

Volumetric Leak Detection Methods for Underground Fuel Storage Tanks

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POLLUTION TECHNOLOGY REVIEW No. 180

ndc

VOLUMETRIC LEAK DETECTION METHODS FOR UNDERGROUND FUEL STORAGE TANKS

by

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Park Ridge, New Jersey, U.S.A.

Copyright © 1990 by Noyes Data Corporation
Library of Congress Catalog Card Number: 89-71008
ISBN: 0-8155-1230-9
ISSN: 0090-516X
Printed in the United States

Published in the United States of America by
Noyes Data Corporation
Mill Road, Park Ridge, New Jersey 07656

10 9 8 7 6 5 4 3 2 1

Library of Congress Cataloging-in-Publication Data

Volumetric leak detection methods for underground fuel storage tanks /
by Joseph W. Maresca, Jr. . . . [et al.] .
p. cm. -- (Pollution technology review, ISSN 0090-516X ; no.
180)
Includes bibliographical references.
ISBN 0-8155-1230-9 :
1. Petroleum products--Underground storage. 2. Leak detectors.
I. Maresca, J.W. II. Series.
TP692.5.V63 1990
665.5'42--dc20

89-71008
CIP

**VOLUMETRIC LEAK DETECTION METHODS
FOR UNDERGROUND FUEL STORAGE TANKS**

Foreword

This book summarizes the results of the U.S. Environmental Protection Agency (EPA) research program to evaluate the current performance of commercially available volumetric test methods for the detection of small leaks in underground gasoline storage tanks. The evaluations were performed by the EPA at its Risk Reduction Engineering Laboratory Underground Storage Tank (UST) Test Apparatus located in Edison, New Jersey.

The objectives of the program were to:

- produce the technical data necessary to support the development of release detection regulations,
- define the current practice of commercially available systems,
- make specific recommendations to improve the current practice,
- provide technical information that will help users select suitable methods for testing the integrity of underground storage tanks.

A unique approach to conducting the evaluation has made it possible to determine and resolve the technological and engineering issues associated with volumetric leak detection, as well as to define the current practice of commercially available test methods. The approach uses experimentally validated models of the important sources of ambient noise that effect volume changes in nonleaking and leaking tanks, a large database of product-temperature changes that result from the delivery of product to a tank at a different temperature than the product in the tank, and a mathematical model of each test method to estimate the performance of that method. The test-method model includes the instrumentation noise, the configuration of the sensors, the test protocol, the data analysis algorithms, and the detection criterion. This study and the ambient noise experiments contributed to a better understanding of the environmental

factors that inhibit detection (temperature, structural deformation, trapped vapor, evaluation and condensation, and waves). These factors are now not only better understood but also better quantified. This knowledge is expected to lead to significant improvement in the performance of current and developing methods.

In the United States there are several million underground storage tanks containing petroleum fuels and chemicals. It is estimated that 10 to 25% of them may be leaking. This translates to up to one-half million leaking tanks in the U.S. The contamination of ground water that results from such leaks is a serious environmental threat and one that impacts public health directly, for in most states at least 50% of the potable water supply comes from underground sources.

In 1984 (through the Hazardous and Solid Waste Amendments to the Resource Conservation and Recovery Act of 1976) the EPA was charged with developing regulations for the detection of releases from underground storage tanks. The new regulations, issued in September 1988, state that all volumetric tank test methods must, within two years, have the capability of detecting leaks as small as 0.1 gallons per hour with a probability of detection of 95% and a probability of false alarm of 5%.

Twenty-five commercially available volumetric leak detection methods were evaluated. The book contains the chronology of the experiments, a thorough explanation of the engineering principles underlying the experiments, and a comprehensive analysis of the results.

The information in the book is from the following documents:

Volumetric Tank Testing: An Overview, prepared by Joseph W. Maresca, Jr. and Monique Siebel of Vista Research, Inc. for the U.S. Environmental Protection Agency, April 1989 (Part I of the book).

Evaluation of Volumetric Leak Detection Methods for Underground Fuel Storage Tanks—Volume I, prepared by Robert D. Roach, James W. Starr and Joseph W. Maresca, Jr. of Vista Research, Inc. for the U.S. Environmental Protection Agency, November 1988 (Part II of the book).

The basic data (977 pages) from which the Appendix to Part II of this book was summarized can be found in the following document (referred to as "Volume II" throughout Part II of the book):

Evaluation of Volumetric Leak Detection Methods for Underground Fuel Storage Tanks—Volume II (EPA/600/2-88/068b), prepared by Vista Research, Inc. for the U.S. Environmental Protection Agency, December 1988.

The table of contents is organized in such a way as to serve as a subject index and provides easy access to the information contained in the book.

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Part I

Overview

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Acknowledgments

Technical assistance was provided by Thomas Young of the EPA Office of Underground Storage Tanks in Washington, DC, and by John S. Farlow of the EPA Risk Reduction Engineering Laboratory in Edison, NJ.

Technical reviewers were James H. Pim, Suffolk County (New York) Department of Health Services; Ken Goldstein, New Jersey Department of Environmental Protection; Dr. Robert Koerner, Drexel University; and Dr. H. Kendall Wilcox of Geraghty and Miller, Inc.