Integrity Diagnostics provides inspection and monitoring services of fiber reinforced plastic structures and pressure equipment during operation using Diagnostic Acoustic Emission (DAE) technology. DAE allows detection of delamination growth, matrix cracking, and fiber breakage under real operational stress conditions. During operation, operational issues causing flaw initiation and development are often identified. DAE detects internal and surface breaking flaws with no limitation while effectively locating flaws along the piping or vessels. Periodic or continuous monitoring of revealed flaws alerts when repair or replacement is required.

Proven experience of Integrity Diagnostics includes inspection and monitoring of wide range of fiber reinforced plastic structures in different countries, particularly:

- FRP piping (water, acid and other)
- FRP pressure vessels
- FRP storage tanks
- Aerospace composite overlap pressure vessels with metal liners
- FRP structures

DAE Unique Advantages – Increased Safety with Excellent Money Saving

- 100% examination of structure
- No need to evacuate product or clean
- Reliable detection of flaws, leaks, and evaluation of flaw propagation rate
- Differentiating between developing and non-developing flaws
- Quantitative long-term monitoring of flaws
- Prioritization of structures for maintenance and repair
What is Acoustic Emission?

Acoustic emission is a phenomenon of sound and ultrasound (stress) wave radiation in materials that undergo deformation or fracture processes.

\[
d = \frac{1}{2} (D - \Delta T \cdot V)
\]

- \(d\) = distance from first hit sensor
- \(D\) = distance between sensors
- \(V\) = wave velocity

Crack, delamination growth, fiber breakage in stressed composite materials results in a fast release of potential energy in form of stress waves with frequencies typically between 50 kHz and 1 MHz. These waves propagate along the structure for distances of several feet and are detected by piezoelectric sensors. Special analysis of detected AE waves is then performed to locate acoustic emission flaw sources, identify flaw type, evaluate rate of flaw propagation and its sensitivity to load/stress/operational changes.
Acoustic Emission Standardization

Acoustic Emission is one of the standard non-destructive test methods with several dozen standards, procedures, and test methods issued by various international organizations such as ASTM, ASME and others. Here are some standards, codes and documents related to use of Acoustic Emission technology:

**ASME**
2. ASME STP-PT-023 – Guidelines for In-service Inspection of Composite Pressure Vessels.

**ASTM**
2. ASTM E 1118 Standard Practice for Acoustic Emission Examination of Reinforced Thermosetting Resin Pipe (RTRP).
3. ASTM E 2191 Standard Practice for Examination of Gas-Filled Filament-Wound Composite Pressure Vessels Using Acoustic Emission
7. ASTM E 2661 / E 2661M-10 Standard Practice for Acoustic Emission Examination of Plate-like and Flat Panel Composite Structures Used in Aerospace Applications.