



ISMR SAYS: Airbus manufactures fuselage parts for different aircraft projects at its site in Nordenham (Germany)

Focus on aerospace

With more than 5,000 aircraft sold, the Airbus aircraft family is recognised for its comfort, economics and versatility. Its A320 Family is a leader in the single-aisle category while the A300 and A310 models pioneered Airbus's 222-inch fuselage widebody cross-section.

The A330/A340 family of twin-engine and four-engine aircraft is currently available in five models covering all long range requirements. 2004 was a fruitful year for innovation and technology as Airbus assembled 'the largest aircraft in the history of aviation' – the A380 – which is the first large double decker due to enter service in 2006. The company also launched the new model A350 in 2005.

Airbus broke new ground in 1988 with the introduction of the electronically-managed fly-by-wire flight control system and side-stick controllers on the A320, which also became the first single-aisle aircraft to offer a wider fuselage cross-section and a fully containerised cargo loading system in the below-deck cargo hold. Thirty years after delivering its first aircraft (the A300B2), Airbus passed the 5000th order milestone in August 2004.

The company declared its intention last year to ramp up production and developed eight Centres of Excellence to enable its different sites to become more cost efficient, managing their own make-or-buy policy, proposing design changes and investing in modern machine tools.

Stand and

Airbus Nordenham and Witte Bleckede have developed a special fixture for clamping pre-formed aluminium sheets during machining

Main photo: The Airbus A350-800



Above: Lufthansa's Senior Vice President Nico Buchholz accepts delivery of the milestone 4,000th Airbus aircraft from Airbus President and CEO Gustav Humbert at a ceremony in Toulouse (9 September 2005)



The Airbus A300-600ST Beluga transported critical relief supplies donated by France and the United Kingdom to the Gulf Coast for Hurricane Katrina emergency relief

The manufacture of fuselage parts for different Airbus projects is carried out in Nordenham (Germany). Weight is an important factor in the aerospace industry and, in almost all areas, weight saving has been exploited to the extreme.

To enable production of the lightest possible fuselage parts, without incurring any loss of quality, Airbus Nordenham and Witte Bleckede jointly developed a special fixture for clamping pre-formed aluminium sheets during machining

CONTACT:

Horst Witte Gerätshan,
 Hornsdorfer Weg 26, D-21354 Bleckede, Germany
 Tel: +49 58 54 89 0
 Email: info@horst-witte.de
 Website: www.horst-witte.de

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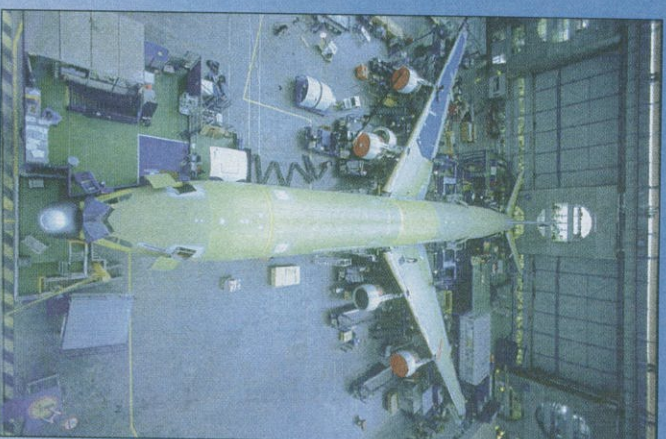
**Aluminium sheet production**

A cylindrical Airbus fuselage segment consists of several single metal sheets. The parts, measuring up to 10,500 x 2,700mm, run through several processes (e.g. rolling) before they reach their final cylindrical form.

After the rolling process, weight-reducing pockets are machined into those parts of the sheet which are statically under less stress. If pockets were machined beforehand, Witte Bleckede told ISMR, they would not comply with quality standards.

However, the material generally used to form pockets had mostly been removed by chemical milling. For economical and environmental reasons, Airbus Nordenham wanted to leave out these chemical processes and presented this challenge to Witte Bleckede with the aim of finding a solution for the positioning, clamping and machining.

"We wanted to start with the machining of pre-formed parts", Guenther Kuck, of the Plant Planning department at Airbus, told ISMR. "Our fundamental idea was



Above: Airbus A340-600 on the final assembly line

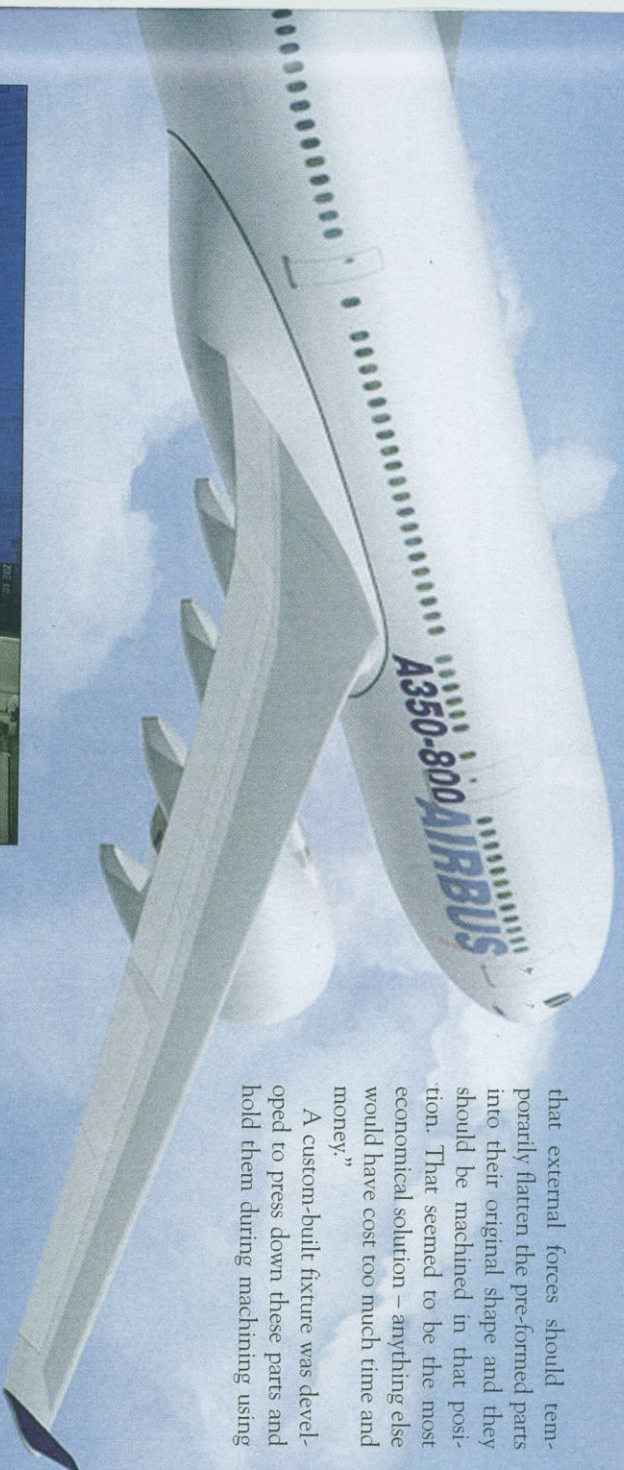
that external forces should temporarily flatten the pre-formed parts into their original shape and they should be machined in that position. That seemed to be the most economical solution – anything else would have cost too much time and money."

A custom-built fixture was developed to press down these parts and hold them during machining using

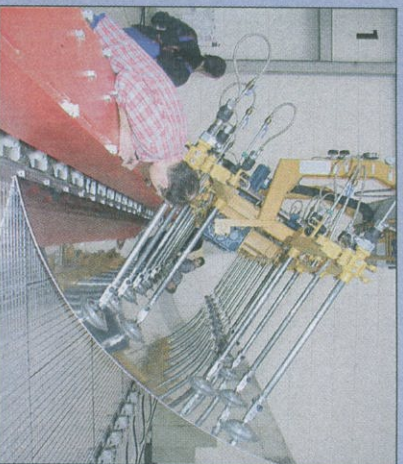
vacuum and clamping elements. After machining, sheets are released and go back to their former contour. The fixture design incorporated mechanical, hydraulic and vacuum clamping elements.

Press – roll – clamp

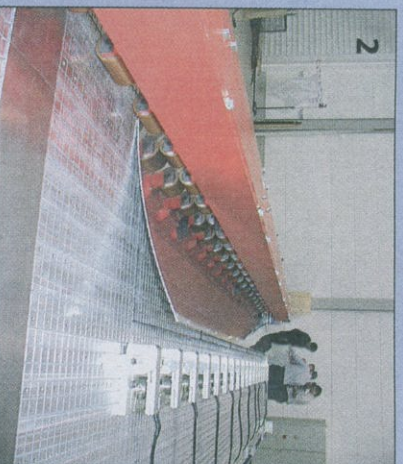
Sheet metal parts are firstly lifted with a crane and vacuum cross bar onto a clamping fixture and then positioned using stops on one long side. Hydraulic clamps are activated along the length and the part is clamped along the positioned edge.



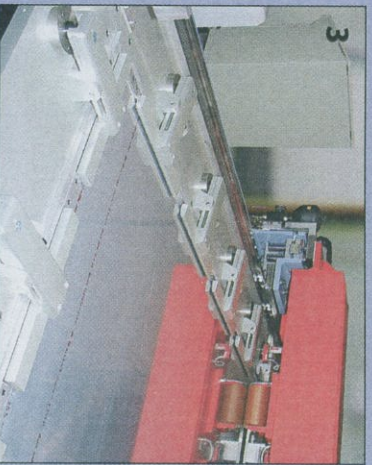
Left: Charles Champion, Airbus Executive VP - A380 Programme (second from left), was present for the A380F first metal cut



1. The Airbus part is transported to the clamping fixture, using a crane, and then positioned against stops on one long side



2. A 14m-long roller bar moves across the part and presses it flat. Hydraulic clamps are ready to fix the part into position along the starting edge



3. Clamps secure the flattened Airbus part



4. Witte Sales Manager Bodo Winowsky and Guenther Kuck, Airbus Plant Planning Dept.



5. Detail of fixed part



6. Roller bar in start position

On the same long side, a 14m long bar (equipped with special rubber rollers) starts to move and presses the parts down flat. It is guided by linear guiding elements and servomotors positioned on both side edges of the clamping surface.

Hydraulic and mechanical clamps along the sides are activated step-by-step in accordance with the flattening process. All clamping elements are monitored by sensors and shown on a display.

While the roller bar is moving, the sheet metal is pressed onto the

clamping surface. At the same time, corresponding vacuum areas are activated from underneath the clamping section by section until the whole area is secure. Pressure difference switches control to each activated vacuum area.

After the part has been pressed flat and is fully clamped, a visual check of position and operating vacuum takes place. The bar goes back to its start position and milling can start. A milling cutter (dia. 30/50) is used to remove up to 3mm on (for example) a 5mm thick sheet.

"The entire vacuum clamping area measures 4100mm x 13000mm. The total surface is divided into thirty six individually-operated areas. This means parts of different sizes can be clamped effectively giving a high degree of flexibility," Bodo Winowsky of Witte Bleckede explained.

A total of fifty hydraulic and eleven mechanical clamping units ensure part positioning along the sides.

"To stop a part moving sideways, we used hydraulic clamping on three sides and mechanical clamps on the fourth because hoses necessary for hydraulic clamping would have limited access and disturbed operators on that side," said Guenther Kuck of Airbus.

Guenther Kuck and Bodo Winowsky are both very happy with their combined project.

"Our operators have accepted the system well and it is working almost constantly on three shifts," added Mr. Toenjes (Manager, Plant Planning at Airbus).

The company from Bleckede, which develops and manufactures different kinds of clamping systems, has long experience working in the aerospace sector. Witte has machined high precision aluminium aircraft parts for over thirty years.

"We welcome complicated clamping challenges," Winowsky told ISMR "In this case, we made a small sample fixture to check the clamping process and assess small problems as early as possible in order to avoid them on the real thing." **ISMR**

A380, A340-600 and A318 in Airbus colours performing a formation flight before the 2005 Paris air show

