

## Energy harvesting from rotating machinery

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This demonstration establishes feasibility of using energy harvesting for rotating machinery. A piezoelectric energy harvester in combination with AmbioMote24-A achieved transmission rates up to 8 transmissions per second at ~500rpm.

For this demonstration we constructed an energy harvester that uses a piezoelectric harvesting element to power an AmbioMote24-A. The harvester responds to range of rotational velocities, in this case to 240-500rpm (other velocities can be configured as well). The harvester, the sensing element and the wireless device are housed inside a roller. The roller is mounted on two supports and driven by a variable-speed hand drill. The sensing element used in this experiment is an analog temperature sensor, though any other sensor can be used in its place. The wireless sensor operates from inside of the roller, sending transmissions to a receiver connected to the computer. Each sensor transmission is timestamped, displayed on the screen along with sensor ID and logged into a file.

We obtained the following results:

- At 240-300 rpm AmbioMote performed up to 40 measurements/transmissions in 30 seconds. This translates into approximately 1.3 measurements per second.
- At 420-480 rpm AmbioMote produced up to 240 measurements in 30 seconds or 8 measurements per second.

These results clearly indicate feasibility of using energy harvesting for monitoring hard-to-reach locations inside rotating machinery.

AmbioSystems LLC designs and manufactures intelligent wireless platforms for sensing, actuation, and structural control of industrial, consumer, and infrastructure systems. Our solutions are differentiated by our focus on using ambient energy sources such as vibration, strain, light, etc to power the systems.

We can customize the demonstrated design of sensor powered by rotation to any practical application, interface other types of sensor, etc.

The video shows real-time operation of the rotation-powered wireless sensor.

Each long message on the computer screen appears as a result of a wireless transmission from the sensor.

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