Manual of Petroleum Measurement Standards Chapter 11.2.5

A Simplified Vapor Pressure Correlation for Commercial NGLs

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A Simplified Vapor Pressure Correlation for Commercial NGLs

1 Implementation Guidelines

This 2nd edition of API *MPMS* Chapter 11.2.5/GPA 8117 replaces the 1st edition, which was published in 2007. This 2nd edition was changed to correct the examples in the 1st edition to agree with the published equations.

Please note that this 2nd edition is effective upon the date of publication and supersedes all previous revisions of the standard/technical publication, including API *MPMS* 11.2.2A/GPA TP-15.

Once this edition is implemented in a particular application, the previous edition will no longer be used in that application.

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2 Background

The transfer of ownership of liquids is usually based on the volume of liquid at agreed-upon standard conditions, usually 60 °F for the U.S. customary system (USC) of units and the greater of one atmosphere pressure or the equilibrium vapor pressure of the liquid. Actual measurement of the liquid volumes and the their associated densities occurs at flowing or process conditions. Thus, these measurements must be converted to equivalent values at the standard conditions. Once the liquid densities are converted, the conversion of the volumes becomes a trivial exercise. Densities are normally converted from measured conditions to standard conditions by equations of the form:

$$\gamma_{60} = F_t \times F_p \times \gamma \tag{1}$$

Where:

- γ_{60} is the relative density at 60 °F and the greater of one atmosphere pressure or the equilibrium vapor pressure of the liquid;
- γ is the relative density at measured conditions;
- F_t is the correction factor for temperature effects; and
- F_p is the correction factor for pressure effects.

Two methods used for calculation of the F_p term were standardized by API: *MPMS* Chapter 11.2.1-1984[2] (now superseded by Chapter 11.1-2004[1]) and *MPMS* Chapter 11.2.2-1986[3]. These methods require a knowledge of the equilibrium bubble point pressure (vapor pressure) at the measured conditions. However, the vapor pressure of the process liquid is generally not measured. The vapor pressure can also be calculated from compositional information, but the composition is not always measured for natural gas liquids (NGLs). Therefore, a correlation for the vapor pressure of NGLs based upon normally measured properties is required.