Mechanical Joining of Composites in High Volume Production

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- Company Background
- Motivational Design example
- General Issues with composites
- Solutions
  • Running
  • Developing
  • Brand new
PROFIL: Your system supplier for pierce nuts and studs
Example of a typical PROFIL Solution
Joining of two composite panels with nut and bolt
Design example

PA6 max surface pressure
- wet, warm, reducing creep
M8 nut/bolt max load (class 8 / 8.8)
--> Necessary washer diameter

-->
80 N/mm²
--> 5 N/mm²
21 kN
--> ~40 mm

Necessary washer diameter

Washer deformation
Washer design balance

Increasing washer thickness

Worst case scenario

[Schürrmann, Konstruieren mit Faser-Kunststoff-Verbunden]
General Issues with Composites

- Corrosion
- Viscoelasticity (Creep)
- Cutting Fiber/ Cutting Material
- Delamination
- Small bearable surface pressure
- Variety of production processes
- Variety of material properties
- Anisotropic Material properties
Recommendation in literature for the connection of two panels:

Rivet joint

Recommendation in literature for threaded application:
Bonding fastener

[Schürrmann, Konstruieren mit Faser-Kunststoff-Verbunden]
Rivet joint with thread --> rivet nut
Comparison with bonding

Force transmission through rivet directly through all layers of material

Force transmission through flange, layer of glue and layer of matrix material before first layer of fibers
KZB Fastener for bonding or laminating
Warm hole forming

Top View

Side View

2. Step riveting
RSP warm hole forming and riveting in one step

1. RSP warm hole forming
2. Riveting in one step
3. Final result
KSB SBF RSF in two steps

Cold punching and riveting
Selfpiercing SBF in Composite in one step

- SBF - stud
- Composite
- Washer
- Die button
Stainless Steel Bolt

- Marine grade material
- Chemical industry
- Cold forging --> cost effective production

in Carbon reinforced material

in stainless steel metal sheet

Aluminum    Steel with special zinc coat    Stainless Steel

12 weeks salt spray + temp variation
Applications in Research projects

University Aachen, Germany
-Inprolight-

Fraunhofer, Germany
-Eprofit-
Applications in Industry

Mercedes: trunk

Porsche: rear shelf
Problem: Delamination

Others: Self piercing rivets

PROFIL: SBV Solid rivet with washer
SBV – piercing material with preload

- No cleaning or preperation of surface necessary.
- Ultimate strength immediately available
- Reliable process.
- Good crash performance.
- All BIW Materials
- Independent of the stack thickness
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Thank you for your attention

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