Laser Markable Materials for Industrial Applications

Presenters:
Andrew Marvin & Sam Wainer
Course Objectives

- **Picking the Right Material**: Decision factors for the industrial customer and the engraving shop.

- **Overview of Materials Available**: Five popular laser markable materials for industrial applications.

- **Techniques**: How to properly mark the various materials with a CO$_2$ laser.

- **Marketing to the Industrial Customer**: How to find and win industrial customers.
Horizons Imaging Systems Group

- Founded in 1946 as a private research company, primarily funded through government grants.
- In the 1970s, the company shifted its focus from research to manufacturing.
- Today: a developer and manufacturer of unique, high-value aluminum based identification products including:
Industrial Experience

- Defense
- Energy & Utility
- Aircraft & Aerospace
- Barcode & Supply Chain
- Marine & Shipbuilding
- Heavy Equipment
- Transportation
- Signage & Design
- Plaque/Award
Common Industrial Applications

Nameplates & Data Plates

Barcode Labels

On-Equipment Service/Process Schematics

Safety Diagrams/Safety Signage

Architectural Signage
Why Industrial Applications?

- **Why Industrial Applications:**
  - Higher Profit/Part
  - Repeat Business
  - Requirement to Follow Specifications

- **Importance of Selecting the Right Material:**
  - Faded or otherwise illegible graphics can lead to safety hazards, equipment failure and even regulatory fines.
  - Industrial customers are usually willing to pay for the assurance that a part will not fail because the cost of failure far outweighs the cost of the part.

Causes of VIN Plate readability failure.

- Weather/Sunlight Degradation and Fading
- Road Salt Corrosion Damage
- Abrasion Damage
Material Decision Factors
Picking the Right Material Centers Around the Application Requirements

Customer Considerations

- specifications
- durability

Right Material for Application Requirements

Shop Considerations

- cost
- ease of marking
- consistency of product
Types of Materials

- **Engravable Metals**
  - Top Layer
  - Etched Area
  - Metal Base

- **Bleachable Metals**
  - Organic Black Dye
  - Bleached Mark
  - Metal

- **Engravable Plastics/Tape**
  - Metallic Paint
  - Etched Area
  - Black Acrylic

- **Ceramic Bonding Metals**
  - Bonded Ceramic
  - Metal
## Comparison of 5 Industrial Materials

<table>
<thead>
<tr>
<th>Material/Manufacturer</th>
<th>Composition</th>
<th>Type</th>
<th>Durability</th>
<th>Specifications</th>
<th>Barcode Readability</th>
<th>Cost Per 12” x 24”</th>
<th>Ease of Marking</th>
<th>Consistency of Product</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black Anodized Aluminum Various</td>
<td>Dyed Anodized Aluminum</td>
<td>Bleachable Metal</td>
<td>Limited Outdoor</td>
<td>MIL-A-8625F</td>
<td>Fair</td>
<td>$low</td>
<td>Fair</td>
<td>Poor</td>
</tr>
<tr>
<td>Laser Markable Acrylic Tapes Tesa/3M</td>
<td>Acrylic Tape</td>
<td>Engravable Tape</td>
<td>Limited Outdoor</td>
<td>UL Listed MIL-STD-130</td>
<td>Good</td>
<td>$medium</td>
<td>Poor</td>
<td>Good</td>
</tr>
<tr>
<td>Ceramic Coatings (CerMark™/TherMark) Ferro Corporation/TherMark</td>
<td>Spray or Tape Laser Bonded Ceramic</td>
<td>Ceramic Bonding</td>
<td>Outdoor</td>
<td>MIL-STD-130 NASA STD 6002 AIAG B-4</td>
<td>Fair</td>
<td>$high</td>
<td>Poor</td>
<td>Fair</td>
</tr>
<tr>
<td>Metalgraph Plus™/Texture® Rowmark</td>
<td>Multi-Layer Extruded Acrylic</td>
<td>Engravable Plastic</td>
<td>Outdoor</td>
<td>- -</td>
<td>Fair</td>
<td>$medium</td>
<td>Good</td>
<td>Good</td>
</tr>
</tbody>
</table>

*Based upon specifications provided on manufacturer’s website; may not be all inclusive
Laser Marking Techniques

**Power**
How much power is the laser producing, percent of total power.

**Speed**
How fast is the laser traveling, percent of total speed.

**DPI**
How close each pass is to the previous in the “Y” direction.

**Tuning**
Typically an advanced setting on Universal Lasers, controls how current sweep of the laser lines up with the previous sweep.
Results - DuraBlack

Ideal Applications:
- Indoor/outdoor signage
- Durable Labels
  - Resistant to heat, chemical, UV and abrasion

Drawback:
Relatively new product
Results – Black Anodized

Ideal Applications:
- Indoor signage and labels
- Monochrome plaque/award

Drawback:
Inconsistent and UV fade
Results – Acrylic Tape

Ideal Applications:
- Unique shape requirements
- Indoor labels
  - Flexible and can be laser cut

Drawback:
- Abrasion and heat resistance
- Limited to 4.72” wide
Results – Ceramic Coatings

Ideal Applications:
- Mark directly on metal surface
- Meets stainless steel requirements
  - Resistant to heat, chemicals, UV abrasion

Drawback:
- Multi-step with variable results
- High cost
Results – Extruded Plastics

Ideal Applications:
- Solid color warning signs
- Indoor/Outdoor signage
  - Resistant to UV, weather and salt

Drawback:
Abrasion, heat and chemical resistance
# Laser Marking Summary

## 35watt Universal Versa Laser

<table>
<thead>
<tr>
<th>Material</th>
<th>Manufacturer</th>
<th>Composition</th>
<th>Speed</th>
<th>Power</th>
<th>DPI</th>
</tr>
</thead>
<tbody>
<tr>
<td>DuraBlack®</td>
<td>Horizons Imaging Systems Group</td>
<td>Multi-Layer Coated Anodized Aluminum</td>
<td>50</td>
<td>30</td>
<td>600</td>
</tr>
<tr>
<td>Black Anodized Aluminum</td>
<td>Various</td>
<td>Dyed Anodized Aluminum</td>
<td>70</td>
<td>50</td>
<td>600</td>
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<tr>
<td>Laser Markable Acrylic Tapes</td>
<td>Tesa/3M</td>
<td>Acrylic Tape</td>
<td>25</td>
<td>17</td>
<td>600</td>
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<td>Ceramic Coatings (CerMark™/TherMark)</td>
<td>Ferro Corporation/TherMark</td>
<td>Spray or Tape Laser Bonded Ceramic</td>
<td>35</td>
<td>100</td>
<td>600</td>
</tr>
<tr>
<td>Metalgraph Plus™/LaserMax®</td>
<td>Rowmark/IPI</td>
<td>Multi-Layer Extruded Acrylic</td>
<td>70</td>
<td>30</td>
<td>600</td>
</tr>
<tr>
<td>Introduction</td>
<td>Decision Factors</td>
<td>Materials</td>
<td>Laser Techniques</td>
<td>Marketing</td>
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</table>

**Marketing**
How to Find & Win Industrial Customers

- Identify Target(s)
  - By industry/application
  - By geography
  - By supply level (OEM vs. repair shop)

- Communicate Your Capabilities
  - Materials & Specifications? Ability to Certify?
  - Fabrication Capabilities?
  - Extra Services: Graphic Design, Installation, etc.
  - Case Studies/Testimonials?

- Reach Industrial Targets
  - Rifle vs. Shot Gun Approaches
  - Google Search
  - Jigsaw
  - Networking

- Sales & Account Maintenance
  - Certifications
  - Prototyping
  - Follow up
  - Saving graphics files for repeat orders
Sample Research

- Identify Target(s): Geographic
- Communicate Your Capabilities: Machine Plates Online
- Reach Industrial Targets: LinkedIn, Jigsaw
- Sales & Account Maintenance
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- Identify Target(s): Geographic
- Communicate Your Capabilities: Machine Plates Online
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DURABLOCK PASSES DURABILITY PERFORMANCE TESTING
DURABLOCK OUTPERFORMS LAST MARKABLE BLACK ANODIZED ALUMINUM AND ACRYLIC LABELS IN SEVERAL SIMULATED OPERATING ENVIRONMENTS

ABSTRACT
DuraBlack, a new CO₂ laser markable aluminum, meets the performance requirements of MIL-STD-1520A, A-A-10271 and MIL-STD-15204F for resistance to abrasion, high-temperature, weather, salt-spray and fluid exposure. The tests, which compare DuraBlack to block anodized aluminum, laser-markable acrylics and photosensitive anodized aluminum (Metaphos), simulate outdoor, marine, abrasive, chemical and high-temperature operating environments. While Metaphos was found to be the most durable material overall, DuraBlack exhibited environmental performance that exceeded other substrates including black anodized aluminum and laser markable acrylics.

MOTIVATION
The usage of laser markable black anodized aluminum has increased with the growing adoption of CO₂ laser marking systems. Although black anodized aluminum can be marked effectively with a CO₂ laser, field experience and laboratory tests show that black anodized aluminum will fade outdoors – leading to label failure. In response to such reported failures, Horizons (ISG) developed DuraBlack™, a CO₂ laser markable material that can withstand harsh industrial and military operating environments without the need to attach additional protective topcoats.

DuraBlack is CO₂ laser markable aluminum that is engineered for on-demand marking in outdoor, marine, abrasive, chemical fluid and high-temperature operating environments. DuraBlack is composed of a multi-level coating upon an aluminum base layer. Its integrated abrasive resistant coating reduces the need to apply a secondary protective topcoat. Available in both 0.065" and 0.027" thicknesses, DuraBlack can be attached to either curved or flat surfaces with adhesive, rivets or screws. DuraBlack is imaged with any CO₂ laser marking system to produce a durable, high-resolution barcode or human-readable image.

The performance testing done by Horizons Incorporated was designed to compare several common label materials across a standardized battery of test conditions. Tests were modeled after those established by the U.S. Department of Defense under MIL-STD-810G (material performance) and MIL-STD-1520 (identification of high value and/or mission critical assets through the VIS program).
Sample Research

- Identify Target(s): Geographic
- Communicate Your Capabilities: Machine Plates Online
- Reach Industrial Targets: LinkedIn, Jigsaw
- Sales & Account Maintenance
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- Identify Target(s): Geographic
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Thank You.

Nameplates & Data Plates

Barcode Labels

On-Equipment Service/Process Schematics

Safety Diagrams/Safety Signage

Architectural Signage

Questions? Comments?
Visit Booth #2401 or email info@horizonsisg.com