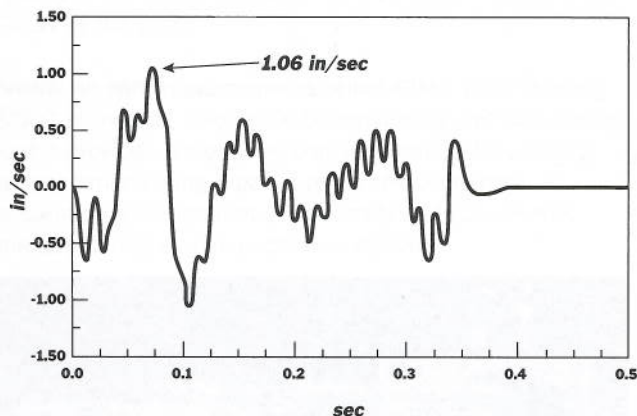


How to get highly accurate measures directly on the shop floor

Far from the comfort of metrology labs where qualified inspectors operate digital CMM with their heavy, stable granite table, portable measurement is still facing several major challenges. In production environments, the permanent vibrations generated by production equipment like machining centers, presses, carriage equipment or cranes), the requirement for rigid equipment setups, the changes in temperature and humidity levels, and the operators' varying experience and skills levels are all daily obstacles faced by users of portable measurement solutions.

REDUCING THE IMPACT OF VIBRATIONS

When the shop floor is inadequately insulated against vibration, vibrations are subsequently transmitted to the measuring system and the object being measured. They may even be amplified if an unstable tripod or non rigid base is being used. A study conducted prior to installation of a CMM in a factory operating stamping presses found vibrations of up to 0.2 mm with a frequency of 17 Hz at a distance of 50 ft. from the press.



Press-induced ground vibrations (instant velocity as a function of time) at a projected CMM location

The *TRUaccuracy* technology developed by Creaform features self-positioning and dynamic referencing and enables the measuring device to be continuously locked to the part by an optical link. To test the performance of *TRUaccuracy*, an experimental setup was used to expose Creaform's HandyPROBE optical CMM (fitted



with *TRUaccuracy*) and a measuring arm to the same level of vibrations. Without vibrations, results obtained for both the arm and the optical CMM were similar. Results with vibrations clearly show the advantage of dynamic referencing, with no notable degradation for the HandyPROBE compared to an error increase by a factor of three for the arm.

REDUCING THE IMPACT OF THE OPERATORS

CMSC's 2011 Measurement Study Report entitled *How Behavior Impacts Your Measurement* includes a compelling and detailed analysis of operator behavior in the metrology process. One of the study conclusions is that human error is a major factor in poor quality measurements.

Dynamic referencing actively contributes to reducing some of the human errors identified in the CMSC study, i.e., inadequate operator assessment of the risks that derive from an unstable environment, heavy traffic, or an unstable part. Dynamic referencing can also be used effectively to act on another parameter identified in the study: alignment quality. Alignment is a key measurement step linking the machine reference to the object reference. With an optical CMM, it is entirely possible, using specialized tools, to position certain targets on points required for alignment. This makes it possible to automatically measure these points and automatically position the optical CMM in relation to the part reference. This eliminates all operator error during the alignment phase and guarantees the best possible alignment, regardless of operator skills. It also minimizes the impact



of operator constraints on the measuring tool (pressure on the probe, traction on axis of the arm, etc.)

Creaform's portable optical CMMs are opening a new chapter in portable 3D measurement. *TRUaccuracy* technology increases measurement reliability and device portability and makes it less operator-dependent. One important benefit of this is to bring measurement directly to the shop environment production line, thereby ensuring greater reactivity during production increases, earlier detection of potential drift, and faster identification of underlying causes. This results in significant productivity gains without requiring extremely costly equipment or, most importantly, measurement environments.

Full paper presented at CMSC conference.

"Dynamic Referencing in 3D Optical Metrology for Higher Accuracy in Shop Floor Conditions - 2012 - Larue, Viala, Brown, Mony"

The CMSC How Behavior Impacts Your Measurement study.

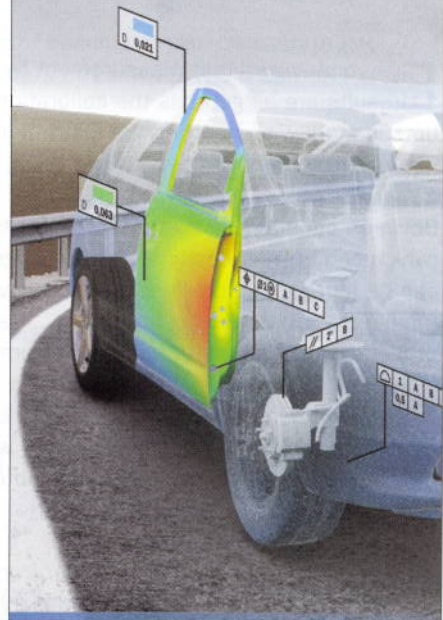
"How Behavior Impacts Your Measurement - 2011 - Bevan, Toman"

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