MOSYCOUSIS, European Union Research Project (2011-2013).

Unexpected failure in an industrial production chain does not only involve the costs of failed parts replacement and the associated man-hour labour, but downtime costs have also have to be considered. To keep a machine functioning well it is a must to have good predictive maintenance, as it helps to reduce operating risk, avoids plant failures, provides reliable equipment, reduces operating costs, eliminates defects in operating plant and maximizes production. Acoustic Emission (AE) is a phenomenon of transient elastic wave generation in materials under stress. When the material is subjected to stress at a certain level, a rapid release of strain energy takes place in the form of elastic wave which can be detected by transducers placed on it. Plastic deformation and growth of cracks are among the main sources of AE in metals. Though AE can came from any system under movement, the main source is doubtlessly from rotating machinery. Sources of AE in rotating machinery include impacting, cyclic fatigue cracks, friction, turbulence, material loss, cavitation, leakage, etc. In most cases the SMEs machine owner would be satisfied with a simple affordable device that is able to warn them from critical equipment failure. Recent developments in sensing technology, microprocessors, and miniaturized radio transceivers has enabled a new generation of Wireless Sensors Networks.

The future of these sensors is to have an ubiquitous sensing nodes that will autonomously report on operating conditions, and that this data will be used to facilitate structural health monitoring, embedded test & evaluation, and condition based maintenance of critical industrial rotating machinery without the use of expensive cabling. In addition, in order to provide sensing networks which are truly autonomous, chemical batteries must be eliminated from the sensor and some kind of energy harvesting has to be foreseen. Piezoelectric materials have demonstrated their ability to convert vibration energy from vibrating machinery and rotating structures into electrical energy for powering a wireless sensing node. Hence, an acoustic emission self-powered wireless sensor is one of the main objectives to be achieved in this project. The sensor will measure using frequency as opposed to time which is advancement from the state of the art.