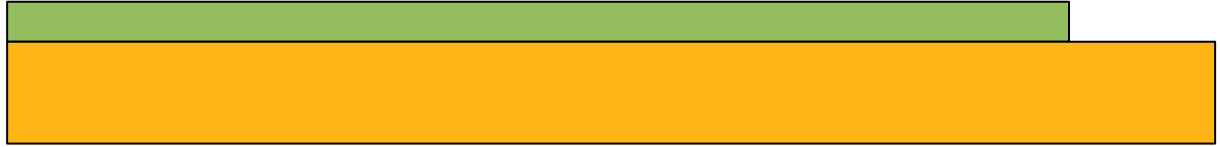


Harfst and Associates, Inc.
Water Management Consultants
William F. Harfst



AN INTRODUCTION
TO
HARFST AND ASSOCIATES, INC.



William F. Harfst
Consultant
HARFST AND ASSOCIATES, INC.
P.O. Box 276
Crystal Lake, Illinois 60039
(815) 477-4559
wfh@mc.net

Harfst and Associates, Inc.
An Independent Water Management Firm

Introduction

My mission is to help clients solve problems, conserve water, reduce chemical costs and save energy by utilizing best practices for applying and controlling their water management program. Drawing upon 40 years of experience, I work with plant managers, supervisors and operating engineers to conserve water and improve the results from their boiler, cooling, process and waste water treatment programs.

Harfst and Associates, Inc. provides water management consulting services as its sole activity. The firm does not have any direct or indirect affiliation with the sale or distribution of chemical treatment products, water treatment equipment, ion exchange resins or other materials sold by specialty or commodity chemical companies. This insures that the technical support services and recommendations are provided without bias or conflict of interest.

Harfst and Associates, Inc. maintains offices and laboratory facilities in Crystal Lake, Illinois, which is located approximately 1 hour northwest of Chicago.

About the Consultant

The principal Consultant is William F. Harfst. Bill has a Bachelor of Science degree in Chemistry from the University of Illinois in Urbana cum laud and forty (40) years of water management experience. He has provided water management consulting services with his firm for the past twenty-one (21) years.

Bill has considerable experience in the design and application of water treatment programs. Some of his client projects over the past 21 years include:

Wrote the water treatment specifications for the City of Chicago bid, "Water Treatment Chemicals and Support Services," for the Department of General Services (DGS) city-wide chemicals contract covering 500 HVAC facility locations managed by DGS.

Seventeen (17) years as the Water Treatment Consultant for the City of Chicago Department of Aviation O'Hare International Airport Heating and Refrigeration Plant;

central hot water and chilled water facility. Developed the Water Technology Training Program for Operating Engineers. Revised and updated the water treatment specification and procedures manual adopted by the Chicago Dept. of Public Works.

Twenty-one (21) years as the Water Treatment Consultant for Chrysler Corporation Assembly Plants. Wrote the specifications for the utility, humidification, process and waste water chemical management program. Member of the committee to draft Legionella control program. Recently completed a Water Balance Project that quantifies where and how water is used in the plant. Works with corporate CEMs to improve energy efficiency in steam and cooling water systems.

Thirteen (13) years as the Water Treatment Consultant for Abbott Nutrition for steam/condensate, cooling tower/chilled water and process water applications. Technical advisor for corporate Legionella control program. Recently completed Water Balance Project that indicates where and how water is used in utility and process applications. Developed Water Technology training program for Energy Center operating engineers.

Ten (10) years as the water consultant for the University of Chicago. This work includes writing water treatment bid specifications for the two central steam and chilled water plants along with the thirty (30) stand-alone cooling towers at the North, South and Hull Court campus. In 2008, completed the design, installation and startup of the new reverse osmosis boiler feedwater system at the South Steam Plant.

Water consultant for City Colleges of Chicago campus locations. Building systems include cooling towers, mechanical chillers and hydronic heating loops. Reviewed and updated the Water Treatment Technology training manual for building operating engineers.

Wrote the water treatment specifications for cooling towers and process steam systems for Olin Corporation at their ammunition plant in St. Louis, Mo.

Consultant to A T & T and the Environmental Defense Fund for improving the water, energy and chemical treatment efficiency of cooling towers within A T & T's portfolio of over 1000 properties under facilities management.

Earlier in his career, 1973-75, Bill served as the water treatment representative for Purdue University at their central steam and chilled water utilities plant in Lafayette Indiana. In 2010-2011, steam production peaked at 646,000 lb/hr. During the summer, the cooling load on the chiller plant peaked at over 26,700 ton-hr.

Training Activities

Bill is an instructor for the College of Engineering, Dept. of Engineering Professional Development, University of Wisconsin. He has instructed on water treatment subjects in these courses:

- Improving Cooling Tower Operation and Cooling Water Treatment
- Boiler Plant Operation and Orientation
- Selecting and Operating Boiler Plants for Central Heating and Process Systems

Legal Work

As part of his consulting practice, he has been retained by law firms and insurance companies as a technical expert to determine the root cause of water-related problems in steam boilers, cooling towers and mechanical chillers. In all cases, these disputes have been resolved to the satisfaction of the client without the need to go to trial.

Publications

Bill has authored papers for the International Water Conference, Electric Utility Workshop and the trade press. He currently writes two monthly columns for Ultrapure Water Journal (Back to Basics) and Industrial Water Treatment (Waterside Fundamentals). Here are a few examples.

"Conserve Water by Improving Cooling Tower Efficiency," Power, January 2009

"Benefits of Soft Water Makeup for Cooling Tower Operation," Presented at 68th Annual Water Conference 2007

"Enhanced Cooling Tower Maintenance Saves Water,"
Maintenance Technology Magazine, October 2008

"Water Conservation: Good for the Environment...Good
for Business," Industrial Maintenance and Plant
Operations, October 2008

"A Green Approach to Cooling Tower Operation," Power,
December 2008

"Non-Chemical Water Treatment," Chemical Engineering,
April 2010

"Chlorine or Bromine: Which is Right for Your System?"
Power, September 1993

"Modern Trends in Cooling Tower Automation," Ultrapure
Water Journal, September 1997

"Water Treatment Programs Respond to Improvements in
HVAC Equipment Design," Maintenance Solutions, January
1997

"Internal Boiler Water Conditioning," Ultrapure Water
Journal, December 2011

"Improving Softener Efficiency," Ultrapure Water
Journal, September 2011

"Essential Instrumentation for RO Systems," Ultrapure
Water Journal, April/May 2012

"Reducing Wastewater Discharge by Conservation, Reuse
and Recycling," Industrial Water Treatment, March 2012

"Water Treatment Requirements for Low- and Medium-
Pressure Boilers," Industrial Water Treatment, May/June
2012

"Corrosion in Copper Pipes Can be Prevented," Water
Technology Magazine, 1999

"Cleaning Reverse Osmosis Membranes," Ultrapure Water,
May/June 2012

Previous Work Experience

While with Dearborn Chemical (a major water treatment chemical supplier), 1975-1979, he was Technical Director for the Eastern Region, responsible for problem solving and root cause analysis for steam and cooling water systems across all industries in the Eastern half of the US.

From 1980 to 1984, he was Director of Dearborn Educational Services responsible for technical training of field service representatives in boiler, cooling and wastewater applications. Later he served as Senior Product Manager for boiler and cooling water chemicals. This included chemical feed and control equipment.

From 1987 to 1990, he worked for Arrowhead Industrial Water (since acquired by US Filter and later by Siemens). Arrowhead designed, built, installed and serviced high purity reverse osmosis and ion exchange equipment for utility, semi-conductor, pharmaceutical and chemical plants. He has considerable experience in the design, operation and maintenance of RO equipment, softeners, filters and high purity water systems.

Harfst and Associates, Inc.

In 1991, Bill merged the knowledge and experienced he gained in industrial chemical treatment (Dearborn) and high purity water treatment equipment (Arrowhead) into his current consulting practice. He works with clients to help them conserve water, reduce chemical consumption, save energy, eliminate waste and control cost. These services include:

- 3rd Party System Audits
- Water Quality Improvement
- Water Conservation Methods
- Chemical Specifications
- Competitive Bid Evaluations
- Corrosion Studies and Investigation
- Training Programs and Client Workshops
- Laboratory Analysis
- Boiler Water Treatment Programs
- Cooling Water Treatment Programs
- Microbiological Control
- Ion Exchange Troubleshooting

- Reverse Osmosis
- Lime Soda Softening
- Equipment Inspections
- Root Cause Analysis
- Water Balance Studies

Much of Bill's work involves ongoing consulting on boiler, cooling and water conservation projects with clients that he has served for many years. He routinely oversees the application and control of water treatment programs both generic and those provided by commercial specialty chemical companies.

Harfst and Associates, Inc was organized as a small business enterprise, Illinois Chapter S Corporation, in March 1991.

You can visit Bill's website at

<http://www.harfstassociates.com>

Thank you for reviewing the capabilities and services offered Harfst and Associates, Inc. Please let me know if you have any questions or require further information.

Very truly yours,

HARFST AND ASSOCIATES, INC.

William F. Harfst