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Canal Automation FOR Irrigation Systems



Task Committee on Recent Advances in Canal Automation

EDITED BY
Brian Wahlin, Ph.D., P.E., D.WRE
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Canal Automation for Irrigation Systems

Prepared by
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of the Irrigation Delivery and Drainage Systems Committee
of the Irrigation and Drainage Council
of the Environmental and Water Resources Institute
of the American Society of Civil Engineers

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CANAL AUTOMATION FOR IRRIGATION SYSTEMS

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PREFACE

Canal automation always has had the potential to save water and improve efficiency of irrigation water supply projects or of irrigation district operations. Recently, there have been a number of technological and engineering advances in the field of canal automation. The Task Committee on Recent Advances in Canal Automation was formed under the Irrigation Delivery and Drainage Systems Committee under the Environmental and Water Resources Institute of the American Society of Civil Engineers to document the new technological progress in canal automation. Members of the task committee gathered information on canal automation research that is taking place around the world. The task committee was truly an international effort with researchers and engineers in several countries (USA, The Netherlands, Australia, France, Spain, Portugal, China, and Mexico) all participating in the development of this Manual of Practice. This publication is designed to provide guidance on how and when to implement canal automation within the context of canal modernization but not covering the full range of canal modernization issues. The manual also provides practical guidance on some of the more routine aspects of canal automation.

DEVELOPMENT OF THE MANUSCRIPT

The task committee kicked off the project with a series of three short video conferences October 13–15, 2009. The video conference was hosted at three sites across the world (USA, Australia, and France). This video conference was unique in that it allowed a large group of canal automation experts to come together to discuss the manual of practice without undue travel. During the video conference, participants discussed the

overall goals of the Canal Automation Manual, developed an outline of the manual, and made initial assignments for writing the chapters. The task committee would like to thank the hosts of the three video conference sites:

- Arid Land Agricultural Research Center (USA),
- University of Melbourne (Australia), and
- Montpellier SupAgro (France).

Participants in this initial video conference included

- David Aughton, Rubicon Water (Australia),
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- Brian Wahlin, WEST Consultants, Inc. (USA),
- Min Xu, Deltares, (The Netherlands), and
- Darell Zimbelman, Water Systems Operations and Management, LLC (USA).

TASK COMMITTEE WORKSHOP

From September 17 to 20, 2012, the Task Committee on Canal Automation held a workshop at the Société du Canal de Provence in Aix-en-Provence, France. The goal of the workshop was to have a face-to-face meeting to discuss the Canal Automation Manual, as well as to share ideas and concepts. The Task Committee would like to thank the Société du Canal de Provence for organizing and hosting the event. Participants included

- Jean-Luc Deltour, Société du Canal de Provence (France),
- Bruno Grawitz, Société du Canal de Provence (France),
- Bruno Vergobbi, Société du Canal de Provence (France),
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- Luciano Mateos, University of Cordoba (Spain).

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Unless otherwise noted, all pictures and figures were provided by the lead chapter author. The editors of this manual would like to express their appreciation to all the lead authors for their dedication to this long-term project.

CHAPTER 1

MODERNIZATION PROCESS, CONSTRAINTS, AND CONCEPTS

1.1. INTRODUCTION

This chapter provides a general overview of the potential benefits of irrigation canal modernization and discusses considerations for assessing whether an irrigation or water district should implement automation as it modernizes, and how to proceed.

1.2. MODERNIZATION

Modernization is a combination of technical, managerial, and organizational upgrading (as opposed to mere physical rehabilitation) of irrigation schemes with the objective of improving resource utilization (e.g., water, labor, economics, or environment) and water delivery service to farms (Wolter and Burt 1997). Such modernization investment focuses on the details of the *inner workings* of an irrigation project. Planners and engineers for irrigation projects frequently equate modernization with practices such as canal lining, piping, and computerized automation; however, such investments are often of low initial priority if one examines the steps needed to improve performance. Computerized automation typically is implemented in later stages of modernization, after basic needs such as flow measurement and accounting procedures have already been completed. Modernization is a *process* that sets specific objectives and selects specific actions and tools to achieve them over an extended period.

Modernization that is intended to respond to external pressures (such as improved return flow quality or reduced diversions) simultaneously should address improved service to the farm/field/customer. Irrigation