

ECE 480 DT 11: Vibration Energy Harvesting

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Introduction

Instrumented Sensor Technology, INC. has provided us the challenge to develop a system in which to extend the operational period of their field instrument in low frequency environments. Most available vibration energy harvesting methods involve mechanisms that function poorly in such low frequency environments. Our intuition has allowed us to bridge the gap where most available products lack effectiveness.

Abstract

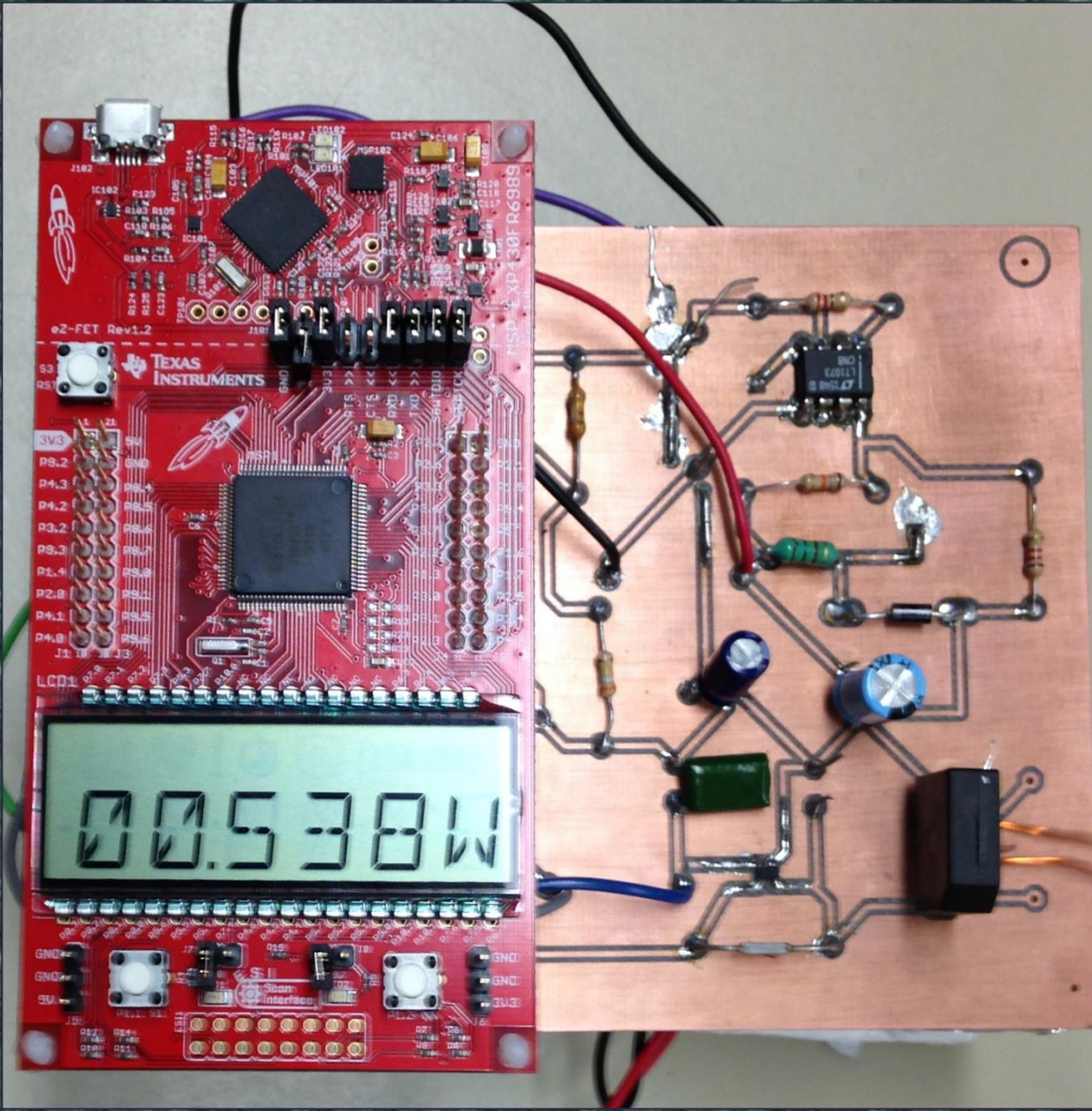
The goal is to generate usable electrical energy from vibration found in semi-truck trailers. Using electromagnetic induction allows for harvesting this low-frequency vibrational energy where other devices cannot. To prolong the length of operation of the field device, this harvested energy is stored in a rechargeable battery.

Project Subsystems

Harvesting Apparatus	Powertrain
- Convert mechanical vibration into AC voltage. - Electromagnetic Coil	- Convert AC power to DC - Connects to rechargeable cell
Supply	Monitoring
- Rechargeable battery where charge is stored 3.6v lithium ion	Monitors input power and power into the supply

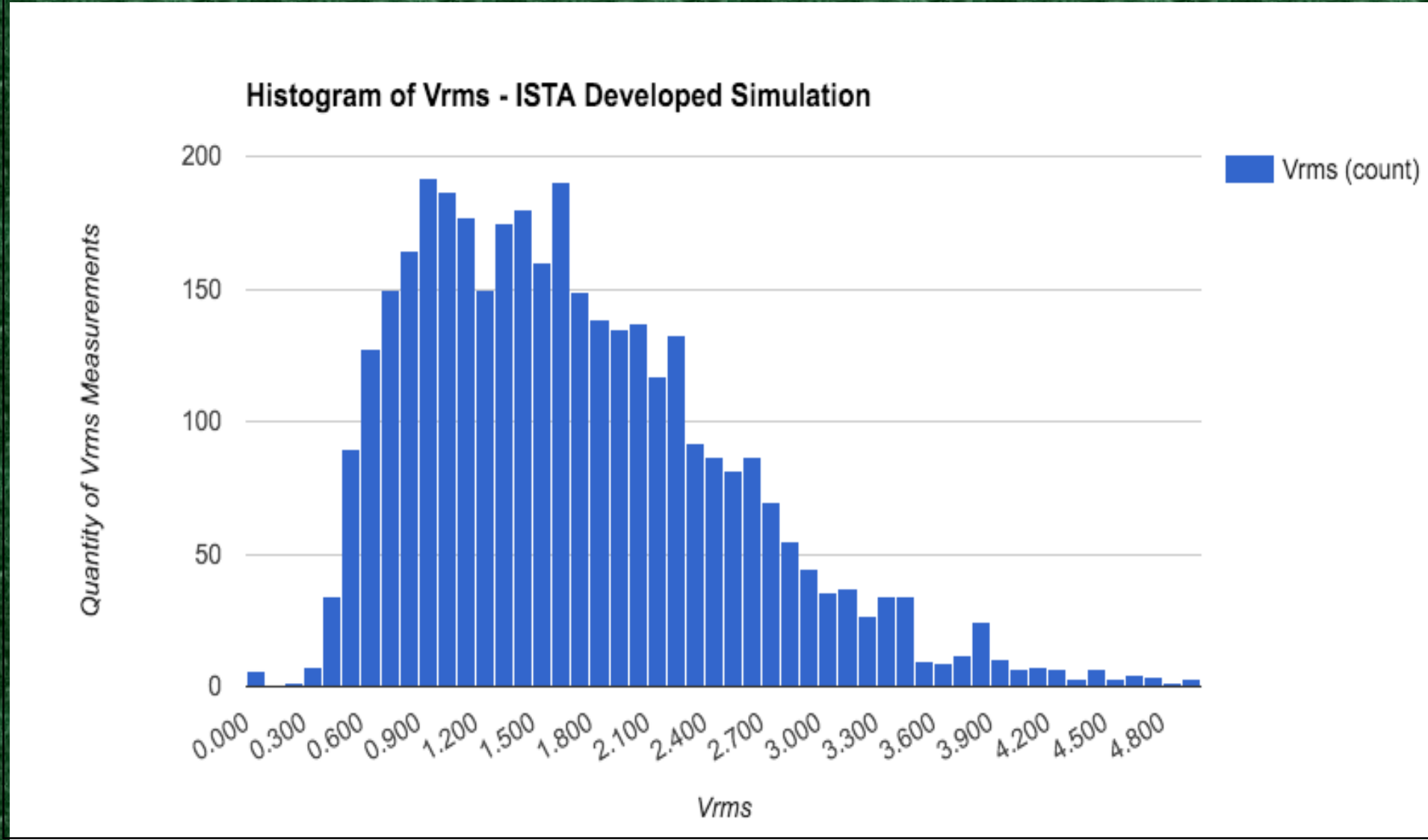
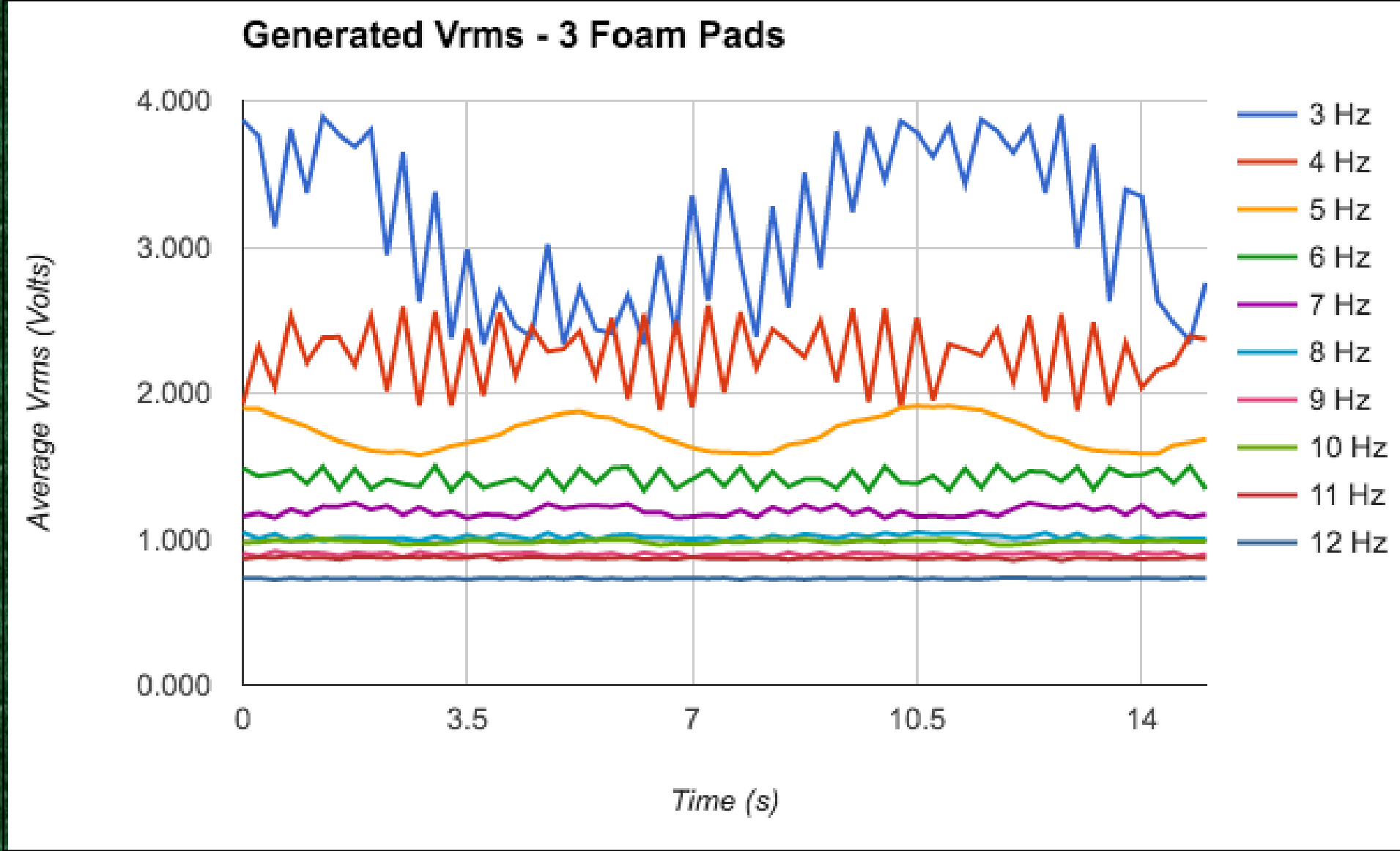
Materials

Qty.	Item	Line Total
1	N52 Neodymium Magnet	\$68.99
4	Compression Spring	\$19.90
1	PVC Pipe	\$3.95
2	PVC Cap	\$3.60
1	Foam	\$1.50
1	Magnet Wire Spool	\$28.40
1	Bridge Rectifier	\$0.65
3	Buck-Boost Converter	\$16.59
3	Inductor	\$1.14
9	Capacitor	\$3.74
4	Diode	\$1.72
10	Resistor	\$1.10
1	MSP430 Launchpad	\$17.99
1	Lithium Ion Battery	\$5.99
2	Current Sense Amplifier	\$1.76
Total		\$177.02



Results

The vibration harvesting apparatus generates adequate RMS voltages at low frequencies and is most efficient as frequency decreases. Roughly 59.2% of truck vibrations are at a magnitude large enough to activate our product and the, VTP-3Dv2, field device.



Conclusion

- This product can effectively lengthen the operation life of IST’s field device.
- The subsystems developed have been designed to make our product an efficient and effective device that operates safely over a long period of time.
- We believe that this product is a testimony towards the viability of harnessing vibrations for sustainable-portable energy as demand increases.

