Inline quality assurance for automated fibre layup processes

**Principle**
Multiple image based sensors are used combined or as a stand alone sensor.

It is used a cascadian analysis structure for a reduction in calculation time.

**First cascade:**
Processing time reduction using a rapid pre-analysis step. This step focuses on rapid detection of areas potentially containing a layup defect. Image data without defects is discarded to minimize data consumption. Only uncertain or defect-inclusive image areas are transferred to the next analysis step. Within this second cascade the part images are analysed in detail.

**Second cascade:**
This stage involves the detailed analysis of identified part images from the first cascade calculations. Within this step, a machine learning approach – in combination with generic feature extraction and an image description process – is used to perform an analysis on a more detailed level. Defect-free image areas are identified and discarded with high precision. Part images containing a layup defect are categorized by defect type and transferred to the next processing step.

**Measurement cascade:**
The last cascade performs a defect measurement. Within this stage, metric measurements of a layup defect are determined using the part image data from the previous cascade. The combined data of defect geometry and defect type are then used for further documentation and simulation purposes.

**Application**
The System is used for inline quality assurance during an automated fibre placement process.

**Goals**
- Continuous process documentation
- Integral, automated detection of tolerance deviations during fibre placement
- Increased productivity of fibre placement machines
- Increased process quality
- Classification, localization and measurement of fibre placement defects
- Corresponding simulations of produced parts

**Requirements**
- Flexible system for various processes and materials
- Layup speed up to 1 m/s
- Combination of multiple sensor systems is possible
- Process integrated (Inline)

**Contact**
Sebastian Meister, Institute of Composite Structures and Adaptive Systems, Tel: +49 531 295 3710
Dr. Frank Holtmann, Technology Marketing, Tel: +49 531 295 3420, Fax: +49 531 295 3422

This handout, and cross-references to related measurement techniques and facilities are available at: [http://messtec.dlr.de/link-579-en](http://messtec.dlr.de/link-579-en).