



**AETech**

Acoustic Emission Technology

**Non destructif testing  
by acoustic émission**  
applied to the field  
of materials and the structures



***Prevent industrial risks  
using the Acoustic émission...***

- Anticipate and detect the structures defects
- Control and follow the ageing of materials
- To increase the safety and the life span of industrial plants and equipments.

# The principal applicability

Many applications can profit from AETech technology,  
We can extend our expertise to your industrial field and your specific needs.



## Materials and structures in transport industry

The transport industry represents in our days one of the most dynamic and demanding sectors in terms of safety and materials performance.

Our expertise helps the players of this industry branch to maintain and develop their competing goals.

### Applications :

- Automotive,
- Railway,
- aircraft and space,
- Shipbuilding.



## Industrial equipment and facilities

We propose a continuous or periodic assessment for industrial structures to detect and follow the severe and irreversible damages (embrittlement, ageing, corrosion, assemblies separation, cracking, break...).

### Applications :

- Control of stressed structures,
- Corrosion control and monitoring,
- Chemicals and petrochemical transport and storage,
- Leaks detection and localization



## Permanent civil engineering structure

In collaboration with its partners, AETech develops innovating and easy to set-up methods of sounding and monitoring.

The use of multichannel acoustic emission system allows a fast and reliable real-time global structures control.

### Applications:

- Auscultation monitoring and survey of structures cables.
- Control of the micro fissuring and cracking of the concrete structures by acoustic emission.
- Control and surveillance of carbon composite structures used to repair structures...



## Manufacturing processes

Improve the product quality through acoustic measurements and diagnosis.

These measurements of sound emission allow the evaluation process parameters improving its monitoring and allowing the increase in the productivity and the reduction of the production costs.

### Applications:

- Pharmacy: active ingredients, excipients. ...
- Food: dextrose, sugars, flours, cocoa...
- Production: in line control of the defective parts,
- Chemical Industry: resins, PTFE...



## Corrosion

The Acoustic emission applied to corrosion control allows the detection, the localization, and the monitoring of metals degradation.

### Applications:

- Control and monitoring of coatings disbanding,
- The use of the acoustic emission with the methods of usual protection (cathodes protection)

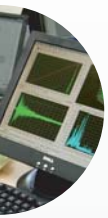


## Research and development

In order to guarantee the success of your projects, AETech established a powerful network of R&D partners.

With the AETech services you also profit from the potential, technical competence of its partners :

- Roberval (UTC, Université de Technologie de Compiègne),
- CNRS (Centre National de la Recherche Scientifique),
- LCPC (Laboratoire Central des Ponts et Chaussées).



# Prevent the risk of accidents and follow materials and structures degradation using Acoustic Emission testing

*Today, safety related to the industrial risks became an essential component within companies ; the ageing of materials and the structures represents a considerable risk factor.*

*The non-destructive testing by acoustics emission makes it possible to check the reliability and the integrity of the installations while reducing the costs of maintenance.*

*The primary advantage of this technique is to provide information in real time, in service, without disturbing the production*

AETech offers its expertise forged through a long and profitable R&D experience carried out in the French research laboratory Roberval CNRS (Université de Technologie de Compiègne).

Prizewinner in 2001 and 2002 of the national contest award of the innovating companies, AETech is present in the field of the materials and industrial structures control and expertise (non-destructive testing by acoustic emission, mechanical tests and innovating approaches of experimental analyses and modeling).

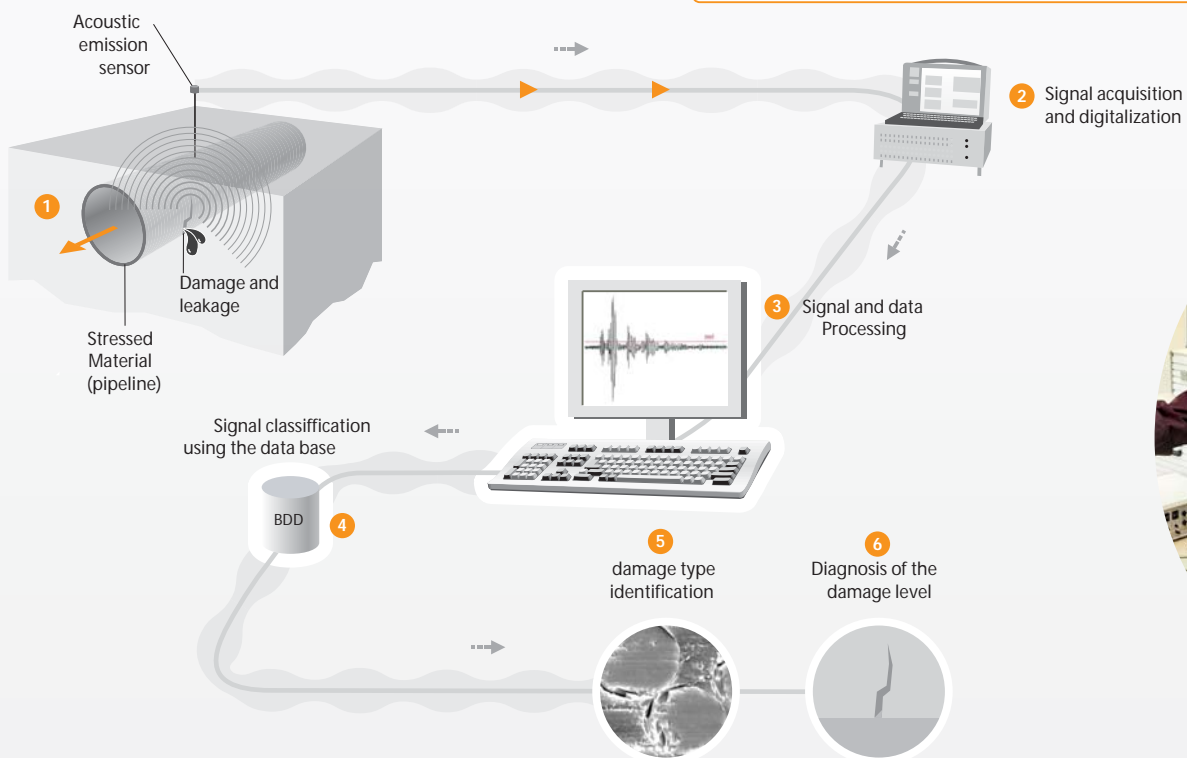
## Principle of the acoustic emission testing

The pertinence of this technique rests on the association of several scientific disciplines. It is the result of 15 years of research efforts.

- Artificial intelligence and neural networks
- Signal processing.
- Data analyzing and processing
- Physics of materials
- Acoustic emission instrumentation

**This technology brings reliable solutions to :**

- Damage detection and localization.
- Corrosion control
- Failures identification
- Inspection of stressed structures
- Monitoring
- Leaks detection and control



# Materials and structures characterization

*AETech has a significant database of acoustic signatures, which allows to classify and to identify various types of structure damage and failure (cracking, break, corrosion) ..*

The mechanical tests and analyses allow a reliable evaluation of products quality and safety at all the stages of their lifespan: development, production, marketing, exploitation.

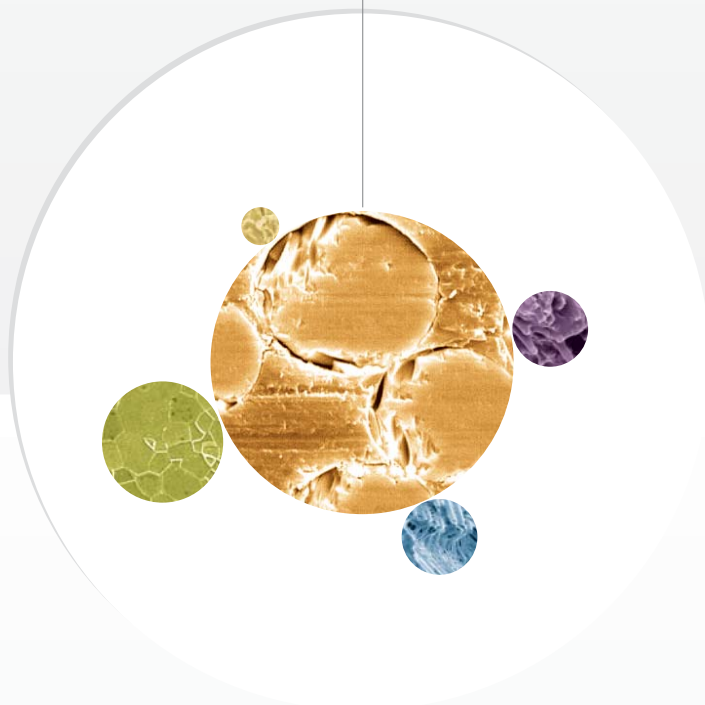
The general-purpose tests that AETech proposes allows the application of mechanical and thermal loadings in simple or complex environments.

This approach makes it possible to evaluate the performances and the safety of the materials and industrial equipment and components.

The AETech expertise applies to metals and alloys as well as plastics and composites.

## NO EXHAUSTIVE LIST OF INVESTIGATED MATERIALS

- metals and alloys,
- polymers & composites,
- building materials,
- ceramics,
- Wood,
- etc...



### OUR OFFER OF SERVICES

#### Design & development

- Research & development for the materials choice and manufacturing processes,
- Simulation of the environmental mechanical stress: static load, fatigue and impact,
- Simulation of the environmental climatic condition: temperature, moisture.

#### Exploitation

- In-service controls and measurements,
- Diagnosis, predictive maintenance.

#### Failure

- Endurance, fatigue behavior,
- Analysis of break causes,
- Expertise.



### ADVANTAGES

- Inexpensive and easy to set up technology with :
- Conformity to the French, European and international standards and regulations,
- Laboratory and/or field interventions by the mobile units of AETech.



# Positioning of the acoustic emission in the non destructive testing

METHOD	PRINCIPLE/ DETECTED DEFECTS	ADVANTAGES	LIMITS
Acoustic emission	Generation of acoustic waves. Any evolutionary defect.	Follow-up under operation. Sensitivity. Global method.	Insensitive with the no evolutionary defects.
Ultrasounds	Transformation of the acoustic wave. Internal defects.	Sensitivity. Mobility. Easy automation	Interpretation by qualified personnel
Radiography	Less absorption of the radiations. Internal defects.	Good definition. Filing.	Operational safety. No mobility.
Eddy currents	Modification of the induced currents distribution. Skin defects.	Without contact smethod . Easy automation.	Conducting material. Difficult interpretation.
Penetrant testing	Retention of pénétrant. Défauts débouchants.	Direct visualization Global method for small parts.	Difficult defects appreciation.

## ADDED VALUE

The acoustic emission testing method is based on a solid knowledge of materials (physical properties, mechanical properties, etc) and on acoustic emission competence built through many laboratory researches and also throughour industrial partnerships.

It is the most adapted technique to supervise and to study the materials and structures damage evolution.

The power of the acoustic emission testing is in the diversity of the parameters of the recorded signal (amplitude, energy, frequency, etc.), and in the methods developed to process them. It is the combination of these parameters and the use of statistical data processing techniques such as the neural networks, which lead to the establishment of an accurate diagnosis on the damage state.

The description of the chronology and the severity of these damages allow to understand the structures behavior and to prevent catastrophic failures.

### Acoustic emission:

The acoustic emission (AE) is the phenomenon of release of energy in the form of transitory elastic waves resulting from local intern micro-displacements within a stressed material (Standard AFNOR NFA 09350).

## Example of application on composite material

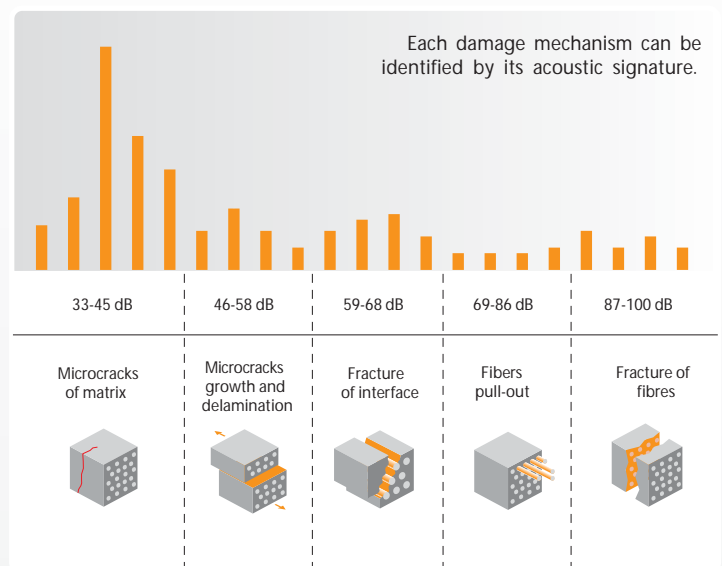
### SPECIFICITIES OF THE COMPOSITE

The use of the acoustic emission technique in the field of composite materials allows very clear advance in the comprehension of the mechanical behavior of these materials in particular their damage mechanisms.

With time, the use of this technique passed from the stage of the laboratory to that of industry. Research established schematic models and acoustic signatures, which describe the chronological damage processes of composite materials.

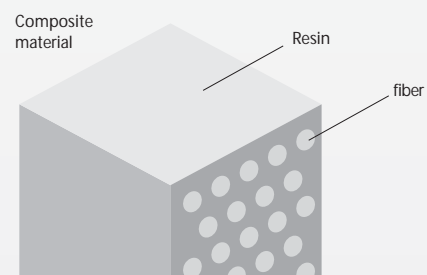
Each damage mechanism was voluntarily isolated and its acoustic signature identified.

### MÉTHODOLOGIE DÉVELOPPÉE



### EXEMPLE

*In development phase, the application of this technique for high stressed areas of a high-speed train allows to identify the zones of brittleness in order to better ldesign them.*



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## They trust us...

Technip

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Epsilon Composite

LCPC (Laboratoire Central des Ponts et Chaussées)

more information on...  
[www.aetech.fr](http://www.aetech.fr)

