

Self-powered Wireless Sensor nodes for SHM

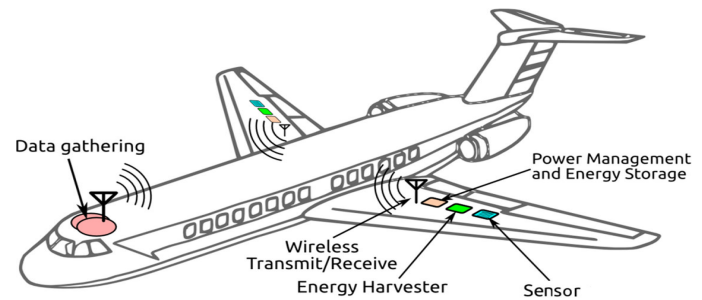


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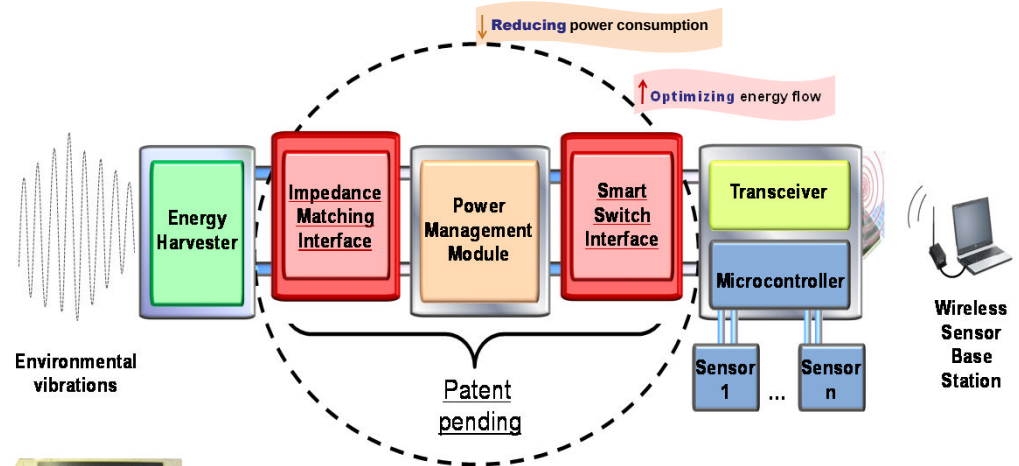
What is the system?

The system is designed to harvest energy from wing vibrations of aircraft in active service, and then convert the harvested energy into usable electrical energy to provide electrical power for sensors and a wireless communication system. The system is self-sufficient in energy supply for monitoring of structural health conditions, e.g., aircraft wing fatigue and in-flight loading.



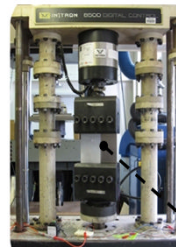
Novel System Approach and Configuration

- Novel piezoelectric energy harvester based on Macro-Fibre Composite (MFC)
- Efficient and compact design for power management
- Flexible energy flow management for energy-aware load activation
- Effective software algorithms reducing power consumption
- Efficient data manipulation enabling multichannel sensing



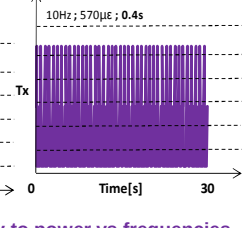
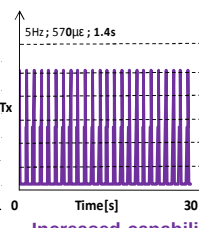
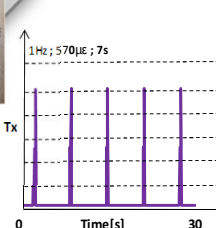
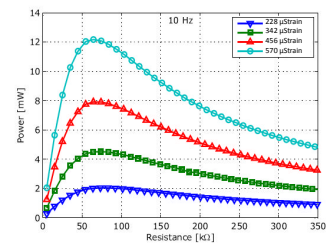
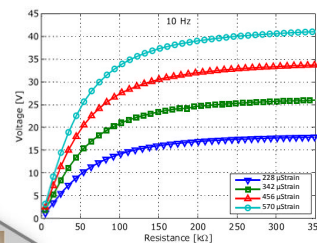
Key Performance

- **High power harvested:** 1.8-12mW at 1-10Hz and 230-570 μ ε
- **Capability to power continuously** wireless sensors: 0.4-15s
- **Low current consumption** in sleeping mode: 1.6 μ A
- **Multi-sensors** on-board: 3-axis accelerometer, temperature sensor and light detector



Aluminium

• $\gamma = 70\text{GPa}$
• $\rho = 2.7\text{g/cm}^3$



Increased capability to power vs frequencies

Potential Applications

- aerospace, aviation & defence
- railway & transport industries
- automotive
- wind turbine renewable energy
- water, oil & gas pipe-lines
- civil bridge & tunnel infrastructures

