OPERATOR'S MANUAL

for the

TDA-13A
Aerosol Particle Size Owl

PN: T13A-0582

Air Techniques International
Division of Hamilton Associates, Inc

11403 Cronridge Drive
Owings Mills, MD 21117 USA

TEL: 410 363-9696
FAX: 410 363-9695

www.atitest.com
info@atitest.com

Page Intentionally Left Blank

AEROSOL PARTICLE SIZE OWL
(Tyndal Visual owl)

1. OBJECTIVE

The objective of this directive is to describe the installation, operation and maintenance of the model TDA-13A Aerosol Particle Size Owl. The TDA-13A was sold by Air Techniques International in two versions. The standard TDA-13A consists of the Polarizing tube only and has an adapter for insertion in the standard lamp port of a model TDA-14 Mechanical Analyzer. A less common configuration, including a cell lamp and aerosol sampling tube, was also offered. This version is sometimes referred to as an E21 Owl or TDA-13. The instructions contained in this manual allow for the complete E21 (TDA-13) version of the visual owl. If the standard unit (TDA-13A) is in use, any comments regarding operation or maintenance of an integrated light source should be disregarded.

2. THEORY OF OPERATION

The penetration of a filter depends greatly on the size of the aerosol particles, and it is necessary to measure and control the size closely. For this purpose aerosol is drawn through the particle size “Owl”. In this instrument the particle size is measured as a function of the degree of polarization of a light beam, matching the intensities of the light in two portions of a split field.

Particle size is controlled by adjustment of the heater in the diluent stream. Higher temperatures yield aerosols of larger particle size and higher Owl readings. Conversely, lower temperatures yield aerosols of smaller particle size and lower Owl readings.

3. GENERAL DESCRIPTION

The Owl (E21) consists of a light scattering tube, with inlet and outlet ports for aerosol sample flow. The light coming from the internal lamp is condensed to a parallel beam by a large condensing lens and illuminates a path through the aerosol. Light scattered at right angles by the aerosol is observed through a side arm on the light scattering tube to which the Polaroid analyzer tube (TDA-13A) is attached. The light passes through a glass sealing window, which makes the sample chamber air tight and is collected by a lens to pass through a bipartite disc (a split field Polaroid, with one half polarizing at right angles to the other). By rotating a single field Polaroid disc and observing the split field through the eyepiece, the two half-discs can be balanced to the same intensity of light. The angle of rotation of the single field Polaroid is shown by the pointer on the stationary degree scale, and this angle varies with the particle size of the aerosol (the degree of polarization of light scattered at right angles is a function of the particle size). A green filter lens in the line of vision is used to facilitate balancing the two fields, since the monochromatic green tint makes the two fields most nearly alike in color.

4. INSTALLATION

4.1. Place the Owl near the Aerosol penetrometer so that observations can be made with the least difficulty.

4.2. With rubber hose connect one of the Owl ports to the aerosol tap on the aerosol penetrometer.

4.3. Another length of rubber hose should be connected to a vacuum source.

4.4. Turn on the Cell Lamp assembly.

5. OPERATION

5.1. Preliminary Check:

5.1.1. Turn the Owl lamp and draw stabilized, aerosol-laden air through the Owl. Look into the eyepiece; if the line between the fields of the bipartite Polaroid disc is not sharply defined, adjust the focus by moving the eyepiece in or out. The dividing line should be exactly horizontal or vertical. (See note page 5.)

5.1.2. If not, the tube should be turned, after loosening one of the units, until it is horizontal or vertical. The light scattering tube must be mounted vertically or horizontally as the case applies. Rotate the Polaroid disc with the pointer to one side of zero until the two halves of the field appear to have the same intensity. Read the scale. Rotate the pointer through zero and then back in the same direction as above. Rebalance the split field and note the reading again. The two readings should agree within ± 1 degree.

5.1.3. In the same manner, take two readings on the opposite side of the scale. If the scale zero has been properly centered, the four readings should agree within ± 1 degree. If a greater discrepancy between the opposite sides of the scale is found, loosen the scale clamping screw and adjust to compensate. An average of the four readings is taken as the true value.

5.2. Application:

5.2.1. Turn on the Owl lamp and draw stabilized aerosol-laden air through the Owl. Look into the eyepiece and rotate the pointer until the two fields of the bipartite appear to be of the same intensity. Read the degrees on the scale. This reading should be 29 degrees, ± 1 degree. Rotate the pointer to the other side of zero and again note the reading, which also should be 29 degrees ± 1 degree. The average of the two readings will be taken as the true value.

6. MAINTENANCE

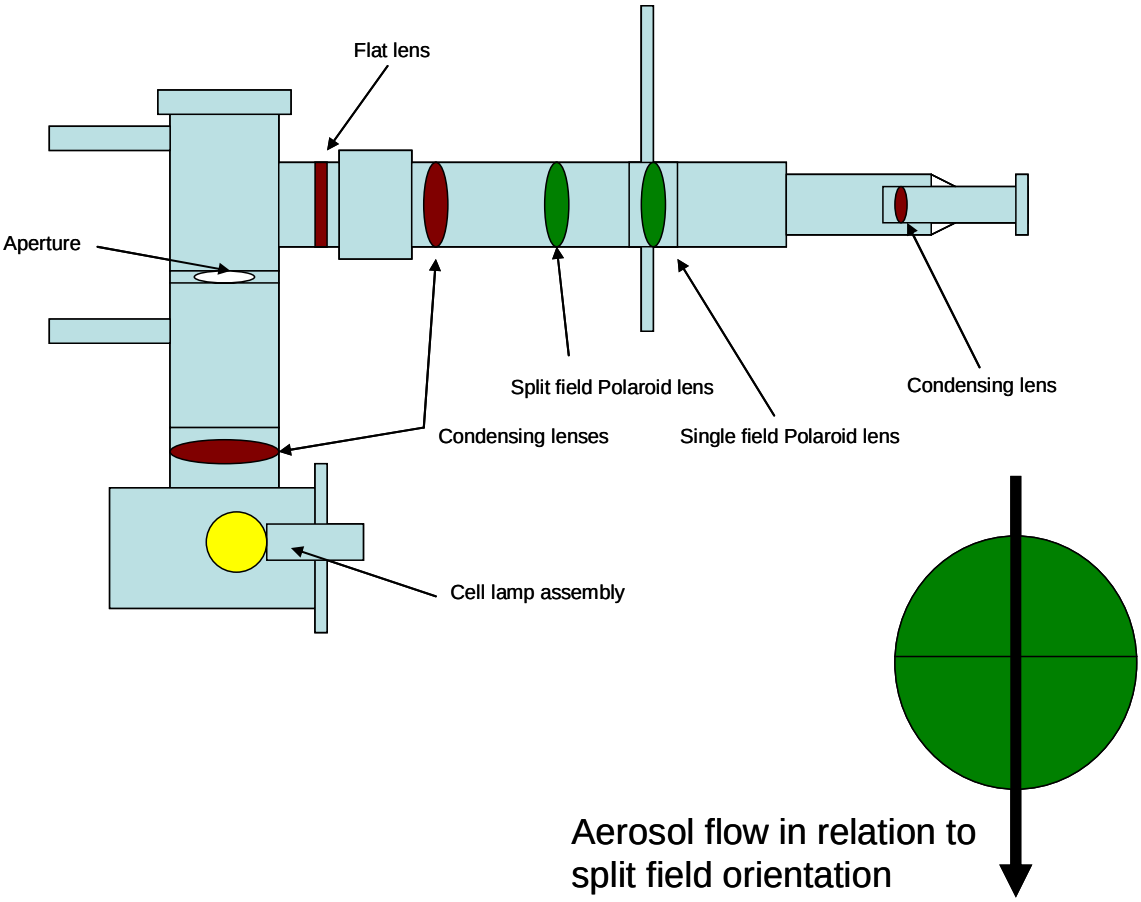
6.1. About once a month the glass window should be cleaned of aerosol which has condensed on its surface. To do so, unscrew the lock nuts on either side of the connecting piece and slip it out, being careful to support the Polaroid analyzer tube to prevent it from falling. In replacing the unit after cleaning, first tighten the nut adjoining the tee tube sufficiently to prevent leakage. Then adjust the Polaroid analyzer tube with split field horizontal or vertical (See note page 5) (the center of the degree scale at top of tube) and tighten it in place. It is important to have the dividing line

of the bipartite disc at right angles to the light-scattering tube, as otherwise the true degree reading will not be obtained.

6.2. The other lens exposed to the aerosol is located in the lamp housing. This lens may need occasional cleaning in order to maintain a sufficiently bright field for analyzing the aerosol. It is readily accessible when the lamp housing unit is removed from the light scattering tube by unscrewing the nut.

NOTE:

If the split field appears in a horizontal position, then the light scattering tube assembly should be mounted in a right angle vertical lane to the Polaroid analyzer tube, but if the split field appears in a vertical position then the light scattering tube assembly should be in a right angle horizontal plane to the Polaroid analyzer tube. Essentially, the split field dividing line must be perpendicular to the light beam.


Flat lens
Aperture
Split field Polaroid lens
Condensing lens
Condensing lenses
Single field Polaroid lens
Cell lamp assembly
Aerosol flow in relation to
split field orientation

7. FIELD CALIBRATION PROCEDURE

7.1. The purpose of this procedure is to provide directions to personnel for performing the manufacturer's recommended calibration procedure of the visual owl, Model TDA-13A.

8. APPLICABILITY

8.1. This procedure is applicable to the field calibration of the Air Techniques International (ATI) Visual Owl, Model TDA-13A used for verifying the filter testing aerosol particle size produced by an ASTM-D2986-95A/Mil-Std 282 type penetrometer.

9. PRECAUTIONS AND LIMITATIONS

9.1. The visual owl shall be handled and stored in a manner that minimizes the chance of damage.

9.2. Do not attempt to calibrate or use the visual owl if the lens appears fogged or presents a cloudy image. This is indication of a need for cleaning and/or maintenance.

9.3. An outside light source shall be used for zeroing the visual owl.

9.4. This procedure shall be conducted under normal, ambient environmental conditions. No special environmental conditions are required.

10. PREREQUISITES

10.1. Personnel performing this procedure shall have completed Required Reading of this procedure.

10.2. The visual owl shall be calibrated on a 5-Year interval.

11. TEST EQUIPMENT, TOOLS, AND SUPPLIES

11.1. Small screwdriver

12. ACTION STEPS

12.1. Look through the visual owl eyepiece towards an outside light source with the "0" of the pointer scale pointed upward.

12.2. Move the scale pointer to the left and right. A distinct difference in the light intensity between the upper and lower halves of the viewing field should be obvious.

12.3. Adjust the pointer until the lower half of the viewing field is at its darkest point.

12.4. Repeat as necessary to ensure that the pointer is properly positioned to indicate maximum lower field darkness.

12.5. If the scale pointer is pointing to "0" (+ or - 1 scale division) on the scale, then the visual owl is acceptable for use and the calibration is complete.

12.6. If the scale pointer is not pointing to "0", loosen the screw securing the scale and adjust the scale for a "0" reading using a small screwdriver.

13. ACCEPTANCE CRITERIA

13.1. The visual owl scale pointer shall read "0" (+ or - 1 scale division) when the lower viewing field is at maximum darkness while focusing on an outside light source.

14. POSTPERFORMANCE WORK ACTIVITIES

14.1. If the visual owl calibration results are outside the acceptance criteria, then notify the responsible supervisor. The supervisor shall evaluate and document the impact of any questionable measurements and perform corrective actions accordingly.

14.2. If for any reason the visual owl cannot be adjusted to bring it within acceptance criteria or if the accuracy of the instrument is questionable for any other reason, then the visual owl shall be removed from service and tagged with a "DO NOT USE" label.

14.3. If the calibration results meet the acceptance criteria, then attach a calibration designation label to the visual owl that indicates the date of calibration, next calibration due date, and the name of the person performing the calibration.

15. DEFINITIONS/ACRONYMS

15.1. **Visual owl** – An optical instrument for measuring the particle size of filter testing aerosols.