



Leading Edge Profile Bench Top

Inspection Problem

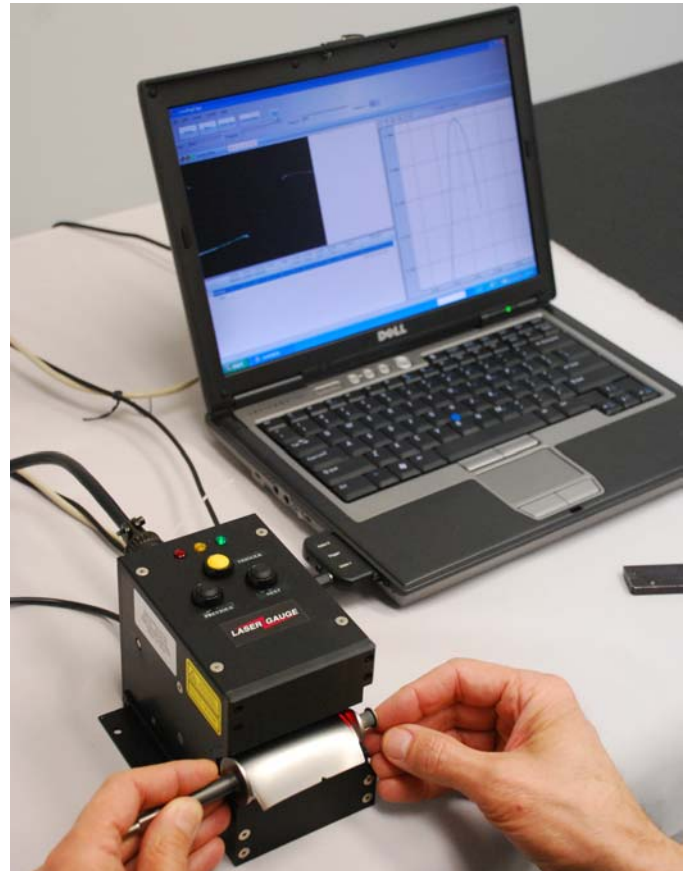
The leading edge of a vane or blade used in aircraft or power system engines must maintain its designed contour within an acceptable range for safe and efficient operation of the engine. Measurements that are critical include the edge radius and the width or thickness of the blade at varying distances away from the edge.

Previously, the only reliable method of inspecting the blade was to use a coordinate measurement machine (CMM). However, this process is very time-consuming and requires each part to be transported to a central location for inspection.

Requirements

Measurements - The leading edge inspection algorithm utilizes engineering data to configure a template and match the part to the template at multiple locations. The leading edge is accurately scanned to ± 0.0005 " and compared to the template to determine if the contour falls within the acceptable range. All out-of-spec conditions are noted graphically and numerically to the display.

Instrument - The Leading Edge Bench Top sensor is secured at any convenient location, including the polishing operation. The sensor has an air fitting on the back to provide a positive purge air flow to help eliminate dust.



LaserGauge® Solution

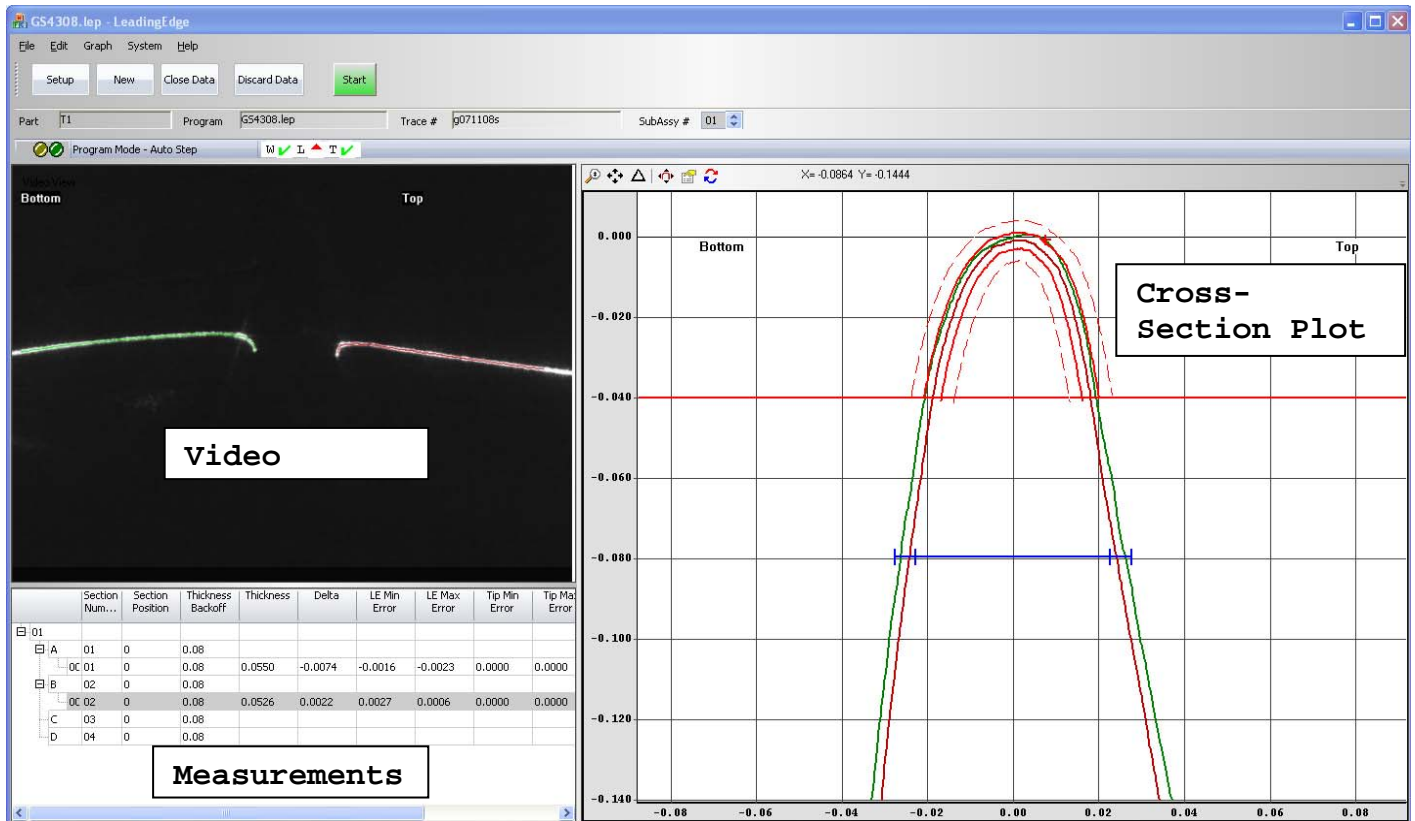
LaserGauge System - A custom sensor was adapted with cross-vector capability to simultaneously capture surface data around the leading edge and on both sides of the blade. The bench top sensor is available in two different setback ranges: model RS400LE-F04, has a 0.250" setback range and is used on smaller blades, and model RS400LE-F06 has a 0.375" setback range which will work with larger blades. "Setback" is the distance from the tip of the blade to the furthest point on each side that can be scanned. Anything beyond this is unseen by the sensor.

A laptop Windows™-computer and a PCMCIA interface card work together with the leading edge sensor to acquire the signal and process/archive the measurements. An optional PCMCIA-to-PCI adaptor will also enable the use of a desktop PC.

Operation - The blade is positioned on the sensor at the required measurement point. Scans can be taken at each location with multiple distances from the leading edge utilizing the trigger button on the sensor, or the remote foot switch. The raw scan of both sides of the blade is shown in the display, and the combined plotted profile of the blade is shown as well.

Measurements - Made automatically as the operator scans the blade, and are associated with a user-defined section number and position. The measurements include:

- Thickness of the blade at the selected offset distance from the leading edge and the delta difference. Up to 10 thickness calculations are available.
- Leading edge MIN and MAX error relative to template.
- Tip MIN and MAX error relative to template.



Documentation - Data displayed in the table can be saved as documentation of the measurements. A scan or profile can also be saved to a file. The file is a flat tabular file with x,y,z coordinates of each point in the scan; the x value representing the position along the blade.

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