

带质量块的微型压电式风能采集器研究

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摘要：

基于风致振动机理的微型风能采集器可以将风能转换为电能，在无线传感等领域具有广阔应用前景。漩涡脱落频率与风速成正比，当漩涡脱落频率与微型风能器固有频率接近时，采集器有较高输出功率，因此为了在低风速环境应用风能采集器，需要降低其固有频率。引入质量块可以降低微型压电式风能采集器的固有频率，使其在较低风速下产生较高输出功率。为了预测带质量块的微型悬臂梁压电式风能采集器的固有频率，基于集总参数建模方法得到了固有频率解析表达式。实验结果表明，对于所制作的风能采集器原理样机，质量块的引入使其临界风速由17.2m/s降低为13.5m/s。

关键词：风能采集；风致振动；压电；漩涡脱落

Study on A Micro Piezoelectric Wind Energy Harvester with a Proof Mass

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Abstract:

Micro wind energy harvesters based on wind-induced-vibration mechanism, which convert wind energy into electrical energy, are promising in such fields as wireless sensing network and so on. The vortex shedding frequency is directly proportional to the wind velocity. The output power of a wind energy harvester is high when the shedding frequency is close to the natural frequency of the harvester. The frequency of the wind energy harvester needs to be decreased when we want to use it in low velocity wind environments. Proof masses were added onto wind energy harvesters to improve the output power under low velocity wind loading. For a cantilevered piezoelectric wind energy harvester with a proof mass, the lumped parameter modeling method was used to derive the frequency expression. For a prototype of micro cantilevered piezoelectric wind energy harvesters, experimental results show that the introduction of the proof mass decreases the critical wind velocity from 17.2m/s to 13.5m/s.

Keywords: wind energy harvesting; wind-induced-vibration; piezoelectric; vortex shedding

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