Laser Bonding Technology

*Making a Permanent Impression℠*

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# Results of Burr Tag Tests at Corpus Christi Army Depot (CCAD)

During the months of May and June 2012, the Corpus Christi Army Depot (CCAD) conducted harsh industrial process survivability tests of burr tags. Burr Tags are made of stainless steel and marked with product information to provide temporary identity for disassembled parts during rework processing. At the end of this rework processing or as the parts are assembled to their next higher level assembly, the burr tags are removed and discarded.

Traditionally, CCAD has embossed human readable, raised characters on burr tags by use of a semi-automatic metal stamping press that employs preformed character (male and female) dies that are manually typeset by the machine operator. The strategy of the current burr tag enhancement study is to retain the human readable features and add machine readable, bar code symbology to allow shop users to scan and input part data to update computer automated, production tracking systems. The tags are typically attached by wire ties to the part undergoing processing.

Intrinsic Marks International (IMI), one of several companies associated with Laser Bonding Technology (LBT) of Los Angeles, CA; was found to offer a non-embossed, laser marking process that can be read by lower cost, general purpose scanners. The LBT technology uses a coating that is first applied directly to the surface of the tag. A computer controlled laser marking system is then used to mark the alpha/numeric characters and bar code symbols. The tag is washed with water and dried to remove the unneeded coating material. Character and symbol areas over-traced by the laser beam causes the coating to thermally bond to the metal, similar to a durable ceramic coating. Sample bar codes (both linear and 2 dimensional) as well as the alpha/numeric characters on the stainless steel burr tags survived the caustic cleaning and tempering processes (aircraft and engine cleaning, plating, heat treat and shotpeen tests). The CCAD on site results are in the table below.

**Pros:** Linear bar codes could be read with existing Intermec/Symbol readers currently deployed at CCAD.

**Cons:** The ability to mass-produce burr tags is unknown at this time.

Tests at CCAD were performed on a sample lot of tags prepared off-site by IMI/LBT. The tags were 2” x 3”, .0625 thick, 304 stainless steel alloy. Bar code scans were conducted after the tags emerged from the test processes using two models of readers, both operating as keyboard wedge input devices to a personal computer:

1. Intermec Inc., model 1545
2. Symbol Inc., model P302FZY

Overall, successful reads were more consistent with the Symbol P302FZY model. This is attributed to its more powerful laser. The sample lot was subdivided in equal batches and run through the following industrial processes:

## LBT Bar Code Burr Tag Results

| Process | Time in Process | Bar Code Reader Results | Remarks |
|---|---|---|---|
| Caustic Cleaning, Engine Parts | 1 hour | 100% | |
| Caustic Cleaning, Airframe | 1 hour | 100% | |
| Caustic Plating Rinse | 20 min | 100% | |
| Plating Hydrochloric Acid Dip | 15 min | 100% | |
| Plating Sulfuric Acid Dip | 15 min | 100% | |
| Plating Nitric Acid Dip | 15 min | 100% | Some substrate pitting |
| Shot Peen | 10 min | 100% | Extreme surface pitting and resulting curvature of samples initially caused some read failures, but read consistently after surface straightening. |
| Heat Treat | 9 hour | 98% | Unevenly darkened metal surface caused some contrast problems. Could only read consistently with Symbol Reader. |

These digital images do not indicate the brightness of the actual tags. What is seen in Picture 1 below are the top two samples that went through the **engine cleaning testing** with the result that the solvents had **no effect on the markings**. The tags are as shiny and bright as they were originally.

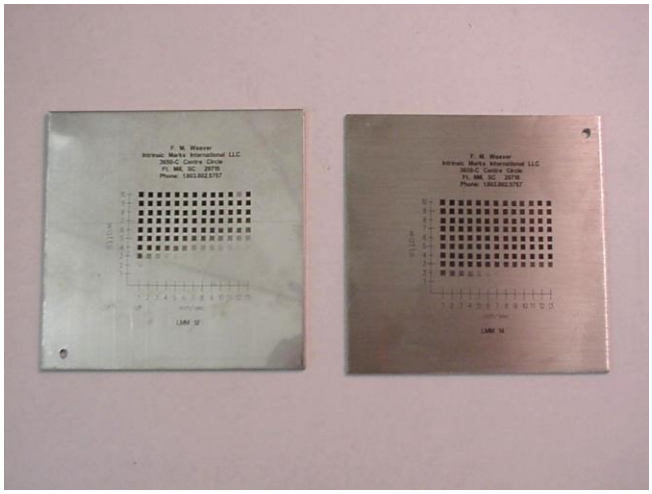

Picture 1

The bottom two samples side-by-side in Picture 1 are from the shotpeen testing. They are bent (see Picture 2 image below), their original smooth finish is now textured BUT all the marking details are present even on the most fine detail. Initially there was a problem reading these tags using both laser scanners due to the curvature of the surface and the orange peel effect on the surface finish of the shotpeened tags causing the reflected laser light to go in all directions.

The Data Matrix codes could be read consistently with both laser scanners once the surface of the sample tags was straightened. To date IMI/LBT is the ONLY company that has passed the shotpeen test. Picture 3 shows laser power test mark charts that were also processed through the cleaning process but did not receive shotpeen testing.


Picture 2

The test pattern remains on the LBT samples after engine cleaning testing.



Picture 3