

Document Title: Description, AN, Measuring the water activity of vegetable oil		Part # and Rev. 13464-00	
		Release Date:	
Rev.	Description	Revision By	Date

Production Filename: 13464 (In Product Library)

Path to Working Files: DecaDoc\Application Notes\Master

Dimensions: 8.5 inch wide, 11 inch tall

Material: Paper, 92 Bright White or better, 75g/m² or heavier

Colors: Color Print on White

Printer: HP Color LaserJet 8550-PS

Finish: None

Adhesive: None

Special Notes: Illustrations are Ref Only ** Not to Scale ** (Shown page 1 of 2)



Application Note

Measuring the Water Activity of Vegetable Oil

Water activity is defined as the vapor pressure of water in a material divided by the vapor pressure of pure water at the same temperature. It is impossible to measure the vapor pressure of water directly in the sample. However, in a sealed system, the water vapor pressure in the headspace above a material will come into equilibrium with the vapor pressure of water in the sample. Once equilibrium has occurred, the vapor pressure of the headspace can be measured and used to determine the water activity of the material. The AquaLab water activity instrument from Decagon Devices, Inc. measures the vapor pressure of the headspace by determining the dew point temperature of the headspace using a chilled mirror system. Once a measurement is started in the AquaLab, a series of water activity determinations are made to establish that equilibrium has occurred. When two water activity tests are within a preset range of each other, equilibrium has occurred and the test is ended.

Some types of samples can present challenges when measuring water activity. One such sample type is vegetable oil. Due to its hydrophobic nature, vegetable oil cannot readily absorb moisture and water cannot easily move through the oil matrix. Consequently, in a sealed system such as is needed for water activity measurement, the vapor pressure in the headspace above vegetable oil will equilibrate with the vapor pressure in the vegetable oil at a much slower rate than most samples. This causes much longer read times than normal. While the common water activity measurement time in an AquaLab water activity instrument is 3-4 minutes, vegetable oil samples can take up to 20-30 minutes.

An even greater challenge is presented when the vegetable oil equilibrates so slowly that it fools the instrument into thinking that equilibrium has occurred. This occurs when water is either escaping from the oil or moving into the oil at such a slow rate that two subsequent water activity measurements in the series of measurements performed by the AquaLab during a test are so close together that the instrument thinks that equilibrium has occurred. However, upon further testing, it becomes apparent that equilibrium has not occurred since the results continue to change with each subsequent test. Figure 1 illustrates the results of a series of tests conducted on vegetable oil sampled right out of the bottle and analyzed in an AquaLab water activity instrument.