



Laser Welds



Inspection Problem

Sheet metal coils of different thickness are laser-welded together and cut into blanks. The blanks are used in stamping certain automotive parts. Using blanks that have variable thickness saves the cost and weight of the unneeded metal. Since the metal is subjected to a stamping process, the integrity of the weld is critical.

Inspection of the welds can be performed on a sampling basis after the welding process is complete. Inspection includes measuring the height difference of the two panels on either side of the weld and analyzing the profile of the weld for concavity and convexity. These measurements cannot be made with any mechanical tools and cannot be performed by operators visually.

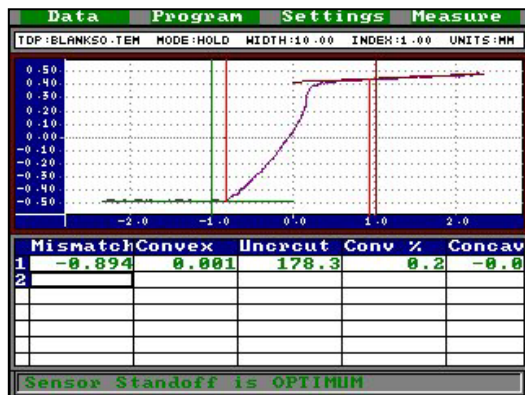


Requirements

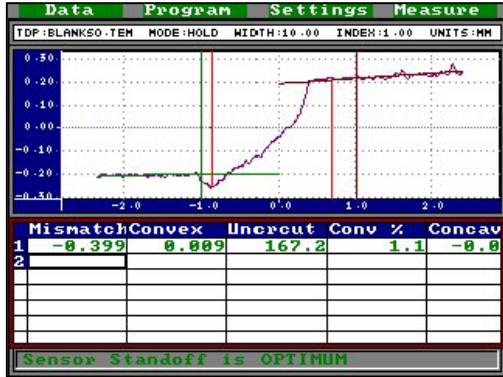
Measurements - The difference in the height of the two sheets must be measured to verify that the sheets were flush on the one side (no mismatch) prior to welding. Also, there should be no angle between the two sheets as they are joined prior to welding. Any concavity and convexity of the weld needs to be identified and expressed as absolute values and as percentages relative to the thinnest sheet.

Instrument - Measurements must be taken quickly and the instrument must be easy to move and position since scores of measurements are taken along several feet of a single weld. Operators need to be alerted to out-of-spec conditions and measurements need to be documented.

LaserGauge® Solution



LaserGauge System - Due to the narrow width of the laser weld and the resolution required, an HS400 sensor with a 0.150" field-of-view is used. An LG1102 controller provides the graphical feedback necessary to allow the operator to position the laser stripe over the weld at a designated location and to view the profile as the measurements are being made.



Measurements - The laser weld algorithm calculates the mismatch between the two sheets, weld concavity and weld convexity in both absolute terms and as a percentage of a sheet thickness and it identifies any undercut at the edge of the weld. All of the measurements are made automatically when the sensor trigger is released. Parameter tolerances are entered only once at the beginning of an inspection session and any out-of-spec conditions encountered are displayed in red.

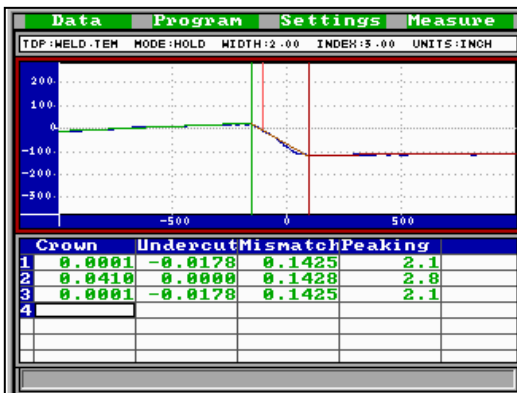
Advantages Realized

Saves Time - Inspections are made as quickly as the operator can position the sensor and pull the trigger. Measurements are accurate and repeatable.

Saves Costs - Out-of-spec conditions are identified immediately to prevent the shipment of bad parts.

Documented Results - Saved data files can be retrieved to a PC and used to track process changes and for other analysis. An operator can capture any unusual weld profiles as an ASCII type file. The profile consists of x,y coordinates for up to 500 points and can be plotted using most common spreadsheet applications. This provides a powerful tool for follow-up analysis and documentation.

Related Applications



LAP WELD - A weld joining overlapping panels creates similar characteristics to the laser weld. There should be no mismatch in the panels other than the height of the panel that is placed on top.

LaserGauge System - Depending on the size of the weld and the resolution required, an HS300 sensor with a 0.5" or 1.2" field-of-view will accurately calculate the parameters. An LG1102 controller will provide the graphic feedback needed.

Measurements - Inspection of a lap weld will include the measurement of the mismatch and angle, if any, between the surfaces of the two panels. Crown height of the weld relative to a line between the two surfaces is calculated and any undercut at the edge of the weld is measured.

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