CALCULATING THE OTR OF MICRO-PERFORATIONS IN A PRODUCE PACKAGE

Calculating OTR of micro-perforated produce packaging using the OpTech®-O$_2$ Model P

Summary

Before you begin you must know the dimension of your <u>whole</u> package. For example, if a package with a surface area (total area that allows for permeation) of the pouch measures 13cm x 15cm on 2 sides, it equates to 390 cm^2 or 0.039 m^2.

The total OTR of the whole package with perforations would be the OTR through the finished package (without perforation) *plus* the total OTR through all perforations. You can use the formula below to calculate the total OTR of your package.

$OTR_{total} = OTR_{of\ pkg\ (no\ perforation)} + OTR_{per\ perf}\ x\ Perforations$

Procedure

1. Test the OTR of the pouch without holes. Or, if you only have OTR for the film, (e.g., film OTR without holes has a value of 1066 cc /(m^2*day)), you'll need to convert it to the actual package dimension. The calculation is as follows:

$OTR_{of\ pkg\ (no\ perforations)} = 1066\ cc\ /(m^2 \cdot day)\ x\ 0.039\ m^2 = 41.57\ cc/(package \cdot day)$

2. Test the OTR through the perforated holes with OpTech-O$_2$ Model P. For example, perforated film samples (using 100cm^2 test area), with 1 and 3 holes would be:

OTR of film with 1 perforation = 2,188 cc/(m$^2 \cdot$ day)

OTR of film with 3 perforations = 4,338 cc/(m$^2 \cdot$ day)

Easy to follow steps help you properly calculate the OTR of each micro-perforation

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3. Using the same 100cm² test area, the amount of OTR contributed from the perforations would be the extra amount over the OTR of the film without perforations. Use the following calculation to obtain each perforation's contribution (cc/day):

$$OTR_{perforations} = OTR_{film\ (with\ perforations)} - OTR_{film\ (no\ perforations)}$$

1 perforation: OTR = 2188 - 1066 = 1122 cc/(m² · day)

Converting to package unit:

1122 cc/(m² · day) x 0.01m² =11.22 cc/day; or 11.22 cc/day per perforation.

3 perforations: OTR = 4338 - 1066 = 3272 cc/(m² · day)

Converting to package unit:

3272 cc/(m² · day) x 0.01m² =32.72 cc/day with 3 perforations; or 10.91 cc/day per perforation.

4. Now you can specify the total number of perforations for the package to meet different products' OTR requirements. Use the equation:

OTR total = OTR pkg (no perforation) + OTR per perforation x number of perforations

Fruits and vegetables have specific requirements for oxygen based on their respiration rates. Please consult with produce and fruit suppliers for actual OTR requirements.

Questions?

Call MOCON to speak with a certified technical support specialist. Tel: +1 763.493.6370 or Email: *info@mocon.com*