AgDDI
Silver Digital Detection Imaging
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Sensors in modern automotive fuel systems often use silver or silver alloys, which are susceptible to corrosion from sulfur and other hetero compounds present in gasoline. In the past decade, refiners have shifted to producing lower-sulfur gasoline, but the process requires more severe hydro-treating that destroys naturally occurring compounds that give some protection against sulfur-based corrosion. Ensuring that fuel stays within acceptable corrosion limits requires constant and accurate testing. Unfortunately, modern silver strip corrosion test methods rely heavily on user’s individual assessment which are biased, as the operator must evaluate corrosiveness by interpreting the color and tarnish level of a silver specimen after it has been bathed in a fuel sample. Corrosion to silver has become a critical indicator of mainly sulfur compounds present in crude oils that persist even after refining processes. Measuring corrosiveness to silver continues to be a challenge, as no accurate standardized test has been developed to date. As mentioned before, current corrosivity tests involve manual and visual evaluation and rating, resulting in human error and bias. The petroleum industry calls for a high-level, high-tech standard for copper corrosion detection.

AgDDI corrosion testing equipment, from VISAYA Inc, uses a four-step automated vision algorithm and classification process to eliminate user bias. After evaluating the silver strip for corrosivity, the algorithm assigns the sample an integer between 0 and 4, with 0 being no corrosion at all and 4 showing significant blackening. AgDDI provides standardization to the current visual silver strip corrosion test as referred in ASTM D7671 and gasoline fuel specification ASTM D4814.
Principle

AgDDI’s exclusive, patent pending design takes the guesswork out of silver corrosion detection. Its unique vision algorithm and light box records, calculates and displays accurate corrosivity coverage ratings in a matter of seconds. A high-resolution camera with sophisticated optics provides higher precision machining and motors for the rotation of the silver specimen. The results are not only a ground breaking improvement on the rating, methodology and sample handling of current laboratory procedures; they are the new standard for corrosion rating.

The AgDDI Method

Corrosion digital detection imaging is a simplified process requiring minimal steps that effect maximum efficiency and accuracy:

Step 1: Insert specimen into specialized holder
Step 2: Place holder into instrument
Step 3: LED light source is automatically activated and regulated
Step 4: Software identifies dimensional data
Step 5: Software then rotates specimen in specific degree increments
Step 6: Readings are tabulated and processed through AgDDI algorithm
Step 7: Final results are displayed on a high-resolution touch screen

Final Results are Clear, Concise and Cutting-Edge.
A Better Rating
AgDDI's improvements over current test rating output and analysis include:

- Easy-to-Use Touch Screen Driven Software
- 1-2-3 Button Operation
- Digital Image Logging Complete with Operator Notes and Calculated Results
- Integrated Industrial Computer for Easy Interface with Network
- Direct LIMS Connectivity
- USB, Ethernet and HDMI Outputs

A Better Method
AgDDI's improvements over current test procedures and end results include:

- Removes Inherent Bias with Manual Rating
- Voltage and Current Controlled Light Box for Consistent Ambient Light Environment
- Automatic Detection of Silver Specimen Size
- Long-lasting LED Light Source
- Auto Rotation of Specimen for full 360 Recording

A Better Sample handling
AgDDI's improvements over current test sample handling and errors include:

- Enables Single-Hand Loading via Two Part Holder and Clip
- Eliminates Fingerprints and Unwanted Markings on Strips
- Slide Holder Doubles in Functionality as Tool for Manual Verification
- Prompts Operator When Strip Shrinks to Unusable Size
- Provides Auto Recognition of Proper Dimensions
## Technical Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applicable Test Methods</td>
<td>ASTM D4814, ASTM D7671, IP 611,</td>
</tr>
<tr>
<td>Corrosion Detection Range</td>
<td>0, to 4 &amp; Levels</td>
</tr>
<tr>
<td>Display Units</td>
<td>Color, ASTM Rating and Strip Size</td>
</tr>
<tr>
<td>Detection Method</td>
<td>Patent Pending CMOS Digital Detection</td>
</tr>
<tr>
<td>Precision</td>
<td>+/- 0.25% of Raw Reading</td>
</tr>
<tr>
<td>Optical Design</td>
<td>Patent Pending Optical Arrangement</td>
</tr>
<tr>
<td>Light Source</td>
<td>LED, 4,500K</td>
</tr>
<tr>
<td>Measuring Time</td>
<td>2.5 minutes</td>
</tr>
<tr>
<td>Calibration</td>
<td>Vision Calibration with Standard</td>
</tr>
<tr>
<td>Display</td>
<td>10.1” Projective Capacitance Touch (Multi Touch)</td>
</tr>
<tr>
<td>Interface</td>
<td>Ethernet x2, USB 3.0 x1, USB 2.0 x4, HDMI, VGA, USB Printer, USB Mouse and Keyboard</td>
</tr>
<tr>
<td>Memory / Storage</td>
<td>64 GB SSD Storage</td>
</tr>
<tr>
<td>Temperature Range</td>
<td>10° to 35° C</td>
</tr>
<tr>
<td>Humidity</td>
<td>Up to 85% Non Condensing</td>
</tr>
<tr>
<td>Power</td>
<td>Auto-switching 90 ~ 264VAC, 47 ~ 63Hz, 280 Watt Power Supply</td>
</tr>
<tr>
<td>Space Requirements</td>
<td>80 mm (3”) on Sides and Back</td>
</tr>
<tr>
<td>Dimension</td>
<td>350x300x270mm (14x12x11”)</td>
</tr>
<tr>
<td>Gross Dimensions &amp; Weight</td>
<td>Weight 10 Kg. (22 lbs.) ; 400x350x530mm, 15 Kg. (15x14x21” 33lbs.)</td>
</tr>
</tbody>
</table>

FULL SPECS AND OPTIONS AVAILABLE AT WWW.VISAYAINC.COM
## Accessories

### 1st Year

- Silver test coupon for D7671, IP227, ea.
- Polishing VISE – Holds 6 Strips
- D7671 Cradle, PTFE, Silver Strip Holder, Procedure A.
- Test Tubes, 25-mm x 150-mm, Dozen
- Viewing Test Tube, Each
- Silicon Carbide Sheets, 240-Grit, 50 Pack
- Silicon Carbide Grains/Powder, 150 mesh, 450 grams
- CuDDI/AgDDI calibration standard. Used as daily QC/Validation and calibration of camera & motor position. Supplied in storage case with certificate valid for one year.

### 2nd Year

- Test Pressure Vessels
- Replacement NFX Handle (Integrated Motor)
- Replacement Glass Overlay – VISAYA
- Replacement Power Board – Universal Input
- Replacement Z-Drive – Supplied with Camera Mount
AgDDI provides standardization to the current visual determination as referred in ASTM D7671 and gasoline fuel specification ASTM D4814 while using a four-step automated vision algorithm and classification process to eliminate user bias.

CuDDI’s simplified, breakthrough procedure provides improved ratings, methodology and sample handling. Using a corrosion detection range of 1a through 4C, outcomes are digitally recorded and seamlessly integrate with LIMS software.

FeDDI provides an complete automated method, which replaces the inherently difficult visual quantification referenced in NACE TM0172 and ASTM D665 while using a four-step automated vision algorithm and classification process to eliminate user bias and provide repeatable results.

FoamDDI accurately controls the air flow, temperature and sequence, which is then augmented using a unique VISION algorithm to accurately determine the height of static and dynamic foam heights, while greatly improving the precision and accuracy.