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Energy Autonomous Wireless Valve Leakage Monitoring System With Acoustic Emission Sensor

Industrial internet will improve process control and increase efficiency to maximize industrial output. Key enabling technologies include low-power wireless communication, energy harvesting power autonomous devices along with the latest in sensing devices. This paper presents a wireless sensing system developed for the key industrial application of condition monitoring, specifically; valve leakage detection. The system integrates advances in all of the three aforementioned topics. A novel MEMS-based acoustic emission sensor is described to detect valve leakage manifested as vibrations in certain frequency bands. An in-house developed ultra-low power wake up radio technology, which enables the deployment of this sensor, will be presented. Two energy-harvesting systems: thermal harvesting in the sensor node and an industrial current loop harvester for the base station are developed. Integration and piloting of this system is described and evaluation results presented. The system presented offers a repeatable and adaptable sensor system deployed for valve leakage detection in an ATEX industrial environment.