



Designation: D7278 – 21

Standard Guide for Prediction of Analyzer Sample System Lag Times¹

This standard is issued under the fixed designation D7278; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reappraisal. A superscript epsilon (ε) indicates an editorial change since the last revision or reappraisal.

INTRODUCTION

Lag time, as used in this guide, is the time required to transport a representative sample from the process tap to the analyzer. Sample system designs have infinite configurations so this guide gives the user guidance, based on basic design considerations, when calculating the lag time of online sample delivery systems. Lag time of the analyzer sample system is a required system characteristic when performing system validation in Practice D3764, D6122, or D8321 and in general the proper operation of any online analytical system. The guide lists the components of the system that need to be considered when determining lag time plus a means to judge the type of flow and need for multiple flushes before analysis on any sample.

1. Scope*

1.1 This guide covers the application of routine calculations to estimate sample system lag time, in seconds, for gas, liquid, and mixed phase systems.

1.2 This guide considers the sources of lag time from the process sample tap, tap conditioning, sample transport, pre-analysis conditioning and analysis.

1.3 Lag times are estimated based on a prediction of flow characteristics, turbulent, non turbulent, or laminar, and the corresponding purge requirements.

1.4 Mixed phase systems prevent reliable representative sampling so system lag times should not be used to predict sample representation of a mixed phase stream.

1.5 The values stated in inch-pound units are to be regarded as standard. Other units of measurement are included in this standard and Appendix X1 examples where normally seen in industry.

1.6 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.7 *This international standard was developed in accordance with internationally recognized principles on standard-*

ization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.

2. Referenced Documents

2.1 *ASTM Standards:*²

D3764 Practice for Validation of the Performance of Process Stream Analyzer Systems

D6122 Practice for Validation of the Performance of Multi-variate Online, At-Line, Field and Laboratory Infrared Spectrophotometer, and Raman Spectrometer Based Analyzer Systems

D8321 Practice for Development and Validation of Multi-variate Analyses for Use in Predicting Properties of Petroleum Products, Liquid Fuels, and Lubricants based on Spectroscopic Measurements

3. Terminology

3.1 *Definitions:*

3.1.1 *continuous analyzer unit cycle time, n*—the time interval required to replace the volume of the analyzer measurement cell.

3.1.2 *intermittent analyzer unit cycle time, n*—the time interval between successive updates of the analyzer output.

3.1.3 *purge volume, n*—the combined volume of the full analyzer sampling and conditioning systems.

¹ This guide is under the jurisdiction of ASTM Committee D02 on Petroleum Products, Liquid Fuels, and Lubricants and is the direct responsibility of Subcommittee D02.25 on Performance Assessment and Validation of Process Stream Analyzer Systems.

Current edition approved Dec. 1, 2021. Published December 2021. Originally approved in 2006. Last previous edition approved in 2016 as D7278 – 16. DOI: 10.1520/D7278-21.

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

*A Summary of Changes section appears at the end of this standard