US-Plus®
Test System for
Online Process Monitoring
Online Process Monitoring in Manufacturing of Composite Parts

Why monitoring Processes online?

► Online process monitoring can provide transparency to your processes

► Real-time process information permits direct evaluation of the process quality

► Real-time measurement offers richer information than evaluating of a finished product by its quality

► Measuring a process opens opportunity for optimization

With real time measurement, manufacturing is different.
Manufacturing Composite Parts

The curing degree is key.

- Polymer matrix influences significantly the mechanical properties of composite parts

- Thermoset resins such as epoxy matrix materials are widely used for manufacturing of composite parts

- Matrix properties are highly depending on the chemical cross-linking process

- Influence of curing degree (number of cross-links) is of significant importance!
Manufacturing Composite Parts

Are all parameters optimized?

▸ What is the ideal curing temperature?

▸ When does the curing process start?

▸ When is the curing process completed?

▸ Is the curing process the same in all positions of the tool?

▸ Is there any optimization potential in the curing process (time/cost)?
Ultrasound Test System GZ US-Plus®

You cannot manage what you cannot measure.  

- Quality assurance at goods receipt
- Process monitoring directly in the manufacturing process (Autoclave, RTM, ...)
- Optimization of manufacturing parameters (curing time, curing temperature)
- Documentation of up to 100% of all parts
- Easy handling and use, also by manufacturing staff

Peter Drucker
Ultrasound Test System GZ US-Plus®

GZ US-Plus provides transparency to the manufacturing process.

► Fast & easy detection of defects (within few minutes)

► Real-time information about curing process (transparency)

► Easy evaluation of manufacturing process possible

► Show optimization potentials

► Very robust test system for use in production area and lab
Process Monitoring using GZ US-Plus®

- Cycle time reduction potential -20% (example)
- Time tool is occupied ↓
- Tool output ↑
- Cost ↓

Example of real measurement of curing process in manufacturing tool

Curing process Too long
Process Monitoring using GZ US-Plus®

Detect defects

► Fast detection of defects
► Short reaction time due to short measurement duration
► Rejects ↓
► Waste of expensive parts ↓

Example of real measurement of curing process in manufacturing tool

Curing process correct

Curing process incorrect
GZ US-Plus®

Reliable test system for detection of defects and process optimization

- Contact-free measurement using ultrasound technology directly in tool

- Developed in cooperation with German Federal Institute for Materials Research and -Testing BAM

- Successfully used for 15 years in industry (Automotive, Aerospace, Research, ...)

- US-Plus clients include e.g. Airbus Helicopters, DLR, Siemens, Audi, Daimler, ...
Grasse Zur Composite Testing

**Test Services**
material tests as a service - mechanical test lab for composites

**Test Systems**
test systems and test fixtures for testing composite materials

**Training**
training on materials testing of composites
Some of our client references

- BMW
- Material tests
- Registered supplier
- Shear test system S-100
- Registered supplier
- US-Plus process control
- Material tests
- Registered supplier

- Lamborghini
- Material tests
- Registered supplier
- Shear test system S-100
- Registered supplier
- US-Plus process control
- Material tests

- Porsche
- Material tests
- Registered supplier
- Shear test system S-100
- Registered supplier
- US-Plus process control
- Material tests

- MT Aerospace
- Material tests
- Registered supplier
- Shear test system S-100
- Registered supplier
- US-Plus process control
- Material tests

- Audi
- Material tests
- Registered supplier
- US-Plus process control
- Material tests

- Composites Systems
- Material tests
- Registered supplier
- US-Plus process control
- Material tests

- Siemens
- Material tests
- Registered supplier
- US-Plus process control
- Material tests

- Sinoi
- Material tests
- Registered supplier
- Material tests
- Registered supplier

- Grob Aircraft
- Material tests
- Registered supplier
- Material tests
- Registered supplier

- Airbus Helicopters
- Material tests
- Registered supplier
- US-Plus process control
- Material tests

- DLR
- Material tests
- Registered supplier
- US-Plus process control
- Material tests

- Bayer
- Material tests
- Registered supplier
- Material tests
- Registered supplier

- Fraunhofer ICT
- Shear test system S-100
- Registered supplier
- Material tests
- Registered supplier

- Dornier Seawings
- Material tests
- Registered supplier

- BASF
- Shear test system S-80
- Registered supplier
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