Testing of composite materials

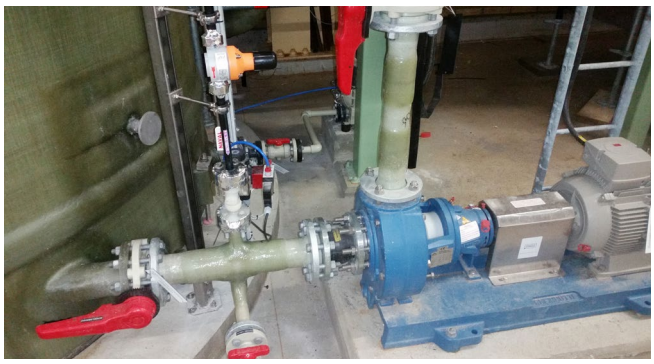
DEKRA
On the safe side.

Various materials require different testing methods

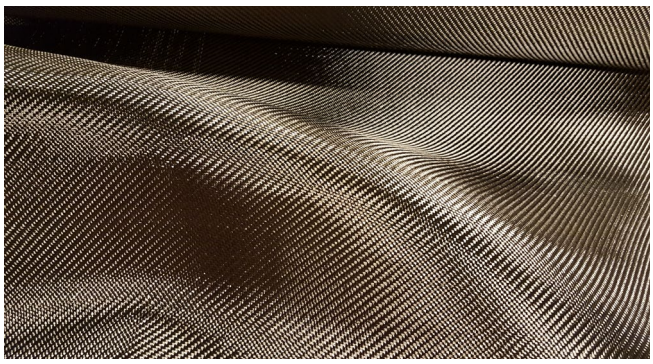
The use of fiber composites is increasing and thus also the need for good non-destructive testing methods. It is more straightforward to inspect a metal materials' homogeneous structure compared to a composite material which is layered and anisotropic. Some testing methods for metals are useless for composite structures, while others require good knowledge about the structure of composite materials to be used.

The level of defect detection depends not only on the test method but also on the material properties. Different methods are preferable for detecting different kinds of defects. In general, the following defects should be detectable in, for example, wind turbine blades: delaminations, cracks, impact damages or lightning damages. Which method that is the most suitable depends on the requirements on the part, e.g. size and shape of the defects that must be detected.

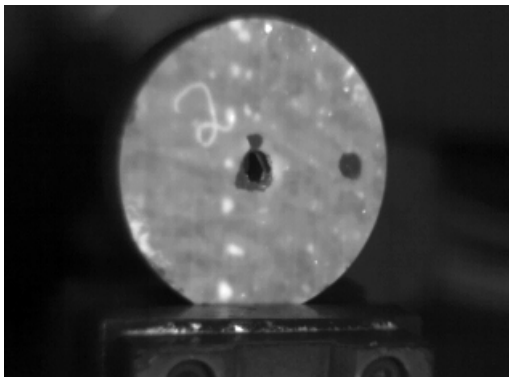
Testing methods often used on composites are ultrasonic (including different resonance methods), radiography, and slightly more recently emerged methods such as thermography and shearography. At DEKRA we are well-experienced within all methods.

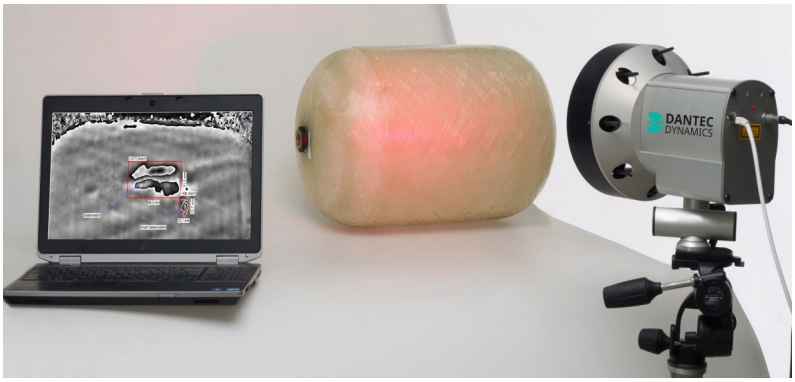


Composite tank



Carbon fiber weave in detail





Ultrasonic

Ultrasonic testing uses a sound wave that propagates through the structure and the echo is measured. Defects will reflect or transmit the sound differently from intact material. Often phased array is used, which simply puts several ultrasonic probes together to cover larger areas or to steer the sound in a specific direction. Resonance methods are usually grouped underneath ultrasonic testing and uses vibrations (sound) in different ways to detect defects by changes in the vibration pattern (as frequency and amplitude variations).

Radiography

Radiography uses gamma or X-rays to inspect materials. Radiography detects defects by a higher or lower grade of absorption of the beam when it passes through the material. Higher density will absorb the radiation more than lower density. A defect in form of a crack will appear as a part of the material with very low density.

Shearography

Shearography uses collimated laser to image the test surface in rest and by shearing the light into two images slightly offset from each other it is possible to measure the difference in surface topography when the surface is loaded to detect the defects. Different types of loading are heating, vacuum and vibration. The method is often used for large area coverage.

Thermography

Thermography uses a thermal camera to measure temperature differences in the region of a defect. Heating or cooling is used to create heat flow changes within the material and a thermal camera records the temperature and disturbances in the heat flow which indicates defects. The method is often used for large area coverage.

DEKRA - Global partner for a safe world
DEKRA is working for increased safety in a variety of industries through independent inspection, testing and certification. DEKRA is Europe's leading expert organization with 40 000 employees in more than 50 countries.

DEKRA Industrial AB
Gamlestadsvägen 2
415 02 Göteborg
Telephone +46 (0) 10 - 455 1000
www.dekra-industrial.se

With reservations for errors and changes.

DEKRA
On the safe side.