



**PROJECT TITLE:** ENERGY HARVESTING FROM RAIL TRACK FOR TRANSPORTATION SAFETY AND MONITORING

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**A**bstract: An efficient electromagnetic energy harvester featured with mechanical motion rectifier (MMR) is designed to recover energy from the vibration-like railroad track deflections induced by passing trains. Trackside electrical infrastructures for safety and monitoring typically require a power supply of 10-100 Watts, such as warning signals, switches, and health monitoring systems, while typical existing vibration energy harvester technologies can only harvest sub-watts or milliwatts power. The proposed harvester is designed to power major track-side accessories and possibly make railroad independent from national grid. To achieve such a goal we implement the MMR, a patented motion conversion mechanism which transforms pulse-like bidirectional linear vibration into unidirectional rotational motion at a high efficiency. The single-shaft MMR design further improved our previously developed motion mechanism, increased energy harvester efficiency and expanded power harvesting potential. The proposed new design improved reliability, efficiency, and provided steadier power output. Bench test of the harvester prototype illustrated the advantages of the MMR based harvester, including up to 71% mechanical efficiency.

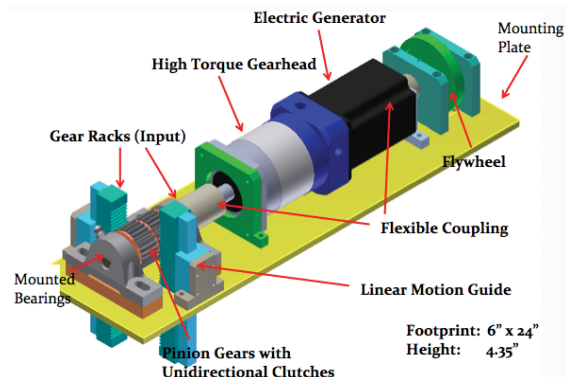
**R**eferences:

John Wang, Teng Lin, and Lei Zuo, "High efficiency electromagnetic energy harvester for railroad application", Proceedings of 2013 ASME Design Engineering Technical Conference (IDETC), 2013

L. Zuo, et al, "High-efficiency energy generator for harnessing mechanical vibration power", US patent publication 20130008157, Publication date Jan 10, 2013, Priority date Apr 15, 2011.



Energy harvester to generate 100 watts of electricity from train-induced track vibrations.



The patented mechanical motion rectifier to converts the up and down vibration into unidirectional rotation with high efficiency and high output power

Fig. 2. The mechanical motion rectifier (MMR) converts the up and down vibration into unidirectional rotation (left) and the lab test shows 71% energy harvesting efficiency (right).



Fig 3 The mechanical motion rectifier (MMR) based railway energy harvester has attract a lot of new media

The mechanical motion rectifier (MMR) based railway energy harvester has attracted a lot of new media attentions and won a national award of Best Application of Energy Harvesting.