrical test
- End-of-line Advanced Cold Test
- Leak test systems

Additionally, ATT designs and manufactures transport systems. The options range from a floor mounted conveyor system to LogiTrack, ATT's proven automated electrical monorail system.

Engineering Experience

*Fig. 2
Tom James is ATT's
Product Group
Manager Test
Systems*



Tom James is ATT's Product Group Manager Test Systems. He's worked at ATT for 22 years and has a degree from the Center for Creative Studies, Detroit. Tom says, "I have held a number of positions in ATT including working in mechanical engineering, sales and product management, so I have seen the business from various angles and this background really helps in my present job".

Tom continues, "The automotive industry is our core market, and within this, a key focus is powertrain test technology. We've built test systems for transmissions, transfer cases, axles, differentials, etc., for many of the world's major automotive manufacturers and their sub suppliers. In addition to cars, we've also developed powertrain test systems for diesel-engined trucks, earth movers and tractors".

*Fig. 3
Gabriel N.
Bannoura is ATT's
Chief Controls
Engineer – he's
worked for the
company for 19
years*



Powertrain

The widely divergent requirements of a powertrain assembly and test demand design flexibility and the capability to supply individually specified systems. Toms says, "We have the proven ability to provide cost effective solutions for the assembly and test of all elements of vehicle powertrain systems. We design and manufacturer from a single test station right through to a complete turnkey solution. Many of our systems feature innovative and proven technologies such as Advanced Cold Test (ACT) systems for engines and Air Testing using advanced signature analysis for transmissions. These systems combine fault finding improvements with reduced rework, and lower investments in equipment. Our customers know what they want to test – our expertise is in how to test".

Tom continues, "Transmission end-of-line production test systems account for about 50% of our business while materials handling projects represent some 25%. The balance is test systems for verification of work in progress. The demand for cold-engine test systems is growing rapidly and we have about 35% of this market. We always work within tight budgets – of course our customers want as much functionality as possible for their investment. Engineering is the most expensive part and represents about 25% of the total cost of a project".

PULSE

Tom says, "The PULSE Multi-analyzer is an excellent solution for NVH data collection and analysis, and we incorporate it into many of our test stands. We think Brüel & Kjær has the strongest name in the market". Tom continues, "For example, we have sold

around 25 transmission test machines in S.E. Asia over the last ten years and most of the customers are Brüel & Kjær users”.

Tom adds, “PULSE is our preferred solution. Not only do we recommend it but our customers frequently specify PULSE as the analyzer they want to use with the test system. We also specify the use of Brüel & Kjær transducers. Even though we calibrate very frequently, their products have proved to be totally accurate and reliable. And we get great support and expertise from Brüel & Kjær’s worldwide network”.

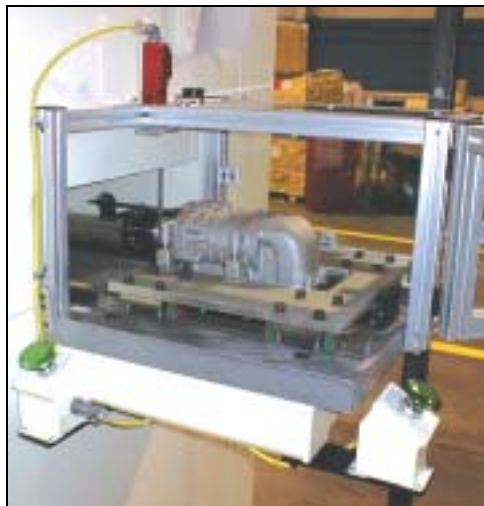
ATT uses a 4-channel PULSE system, including a range of accelerometers and microphones, in its own laboratory. Tom explains, “We use the PULSE system in product development and also for testing of our customers’ products prior to implementation of new test systems.”

Software

ATT uses Brüel & Kjær’s standard Type 7700 Noise and Vibration Analysis software. It also uses customised operator interfaces that are either developed internally or are by third-parties. Tom says, “Generally our customers are not NVH experts and therefore we aim to make our systems as easy to use and intuitive as possible. The easier a system is to use, the less mistakes an operator will make”.

Eaton Corporation – a Powerful Solution

*Fig. 4
A supercharger is tested on one of ATT’s end-of-line production test systems using sophisticated vibration analysis*



Eaton Corporation's Air Management Systems Division designs, manufactures and markets modified Roots-type positive displacement pumps (commonly known as “superchargers”) for the original equipment and aftermarket industries.

Tom says, “Eaton is a world leader in supercharger production and they have about 40% of the world market. The use of superchargers is growing – you get more power for a given engine size and a huge increase performance so they are attractive to the designers of sports cars”.

He explains, “Eaton awarded the first order for a supercharger test system to ATT. We won the turnkey project on a competitive basis and because of our reputation in the test market. The first test system was followed by orders for two more – another for Georgia in the US, and the third is installed at Eaton’s facility in Brazil. Eaton can test a number of different models on the same test system. The supercharger turns at about 14 000 rpm and we test it using sophisticated vibration analysis”.

Tom adds, “Each Eaton test system has a 4-channel PULSE system, customised software and accelerometers. The placement of the accelerometers on the supercharger is highly critical and was the result of joint development between Eaton and ourselves. The test system operators are not NVH specialists and the interface shows a simple pass or fail test result. The test system automatically writes an RF tag on the pallet. The test data is available for repair of the failed supercharger and is also used to further optimise the Eaton’s production processes”.

Tom ends by saying, "Eaton are very pleased with all aspects of their test systems. They appreciate the short delivery time, robustness of the design, the quality of the engineering and installation, and the on-going support. We were pleased too!"

Accreditation

ATT has full accreditation to a number of standards including:

- ISO 9001
- Ford Q1
- QS 9000 (TE supplement)

Application is being made for ISO 14001 accreditation – ISO 14001 was first published in 1996 and specifies the actual requirements for an environmental management system. It applies to those environmental aspects which the organisation has control and over which it can be expected to have an influence.

Data Handling and Reporting

ATT's test systems run under Windows NT[®] or Windows[®] 2000. Tom explains, "Generally our customers have an existing LAN (local area network). We supply the database server computer and a backup system. It's frequently necessary to inspect the archived test data". Tom continues, "We have developed a range of standard reports which can be customised according to the customer's needs. The test data is exported to Microsoft[®] Excel and I especially like this facility in PULSE as it's easy and quick to make reports in a variety of formats".

Key Facts

- ATT is a major worldwide supplier of equipment for development, assembly and test applications on a variety of automotive items including engines, complete transmissions, transfer cases, axles, differentials and components
- ATT's customers include many of the world's leading automotive manufacturers and their sub-suppliers
- PULSE is incorporated into many of ATT's test stands, and the company uses a 4-channel PULSE system in its own laboratory
- "PULSE is an excellent solution for NVH data collection and analysis"
- PULSE is incorporated into many of ATT test stands and is its preferred solution
- "We think Brüel & Kjær has the strongest name in the market and long experience shows their products are very accurate and reliable"
- ATT has sold around 25 transmission test machines in S.E. Asia over the last ten years – most of the customers are Brüel & Kjær users
- ATT specifies Brüel & Kjær transducers
- "We aim to make our systems as easy to use and intuitive as possible – the easier a system is to use, the less mistakes an operator will make"
- ATT has full accreditation to a number of standards including ISO 9001, Ford Q1, QS 9000 (TE supplement)