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Measuring System Optimization to Increase Productivity

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Abstract

A particularly important element in increasing the productivity is the metrological check, meaning a more accurate measurement in the shortest time possible. A performance measurement system involves main elements, hardware, measurement technique, probing system and software, each having an important role in checking the quality of products made in production. Due to automation levels in recent years, most parts can be measured using coordinate measuring machines (CMM), on whose heads are mounted on measuring probes with contact or contactless view digitizing or scanning the measuring parts. This paper highlights how to optimize the system for measuring a company that produces stator blades for gas turbines (gas turbine stator blades) using the new 5-axis touch trigger system.

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Keywords: measuring system; productivity; indexing-head; touch-trigger; accuracy.

1. Introduction

Product quality is one of the most important concerns in industrial activity and the interest in quality has become so acute that nearly all countries have set an objective to increase quality [1]. In relation to this issue so important to the industry, metrological check and allocated time are important elements that influence the efficiency in production. For this reason, for measuring parts different techniques are used as efficient as possible to match the requiered standards.

The processing progress on the CNC and the need of producing interchangeable products as accurate as possible explains the momentum gained by the coordinate measuring machines [2]. This paper highlights how to optimize the

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measuring processes in a company that produces blades (Fig. 1a) for gas turbines stator (Fig. 1b) using a measuring PH20 head with the new 5 axis touch-trigger system. The product is installed in the compressor of the turbo compressor (Fig. 1c).

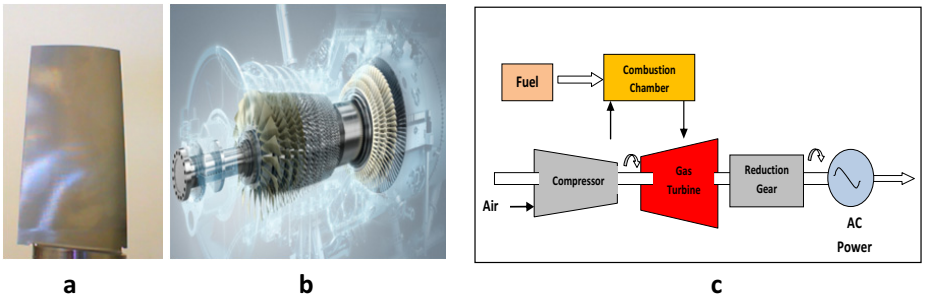

Fig. 1. (a) stator blade; (b) stator blades in gas turbine; (c) gas turbine electric power generation

Nomenclature

CMM	coordinate measuring machine
CV	convex edge
CC	concave edge
LE	leading edge
TE	trailing edge

2. Teoretical foundation

For a piece to perform its functional role in an assembly, as the efective dimension must not exceed the size limit, some deviations from the nominal dimension are requiered. Due to precision, productivity and especially using complex forms of measurement, the coordinate measuring machines (CMM) are beeing used instead of using callipers, micrometers or indicating gauges. Among the methods of acquiring information related to the shape and dimensions of a piece, we remember the digitization or scanning the surface of a part, either by contact or by the lack of contact, on the CMM measuring heads have been mounted touch probes with contact or contactless touch ones. Scanning a surface using a contact trigger is the most common practice of digitizing the surface, the contact between the sphere and part generating an electrical signal which helps us to determine the coordinates of the measured point [3]. Normally, determinations are based on the CAD model, facilitating the measurement proces, primarily due to real-time visualization of results and rapid provision of information about their geometric dimensions and tolerances [4]. This is due to an overlay surface that results in the triangulation of the points over the CAD model, to be more accurate, each point of the triangulated surface is compared to the CAD model and the distance value must be within a previously defined scale deviation. Thus, based on the report measurement results, from this comparison there may be areas of different colors, the deviations of the measured dimensions and standards are larger and will examine the differences between the two entities, or differences may occur for example by charging the probe, and if there are problems the causes are determined and actions are taken. As the distance between the palpated points on a certain surface of the workpiece is smaller, the greater the efficiency of the algorithm comparing the surface and measured CAD model, which demonstrates that the **step measurement** may have a role in determining the efficiency of the dimensional deviations.

Another important factor in determining accurate measurements and determining the level of confidence in decisions is the measuring uncertainty, the probability with which it is believed that the true value of the measurand is in a range of values, called regulations, of a quantity of the same nature as the measurand [5]. Maximum