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Predictive Maintenance in plasma etching processes: a statistical approach

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This contribution is a joint work of academicians and a research group of STMicroelectronics (Italy) a leading industry in semiconductor manufacturing.

The problem under investigation refers to a predictive maintenance manufacturing system in Industry 4.0. Modern predictive maintenance is a condition-driven preventive maintenance program that uses possibly huge amount of data for monitoring the system to evaluate its condition and efficiency. Machine learning and statistical learning techniques are nowadays the main tool by which predictive maintenance operates in practice. We have tested the efficacy of such tools in the context of plasma etching processes. More specifically the data considered in this paper refers to an entire production cycle and had been collected for roughly six months between December 2018 and July 2019. 2874 timepoints were considered in total. Quartz degradation was monitored in terms of the reflected power (RF). In addition to the reflected power, the values of more than one hundred other variables have been collected. Results suggest that the considered variables are related to the quartz degradation differently in different period of the production cycle. Blending different penalized methods to shed light on the subset of covariate expected to be prone of signals of the degradation process, it was possible to reduce complexity allowing the industrial research group to focus on them to fine tune the best time for maintenance.

Keywords

Predictive Maintenance; statistical learning; Etching process

Special/invited session

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