MEASUREMENT OF TOTAL PACKAGE OXYGEN (TPO) AT BOTTLING

Prepare the materials
- Sensor spots PSt3 (two per bottle)
- Gluing kit (glue, spatula)
- Temperature sensor
- Optical fiber
- Flint bottles of the same type/dimensions as the production bottle used

Glue spots inside the flint bottles
- Position the spot on the tip of the spatula (red side facing upwards).
- Apply a small quantity of glue on red side, without it covering the black side.
  a. Place the first spot in the body/middle of the bottle (red side glued to glass).
  b. In the neck of the bottle, mark position of fill height and length of the cork + 2 mm.
  c. Place the second spot between the two marks.
- Let it dry for min. 30 minutes.

Bottling line
- Introduce the flint bottle(s) with the spots on the bottling line.
- Collect the bottle(s) immediately after corking/capping. Take an additional production bottle off the line.
Measurement

a. Enter the calibration data from the spots calibration sheet into the analyser.

b. Open the production bottle (with no spots) and insert the temperature sensor.

c. Measure the oxygen in the headspace (HS) in hPa.

d. Measure the ullage (distance between wine and closure) in mm.

e. Wait for 40 min and measure the dissolved oxygen (DO) in ppm.

Calculate the Total Package Oxygen (TPO = dissolved + headspace oxygen) in the bottle

- Use the provided Excel spreadsheet to enter your data.

<table>
<thead>
<tr>
<th>Temp (°C)</th>
<th>HS (mm)</th>
<th>HS (hPa)</th>
<th>DO (ppm)</th>
<th>HS(ppm)</th>
<th>TPO ppm</th>
</tr>
</thead>
<tbody>
<tr>
<td>19.0</td>
<td>14</td>
<td>102</td>
<td>1.20</td>
<td>0.83</td>
<td>2.03</td>
</tr>
<tr>
<td>19.0</td>
<td>14</td>
<td>122</td>
<td>1.10</td>
<td>0.99</td>
<td>2.09</td>
</tr>
<tr>
<td>19.0</td>
<td>14</td>
<td>121</td>
<td>1.30</td>
<td>0.98</td>
<td>2.28</td>
</tr>
</tbody>
</table>

Variations

- Screw caps: the spot applied in the bottle neck will be covered by the screw cap skirt. For headspace oxygen, carefully cut away skirt without breaking the seal to access the spot.
MEASUREMENT OF TOTAL PACKAGE OXYGEN IN A BAG-IN-BOX® (BIB)

1. Prepare the materials
   - Sensor spots PSt3 (1 per tap)
   - Gluing kit (glue, spatula)
   - Transparent Vitop BiB tap
   - BiB ‘Cone meter’ from Performance BiB
   - Temperature sensor
   - Optical fiber

2. Glue a spot into the transparent taps as illustrated
   - Position the spot on the tip of the spatula (red side facing upwards).
   - Apply a small quantity of glue on red side, without it covering the black side.
   - Apply spot inside tap and let it dry for minimum 30 min.

3. Substitute with the normal tap
   - Introduce the transparent taps on the filling line, ensuring correct insertion into bags. Collect the bags post filling.
Measurement

a. Enter the spots calibration data into the analyser and verify the calibration (see calibration sheet).

b. Temperature:
   - Record the temperature of the wine at filling and enter manually into analyser or
   - Measure temperature automatically by inserting the temperature sensor into a production bag.

c. Position the bag so the tap is in contact with air only. Measure the oxygen in the headspace (HS) in hPa.

d. Turn the bag to create a cone with air and measure the volume in ml. using the ‘Cone meter’.

e. Hold the bag and point the optical fiber directly on the spot in contact with wine, -open the tap to create a flow and read the DO in ppm after approx. 60 s.

Calculate the Total Package Oxygen in the BiB (TPO = dissolved + headspace oxygen) in the bag

- Use the provided Excel spread sheet to enter your data.

<table>
<thead>
<tr>
<th>BIB n°</th>
<th>BIB volume (L)</th>
<th>Volume HS (mL)</th>
<th>Temp. (°C)</th>
<th>DO (ppm)</th>
<th>HS (HPa)</th>
<th>HS (ppm)</th>
<th>TPO (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5</td>
<td>33.7</td>
<td>13.3</td>
<td>4.96</td>
<td>130</td>
<td>1.18</td>
<td>6.14</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
<td>44.1</td>
<td>13.3</td>
<td>4.57</td>
<td>125</td>
<td>1.48</td>
<td>6.05</td>
</tr>
<tr>
<td>3</td>
<td>5</td>
<td>33.7</td>
<td>13.3</td>
<td>4.44</td>
<td>132</td>
<td>1.20</td>
<td>5.64</td>
</tr>
</tbody>
</table>
RECALIBRATION OF PST3 SPOTS

RE-CALIBRATION OF SPOTS ARE ONLY RECOMMENDED IF THE FACTORY CALIBRATION (CALIBRATION VALUES IN SHEET) CANNOT BE VERIFIED.

Preparation

1. Place the bottles (equipped with spots) and temperature sensor in the room where you will do the calibration (at least one hour before).
2. Check on the internet or measure the atmospheric pressure of the day at your location. If you don’t have the information, choose 1000 hPa.

Measurement

1. Turn on the NomaSense device and select the second screen reading by clicking “View”.
2. Measure the spots of all the bottles in air and record the values of stable phase and temperature (the phase must be between 25° and 29°).

This is the new Calibration value ‘100’.
3. Then flush the bottles with nitrogen and record the values of phase and temperature when stable (the phase must be between 58° and 62°). This is the new Calibration value ‘0’.

4. Record and use these values (atm pressure, phases and temperatures, so 5 values) as calibration values, typing them into manual calibration.

5. NB:
   It is very important to start the calibration in the air as the bottle is already equilibrated with air.
ADVISE ON CORRECT USE OF DIPPING PROBE

Preparation

• Attach the dipping probe to the NomaSense unit outlet. Handle the probe and the outlet connection area with care.

• Enter the calibration data supplied with the probe into the NomaSense unit.

• Ensure correct temperature compensation setting before measurement.
  - Apply the PT1000 temperature probe to the sample (PT1000).
  - Measure and enter the temperature into the unit manually (Manual).

• Check settings by reading while probe is in atmospheric air (using % oxygen or HPa unit). Correct reading is 20.9 % +/- 1 % or 210 +/- 10 hPa.

Measurement

• Introduce the dipping probe into the sample of wine or air.

• Enter the desired measuring unit (ppm for DO, or HPa or % Oxygen for air).

• Check temperature compensation setting and ensure the temperature probe is at the point of oxygen measurement (temp. gradients can occur).

• Let the probe stabilise for 5-10 min in liquid ensuring movement over the sensor tip to facilitate stabilisation (stir gently by hand).

• In air, the probe needs only seconds to stabilise

• Once the reading on the display is stable, read the oxygen concentration of the sample.

• Remove the dipping probe and clean in water. Reapply the protective cap on the sensor tip.
Tips

• Measurements in tanks:
  - **Wine**: often tanks contain gradients of oxygen and temperature and measurements at different depths may be necessary to obtain representative results. A small weight can be applied/tied to the dipping probe. Alternatively, measurement can be done through a sight glass using a sensor spot.
  - **Air**: simply apply the probe to the air at the top/head space for easy check of the inert gas management of the tank ullage.

• Obtain faster readings:
  Creating a flow/movement over the sensor at the tip of the probe will provide the fastest and most representative readings for wine samples.

• Sparkling or fermenting wine:
  Move the dipping probe at the time of measurement as there is a risk of an air bubble being trapped on sensor tip.