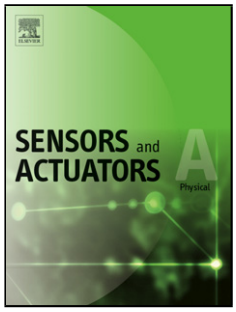

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PII: S0924-4247(17)30499-5
DOI: http://dx.doi.org/10.1016/j.sna.2017.09.014
Reference: SNA 10322

To appear in: *Sensors and Actuators A*

Received date: 23-3-2017
Revised date: 7-6-2017
Accepted date: 8-9-2017

Please cite this article as: Lijuan Wang, Yong Yan, Kamel Reda, Comparison of Single and Double Electrostatic Sensors for Rotational Speed Measurement, Sensors and Actuators: A Physicalhttp://dx.doi.org/10.1016/j.sna.2017.09.014

Comparison of Single and Double Electrostatic Sensors for Rotational Speed Measurement

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Highlights

- Comparison of the performance of single-sensor and double-sensor systems.
- Effect of different rotor materials on the performance of both systems.
- Effect of surface roughness of the rotor on the performance of both systems.
- Effect of the rotor size on the performance of both systems.

Abstract

Accurate and reliable measurement of rotational speed is crucial in many industrial processes. Recent research provides an alternative approach to rotational speed measurement of dielectric rotors through electrostatic sensing and signal processing. This paper aims to explore the electrostatic phenomenon of rotational machineries, design considerations of the spacing between double electrostatic sensors and effect of dielectric rotors on the performance of the rotational speed measurement systems based on single and double electrostatic sensors. Through a series of experimental tests with rotors of different material types, including polytetrafluoroethylene (PTFE), polyvinyl chloride (PVC) and Nylon, different surface roughness (Ra 3.2 and Ra 6.3) and difference diameters (60 mm and 120 mm), the accuracy and reliability of the two measurement systems are assessed and compared. Experimental results suggest that more electrostatic charge is generated on the PTFE rotors with a larger diameter and coarser surface and hence better performance of the