

Reconciliation of Liquid Pipeline Quantities

API STANDARD 2560
FIRST EDITION, DECEMBER 2003

REAFFIRMED, JANUARY 2010



AMERICAN PETROLEUM INSTITUTE

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Measurement Coordination

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Reconciliation of Liquid Pipeline Quantities

1 Introduction

1.1 In the ideal world every drop of liquid received into a pipeline system and every drop delivered out of the system, as well as all liquid inventory within the system, would be measured and accounted for precisely, and a comparison of all receipts and all deliveries—adjusted for inventory changes—would be exactly the same. The system would never experience a loss or a gain. Unfortunately, this ideal pipeline balance seldom exists in the real world.

1.2 Most pipeline systems typically experience some degree of loss or gain over time. This represents the normal loss/gain performance for a system. From time to time, losses or gains greater than normal may occur for a variety of reasons. Excessive or unexplained loss/gain often leads to contention between participating parties, sometimes requiring monetary settlements to adjust for abnormal loss/gain. In such cases, it is necessary to be able to (1) identify abnormal loss/gain as quickly as possible, (2) determine the magnitude of abnormal loss/gain, and (3) institute corrective actions.

1.3 Sometimes losses or gains are real, and adjustments must be made to correct shipper batches and/or inventories. Most of the time, though, there are no real physical losses or gains. The loss/gain that occurs in day-to-day operation is usually small (a fraction of a percent) and is caused by small imperfections in a number of measurements in a system.

1.4 In a sense, loss/gain is a measure of the ability to measure within a system. Loss/gain should be monitored for any given system at regular intervals to establish what is normal for that system and to identify any abnormal loss/gain so that corrective action can be taken.

2 Scope

2.1 This publication provides methodologies for monitoring liquid pipeline loss/gain, and for determining the normal loss/gain level for any given pipeline system. Troubleshooting suggestions are also presented.

2.2 This document does not establish industry standards for loss/gain level because each system is an individual and exhibits its own loss/gain level and/or patterns under normal operating conditions.

2.3 The document provides operational and statistically based tools for identifying when a system has deviated from normal, the magnitude of the deviation, and guidelines for identifying the causes of deviation from normal.

3 Field of Application

3.1 The primary application of this publication is in custody transfer liquid pipeline systems in which there is provision for measuring all liquids that enter the system, exit the system and liquid inventory within the system. The application is not intended for non-liquid or mixed phase systems.

3.2 The applications and examples in this document are intended primarily for custody transfer pipeline systems, but the principles may be applied to any system which involves the measurement of liquids into and out of the system and possibly inventory of liquids within the system.

4 Reference Publications

API Manual of Petroleum Measurement Standards

Chapter 2 “Tank Calibration”

Chapter 4.8 “Operation of Proving Systems”

Chapter 12.1 “Upright Cylindrical Tanks and Marine Vessels”

Chapter 12.2 “Calculation of Liquid Petroleum Quantities Measured by Turbine or Displacement Meters”

Chapter 12.3 “Calculation of Volumetric Shrinkage From Blending Light Hydrocarbons with Crude Oil”

Chapter 13.1 “Statistical Concepts and Procedures in Measurement”

Chapter 13.2 “Statistical Methods of Evaluating Meter Proving Data”

5 Definitions

For the purposes of this document these specific definitions apply.

5.1 action limits: Control limits applied to a control chart or log to indicate when action is necessary to inspect or calibrate equipment and possibly issue a correction ticket. Action limits are normally based on 95 percent to 99 percent confidence levels for statistical uncertainty analyses of the group of measurements.

5.2 control chart—fixed limit: A control chart whose control limits are based on adopted fixed values. Historically, fixed limits have been used to control the limits on meter factor changes.

5.3 control chart—loss/gain: a graphical method for evaluating whether loss/gain and/or meter proving operations are in or out of a “state of statistical control.”