Manual of Petroleum Measurement Standards Chapter 19.2

Evaporative Loss From Floating-Roof Tanks

THIRD EDITION, OCTOBER 2012

AMERICAN PETROLEUM INSTITUTE

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Summary of Changes to API MPMS Chapters 19.1, 19.2 and 19.4

The third edition of API Manual of Petroleum Measurement Standards (*MPMS*) Chapter 19.4 was published following a revision that was carried out concurrently with revisions to Chapter 19.1, published as the fourth edition, and Chapter 19.2, published as the third edition. Primary changes are:

1) Consolidation of common material in Chapter 19.4. Material that had previously been included in both Chapters 19.1 and 19.2 has been moved to Chapter 19.4. Chapter 19.4, which was previously *Recommended Practice for Speciation of Evaporative Losses*, now has the title *Evaporative Loss Reference Information and Speciation Methodology.* This Chapter had already contained reference information on the properties of chemicals and typical petroleum liquids, and this information has now been removed from Chapters 19.1 and 19.2. In addition, meteorological data have been moved from Chapters 19.1 and 19.2 to Chapter 19.4. In the revised documents:

   a) Meteorological data are found in Chapter 19.4,

   b) Calculation of storage tank temperatures is found in Chapters 19.1 and 19.2 (in that fixed-roof tanks involve calculation of the vapor space temperature in order to determine vapor density, whereas this step is not involved in estimating emissions from floating-roof tanks), and

   c) Calculation of true vapor pressure is found in Chapter 19.4 (in that this is now calculated in the same manner for both fixed- and floating-roof tanks).

2) Reconciliation of nomenclature. Chapters 19.1 and 19.2 previously had different nomenclature for the same variables. These revisions adopt a common set of symbols for both chapters.

3) Reorganization of the formats. In addition to common material having been removed from Chapters 19.1 and 19.2, the remaining text has been edited to remove unnecessarily verbose or repetitive language. The summary tables were deemed redundant, and have been deleted.

4) Appendices. Appendices have been redesignated as annexes.

5) SI units. An annex has been added to each chapter to address SI units.

Chapter 19.2, third edition

In addition to common reference material being deleted from Chapter 19.2, the following changes have been made:

1) Reference to API Technical Reports. References to API TR 2567 (floating roof landings), API TR 2568 (cleaning storage tanks), and API TR 2569 (closed vent IFRTs) have been added.

2) Terminology. The following terminology has been revised:

   a) “Covered floating-roof tank (CFRT)” has been changed to “domed EFRT.”

   b) “Standing storage loss” has been changed to “standing loss.”

   c) “Withdrawal loss” has been changed to “working loss.”

   d) “Solar insolation” has been changed to “insolation.”

3) True vapor pressure from liquid surface temperature. The temperature used for calculation of the true vapor pressure has been changed from the liquid bulk temperature to the liquid surface temperature for floating-roof tanks, using the same method to calculate liquid surface temperature as has been used for fixed-roof tanks. This

brings the API methodology into line with the EPA methodology published in AP-42 at the time of publication of this 3rd Edition of the API standard.

4) Ladder/Guidepole Combination. An equipment description and factors for ladder/guidepole combinations have been added.

5) Effective Throughput. An expression has been added for the sum of changes in liquid level, designated ΣH_Q, for calculating effective throughput.

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Chapter 19.2—Evaporative Loss From Floating-Roof Tanks

1 Scope

This standard contains methodologies for estimating the total evaporative losses of hydrocarbons from external floating-roof tanks (EFRTs), freely vented internal floating-roof tanks (IFRTs), and domed external floating-roof tanks (domed EFRTs).

The methodologies provide loss estimates for general equipment types based on laboratory, test-tank, and field-tank data.

Types of floating roofs, rim-seal systems, and deck fittings are described for information only.

The equations estimate average annual losses from floating-roof tanks for various types of tank construction, floating-roof construction, rim-seal systems, and deck fittings, as well as for various liquid stocks, stock vapor pressures, tank sizes, and wind speeds (EFRTs).

The equations were developed for:

a) stocks with a true vapor pressure greater than approximately 0.1 psia,

b) average wind speeds ranging from 0 miles per hour (mph) to 15 mph (EFRTs), and

c) tank diameters greater than 20 ft.

The estimation techniques become more approximate when these conditions are not met.

When this standard is used to estimate losses from non-freely vented (closed vent) internal or domed external floating-roof tanks (tanks vented only through a pressure-vacuum relief vent, blanketed with an inert gas, vented to a vapor processing unit, or otherwise restricted from being freely vented), refer to the methodology in API TR 2569[7].

The equations are not intended to be used in the following applications.

a) To estimate losses from unstable or boiling stocks (i.e. stocks with a true vapor pressure greater than the atmospheric pressure at the tank location) or from petroleum liquids or petrochemicals for which the vapor pressure is not known or cannot readily be predicted.

b) To estimate losses from tanks in which the materials used in the rim seal, deck fittings, or deck seams have either deteriorated or been significantly permeated by the stored stock.

c) To estimate losses from storage tanks which do not have a floating roof.

d) To estimate losses from landing floating roofs (API TR 2567[8] addresses this).

e) To estimate losses from cleaning storage tanks (API TR 2568[9] addresses this).

The estimation procedures were developed to provide estimates of typical losses from floating-roof tanks that are properly maintained and in normal working condition. Losses from poorly maintained tanks can be greater. Because the loss equations are based on equipment conditions that represent a large population of tanks, a loss estimate for a group of floating-roof tanks will be more accurate than a loss estimate for an individual tank. The estimation can be improved by using detailed field information, including climatic data and operational data for the appropriate time period.

Evaporative-loss considerations are not the only criteria for equipment selection. Many other factors not addressed in this standard, such as tank operation, maintenance, and safety, are important in designing and selecting tank equipment for a given application.