Your program committee would like to invite you and your company to the 2016 Annual Conference this year held in Houston, Texas. Along with the outstanding location we have a great program lined up for you. We have a full offering of information, education, and an opportunity to participate in some of the ongoing work on standards and codes. We believe it is our responsibility to make sure what we have to offer you can share with others at your company. Our goal is to bring you the most timely and latest information in the industry.

We have 28 papers being presented in a concurrent format on Monday and Tuesday. Water Treating will have one session, and our Performance & Technology Group and Engineering Standards & Maintenance Group will have the other. We hope you find our program beneficial.

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Owner Operator Seminar ........................................page 3
Water Treating Panel Discussion ............................page 3
CTI’s Newest Members ........................................... page 4
Licensing for Testing Agencies .................................page 4
Hospitality Sponsorship ..........................................page 5
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President Elect ....................................................... page 15
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Press Statement on Legionellosis ............................. Page 23
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On behalf of the Board of Directors and the staff at CTI, we would like to thank all of those folks who attended the Committee Workshop in St. Pete Beach, Florida in July ’15. Thanks to the hard work by our many dedicated volunteers significant progress was made in updating and writing new codes, standards and guidelines during the workshop.

I also want to thank Vicky Maser and her staff for arranging the workshop which, as always, was flawless.

CTI is truly an internationally recognized organization as evidenced by the visit to the Workshop by a delegation from the Cooling Equipment Branch of China’s General Machinery Association to learn more about CTI and to initiate dialogue on potential future collaboration between our organizations. Follow-up discussions are planned for Spring ’16.

My tenure as CTI President ends during the upcoming Annual Conference at the Hilton North in Houston, Texas, scheduled for February 7-11, 2016. It has been a great honor for me to serve as President of CTI during the past two years. Much progress has been made over the past two years in a number of areas such as the sustainability of CTI and the benefits of our membership. Thanks to the efforts of our Committee and Task Group Chairs, there will be a Panel Discussion on Monday, 2:00p – 3:45p that will cover “Solving Cooling System Treatment Issues.” The CTI program includes an Owner/Operator Seminar (w/lunch) on Tuesday from 10:00a – 2:00p. All Owner/Operators (only) are invited. Be sure to mark it on your registration form so we’ll have a close count. The very popular Ask The Expert session will be held Tuesday from 2:00p - 4:30p. Come prepared with your questions for the panel of experts. We will have folks from all the standing committees ready to support your questions with good qualified answers. Then on Wednesday from 8:00a - 12:00p it will be the Education Program Session with Legislation as the topic. Information on the program is on page 3 of this newsletter.

The CTI Program Committee has put together a program that will offer the best opportunity to inform, educate and expand your knowledge about our industry. We hope you come prepared to take full advantage of everything we have to offer you. A great location, outstanding food, entertainment, and a conference that will give back to the membership what you want… “Information.”

I, Phil Kiser, Helen Cerra, John Lichtie, Ethan Chesnut, and Pete Elliott, your program committee, invite and welcome you to the 2016 Annual Conference and meeting. I look forward to seeing you in Houston, Texas.

Brandon Rees,
2016 CTI Program Chairman
The next generation of industrial fans for cooling towers and heat exchangers.
Session 1:
“Fundamentals of Cooling Water Chemistry, with a Focus on Microbial Control - When It’s Not Good to be Green” This presentation will discuss the basics of cooling water chemistry, with an emphasis on best practices for microbiological control.

Mr. Post has 40 years of industrial water treatment experience, including 38 years in the development, application, and evaluation of water treatment programs. Ray graduated with a BSE in Chemical Engineering from Princeton University in 1976. Prior to joining ChemTreat in 2008, Ray held several positions with Bent Laboratories and GE Water including global technical leader for cooling water chemistry, and positions in product development, product management, and technical services. Ray is a licensed professional engineer and a member of ASME, Cooling Technology Institute, International Water Conference Advisory Council, and the National Society of Professional Engineers. He holds 2 US Patents and has authored more than 50 technical papers on industrial water treatment.

Session 2:
ASHRAE Legionella Standard 188 Evidence-based interpretation and Application - On June 26, 2015, the American Society of Heating, Refrigerating and Air-conditioning Engineers (ASHRAE) published the first U.S. standard for the prevention of Legionnaires’ disease. The normative section includes the development of a water management plan (WMP) for building water systems and a WMP for devices, including open and closed circuit cooling towers and evaporative condensers. While the standard provides basic requirements on what to do to manage risk it’s not prescriptive and leaves a myriad of decisions about Legionella control up to the water management team. Information on Legionella will be shared in developing a water management plan that is evidence-based and defensible.

Dr. Janet E. Stout president and director of Special Pathogens Laboratory, and research associate professor at the University of Pittsburgh Swanson School of Engineering in the Department of Civil and Environmental Engineering. A clinical and environmental microbiologist, she is internationally known for more than 30 years of pioneering research in Legionella. Her expertise includes prevention and control strategies for Legionnaires’ disease. Toward that end, Dr Stout has introduced seminal discoveries, evaluated all major Legionella disinfection technologies in use today, and continues to explore new approaches for Legionella detection and control. Her research is widely published in major medical and scientific peer-reviewed journals. Dr. Stout also co-authors Legionella chapters in books and manuals, such as APIC Text, Hospital Epidemiology and Infection Control and the Manual of Clinical Microbiology, and UpToDate. An advocate for prevention, she serves on Legionella committees for CTI and ASHRAE including ASHRAE Guideline 12 and SPC 188.

Session 3:
ASHRAE released a long-awaited Legionella Standard (188) in June of 2015. It was followed within weeks by New York City’s worst recorded outbreak of Legionnaires’ disease – killing 12 and sickening more than 120 people. The ANSI/ASHRAE Standard 188-2015, titled “Legionellosis: Risk Management for Building Water Systems”, is the first U.S. standard dealing with Legionella and establishes minimum legionellosis risk management requirements for building water systems. This seminar will present an overview of ASHRAE Standard 188 with compliance considerations for building owners and the (new) role of water management plan implementation that building operators must have for cooling towers and other water systems that can harbor and transmit Legionella bacteria.

Mr. Pearson lives in Raleigh, North Carolina and is a Vice President of Sales and Technical Services of RayTech Water Technologies, a company that has been in the cooling water treatment business for more than 50 years. Ray has authored nearly 100 technical papers on industrial water treatment and has been invited to speak to the American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) and to the Cooling Technology Institute (CTI). Ray is a past-chair of the Water Treatment Technical Committee at ASHRAE and an ASTM Standards Visiting Committee member on the ASHRAE SSSC for Standard 188 (Legionella). He has served on the AWI Board of Directors, was President of AWI in 2003 and received the Ray Baum Memorial Water Technology of the Year Award in 2005.

Session 4:
CTI GDL-159 is a guideline intended to assist all of those involved with evaporative heat rejection equipment in effectively managing the equipment relative to risk of Legionnaires’ Disease. The seminar content will include the structure and objectives for content in the guideline. The guideline is intended, among other purposes, to complement ASHRAE STD-188 with regard to evaporative heat rejection equipment for building water systems. This session has co-presenters, presenting in no particular order.

Helen is a Technical Staff Consultant with ChemTreat, Inc. located in Richmond, Virginia. She has over twenty-five years of professional experience in all aspects of water treatment. She has authored papers for and made presentations at various trade organizations including, ASHRAE, CTI, Electric Utility Chemistry Workshop (EUCW), International Water Conference (IWC), and NACE. Helen is Secretary of the ASHRAE Standing Standard 188 Committee as well as Vice Chair of the ASHRAE Technical Committee 3.6, Water Treatment. In addition, she is active on the Water Treating Committee and Program Committee with Cooling Technology Institute (CTI), having been a past member of their Board of Directors. She is Chair of GDL-159, the committee expanding CTI Guidelines for Control of Legionella. Helen holds a B.S. in Chemical Engineering from Lehigh University and is a member of American Institute of Chemical Engineers (AIChE).

Paul Lindahl is a past CTI President, and a permanent member of the CTI Past President’s Council. He has been active since 1982 on multiple CTI committees and is currently Chair or Vice-Chair of six committees. He has been active in multiple ASHRAE committees, and is the current Chair of ASHRAE SSSC188 on Legionnaires. He is also active in AHRI and AWWA committee work. Paul retired on 2-October after 47 years with Marley and successor companies. He is currently a consultant to SXI Cooling Technologies, continuing work in organizations including those noted above.
For nearly thirty years, the Cooling Technology Institute has provided a truly independent, third party, thermal performance testing service to the cooling tower industry. In 1995, the CTI also began providing an independent, third party, drift performance testing service as well. Both these services are administered through the CTI multi-agency Tower Performance Test Program and provide comparisons of the actual operating performance of a specific tower installation to the design performance. By providing such information on a specific tower installation, the CTI Cooling Tower Certification Program stands in contrast to the CTI cooling Tower Certification Program which certifies all models of a specific manufacturer’s line of cooling towers perform in accordance with their published thermal ratings.

To be licensed as a CTI Cooling Tower Performance Test Agency, the agency must pass a rigorous screening process and demonstrate a high level of technical expertise. Additionally, it must have a sufficient number of test instruments, all meeting rigid requirements for accuracy and calibration. Once licensed, the Test Agencies for both thermal and drift testing must operate in full compliance with the provisions of the CTI License Agreements and Testing Manuals which were developed by a panel of testing experts specifically for this program. Included in these requirements are strict guidelines regarding conflict of interest to insure CTI Tests are conducted in a fair, unbiased manner.

Cooling tower owners and manufacturers are strongly encouraged to utilize the services of the licensed CTI Cooling Tower Performance Test Agencies. The currently licensed agencies are listed below.

### Licensed CTI Thermal Testing Agencies

<table>
<thead>
<tr>
<th>License Type*</th>
<th>Agency Name</th>
<th>Contact Person</th>
<th>Website / Email</th>
</tr>
</thead>
<tbody>
<tr>
<td>A,B</td>
<td>Clean Air Engineering</td>
<td>Kenneth Hennon</td>
<td>cleanair.com</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A,B</td>
<td>Cooling Tower Technologies Pty Ltd</td>
<td>Ronald Baptie</td>
<td><a href="mailto:coolingtowertech@bigpond.com">coolingtowertech@bigpond.com</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A,B</td>
<td>McHale &amp; Associates, Inc</td>
<td>Thomas Wheelock</td>
<td>mchale.org</td>
</tr>
</tbody>
</table>

* Type A license is for the use of mercury in glass thermometers typically used for smaller towers. Type B license is for the use of remote data acquisition devices which can accommodate multiple measurement locations required by larger towers.

### Licensed CTI Drift Testing Agencies

<table>
<thead>
<tr>
<th>Agency Name</th>
<th>Contact Person</th>
<th>Website / Email</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clean Air Engineering</td>
<td>Kenneth Hennon</td>
<td>cleanair.com</td>
</tr>
<tr>
<td>McHale &amp; Associates, Inc</td>
<td>Thomas Wheelock</td>
<td>mchale.org</td>
</tr>
</tbody>
</table>

* Day 1 license is for the use of mercury in glass thermometers typically used for smaller towers. Type B license is for the use of remote data acquisition devices which can accommodate multiple measurement locations required by larger towers.

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**New CTI Members for 2015**

Agni Fiber Boards*  
AIC Pvt Ltd  
Axial Fans Int SRL  
Bahop Industrial (Dalian) Co., Ltd  
Choice Industrial Solutions  
Cimco Toromont Industries  
Classik Cooling Towers*  
Corona Environmental Consulting  
Debra-Kuempel  
Dunham Bush Yantai Co., Ltd*  
Fanavaran Boj Khonak Kon  
Fibre Craft Industries  
Guangzhou Luxun Technology Exploip Co., Ltd*  
Handco Cooling Systems Factory  
Hansen Industrial Transmissions NV  
Iwaki America, Inc.  
Jiangsu Seagull Cooling Tower Co., Ltd*  
Lucky Hill Corporation*  
MB Group Company  
OMNI Cooling Tower Corporation  
PoongCheon Engineering  
Siner, Servicios De Ingenieria  
Super Tower Industries Pte Ltd*  
SV Cooling Towers Pvt Ltd  
Texas AirSystems  
Tochal Tahvich Iranin  
Tower Service & Supply LLC  
U.S. Motors/Nidec Motor Corporation  
UGSI Chemical Feed, Inc.  
Xiamen Xingling Shuangquan FRP Co.  
*reinstated members
CTI Thanks The Following Sponsors For Their Contributions To The Hospitality Suites For 2016

Full Conference(s) Sponsorship

3. Amarillo Gear Company 15. F.E. Moran, Inc.
6. Brentwood Industries 18. Howden Netherlands
   Equipment Co., Ltd. 20. Infinity Fasteners, Inc.
11. Cooling Tower Technologies, LLC 24. Kyung In Machinery Co., Ltd (KIMCO)
26. MasterTech Services Inc.
27. Midwest Cooling Towers, Inc.
28. Moore Fans LLC
29. Paharpur USA, Inc.
30. Precision Cooling Towers, Inc
31. Rexnord Cooling Towers
32. C.E. Shepherd Co., LP
33. Solenis
34. Special Pathogens Laboratories
35. SPX Cooling Technologies
36. Star Cooling Towers
37. Strongwell
38. Tower Engineering, Inc.
39. Tower Performance, Inc.

CALL FOR PAPERS
2017 Annual Conference
February 5-9, 2017
Sheraton New Orleans
New Orleans, LA

The following schedule will begin the process for papers presented at
the 2017 Annual Conference:

2016
May 6: Deadline for Abstracts
June 10: Authors Notified by
Program Chair
Aug 5: Copy of the first draft must
be sent to CTI office for
review
Nov 11: Final draft, based on review
comments and slides due in
the CTI office

Abstract Forms can be
obtained by contacting
the CTI office at
281.583.4087 or email:
vmanser@cti.org
Cooling Technology Institute

Code of Ethics

We the members of the Cooling Technology Institute (CTI), when acting on behalf of CTI, its members and the industry, will always abide by:

• Behaving with honesty, trustworthiness, and in good faith in representing and performing duties for the betterment of the CTI.
• Always striving to provide the best and most up to date technological information so CTI remains current with industry standards, specifications, guidelines and recommended practices for the benefit of both our members and our industry.
• Insuring that all official works, statements and/or actions on behalf of CTI are so noted as official property of the CTI. All non-official works, statements and/or actions will be clearly recognized as not of CTI and are of personal opinion.
• Avoiding damaging or critical actions with other CTI members that might be personally hurtful or degrading to their employer.
• Exposing existing or past conflicts and rectifying these conflicts in an expedient manner to the best possible solution for all parties involved.
• Holding fellow CTI members in the highest regard of respect and admiration.

August 29, 2006

Key Features of CTI ToolKit Version 3.1

• Air Properties Calculator. Fully ASHRAE compliant, psychrometrics. Interactive.
• Thermal Design Worksheet. in the “Demand Curve” Tab which can be saved to file and retrieved for later review. Now with printable and exportable graphs.
• Performance Evaluator. in the “Performance Curve” Tab to evaluate induced draft or forced draft, crossflow or counterflow cooling tower performance. Now calculates percent performance or leaving water temperature deviation. Data can be entered manually or with an input file. Automatic Cross-plotting. Now with printable and exportable graphs.
• New and Improved Help Files. guide you through the software, explain performance evaluation techniques and offer tips for use.

Now works with Microsoft Windows 7 and all earlier Windows Operating Systems back to Windows 95
(16 MB ram recommended, and 3 MB free disk space required)
Aggreko

Cooling Solutions To Grow Your Business

When a cooling tower fails or when a short-term problem overwhelms the capacity of your tower, Aggreko Cooling Tower Services (ACTS) is the solution.

We have over 50 years’ global experience, 24/7 service from technical experts and the largest fleet of modular cooling towers in the industry. Aggreko can help you address emergencies, maximize production, and keep your operations running smoothly when the heat is on.

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For the location nearest you, please go to: www.aggreko.com/contact

www.aggreko.com
Attend the Committee Meeting of Your Choice
February 7-11, 2016

Engineering Standards and Maintenance Agenda

James F. Blake - American Lightning Protection
Bill Howard - Cooling Tower Depot, Inc., Chair
Ken Mortensen - SPX Cooling Technologies

I. Call to Order/Announcements
II. Introduction of Attendees
III. Approval of 2015 Summer Workshop Meeting Minutes
IV. Professional Development Hours (PDH)
V. Documents Awaiting Ad-Hoc Approval
VI. Documents Awaiting Board Approval
VII. Documents Approved in 2012
VIII. Standing Lead Task Group Reports
    • Wood, Metal, and Concrete Materials Task Group
    • Mechanical Equipment Task Group
    • FRP and Plastics Task Group
    • Tower Operations Task Group
    • Hazard & Environmental Protection Systems Task Group
IX. New Business/Old Business
X. Adjourn

Make your plans to attend Future Meetings for CTI

Annual Conference
February 7-11, 2016
Hilton Houston North
Houston, TX

Committee Workshop
July 10-14, 2016
Pointe Hilton Tapatio Cliffs
Phoenix, AZ

Annual Conference
February 5-9, 2017
Sheraton New Orleans
New Orleans, LA

Committee Workshop
July 16-19, 2017
Hilton Orlando Lake Buena Vista
Lake Buena Vista, FL

Annual Conference
February 4-8, 2018
Hilton Houston North
Houston, TX
I. Call to Order

II. Acknowledgement of Attendees

III. Active Task Groups:
   - ATC-105 (Thermal Test Code)
   - STD-146 (Water flow Measurement Standard)
   - STD-201 (Thermal Test Certification Program)
   - STD 202 (Publication of Thermal Test Results)

IV. New Business
The 2016 CTI Annual
Again this year the Technical Sessions will run simultaneously between

Monday, February 8, 2016
7:00a - 10:00a - Service, Atrium
7:00a - 5:00p - Registration and Paper Sales, Atrium
7:00a - 5:00p - Speakers’ Breakfast, Photo Session & Prep Room, Salon 1
7:30a - President’s Address - Frank Michell, Raphael Ballroom A
7:40a - Long Range Planning - Trevor Hegg, Raphael Ballroom A
7:50a - Eurovent Update - Paul Lindahl, Raphael Ballroom A
8:00a - Multi Agencies Report - Frank Michell, Raphael Ballroom A
8:10a - Certification Report - Tom Womack, Raphael Ballroom A

Bar Closes @ 9:30p

Monday’s Technical Sessions running simultaneously between Raphael Ballrooms A&B and the Donatello Room

Raphael Ballrooms A&B (E&S&M and P&T Sessions)

8:30a - 9:00a

TP16-01
Mechanical Behavior Of Polymer Fills
Nina Woicke, Ph.D and Daniel Dierenfeld, GEA 2H Water Technologies GMBH

Born on 17 Nov 1975 in Kiel (Germany). Engineering degree in process engineering in 2002 and Ph.D. in Polymer Engineering in 2006. Since then head of R&D of GEA 2H Water Technologies GMBH and responsible for fill design and material composition. This paper will outline the mechanical properties of polymer fills and discuss the influence of different parameters (like design, foil thickness, PP vs PVC) as well as the influence of the boundary in cooling tower surrounding.

9:00a - 9:30a

TP16-02
Increasingly Complex Tower Makeup Water Issues
Brad Buecker and Behrang (Ben) Pakzadeh, Kiewit Engineering And Design

Brad Buecker is a Process Specialist with Kiewit Engineering and Design Company. He has 34 years of experience in the power industry including 18 years as a chemist, air quality control specialist, and results engineering specialist at City Water: Light & Power (Springfield, IL) and Kansas City, Power & Light. He has authored many articles and three books on steam generation topics.

As fresh water becomes increasingly scarce in the United States, or presents due to political pressures, new power and industrial plant owners are turning to alternatives supplies for plant makeup, including the makeup to cooling towers. A common source is secondary treated municipal wastewater effluent. These waters often contain impurities that serve as nutrients for microbiological fouling in cooling systems, and include ammonia, phosphorus, organics, and suspended solids. It may not only be beneficial but imperative to remove these contaminants upstream of the cooling tower, but methods to do so require careful planning and selection. Technologies that are coming to the forefront from include membrane bioreactors (MBR) and moving bed bioreactors (MBBR). They may be integrated with clarification and other treatment methods to achieve the desired cooling tower makeup quality. This paper examines these emerging issues.

9:00a - 9:30a

TP16-03
A Technical Evaluation and Reconstruction of Factory Assembled Cooling Towers Including The retrofits To Direct Drive air Motor Technology
Philip Poll, OBR Cooling Towers, Inc.; Slava Prash, NRG Thermal

Philip Poll is a Field Engineer with OBR Cooling Towers, Inc. Philip started his career in the cooling tower industry as a field repair technician in 2001. He attended Ohio University receiving a B.S. in Mechanical Engineering, where he participated in both the independent study and Co-op programs focusing on thermal systems. His experience includes project management, product design, equipment inspection and water treatment for two fields erected and packaged cooling towers. Prior to joining OBR, Philip was employed as a District Representative for The Nalco Chemical Company, where he completed Nalco’s technical sales engineering training program.

This paper addresses a project involving the online reconstruction and upgrading of deteriorated package of cooling towers at district cooling facility located in the Southwestern United States. Examination and evaluation of the existing equipment will be explained in detail along with the process of the rebuilding and conversion of the fan drive system to direct drive permanent magnet motor technology. Observed and measured performance and reliability results are presented demonstrating the effectivity of the project.

9:30a - 10:00a

TP16-04
Innovate Energy Efficiency By Analyzing Cooling Water Systems
Corey Hensley, EPI Engineering

Responsible for the overall direction, coordination, implementation, execution, and completion of projects ensuring consistency with company strategy, commitments and goals. EPI Engineering provides intelligent technology-based engineering services focused on utility optimization, energy reduction, water conservation, and process safety; primarily for the refining and chemical processing industries. EPI offers full cycle solutions, from initial diagnosing and optimization through detailed design, implementation and construction.

Cooling water systems have traditionally not been studied in detail yet they have a large impact on your plant’s performance and overall energy efficiency. With the latest advancements in cooling tower internal fill upgrades and software modeling of the piping distribution system, large cooling water systems can be significantly improved at low cost with significant impact on plant profitability. Case studies will be reviewed that demonstrate how analysis of cooling water systems are low-cost, high-impact way to improve separation efficiency of distillation columns and the overall energy efficiency of manufacturing facilities.

9:30a - 10:00a

TP16-05
Safety In Cooling Tower Maintenance
Magose Abraham Eju, Energy Business Total Solutions Limited

Magose Abraham Eju holds a PhD degree in Mechanical Engineering from the University of Strathclyde, Glasgow, UK and an MBA degree in Project Management from the University of Technology Overeti, Nigeria. His PhD dissertation was on the topic “Improving the thermal performance of cooling towers by conditioning of air”. He has over twenty years of working experience in the oil and gas industry. Between 1991 and 1994, he worked with a multi-national marine company – Holt Leasing Marine - as a 3rd class marine engineer. Between September 1997 and June 1998 he worked as a freelance inspection engineer with a multi-national inspection company - SGS Inspection Company Limited. Between July 1998 and September 2014, he worked with a multi-national liquefied natural gas company – Nigeria LNG Limited where he worked as a Gas Production Operator, Process Engineer and Project Coordinator. He has undergone / attended several professional technical / management training / conferences in Australia, Belgium, Holland, Malaysia, Nigeria, UK and USA during his working career. He is currently the Chief Operating Officer of Energy Business Total Solutions Limited.

Maintenance of Cooling Towers usually poses quite a number of occupational/personal safety challenges. For example, the process of removing and replacing packing (fill) in a cooling tower involves working at height in most cases. If not well managed, this exercise can result to accident of falling, leading to injury and/or fatality. In order to avert such safety incidents during Cooling Tower maintenance, a robust safety management system needs to be developed for ever maintenance work. This paper uses a case study to show the various safety hazards that can be associated with maintenance of Cooling Towers, as well as, suggest ways these hazards/risks could be mitigated.

9:30a - 10:00a

TP16-06
Novel Efficient Non Phosphorous Cooling Water Corrosion Inhibitor
Mary Jane Felipe, David Fulmer, Corina Sandu, Bing Bing Guo, Khac Nguyen, Baker Hughes Inc.

Mary Jane Felipe is currently an R&D Scientist at Baker Hughes Inc. She received her BS Chemistry degree at the University of the Philippines and PhD Chemistry at the University of Houston. Before coming to the USA, she was an instructor at the University of the Philippines-Diliman and was a Regional Task Force for United Nations Development Program - Partnerships in Environmental Management for the Seas of East Asia. She is a synthetic organic and surface chemist by profession and currently working on water use chemicals for use in water treatment.

Corrosion may cause deleterious problems in cooling water systems and typically, when poorly controlled, may lead to decreased plant efficiency due to loss of heat transfer or even equipment failure. Most industrial cooling towers utilize orthophosphates, polyphosphates or other phosphorus-containing water treatment programs as corrosion mitigation measures. However, the use of such corrosion inhibitors is steadfastly becoming the object of federal and local regulations due to phosphorous contamination of surface water. In this regard, this paper details the technological development of non-phosphorous corrosion inhibitor for use of cooling water systems.

continued on page 11
The CTI Office has worked hard to schedule a program that fits everyone’s needs. Incidental arises that may cause changes and/or omissions to parts of the program that are out of our hands. Our apologies if this happens.
What are its limitations? These questions will be explored in this paper. What material properties are important to proper applica-
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tion? What are its limitations? These questions will be explore...
The large fan design virtually eliminates hot air recirculation compared to 5% to 35% recirculation rates of traditional small fan designs.

**Methodology To Validate Sound Levels Of Factory Assembled Towers**

John Dalton and Larry Burdick, SPX Cooling Technologies

*John Dalton is a Senior R&D Engineer at SPX Cooling Technologies with experience in sound testing, thermal ratings, and product applications. Larry Burdick is the Manager of the Ratings and Mechanical Components Groups at SPX Cooling Technologies. The Cooling Technology Institute has a successful, long standing program for thermal capability certification of factory assembled towers, but this type of confidence or 3rd party validation for published sound levels does not exist within the industry. The paper discusses an approach taken, with its successes and challenges, to acquire a sound data set for an entire crossflow model line that accurately reflects sound emission of all models within the line.*

**TP16-19**

8:00a - 8:30a

**Using Cooling Towers For Energy Recovery In Hot and Humid Climatic Conditions**

Moe Salem, AïZO Cooling Limited

*Mr. Salem is the Co-Founder and the CTO of AïZO Cooling LLC. Mr. Salem has a B.Sc. in Mechanical Engineering and a Diploma of Business Administration. He serves as capacity of CTO (Chief technical Engineer & Consultant) for AïZO Cooling LLC. He holds numerous patents for the Indirect/Direct Evaporative cooling technology as well as the control Systems for its Hybrid operations. Mr. Salem has over 20 Years of Experience in the HVAC field as well as experience in the sustainable energy saving solutions for HVAC and energy recovery systems. Mr. Salem taught at many engineering schools in USA (San Jacquie Valley Collage –California) (Fresno Institute of technology –California). Mr. Salem is one of the pioneers of the outdoor cooling systems. He was the head of the design team for one of the largest outdoor cooling projects in the world (Universal Studio Singapore Theme Park). Currently he is leading AïZO Cooling LLC. as CTO in Indirect/Direct Evaporative cooling solutions with its revolutionary product line (CRS) that could save up to 80% of energy consumption, and in its effort for market transformation, across the American, European, and Middle Eastern markets. This paper evaluates the energy savings potential of evaporative recovery (Using a cooling tower and coil) as fresh air pre-cooling in hot and humid climatic conditions. Energy saving chart was generated for various climatic conditions. Depending on the climatic conditions observed, results show that ER has an energy range from 40% to 90% higher when compared to using thermal wheel or run around coils.*

If you are new to our conference and seem to be a little overwhelmed look for the CTI Ambassadors (the members with ‘Yellow’ name badges). These members will be able to help you and answer any questions you may have.
Wood, steel, and concrete have been used as structural materials in cooling towers for decades. More recently, cooling towers of fiber reinforced polymers (FRP) have also become very popular. When evaluations needed to be done to understand the structural integrity of the materials used after years of service of the towers, specialized procedures were developed to characterize the condition of different material. This paper describes some of the nondestructive testing techniques used in the past, current testing procedures and what can be expected in the future. Some case histories are discussed.

**TP16-25**  
**Wind Effects On Air Cooled Condensers: Insights From The Wind-Tunnel**  
Ryan Parker and Bruce R. White, University of California Davis

Ryan is a PhD candidate at the University of California Davis studying the effects of wind on air cooler performance and developing experimental techniques for analyzing wind effects on air-cooled condensers. His research is primarily focused on understanding the effects of high speed wind on air-cooled condensers through experimental modeling and fluid dynamic data analysis. Air-Cooled Condensers (ACCs) offer a way to significantly reduce U.S. water consumption but are susceptible to adverse wind conditions. An ongoing interdisciplinary research project is investigating the effects of wind on the thermal performance of ACCs with a field study of an existing fully-scale combined cycle power plant. The presentation will focus on insights provided by the wind tunnel study, and include limited comparisons with the other methods. Included in the modeling are the effect of some mitigation methods such as wind screens and solid walls.

**TP16-29**  
**Comparison Of Fouling Kinetics On Four Different Fills Operated In Pilot Cooling Towers**  
Aurélie Mahrouk, Ph.D and Mohamed Ararou, EDF

Dr. Aurélie Mahrouk was born in Paris, France, in 1983. She earned her B.E. degree in chemistry, in 2006. She earned her M.S. degree in engineering chemistry in 2008 from the University of Paris VI, Paris, France. She took her PhD in Chemical Engineering from Mines ParisTech in 2012. Her subject was ultrapurification of water and ion exchange resins for nuclear power plant reactors. She is currently research engineer for EDF. Her research interests include caloric precipitation (scaling) in wet open cooling circuits of nuclear power plants. This topic is the core of her studies. She is the author of a number of scientific publications and holds several patents. EDF operates 300 condenser open cooling circuits in its French nuclear power plants (NPP). In order to extend their lifetime, the company has to carry out major renovations of the fills located in the cooling towers, which need to be replaced after around 30 years. The choice of a fill is determined by the results of preliminary tests. An experimental study was realized in order to study and differentiate the fouling risk of different fills. The pilot is constituted of four reduced-scale open cooling circuits (around 15 thermal kW) able to mimic the thermal and chemical behavior of an industrial cooling circuit such as those found in nuclear power plants. To allow this comparison for a duration limited to a few months, the four pilots were operated in scaling conditions, fed by Seine River water (calcium concentration around 90 mg/L and hydrogen carbonates concentration around 230 mg/L), with a Concentration Factor (CF, also called Cycles of Concentration) equal to 2, without injection of acid, and while maintaining the temperature at the outlet of the condenser at 40°C. Among the tested fills, two were trickle fills and two were film fills. All the fills were distributed on 4 levels. The measurement of weight gain was realized once a week for three months.

Fouling has been estimated by mass measurements on fill coupons. Contrary to expectation, the two trickle fills were heavily weighted. One of the film fill showed a lower weight and the other gave results comparable to trickle fills. These results were homogenous whatever the level within the tower. This accelerated test carried out on reduced-scale open cooling circuit pilots and in scaling conditions, was able to discriminate the fouling potential of four different packages, which can help the tower designer to choose the right package. The results would need to be compared to data collected directly from fills present in the industrial towers, so as to consolidate the comparison of the fouling potential of the different fills. On the whole, these results show that the pilots represent the thermal and chemical behavior of an industrial cooling circuit such as those found in nuclear power plants, even if some modifications could be done on this unit to improve its representativeness for the next experimentation.
Monday Night / Hospitality February 8, 2016
Open to everyone in celebration of Vicky’s 35th Anniversary with CTI.
Come join the fun at the Casino with Karaoke on the side.

Cooling Technology Institute’s 2016-2017 President Elect
Bill Howard is a Senior Vice President with Cooling Tower Depot and boasts a bachelor’s degree in Architectural Engineering, “Structures” from University of Colorado 1982. He is a registered professional engineer, a member of NSPE (National Society of Professional Engineers), a member of and an active participant in CTI since 1990, a past director, vice president, and chair of numerous standards, code, and guidelines in the past 25 years as well as the current chairman of the Engineering Standards and Maintenance Committee.

In addition to being an all around great guy and an asset to CTI, Bill would also have you know that he is a pretty darn good skier. Join us in congratulating him on his election as President of the Board for the coming year.

For further information on the CTI in general, including how to become a member, please visit www.cti.org or contact Vicky Manser, the CTI Administrator, at vmanser@cti.org or 281-583-4087.
Right now while you’re at the CTI conference, Bedford has thousands of corrosion-resistant FRP profiles in stock, available immediately. You could place an order today, have it fabricated to your specs, and get it shipped faster than ever before. We’ve built up our inventory to deliver the industry’s shortest lead times — so you can deliver faster for your customers.

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Standing Committee Minutes from July 2015

III. Equipment Standards and Maintenance

James F. Blake - American Lightning Protection
Bill Howard - Cooling Tower Depot, Inc., Chair
Ken Mortensen - SPX Cooling Technologies

I. Lead Task Group Chair Reports

Wood, Metal, and Concrete Materials Task Group [Bill Howard]
- Wood, STD-112 Pressure Treatment, and ESG-117 Maximizing Life of Lumber, Joe LaBove, Phillip Poll – Review the standard to include only the currently EPA approved treatments. This removes creosote and ACC treatments. A draft was assembled and will be reviewed at Winter CTI Meeting.
- ESG-153 Recommended Guidelines for Portland Concrete, Narendra Gosain and Tom Kline – Final review of recent changes – Ad Hoc review is expected soon for this document.
- ESG-160 Corrosion of Concrete, Narendra Gosain, Tom Kline – This document is in the AdHoc/BOD process.
- ESG-162 Cleaning Cooling Towers, Philip Poll, Don Zelek - The rough draft is being finalized. Seeking input from water-treatment committee and specialty cleaning companies on water additives.

Chapter 9 Materials of Construction, Ethan Chesnut – A test is being updated and CTI Standard numbers will be included as references. Many comments were discussed and resolved. This document is expected to go to Ad Hoc after the Winter 2016 meeting.

Fasteners - Committee was formed and updates are being reviewed.

Mechanical and Electrical Task Group [Craig Burris]
- STD-163 Vibration, Craig Burris – This document has been approved by the Board of Directors and is now available.
- STD-111 Speed Reducers - Craig Burris – This document was sent to members. A draft with combine comments will be sent out for review. Information from the electrical group at Southern Co. and Baldor is being sought for review and comment. Monthly calls are planned.

Chapter 11 – Electrical Components, Need a Chair - This group is gathering previous information to Consolidate into a draft and finalize.

ACC Gearboxes Guideline – Natasha Peterson – kick-off meeting held. The group is soliciting input.

FRP and Plastics Task Group [Glenn Barefoot, Jamie Bland]
- STD-131 FRP Siding Panels, John Ahern, Brian Fuqua – Draft nearing completion, working on finishing for Ad Hoc review.
- STD-154 Filament Wound FRP Pipe Bill Daugherty Greg Deshong, Tom Toth - this document needs only small changes this round, working on finishing for Ad Hoc review.
- ESG-157 Wood to FRP, John Ahern, Ken Mortensen – Significant progress on the Scope, References, and Work Recommendations were completed. This document should fall into cycle with STD-137 and ESG-152. Changes are needed to those documents as a result of ASCE actions and the LRFD on FRP construction. The goal is to finish the changes from the Summer Meeting and identify the next steps for the document.
- ESG-164 on Thermoplastic Fill, Kevin Hole, Chris Spencer – The document is in major rework based on substantial input since the Winter Meeting. Fill is the focus. Four areas of concentration were identified and editing of the available input for review will be completed and that draft will be sent out and a call prior to CTI Winter is planned.
- STD-136 Thermoplastic Material for Fill, Chris Bowman, Ken Mortensen – Work began on this document with substantial discussion on the LOI burn testing method discussing what should be included in the document. Review by all parties of the types of plastics and their properties and testing methods will continue. A call prior to CTI Winter is planned.
Standing Committee Minutes from July 2015 continued

Water Treating Committee

Charles Kuhfeldt - Athlon Solutions
Jim Kanuth - ChemTreat, Inc. - Vice Chair
Phil Kiser - G&F Power and Water, Chair

Call to Order:
Phil Kiser, Chairmen of the water treatment committee called the meeting to order at 9:00 AM July. 13, 2015 at the Trade Winds Hotel, St. Pete Beach, FL. The meeting times for all task groups were reviewed. The minutes for the 2015 Spring Meeting were accepted.

Task Groups:
The opening status reports from the group were discussed at the opening session.

• WTG-130C Microbiological Monitoring - Pete Elliot, Chair - The group has had some conference calls since the Spring 2015 meeting. Their task was to edit the document and make changes. This group has made some progress. New assignments were made on Planktonic and Sessile monitoring. Will meet via telephone this Fall.

• WTG-158 Physical Water Treatment - Mark Winter, Chair - The group is working towards a paper with two main sections: an Information Bulletin and a bibliography or reading list. The progress will be reviewed and new tasks will be developed. Next conference call in October 2015.

• WTG-161 Best Practices, Guidelines for Cooling Water Systems - Jack Bland, Chair - The group continues to work toward a clear scope for the “good, better, best effectiveness of sessile bacteria monitoring methods in cooling water systems. For biofilm measurement. ASHRAE is moving towards a research project to investigate the effectiveness of sessile bacteria monitoring methods in cooling water systems.

Additional Business:
- The WTG 147 Water Reuse document is up for review and will be reviewed by Jim Kanuth and Charles Kuhfeldt. A task group was started as noted above to re-write this document.
- The group had a discussion about an appropriate topic for the Panel Discussion to be held in February. There is a need for a topic, scope, and speakers. Past topics have included instrumentation and control, extending the life of heat exchangers, and what to do to treat a new cooling tower.

Adjournment
The motion to adjourn the opening full committee was made and seconded and the meeting adjourned.

If you are new to our conference and seem to be a little overwhelmed look for the CTI Ambassadors (the members with ‘Yellow’ name badges). These members will be able to help you and answer any questions you may have.
Owner/Operator Seminar  
*box lunch included*  
**Tuesday**  
February 9, 2016  
Noon - 2:00p  
Raphael Ballroom D  
lead by:  
Frank Michell w/AEP & Natasha Jones w/Bechtel

**DRESS CODE**  
for the Annual Conference is Business Casual  
**NO TIES!**

**CALL FOR PAPERS**

2017 Annual Conference  
February 5-9, 2017  
Sheraton New Orleans  
New Orleans, LA  
The following schedule will begin the process for papers presented at the 2017 Annual Conference:

**2016**  
May 6: Deadline for Abstracts  
June 10: Authors Notified by Program Chair  
Aug 5: Copy of the first draft must be sent to CTI office for review  
Nov 11: Final draft, based on review comments and slides due in the CTI office  

Abstract Forms can be obtained by contacting the CTI office at 281.583.4087 or email: vmanser@cti.org

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2016 CTI Annual Conference
Table Top Exhibitors
Hilton Hotel • Houston, Texas
Tuesday, February 9, 2016, 4:00p - 8:30p

The following companies have reserved their tables for exhibiting:

5. Fibrosan CTP Sanayi ve Ticaret
6. ProMinent Fluid Controls, Inc
11. Composite Cooling Solutions
13. Glocon Inc.
14. Design Control
15. Cooling Towers of Texas
16. AirFlo Cooling Technologies
17. Hudson Products Corporation
18. Bedford Reinforced Plastics
19. International Cooling Tower
20. Rexnord Industries
21. Solenis
22. Resolite
24. EcoWater CHC
25. EPI Engineering
26. EvapTech, Inc
27. G&G Marine
28. Midwest Cooling Towers, Inc.
29. GEA 2H Water Technologies
30. CleanAir Engineering, Inc
31. Amarillo Gear Company
32. Baltimore Aircoil Company
33. Dynamic Fabricators
34. Cooling Tower Resources, Inc
35. Denso North America
36. C.E. Shepherd
37. Moore Fans LLC
38. IMI Sensors / PCB
39. Tower Tech, Inc
40. FasTech International
41. Brentwood Industries
42. Proco Products
43. ChemTreat, Inc
44. SPX Cooling Technologies
45. Aggreko Cooling Tower Services
46. Rain for Rent
47. Gaiennie Lumber
48. Hewitech GmbH
49. Polser A.S.
51. McHale & Associates
52. Neptune/Benson

There are plenty of spaces still left for your company to exhibit.
Spaces already reserved are indicated by the red boxes. Don’t forget to reserve your space at $1,350/space.

For information on reserving your table
contact Virginia Manser
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Prioritizing Performance

Performance testing is at the core of our research and development. We know that rigorous testing yields an optimized product, so our manufacturing process does not begin until the design has been perfected. This allows us to provide products that maximize your tower’s performance while extending the lifespan of your installation.
The Institute has addressed Legionella bacteria and the disease Legionellosis for years, and has prepared a guidance document that provides more specific information. This document is available for free download on the Cooling Tower Institute (CTI) web site, www.cti.org. The CTI has addressed Legionella as it relates to cooling tower systems. Other organizations have addressed Legionella as it relates to other water systems. (OSHA, ASHRAE, CDC, etc.)

The only route of exposure by which a person can become ill is by inhalation or aspiration of airborne bacteria deep into the lungs. Contact by skin or by normal ingestion will not result in illness. Legionella bacteria are not a risk for most people and most situations. Only under specific situations can the bacteria multiply and become airborne. Further, few people are susceptible to becoming ill even when exposed.

Legionella bacteria are organisms that can be found in many places, but the populations are very low, and do not pose a risk to most people and most situations. Cooling towers, open and closed circuit, and evaporative condensers are a potential source where conditions could exist that promote Legionella growth and aerosol formation. However, adherence to proper maintenance practices such as those in the referenced documents will minimize the risk from overgrowth of Legionella and aerosol formation.

References:
US Centers for Disease Control (CDC), http://www.cdc.gov/legionella/about/index.html

Standard 188 Legionellosis: Risk Management in Building Water Systems, American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE), 2015

References:
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This article can be found on the CTI website at www.cti.org.
Make your plans to attend Future Meetings for CTI

Annual Conference
February 7-11, 2016
Hilton Houston North
Houston, TX

Committee Workshop
July 10-14, 2016
Pointe Hilton Tapatio Cliffs
Phoenix, AZ

Annual Conference
February 5-9, 2017
Sheraton New Orleans
New Orleans, LA

Committee Workshop
July 16-19, 2017
Hilton Orlando
Lake Buena Vista
Lake Buena Vista, FL

Annual Conference
February 4-8, 2018
Hilton Houston North
Houston, TX

Dr. Arthur J. Freedman

Dr. FREEDMAN – Dr. Arthur J. Freedman, Ph.D., aged 90, passed away peacefully in his sleep on July 24th at his home in Naperville, IL. Dr. Freedman was founder and President of Arthur Freedman Associates, Inc., consultants to the water treatment industry. Dr. Freedman was born in 1924 to Alice and Samuel Freedman in Brooklyn, NY and spent his childhood in Larchmont, NY.

Dr. Freedman earned his doctorate in inorganic chemistry, cum laude, in 1948 from New York University. After graduating, he worked in the field of radiochemistry at the Los Alamos Scientific Lab and at MIT. In 1954, he focused on water treatment at the Standard Oil Company of Indiana (Amoco) and then at Nalco Chemical Company where he worked for many years before founding Arthur Freedman Associates, Inc. in 1981.

Dr. Freedman led a full and vibrant life. He enjoyed camping and traveling with his wife and children, and felt strongly about social, scientific and environmental causes. He was active in the Unitarian Universalist church community and was an accomplished musician. He touched the lives of hundreds through classical music as a French horn player, teacher, and church choral and musical director. Nothing gave him more pleasure in life than music. His dry humor, steadfast passion for the truth and kind generosity will be dearly missed.

He is survived by his beloved wife of 51 years, Sally Ann Freedman, his brother, Lawrence Freedman, his six children, Thomas, Peter, Kerry, Erin, Shannon and Douglas, numerous grandchildren, a great-grandchild, nieces and a nephew.

CTI says goodbye:

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Marcel Lefevre

(May 27, 1932 – September 22, 2015) - It is with great sadness that we report the death of our colleague and friend Marcel Lefevre. Marcel was known worldwide for his knowledge of water cooling technology and his willingness to share that knowledge. Countless individuals and many companies relied on Marcel for help and guidance in the thermal design and evaluation of cooling towers and other heat transfer equipment.

Marcel grew up as a child during WWII in Belgium. After getting his degree in Mechanical Engineering from University Travail in 1953 he spent several years helping with family businesses and performing his military service. In 1956 Marcel started his cooling tower career working for Hamon Cooling Towers. At Hamon, he was one of the first engineers to use computers to perform cooling tower calculations. When Hamon licensed their technology to Research-Cottrell, Marcel came to the US in 1971 to work on the counterflow natural draft towers and large counterflow mechanical draft towers that were being introduced to the US market. After helping to establish Research-Cottrell as a major innovator, in 1983 Marcel moved to another industry innovator, Munters Corporation, which became a supplier of high performance fill and drift eliminators to almost all of the major cooling tower manufacturers.

In 1986, Marcel left Munters to start his consulting firm, MRL Corporation. Marcel helped clients of all sizes in virtually every industry. However, during that time, his major contribution to the water cooling tower industry was the development of several software programs that became worldwide standards. The software tools that he developed allowed engineers to design and evaluate cooling towers with more accuracy in a small fraction of the time required for hand calculations. While others have also developed cooling tower design programs, the MRL programs remain the standard by which others are judged.

While Marcel was not a prolific writer, the papers that he produced are still referenced today. The ideas and technology described by his 4 patents are still in use today. But the water cooling tower industry will miss more than his technical expertise. His wit, charm and joie de vivre will also be remembered fondly.

Marcel is survived by his wife and essential business partner Nicole, his children George, Michel, Veronique and three grandchildren.
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Cooling Technology Institute
Annual Conference, February 7-11, 2016

HOTEL INFORMATION
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866.577.1154 or visit www.cti.org to register
(Reference to Cooling Technology Institute Annual Conference Group)

Hotel Cut-Off Date - January 22, 2016

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Standard Accommodations (Subject to Availability):
Single - $132++ / Double - $142++
Registration Form for the
CTI 2016 Annual Conference
February 7-11, 2016

Complete and send this form to: Cooling Technology Institute • PO Box 681807 • Houston, TX 77268
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Early Bird Registration Ends: January 29, 2016

Please type or print clearly all information. A separate form must be completed for each registrant. Photocopies of this form may be used.

1. REGISTRATION INFORMATION:
I was invited to the conference by: (If applicable give name of the person and their company responsible for your attendance)

Aware of the conference after seeing (please check one):

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<thead>
<tr>
<th>Last Name:</th>
<th>First Name:</th>
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<td>Fax (Country Code/Area/Number):</td>
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<tr>
<td>Email:</td>
<td>First Name or Nickname (as you wish it to appear on your badge)</td>
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Spouse’s Name Only if they accompany you to the Conference:

Badge Information -

PDH CREDITS AVAILABLE - PLEASE ASK AT THE REGISTRATION TABLE!

2. SPECIAL NEEDS:

Dietary: _____ Vegetarian

Physical: _____ Please check here if you require special accommodations to participate and email a description of your needs by January 30, 2016 to vmanser@cti.org. We cannot guarantee we can accommodate your request but will do our best.

3. IN CASE OF AN EMERGENCY DURING CONFERENCE, PLEASE CONTACT:

Name (Please print clearly):

Daytime Phone: __________________________ Evening Phone: __________________________

4a. REGISTRATION FEES: (Full-conference or one-day registrants)

Check Appropriate Category: Early Bird Rate by: January 29, 2016 Conference Rate after: January 29, 2016

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<td>Press (one attendee per company only / ID Required)</td>
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Section 4a Subtotal US$: __________________________

4b. CONFERENCE EVENTS / OTHER FEES: (Full-conference or one-day registrants)

Check Appropriate Category: Conference Rate:

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<tr>
<td>Set of Papers - Hard Copies</td>
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<td>Set of Papers - CD (w/PDF file of each paper) Available after conference</td>
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<td>Mailing for papers and/or CD sent to all other countries</td>
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Section 4b Subtotal US$: __________________________

Total Amount Due US$: __________________________

4c. CONFERENCE EVENTS (Full-conference or one-day registrants)

- I will attend the Water Treating Panel Discussion on Monday afternoon
- I will attend the New Member Breakfast on Tuesday morning
- I will attend the Owner/Operators’ Seminar on Tuesday noon
- I will attend the ‘Ask the Expert’ Seminar on Tuesday afternoon
- I will attend the Educational Seminar on Wednesday morning

5. PAYMENT (Please check one)

Enclosed is Check# ___________ in the amount of US$ ___________ (Please write the registrant’s name on the check)

Credit Card: Please Charge US$ ___________ to the following credit card. [ ] Visa [ ] MasterCard or [ ] AmEx

Card#: __________________________ Exp. Date: __________________________ CVC Code: __________________________

Cardholder’s Name: __________________________

Cardholder’s Signature: __________________________

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