

GRASSE ZUR
COMPOSITE TESTING

US-Plus®
Test System for
Online Process Monitoring





Why monitoring Processes online?

With real time measurement,
manufacturing is different.

- ▶ 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





Manufacturing Composite Parts

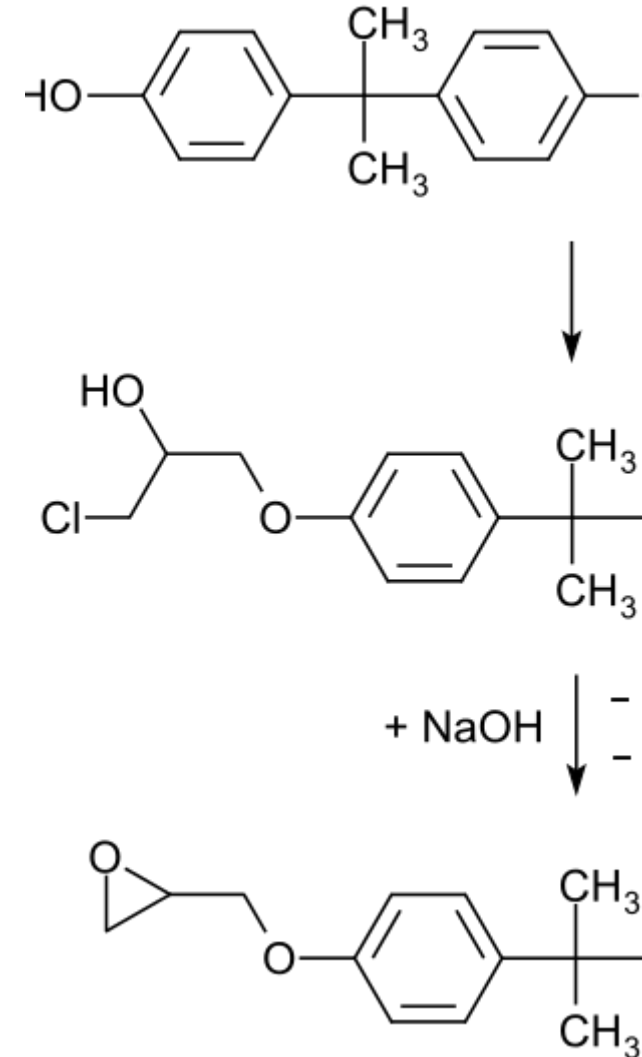
The curing degree is key.

- ▶ 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!



Are all parameters optimized?

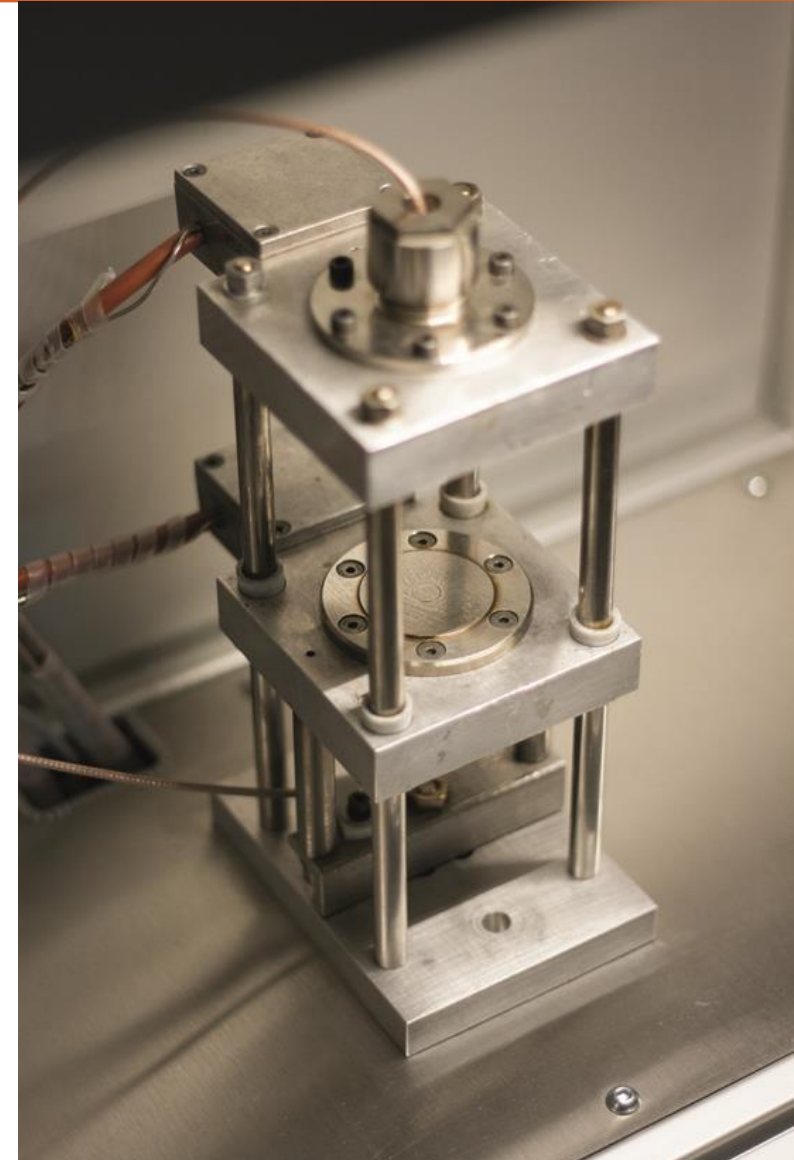
- ▶ What is the ideal curing temperature?
- ▶ When does the curing process start?
- ▶ When is the curing process completed?
- ▶ Is the curing process the same in all positions of the tool?
- ▶ Is there any optimization potential in the curing process (time/cost)?



You cannot manage
what you cannot measure.

Peter Drucker

- ▶ 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



Ultrasound Test System GZ US-Plus®



GRASSE ZUR
COMPOSITE TESTING

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

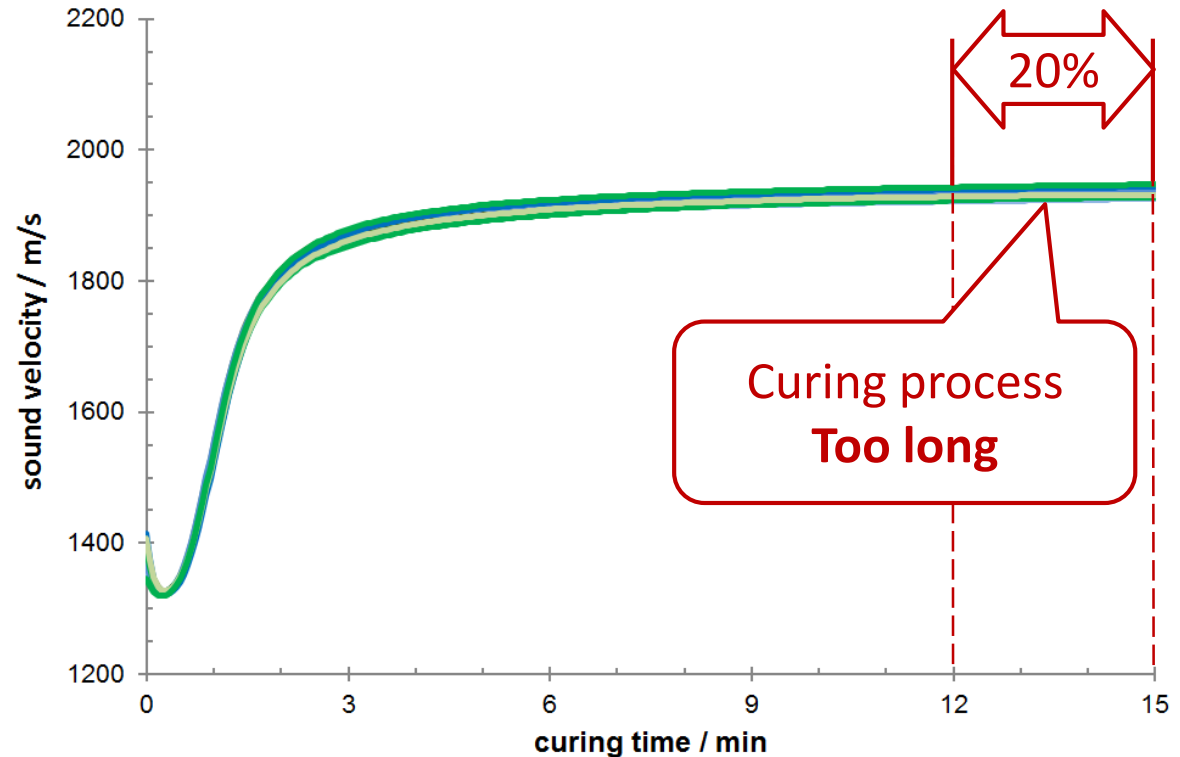




Safe costs

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

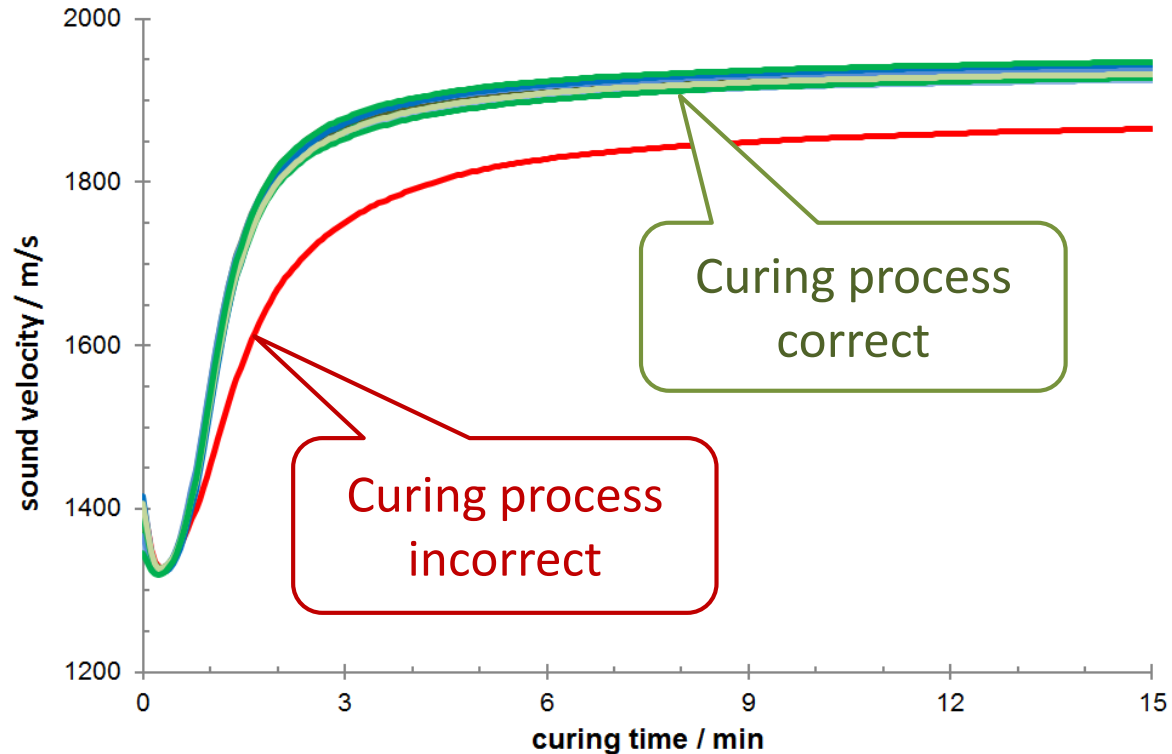
Example of real measurement of curing process in manufacturing tool



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



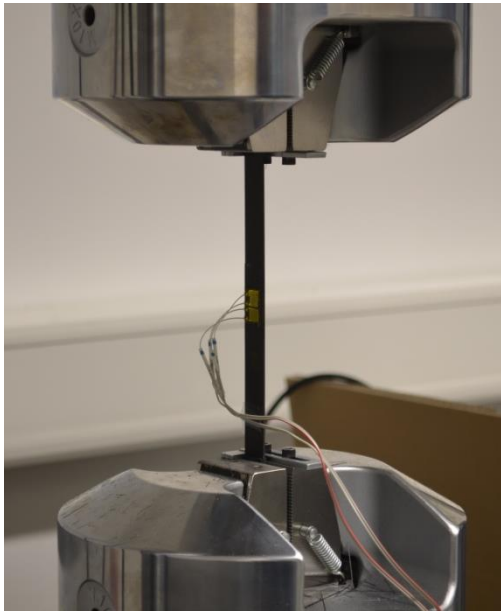
Reliable test system for detection of defects and process optimization

- ▶ 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, ...



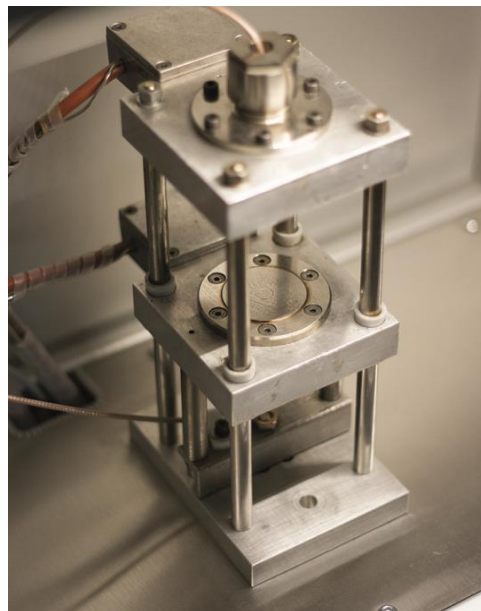
Test Services

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



GRASSE ZUR
COMPOSITE TESTING



- ✓ Material tests
- ✓ Registered supplier



- ✓ Shear test system S-100
- ✓ Registered supplier



PORSCHE

- ✓ Material tests
- ✓ Registered supplier



- ✓ Material tests
- ✓ Registered supplier



- ✓ US-Plus process control
- ✓ Material tests



- ✓ US-Plus process control
- ✓ Material tests



- ✓ US-Plus process control
- ✓ Material tests

SIEMENS

- ✓ US-Plus process control
- ✓ Material tests



- ✓ Material tests
- ✓ Registered supplier



- ✓ Material tests
- ✓ Registered supplier



- ✓ US-Plus process control
- ✓ Material tests



- ✓ US-Plus process control
- ✓ Material tests



- ✓ Material tests
- ✓ Registered supplier



- ✓ Shear test system S-100
- ✓ Registered supplier



DORNIER SEAWINGS

- ✓ Material tests
- ✓ Registered supplier



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



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