SMOKE TESTING COMPLIANCE ADVISORY – CALIFORNIA’S PERIODIC SMOKE INSPECTION PROGRAM (PSIP) FOR HEAVY-DUTY DIESEL VEHICLES (HDDVs)

This regulatory advisory is to help inform the end user on the proper reading and interpretation of opacity test results using currently available smoke meters for HDDVs.

NEW OPACITY STANDARDS

The California Air Resources Board (CARB) has recently reduced the opacity standards for all HDDVs operating within the State of California. As of July 1st, 2019, HDDVs greater than 6,000 pounds gross vehicle weight rating (GVWR), must be tested annually in accordance with the test procedures set forth in Society of Automotive Engineers (SAE) Recommended Practice J1667 "Snap-Acceleration Smoke Test Procedure for Heavy-Duty Diesel Powered Vehicles" as issued February 1996, and shall not exceed a smoke opacity percentage of (Table 1):

<table>
<thead>
<tr>
<th>Year Range</th>
<th>Opacity Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-1991 MY</td>
<td>40% Opacity Limit</td>
</tr>
<tr>
<td>1991-1996 MY</td>
<td>30% Opacity Limit</td>
</tr>
<tr>
<td>1997–2006 MY</td>
<td>20% Opacity Limit</td>
</tr>
<tr>
<td>2007 MY or subsequent MY Engine</td>
<td>5% Opacity Limit</td>
</tr>
<tr>
<td>2007 MY and Newer Engines and Engines Equipped with a Level 3 Verified Diesel Emissions Control System (VDECS)</td>
<td>5% Opacity Limit</td>
</tr>
<tr>
<td>Engines Equipped with a Level 2 VDECS</td>
<td>20% Opacity Limit</td>
</tr>
<tr>
<td>Two Engine Cranes Driven by a non-DPF Off-Road Engine</td>
<td>40% Opacity Limit</td>
</tr>
</tbody>
</table>

PROPERLY INTERPRETING TEST RESULTS WHEN USING EXISTING SMOKE METERS TO DETERMINE COMPLIANCE WITH NEW PSIP OPACITY STANDARDS

Existing smoke meters generally provide a “Pass/Fail” output on the test strip at two opacity thresholds, 40 percent and 55 percent, coinciding with the previous opacity standards in effect since the 1990’s. Unless the existing smoke meter settings have been modified to incorporate an appropriate “Pass/Fail” threshold for each lower...
opacity standard, **fleets should not rely on the default printout of either “Pass” or “Fail” to determine compliance.**

Rather, compliance with any specific opacity standard must be determined by looking at the calculated average of the three required opacity measurements as shown on the output printout (see Figure 1 below as an example).

![Figure 1 Sample Test Strip](image)

<table>
<thead>
<tr>
<th>Tests</th>
<th>Actual Opacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test 1:</td>
<td>21.4 (percent)</td>
</tr>
<tr>
<td>Test 2:</td>
<td>22.0 (percent)</td>
</tr>
<tr>
<td>Test 3:</td>
<td>21.1 (percent)</td>
</tr>
<tr>
<td>Average:</td>
<td>21.5 (percent)</td>
</tr>
</tbody>
</table>

**Final Result**

PASS

A 1999 MY engine must meet a 20% opacity limit. The calculated average of the three required opacity measurements is greater than 20%, which indicates a failed test. **“Final Result” inaccurately indicates a passing test.**

If the user prefers to update the “Pass/Fail” thresholds, they can choose from one of the following options:

1. Manually override the default “Pass/Fail” opacity limit of the smoke meter by following the instructions specified in the operating/user manual or instructions obtained from the manufacturer;

2. Have the smoke meter updated by the manufacturer to accommodate the new opacity standard thresholds.

Manufacturers may have different procedures for setting the “Pass/Fail” opacity threshold. Table 2 shows the most commonly used smoke meters currently on the market and whether a user can manually set the “Pass/Fail” opacity limit by overriding the default “Pass/Fail” factory setting. **Some manufacturers “Pass/Fail” limit settings are higher than 5%, which could lead to faulty pass results (see Table 2 below).**

Regardless of any differences in the “Pass/Fail” limit settings, all smoke meters listed in Table 2 are compliant with SAE J1667 requirements and can be used to measure smoke opacity from diesel vehicles when properly calibrated. When auditing fleets for compliance with the PSIP regulation, CARB staff will look at the average opacity reading of the three opacity measurements when determining compliance with the applicable opacity standard and will not rely on the “Pass/Fail” output determination on the test printout.
Table 2: Commonly Used Smoke Meters and “Pass/Fail” Limit Reset Capabilities:

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Smoke Meter Model</th>
<th>“Pass/Fail” Limit Settings</th>
<th>Who Can Adjust the “Pass/Fail” Setting</th>
<th>Manufacturer Contact Information</th>
</tr>
</thead>
</table>
| Beryl Technologies LLC    | BT2000 Wireless   | “Pass/Fail” limits can be set down to 5 percent opacity. | Either user or manufacturer | Phone: (562) 698-2444  
Email: sales@beryltechnologies.com  
Website: www.beryltechnologies.com |
| Bosch                    | RTT100            | “Pass/Fail” limits can be set down to 10 percent opacity. | Either user or manufacturer | BECS Pacific  
Phone: (888) 359-3999  
Email: info@becspacific.com  
Website: www.becspacific.com |
| Caltest Instruments      | Caltest 1000      | “Pass/Fail” limits can be set down to 10 percent opacity. | Either user or manufacturer | Phone: (310) 835-6909  
Email: customerservice@omstardx1.com  
Website: www.caltest.com |
| Red Mountain, Inc.       | Smoke Check 1667  | “Pass/Fail” limits can be set down to 5 percent opacity. | Manufacturer only | Phone: (949) 595-4475  
Email: cmurata@redmtnengr.com  
Website: www.redmtnengr.com |
| Telonic Berkeley, Inc.   | TBM300            | “Pass/Fail” limits can be set down to 5 percent opacity. | Either user or manufacturer | Phone: (760) 744-8350  
Email: scottm@telonicberkeley.com  
Website: www.telonicberkeley.com |
| Wager Company            | 6500 7500 RHW Wireless | N/A: No “Pass/Fail” setting on devices. | N/A | Phone: (336) 969-6909  
Email: bcarpenter@wagerusa.com  
rharris@wagerusa.com  
Website: www.wagerusa.com |

For More Information:  
For further information on the PSIP, please visit our website at www.arb.ca.gov/truckstop.