DOE Sensors & Automation 2007 Annual Portfolio Review

INDUSTRIAL WIRELESS IS HERE:

Low-cost vibration power harvesting for industrial wireless sensors

Presenter:

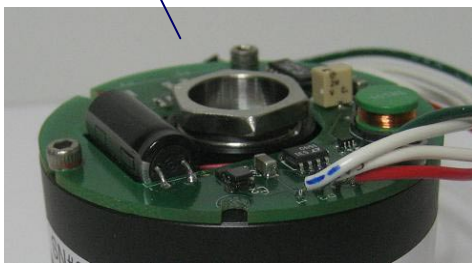
Dr. Jeremy Frank
KCF Technologies, Inc.
112 W. Foster Ave, State College, PA
jfrank@kcftech.com
814-867-4097

Technology Description

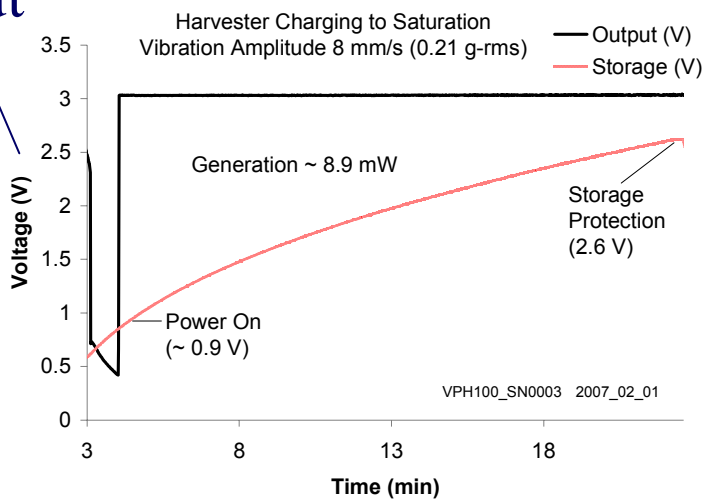
- KCF Technologies and Penn State University
  - Vibration power harvesting devices enable self-powered industrial wireless sensors
- Purpose: convert freely available vibrations to electricity
  - Store and deliver power to the wireless sensor

2nd Generation Design

Circuit & Storage



Output



Technology Significance

- Wireless sensors reduce the installed cost of industrial sensors by up to 90%.
  - But, in many situations battery-change = maintenance costs
- Vibration power harvesting eliminates the need for batteries
  - Typical battery life is 3-18 months
  - Sensor efficiency is improving, but the desire for increased sensing requires more energy consumption
- Power harvesting enables a one-time installation

Energy Savings… via Cost Savings

Vibration Power Harvesting is an Enabling Technology

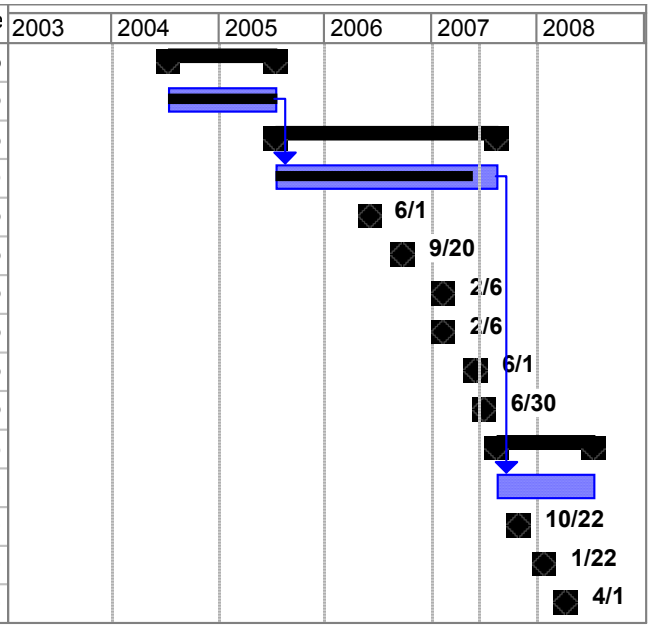
- Mean Time Between Attentions (MBTA)
  - With this technology: maintenance is eliminated
- Life cycle cost savings for wireless sensing in industry
  - With wires or batteries, life cycle cost is at least three (3) times higher than the installed sensor cost (estimated at $1,000 - $3,000)
  - Payback is measured in life-cycle cost savings for installed sensors

Economic and energy savings impact

- Adoption of wireless sensors where wired or battery solutions are not feasible

Current Status

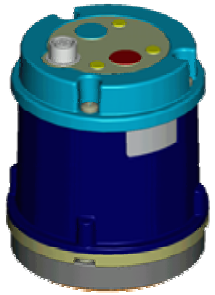
ID	Task Name	% Complete
1	**Phase I**	**100%**
2	Feasibility Demonstration	100%
3	**Phase II**	**88%**
4	Product Development	88%
5	1st Generation Design Complete	100%
6	Demonstration: Johnson Controls (York, PA)	100%
7	2nd Generation Design (RLW, Inc.)	100%
8	Demonstration: Johnson Controls (York, PA)	100%
9	3rd Generation Design - Integrated Harvester / Sensor	100%
10	Deliver Units for Demonstration: Johnson Controls, ExxonMobil	100%
11	**Phase II Supplement**	**0%**
12	Production Setup	0%
13	Complete Tooling for Injection Molded Parts	0%
14	Preliminary Production Line Setup (KCF)	0%
15	Production Line Setup (Omega Piezo)	0%



1st Generation

2nd Generation

3rd Generation
Harvester/Sensor



Next Steps

- Remaining Phase II Work (Through July 07)
  - Harvester/Sensor demonstration kits
- Phase II Supplement (July 07 to July 08)
  - Production ramp-up
  - Custom designs for end-user applications
    - ExxonMobil
    - Johnson Controls
  - Integration with wireless sensor solutions
    - RLW, Inc.
    - Seeking partnerships with sensor network designers