CFK-Valley Stade Convention 2013

A350XWB Wing upper cover stringer production

Development and implementation

Presented by
Jan Christoph Kako / Manufacturing Engineering Composite Parts Generic Technologies, Stade
Dr. York C. Roth / Manufacturing Engineering Composite Parts, Stade
Dr. Achim Etzkorn / A350XWB Wing Upper Cover Manufacturing, Stade

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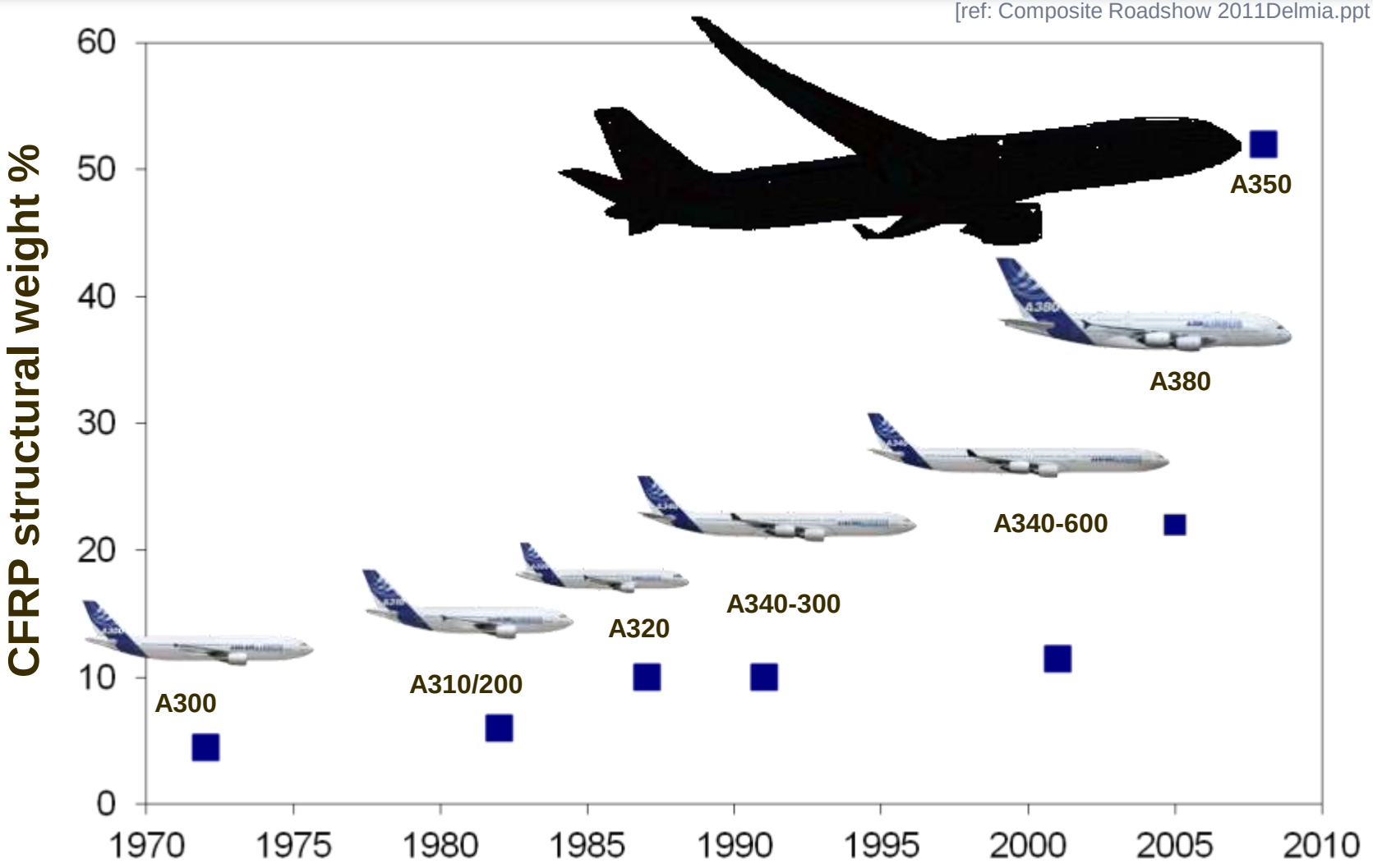
Airbus: CFRP evolution in Commercial Programs

[ref: Composite Roadshow 2011Delmia.ppt v7.ppt]



Airbus: Stade Plant – CFRP Single Parts & Assembly

[ref: 2012-11-06_IVW-Koll_Alumni_CFRP_Prod_Roth_PR1248192_v1.ppt]

- Employees (August 2012) ~2.500

- Area of plant 491.000 m²
  - Production and office area 184.000 m²

- Main tasks
  - Production of CFRP components
  - Components assembly
  - Final assembly of vertical tail plane

Overview – A350 XWB Wing Upper Cover

- Largest monolithic CFRP component within Airbus
- Length of approx. 32m
- Approx. 2t weight
- Prepreg based technology
- Stringers integrated in co-bonding process
- Approx. 300m of stringer per cover
- Harmonized process with intensive transnational collaboration

Development Route

Available best practice technology at project start for wet stiffener production:

- Layup of large “carpets” with Automated Tape Laying (ATL)
- Cut out of final shape laminates
- Cold storage of not immediately used laminates
- Forming with specific tools in a universal forming machine
- Manual treatment with fillers and adhesive
- Manual integration into the cover (assisted with laser tracking)

Development Route

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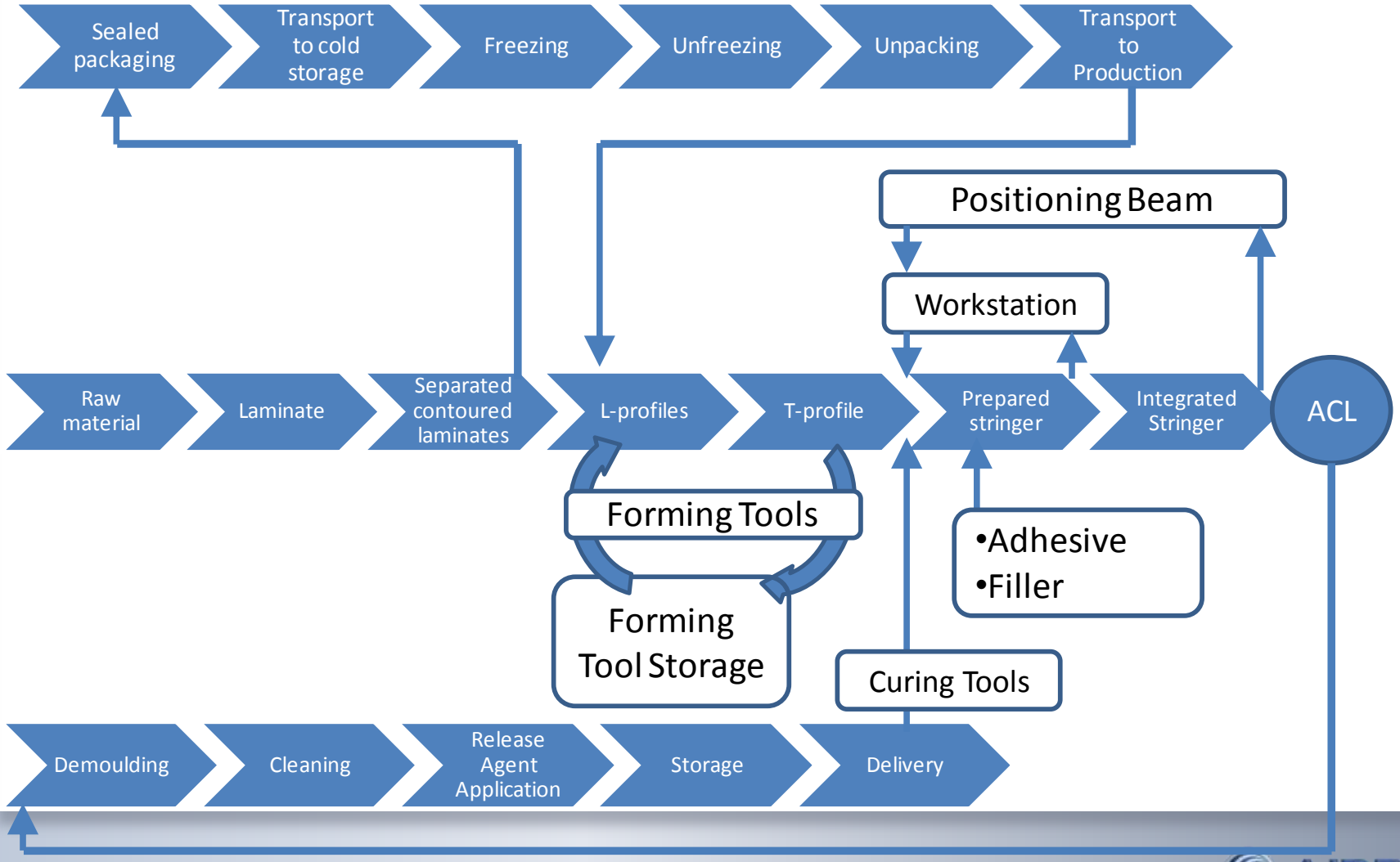
- Layup of large “carpets” with Automated Tape Laying (ATL)
- Cut out of final shape laminates
- Cold storage of not immediately used laminates
- Forming with specific tools in a universal forming machine
- Manual treatment with fillers and adhesive
- ~~Manual int[illegible] over~~
  Not possible with part size and weight
  ~~[illegible] with laser tracking)~~

Development Route

This first step process results in very complex logistics



Development Route – Fibre Placement

Introduction of new technologies is resulting in opportunities to significantly streamline the process

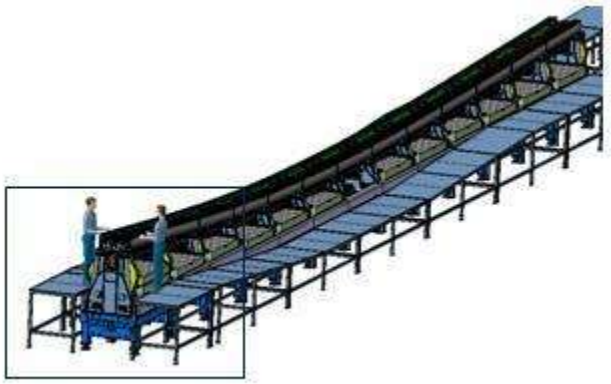
Fiber placement instead of ATL:

- Less excess material consumption due to higher flexibility
- Higher productivity
- No speed penalty for cutting
  - ➢ Lay up of different stringers in one operation instead of a large laminate for a number of identical stringers

➔ Massive reduction in logistics possible (no cold storage anymore)

Development Route – Forming Process

Introduction of new technologies is resulting in opportunities to significantly streamline the process

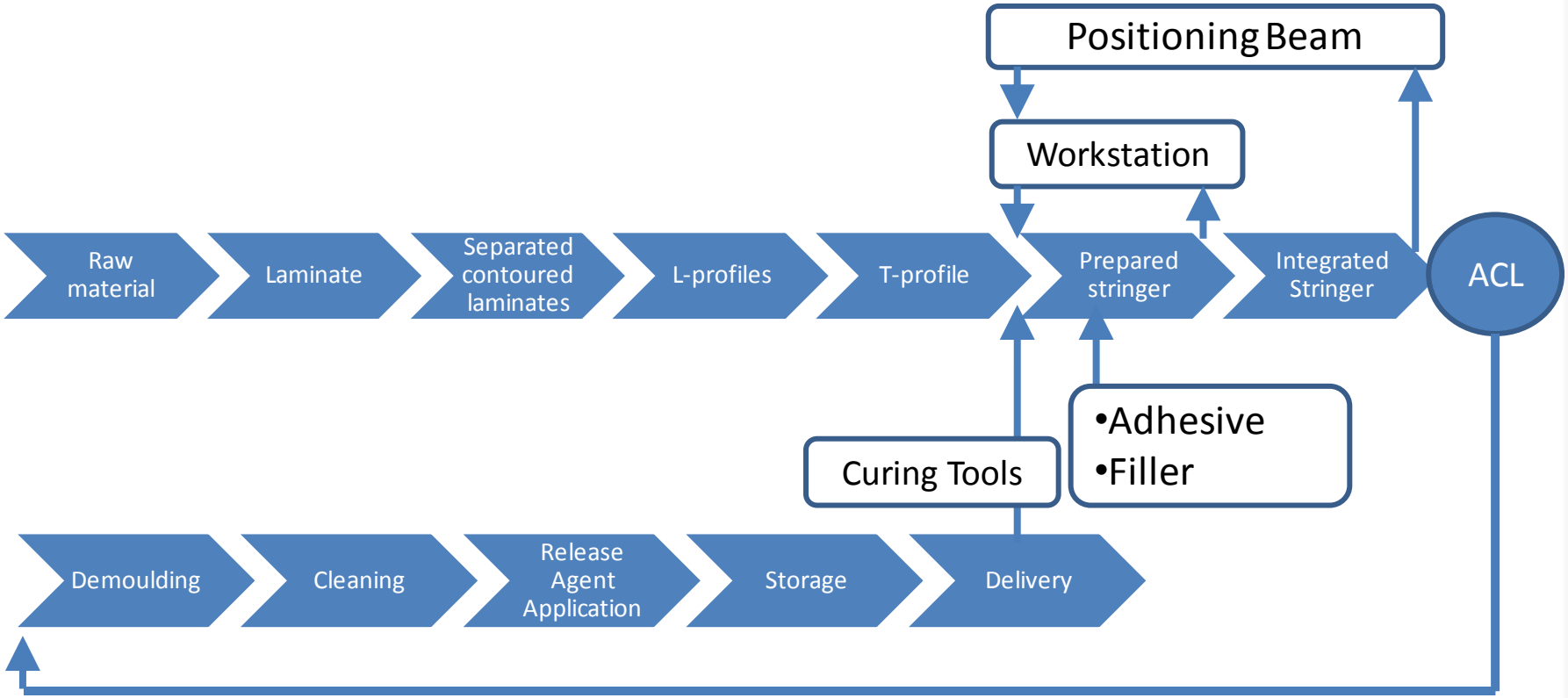


Change of the forming process:

- A dedicated machine for each stringer position
- Better guidance of the laminate for better quality
- Slower forming for better quality
- More cost effective machine design
- No logistics for forming tools necessary
- No tool change necessary during continuous production

Process chain

Optimized Process



Industrial Implementation

The process has been implemented in a new production line with the following main features:

- No manual transportation or movement of product
- Fiber placement with high productivity and just in time production
- High quality forming with dedicated machines
- Lay out defined by the process & single movement direction of product
- External referenced automated stringer integration

Achievements & Summary

Automation in CFRP production is:

- a major driver to improve process stability and improve part quality
- The only way to economically face a challenging program like A350XWB with the expected high production rate

After an intense development and implementation phase, the first stringer set has been manufactured in the beginning of 2011 and since then a serial production is running proving very good part quality and reproducibility.

An excellent start for meeting A350XWB process stability requirements and future ramp up demands!

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