

Focused Specialties ➔ Broad Capabilities

These non-synchronous assembly and test systems for multiple compressor models are composed of six integrated lines, 91 stations, and occupies 26,000 square feet. They were designed, built, and installed for a customer in Europe and the USA by Advanced Assembly Automation (AAA), a Division of Assembly & Test Worldwide (ATW). Elements of each system met "CE mark" requirements, the European Community Standards required for all manufacturing equipment and components. The engineering, assembly, testing, and runoff activities occurred at AAA's 160,000 square foot engineering and manufacturing plant in Dayton, Ohio USA, which is part of ATW's 750,000 square feet of facilities.



## System Values & Benefits

- In the 2001 Production Year, only 2 parts per million were rejects
- Upon initial installation, good parts first time through were in excess of 90%
- Production rate exceeds 2,500 parts per shift
- Multi-line concept allows segmented production
- Test requirements integrated into the assembly line
- Multiple select-fit components were assembled with error-proofing

## System Highlights

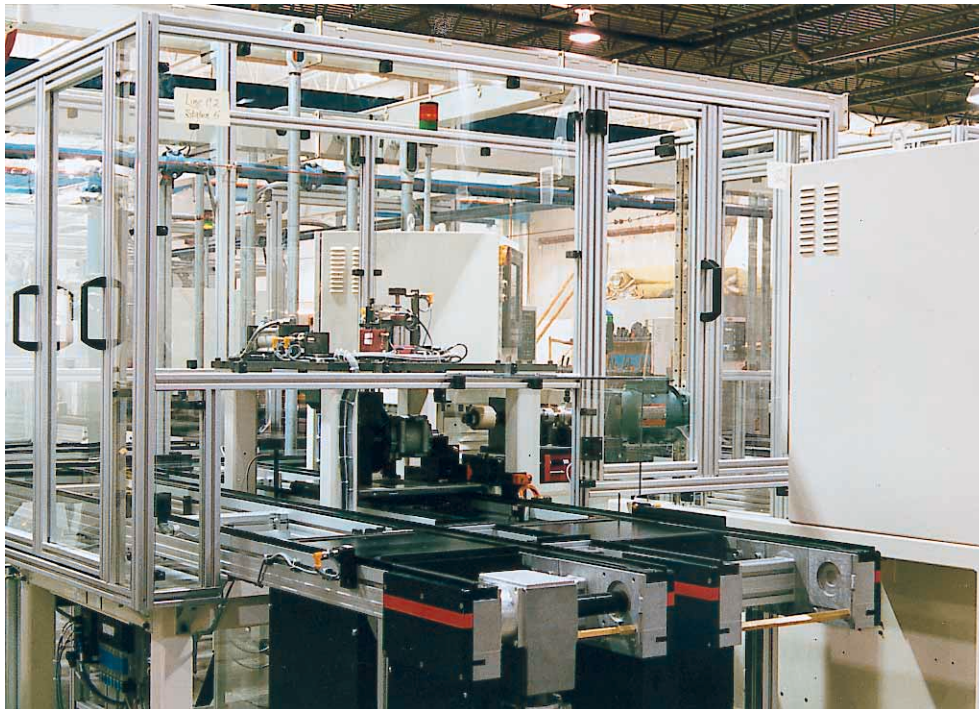
### Applied technologies and system features include:

- Signature analysis of each compressor includes average torque, discharge pressure, and flow
- Testing for oil fill occurs with three tests: VEK meter, flow meter, and weighing of product before shipment
- 3-axis, closed-loop servo control system allows bushings to be positioned anywhere in 6" square window to accommodate a variety of product mountings
- Vision system verifies that operator assembly complies with requirements for each product model
- RF system verifies successful completion of task(s) at each station
- Torque and angle monitoring of fastening processes
- Flexible repair system enables in-process correction and re-entry of product into the system
- All press operations monitor force and distance to verify desired product quality
- Intelligent Valve Banks for stations on all six lines are of a common design
- "CE mark" (European Community Standards) compliance

# Automotive Compressor Assembly System



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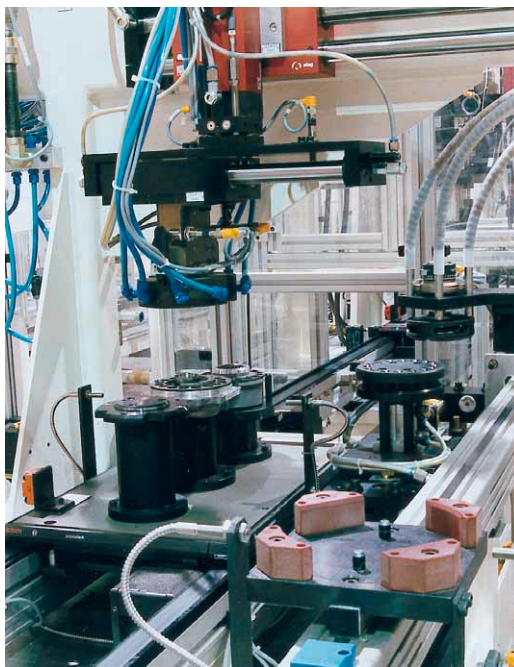
▲ At this test station, each unit is mechanically coupled and driven to verify functional operation

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## System Overview

- Non-synchronous, palletized assembly and test system is comprised of 6 sub-systems
- 26,000 square feet
- 1600' of conveyor; 420 pallets
- **Line 1: Front Head Assembly**  
15 automatic stations (includes 3 gage stations and 3 robot stations) and 5 manual stations; achieved 1.67 CPK for torque and angle on all screws; Gage R & R (Repeatability and Reproducibility) ranged from 10 to 30%
- **Line 2: Rear Housing Assembly**  
9 automatic stations and 4 manual stations
- **Line 3: Compressor Housing Assembly**  
13 automatic stations and 5 manual stations, including select fit stations
- **Line 4: Mass Spectrometer**  
10 automatic stations with robotic transfer of sub-assembly to Line 5
- **Line 5: Functional Test**  
12 automatic stations (includes 2 robots, signature analysis, and 2 tests for oil in the compressor with robotic transfer of sub-assembly to Line 6)
- **Line 6: Final Assembly**  
11 automatic stations and 7 manual stations
- 27 operators

◀ A set of ball bearings are fed into a nest and placed onto the compressor housing

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