

## **RESEARCH CONDUCTED for the Awwa Research Foundation By New Dimension Solutions, Inc.**

**Project Title:** Implementing Reliability-Centered Maintenance (RCM) Programs at Water Utilities

**Project Number:** AwwaRF Project 2953

**Principal Investigators:** Marius Basson and Chris Fynn, New Dimension Solutions, Inc.  
734 Franklin Avenue, # 514, Garden City, NY 11530

### **Objectives:**

This project has two primary objectives. The first is to assess how water utilities can apply RCM to new and existing infrastructure, and the second is to evaluate costs and benefits of RCM programs at water utilities.

The first objective seeks to determine, and then clearly specify, the optimal approach for RCM projects for new and existing assets to ensure successful program execution, achievement of expected results and maximized return on investment.

The second objective seeks to evaluate the costs and benefits of RCM programs at water utilities to give a benchmark on results that can be achieved.

### **Background:**

The background to this research is the increasing emphasis on improved asset management in the water industry. Many water utilities are seeking to improve reliability, availability and utilization of their assets while also looking to control or reduce maintenance costs as they grapple with issues such as aging assets, more stringent environmental rules, a graying workforce and tight budgets. In addition many utilities are poised to make significant investments in new infrastructure to replace assets reaching the end of their life-cycle, cater to increased user bases or adhere to stricter compliance requirements. This research project seeks to assess the benefits for water utilities in utilizing **RCM** to develop optimized maintenance programs which will improve asset reliability and avoid unnecessary cost — both for existing assets and new capital investment programs.

### **Highlights:**

A number of conclusions have been reached as a result of this project:

- Properly structured RCM programs can reduce maintenance costs by as much as 25-30% while improving asset performance.
- The survey indicates that RCM is currently utilized in a relatively small fraction of water utilities — less than 10%.
- The maintenance programs in place at the utilities that responded to the survey are derived mostly from OEM recommendations (48%) and equipment history (31%) with only 3% from RCM.
- Over half the survey respondents (57%) indicated that asset performance and optimal management of the utility's assets is becoming an important issue for utility management. 13% of respondents stated it is critical.

## **Approach:**

To achieve the overall objective of the research project and address the specific project tasks required in the AwwaRF Request, NDS performed the following activities:

1. Completed two RCM pilot projects with participating water utilities (Denver Water Board and Veolia Water Indianapolis) following the recommended best-practice approach described in the report and carefully tracking costs and benefits with detailed analysis of the “before” and “after” situations (to the extent of available information).
2. Evaluated established RCM programs at two water utilities (Broward County, FL and Massachusetts Water Resources Authority). These utilities have already completed a significant number of RCM analyses and measured their results.
3. Completed a substantial survey of approximately 180 water utilities to identify how water utilities are currently developing their maintenance programs and the current level of understanding and application of RCM practices.
4. Conducted a literature review to assess the key literature available on RCM in general and specific to the water industry.
5. Compiled a comprehensive research report utilizing inputs from Items 1, 2, 3 and 4 above and addressing the AwwaRF Project Objectives — laying out the recommended approach for RCM projects and bench-marking results that can be achieved from RCM in a clear manner for water utilities to use and review.

## **Results/Findings:**

### **1. Cost-Benefit Possibilities of Well-Managed RCM Programs**

Detailed analysis of established RCM programs in the case studies included in this report (MWRA and Broward County) indicates that in both cases the RCM programs delivered substantial reductions in maintenance cost while simultaneously improving asset performance. At the MWRA substantial cost savings (in the order of **25%**) were achieved by reduction of both Preventive and Corrective Maintenance hours while equipment reliability and plant availability were improved. The case study at Broward county also showed significant maintenance cost reductions (>25%) from reduction of both preventive and corrective maintenance hours.

The conclusion to be derived from these detailed evaluations of established RCM programs is that benefits substantially outweigh the costs of implementing the RCM program. The programs provided substantial payback from cost reduction aspects alone — before quantifying the benefits of improved reliability, asset performance and increased asset life.

### **2. Extent of Usage of RCM**

The survey indicates that RCM is currently utilized in a relatively small fraction of water utilities — considerably less than 10% are pursuing properly structured RCM programs. This indicates significant opportunity for savings and improvement at many water utilities.

### **3. Current Maintenance Program Formulation Tools**

The maintenance programs that are currently in place at the utilities that responded to the survey are derived as follows: 48% from OEM recommendations, 31% from equipment history, 10% from a formalized preventive maintenance optimization process, and currently only 3% from RCM.

### **4. Strong and Growing Emphasis on Managing Physical Assets at Water Utilities**

Survey data revealed that there is an emergent focus by utility management on asset performance and optimal management of the utility’s assets. Over half of respondents (57%) indicated that this focus is becoming an important issue for utility management, and 13% of respondents stated that optimal management and performance of the utility’s assets is becoming **a very critical issue for utility management**.

**Impact:**

This RCM research report should have significant impact for the water industry, given the serious issues facing utilities in the area of asset management (tight budgets/cost control, major CIP needs for assets at the end of their useful lives and to handle increased user communities, stricter compliance requirements, a graying workforce and others).

The report lays out clear evidence of the significant successes that can be achieved by properly structured RCM programs (cost reduction and asset performance improvement delivered by realizing a more effective maintenance program using the RCM methodology). RCM experts also make clear that the RCM process can achieve even more striking results when applied to new capital investments where plant design can be optimized for reliability and maintainability and the maintenance function is able to hit the ground running with an optimized maintenance program for the assets on day 1.

The report lays out detailed and pragmatic recommendations on the exact steps to follow to achieve the successes documented in the two case-studies. The impact of this report can be to initiate an industry-wide adoption of the RCM best-practices specified in the report within the water industry. Reliability-based principles are steadily being adopted in all major asset-intensive industries and the water industry should be no exception. The results that can be achieved from a well-structured program are clearly attainable.

**Multimedia** (if applicable): A CD is provided with the main report. The CD contains the detailed reports on the two pilot programs (Denver Water and Veolia Water Indianapolis) and the evaluations of the two existing RCM programs at MWRA and Broward County.

**Participants**

- Massachusetts Water Resources Authority
- Denver Water Board
- Veolia Water Indianapolis
- Broward County, Florida

The Awwa Research Foundation (AwwaRF) is a member-supported, international, non-profit organization that sponsors research to enable water utilities, public health agencies, and other professionals to provide safe and affordable drinking water to consumers.

For further information, visit AwwaRF's website at <http://www.awwarf.org>