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Standard Guidelines for In-Process Oxygen Transfer Testing

ASCE
AMERICAN SOCIETY OF CIVIL ENGINEERS

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ENVIRONMENTAL & WATER RESOURCES INSTITUTE

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CONTENTS

ASCE STANDARDS . . . iii

PREFACE . . . vii

ACKNOWLEDGMENTS . . . ix

1 SCOPE . . . 1

2 NONSTEADY-STATE METHOD . . . 3
- 2.1 Objective . . . 3
- 2.2 Theoretical Basis . . . 3
- 2.3 Assumptions and Limitations . . . 3
- 2.4 Procedure . . . 4
  - 2.4.1 The H_2O_2 Technique . . . 5
- 2.5 Sample Calculation . . . 6
- 2.6 Quality Control . . . 7
- 2.7 Test Variability . . . 8

3 OFF-GAS METHOD . . . 13
- 3.1 Objective . . . 13
- 3.2 Theoretical Basis . . . 13
- 3.3 Assumptions and Limitations . . . 14
- 3.4 Apparatus and Supplies . . . 15
  - 3.4.1 Off-Gas Analyzer . . . 15
  - 3.4.2 Off-Gas Collection System . . . 15
- 3.5 General Requirements of the Apparatus . . . 15
  - 3.5.1 Off-Gas Collection System . . . 15
  - 3.5.2 Off-Gas Analyzer Capabilities . . . 15
  - 3.5.3 Liquid-Phase DO Hardware . . . 16
  - 3.5.4 Miscellaneous Equipment . . . 16
- 3.6 Procedure . . . 16
  - 3.6.1 Conduct of Test . . . 16
  - 3.6.2 Analyzer Operation . . . 16
  - 3.6.3 Sampling Criteria . . . 16
  - 3.6.4 Recorded Data . . . 16
- 3.7 Off-Gas Calculations . . . 17
  - 3.7.1 General . . . 17
  - 3.7.2 Summary Data Sheet . . . 17
  - 3.7.3 Ancillary Information . . . 17
  - 3.7.4 Report of Results . . . 17
- 3.8 Quality Assurance/Quality Control Procedures . . . 17
  - 3.8.1 Leak Test Analyzer Module and Conduit Hose . . . 17
  - 3.8.2 Oxygen Sensor Calibration . . . 17
  - 3.8.3 Sampling Plan Adequacy . . . 18
  - 3.8.4 Conversion of OTE_f to $SOTE_{pw}$ . . . 18
- 3.9 Accuracy and Precision . . . 18

4 TRACER MEASUREMENT OF OXYGEN TRANSFER . . . 19
- 4.1 Objective . . . 19
- 4.2 Theoretical Basis . . . 19
- 4.3 Assumptions and Limitations . . . 20

4.4 Apparatus . . . 20
4.4.1 Liquid Scintillation Spectrophotometer . . . 20
4.4.2 Grab Sampling Device . . . 20
4.4.3 Alternate Continuous-Flow Sampling Arrangement . . . 20
4.5 Procedures . . . 20
4.5.1 Tracer Quantities . . . 20
4.5.2 Tracer Release . . . 21
4.5.3 Sampling Locations, Test Duration, and Sampling Frequency . . . 21
4.5.4 Sample Collection, Storage, and Shipment . . . 21
4.5.4.1 Grab Sampling . . . 21
4.5.4.2 Continuous Flow Sampling . . . 21
4.5.5 Laboratory Analysis . . . 21
4.6 Calculations . . . 21
4.6.1 General . . . 21
4.6.2 Example . . . 22
4.7 Quality Assurance and Quality Control Procedures . . . 23
4.8 Accuracy and Precision . . . 23

5 COMPARISONS AMONG FIELD OXYGEN TRANSFER TECHNIQUES . . . 25

APPENDIX A OFF-GAS ANALYZER . . . 29
A.1 Capabilities . . . 29

APPENDIX B SAMPLE CALCULATION FOR OFF-GAS TECHNIQUE . . . 31
B.1 Example 1—Standard Oxygen Transfer Efficiency . . . 31
B.2 Example 2—Computing the Mean Weighted Average (MWA) OTE_f and $SOTE_{pw}$ . . . 34

APPENDIX C CORRECTIONS TO THE K_{Kr}/K_La RATIO FOR KRYPTON STRIPPING . . . 35

APPENDIX D OTHER METHODS . . . 37
D.1 Steady-State Oxygen Uptake Rate (R) Technique . . . 37
D.1.1 Objective . . . 37
D.1.2 Theoretical Basis . . . 37
D.1.3 Assumptions and Limitations . . . 37
D.1.4 Procedure . . . 37
D.1.4.1 General . . . 37
D.1.4.2 Oxygen Uptake Rates—Ex Situ . . . 38
D.1.4.3 Ex Situ Oxygen Uptake Test Accuracy . . . 38
D.1.4.4 Other Methods—Off-Gas Column Test for Alpha Determinations . . . 38
D.1.4.5 Sample Calculation . . . 40
D.1.4.6 Quality Control . . . 40
D.1.4.7 Test Variability and Accuracy . . . 40
D.2 Mass Balance Oxygen Transfer Determination in Process Water . . . 40
D.2.1 Objective . . . 40
D.2.2 Theoretical Basis . . . 41
D.2.3 Assumptions and Limitations . . . 41
D.2.4 Procedures . . . 41
D.2.4.1 Driving Force Factor . . . 42
D.2.4.2 Saturation and Temperature Correction . . . 42
D.2.4.3 Nitrification–Denitrification Factor . . . 42
D.2.4.4 Benthal Oxygen Demand . . . 42
D.2.4.5 Surface Reaeration . . . 42
D.2.4.6 Photosynthetic Factor . . . 42
D.2.5 Example Calculation . . . 43
D.2.6 Accuracy and Precision . . . 44
D.2.7 Activated Sludge Systems . . . 45

APPENDIX E ABBREVIATIONS AND NOTATION . . . 47

APPENDIX F REFERENCES . . . 49

INDEX . . . 51

PREFACE

These guidelines for testing oxygen transfer devices in process water are the result of field testing by the ASCE Oxygen Transfer Standards Committee since about 1979. A significant portion of the early work by the Committee was supported by grants from the US Environmental Protection Agency.

Preparation of these guidelines was difficult. Side-by-side testing of a number of methods was used to verify reproducibility of the techniques and has led to substantial refinement in procedures and rejection of some techniques. The methods selected have proven to be most reliable under rigorous field conditions. The technology continues to remain dynamic, however, and modifications and/or new procedures are likely to occur in the future.

It is intended that these guidelines be used by engineers, owners, and manufacturers in evaluating the performance of aeration devices under process conditions. They are not intended for compliance testing of aeration devices insofar as performance under process conditions is affected by a large number of process variables and wastewater characteristics that are not easily controlled. In-process testing does provide the engineer with useful information that can be used in future design. It provides the owner with data that can be used for operation and maintenance of the aeration equipment. These procedures provide manufacturers with a useful research and development tool for their equipment development and design.

The procedures as a whole are applicable for all oxygen transfer devices in suspended growth systems. They may also be applicable to testing oxygen transfer devices in lakes and streams. They are not applicable to fixed-film reactors, although modification of some of the methods might serve to provide data on these processes as well. The substance of the guidelines is based on the report, "Development of Standard Procedures for Evaluating Oxygen Transfer Devices," EPA 600/2-83-102, October 1983; however, other pertinent references are provided throughout this document dealing with more detail about the techniques. Section 5.0 provides a discussion on the comparison of the methods.

Since the original publication in 1996, the procedure that has gained the widest acceptance and use is the off-gas method detailed in Chapter 3. While still considered an accurate and reliable method for measuring oxygen transfer in process systems, the tracer technique described in Chapter 4 has not been used in recent years.

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The contributions of the EPA for workshops, laboratory, and field studies that support the development and refinement of these guidelines are gratefully acknowledged.

This standard was formulated through the consensus standards process by balloting in compliance with the procedures of the ASCE Codes and Standards Activity Council. Those individuals who serve on the EWRI Oxygen Transfer Standards Committee are

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CHAPTER 1
SCOPE

The methods described under these standard guidelines, which were first developed by ASCE (1996), provide several proven techniques for measuring oxygen transfer under process conditions. Nonsteady-state, off-gas, and inert gas tracer methods are described in Chapters 2, 3, and 4. Chapter 5 is a brief comparison among methods. The methods presented are considered to be well developed and provide satisfactory precision for a wide range of aeration processes in suspended-growth biological systems. Because a wide range of process variables and wastewater characteristics that affect the precision (and accuracy) of these methods are difficult to control, the methods are offered as standard guidelines and are not recommended for compliance testing of aeration equipment. These guidelines use both the Système International (SI) units and common units. Symbols and nomenclature are defined in Appendix E. ASCE (1996) can still be obtained from the American Society of Civil Engineers in Reston, VA.