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# Innovative digital optical inspection system for Gas Turbine combustion chamber components

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The efficiency, performance, emissions and durability of gas turbines are directly influenced by the integrity of critical combustion chambers components. These components operate under extreme conditions of high temperature and mechanical stresses. Making effective inspection is essential for guarantying performance and preventing failures. Due to complex geometries and the differences between a new and an operated part, the inspection is challenging. Traditional inspections methods rely on manual go/no-go gauges measurements, which are good to capture deviations, but lack granularity to support predictive maintenance models.
In this work, we present an advanced optical measurement system, that enables a digital high resolution, non-invasive inspection of key geometric features. The inspection system can automatically inspect complex openings, for example cooling holes or louver, in gas turbine components faster and more precisely. Thanks to automatic positioning and real time data acquisition it provides robust digital data to help in the assessment of the component. An adaptive optical configuration ensures precise measurements of complex critical features, independent from operators' skills and experience.
The system has undergone stringent tests to confirm the soundness of inspection of both new and heavily operated components. We will provide sound statistical evidence of the verification in lab and in-situ against go/no go gauges demonstrating the system's precision and applicability to industrial environments.
This work highlights the transformative role of digital optical measurements technologies in advanced gas turbine inspection methods to enhance quality assurance processes in service and pave the road to component life extension and scrap reduction.

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