Manual of Water Supply Practices

M64

Gas Transfer Applications in Water—

Addition and Removal

American Water Works Association

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American Water Works Association

American Water Works Association
6666 West Quincy Avenue
Denver, CO 80235-3098
awwa.org

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Preface

A group of volunteers from the Inorganics Committee of the American Water Works Association (AWWA) prepared this manual of practice. The need for a manual on aeration and air stripping was brought to the attention of the committee at the 2010 Inorganic Contaminants Workshop. It was discussed at the workshop that a standalone manual on aeration and air stripping did not exist. The goal of this first edition of M64 is to provide the reader with a general understanding of the principles of aeration and air stripping, providing knowledge regarding the applications of aeration and air stripping, and providing operators guidance on the operation and maintenance of aeration and air stripping equipment, including case studies. The manual includes Henry's law constants for several contaminants of interest in drinking water applications. We encourage interested readers to pursue additional information on aeration and air stripping topics through other AWWA resources.

The contents of this Manual include the importance of gas transfer operations in water treatment, including a definition of aeration (Chapter 1), the physical mechanism of gas transfer, including Henry's law constants and information regarding blower selection (Chapter 2), the principles and applications for gas addition (Chapter 3), the principles and applications for gas removal (Chapter 4), and the installation, operation, and maintenance of aeration and air stripping equipment (Chapter 5). Chapter 2 contains a summary table of Henry's law constants, and Chapter 5 includes case studies of existing system operation and maintenance. The index can be helpful in finding information on a subject of interest presented in different context throughout the manual.

This manual is designed to provide operators and engineering staff with an understanding of aeration and air stripping systems, with a comprehensive look at different technologies and applications of gas addition and gas removal. The Inorganics Committee is hopeful that M64 will meet industry needs and will be a useful resource for a broad audience. As this is the first edition of AWWA Manual M64, *Gas Transfer Applications in Water: Addition and Removal*, the Inorganics Committee and AWWA welcome comments and suggestions for improving future editions of this manual. Please contact the AWWA Water Quality Engineer, 6666 West Quincy Avenue, Denver, CO 80235-3098 to provide feedback on the contents of this manual.

Jennifer Baldwin, Ph.D., P.E.
Chair, M64 Committee

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Steering Committee Members

Jennifer Baldwin, Chair, Jacobs, Knoxville, Tenn.
Thomas Gillogly, Carollo Engineers Inc., Wilton Manors, Fla.
Patrick Gurian, Drexel University, Philadelphia, Pa.
Jerry Lowry, Lowry Engineering, Inc., Blue Hill, Maine
Jennifer Santini, AWWA Staff, Denver, Colo.

Contributors to the 1st edition

Jennifer Baldwin, Chair, CH2M, Knoxville, Tenn.
Marnie Bell, Arcadis, Buffalo, N.Y.
Frederick Bloetscher, Public Utility Management and Planning Services, Inc., Hollywood, Fla.
Nicole Blute, Hazen and Sawyer, Los Angeles, Calif.
William Byers, CH2M, Corvallis, Ore.
Patrick Cole, H2M Architects + Engineers, Howell, N.J.
Catherine DiPietro, Aquarius Engineering, Pownal, Maine
Joseph Drago, Kennedy/Jenks Consultants, San Francisco, Calif.
Thomas Gillogly, Carollo Engineers Inc., Wilton Manors, Fla.
Angelica Gregory, Carollo Engineers Inc., Coral Springs, Fla.
Pierre Kwan, HDR Engineering, Inc., Seattle, Wash.
Milton Larsen, Kennedy/Jenks Consultants, Federal Way, Wash.
Jerry Lowry, Lowry Engineering, Inc., Blue Hill, Maine
Lee O'Dell, CH2M, Portland, Ore.
Michael Schock, Environmental Protection Agency, Cincinnati, Ohio
Samuel Silva, California Water Service Co., Menlo Park, Calif.

Chapter 1

Importance of Gas Transfer Operations in Water Treatment

OVERVIEW

Aeration is a well-established and relatively common process that has been used for producing drinking water for many centuries. The industry definition of aeration per the AWWA Water Dictionary is "a gas transfer unit process that allows for the absorption of gas (frequently oxygen or disinfectant) by water, the air stripping of volatile compounds, and the precipitation of inorganic contaminants."

This short definition covers a broad range of processes that involves gas transfer into and out of water. This chapter is intended to provide an overview of the aeration process, how it was developed and has been refined to its current design, why it has been used, what gases are added into or removed from water, and contaminants it can be used to remove. From this overview and introduction, readers should gain a basic understanding of the aeration process before seeking out the more topic-specific chapters later in the manual to address their individual questions and requirements.

HISTORY AND FUTURE

Aeration has been used since the earliest civilizations as people recognized the benefit of mixing water with air. Those humans found that adding air removed odors and improved the taste of surface and groundwaters. In those earliest aeration applications, the aeration