Your program committee would like to invite you and your company to the 2018 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 30 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 attempt to add more technical papers to our program beneficial.

The Table Top Exhibits on Tuesday from 4:00p – 8:30p will consist of 63 top vendors from our industry to offer you a time to view the products and services they provide. There is still room for your company to put up a table for the exhibits.

The CTI office will be happy to answer any questions you have. Contact the CTI office with your inquiries.

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.

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Then on Wednesday from 8:00a - 12:00p will be the Education Program Session with five different topics. 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.

Please refer to the CTI news for times and committee work to be done. In addition, please check our mobile app for the most up to date information.

We will offer an extended time for committee work. In past winter meetings we have only had a very short amount of time set aside to do the committee work. This year we have allowed much more short time to do the work so important to the CTI. The Table Top Exhibits on Tuesday from 4:00p – 8:30p will consist of 63 top vendors from our industry to offer you a time to view the products and services they provide. There is still room for your company to put up a table for the exhibit.

Contact the CTI office with your inquiries.

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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 bring back to the membership what you want... “Information!”

I, Helen Cerra, John Lichtie, your program committee, invite and welcome you to the 2018 Annual Conference and meeting. I look forward to seeing you in Houston, Texas.

Phil Kiser, 2018 CTI Program Chairman
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2018 Educational Seminar
Wednesday, February 7, 2018, 8:00a - Noon

Session 1: Cooling Tower Fundamentals presented by Kent Martens, SPX Cooling Technologies

Have you ever had a "basic" question about cooling towers, but were afraid to ask? You're not alone! Even seasoned industry veterans are sometimes involved in a very specific area of cooling towers, and may not know everything about the basics. The broad range of topics covered in this presentation will include common cooling tower terminology, how cooling towers work, the parameters that need to be defined as cooling tower design, the advantages and disadvantages of different tower types, designing and operating towers efficiently, how to design for reduced flow operation, water quality basics, water consumption, and basic sound mitigation techniques.

Kent Martens has been employed by SPX Cooling Technologies/Marley for thirty-four years, serving in a variety of technical and commercial positions. His responsibilities include thermal ratings, product management, sales, marketing, management, training, and technical advisory roles. He is currently the President and Chief Executive Officer of Allergy & Asthma Network. Furthermore, he is on the board of directors of ASHARE, and a Medical Director of the ASHARE Network Immunology Initiative. The open discussion following the presentation is a great opportunity for owner/operators to discuss their ongoing operations, problems and solutions. Come prepared to share thoughts and experiences on topics ranging from performance monitoring, cooling tower operation, core water quality, plume abatement, and vibration. Be sure to sign up and come enjoy the benefits of being an active participant in this Council.

Session 2: Patient’s Perspective of Legionnaire’s Disease presented by Tonya Winders, Allergy & Asthma Network

This session will cover the patient’s perspective of Legionnaire’s Disease and the need for comprehensive standards focused on the entire water system, not just the cooling towers alone. Tonya Winders, MBA is currently the President and Chief Executive Officer of Allergy & Asthma Network, the leading patient advocacy organization dedicated to ending needless death and suffering due to asthma, allergies and related conditions. Tonya has over 17 years of experience in leadership roles within the allergy and asthma industry. From sales and marketing leadership to managed markets access, she has worked tirelessly to ensure patients have access to effective diagnostic and treatment tools. Tonya works on several expert panels including NAEPF and NIAID Immunotherapy Utilization. Furthermore, she is on the board of directors of Not One More Life, American Respiratory Care Foundation and is the current president of the Global Asthma & Allergy Patient Platform. Tonya is the mother of five children, four of whom have asthma and/or allergies, ranging in age from 12-18 years old. She is a fierce patient advocate who overcame cancer twelve years ago. She now enjoys spending time with her husband of twenty years Brian Winders and cheering on her children in various sports.

Session 3: EPRI Research on Cooling System Technologies presented by Jeffery Preece, Electric Power Research Institute (EPRI)

Mr. Preece’s presentation will highlight the following points: General overview of EPRI research on cooling system technologies and new test center (under development); Review of techno-economic evaluation on flue gas heat recovery combined with membrane distillation for cooling tower water makeup treatment; Review of demonstration using iodine vapor for cooling water biofouling control; and Review of recent projects related to advanced cooling system technologies.

Jeffery Preece is a senior technical leader at the Electric Power Research Institute (EPRI) and is responsible for planning and managing power plant water management R&D projects for EPRI’s Water Management Technology program. Focus areas include water requirements for environmental controls; increasing efficiency of water use; and addressing water treatment issues. Prior to joining EPRI in 2014, Jeffery provided technical support for flue gas desulfurization wastewater treatment systems at a U.S. electric utility company. In previous roles, he supported boiler/steam cycle utility, desalination, crystallization, and water chemistry applications for coal-fired and combined-cycle facilities. Jeffery has a B.S. in Chemical Engineering from North Carolina State University.

Session 4: Cooling Tower Performance Curves - a Primer presented by Rich Aull, Rich Aull Cooling Tower Consultant

CTI’s cooling tower thermal test code ATC-105, is used as the basis of cooling tower testing around the world. The test code is complete with appendices that illustrate the use of the code with example analysis in both US customary and SI units. Examples of typical performance curves are provided for both mechanical draft and natural draft towers. These curves are used in the interpretation of test results and form the basis of the resulting reported tower’s capability and cold-water deviation. My talk will center on how typical performance curves should appear for all types of cooling towers, how they differ with regard to tower type, how to recognize curves that are blatantly incorrect, and how the new revision of CTI ATC-105 will address these issues. Also, there will be reference to the CTI Toolkit software and how it can be used as tool for producing and checking performance curves.

Rich Aull, PE is an expert in cooling tower design, j. Rich received his B.S. & M.S. Degrees in Mechanical Engineering from the New Jersey Institute of Technology and is a registered Professional Engineer in the States of New Jersey & Pennsylvania.

Session 5: Reliability in an ACC Gear Box: From a Designers Perspective presented by Chad Brown, Amarillo Gear Company, LLC

Gearbox reliability is imperative in critical and demanding applications. If reliability is not focus relative to the design work, the result will be frustration and downtime when the gearbox is expected for operation. During the gearbox design stage, there are certain considerations necessary to ensure proper gearbox performance and that the expected equipment life is realized. Design standards, application understandings, and serviceability are key categories to evaluate when designing a gearbox for a specific purpose and duty point. This paper will discuss proven considerations that will build reliability at the foundation of an air-cooled condenser parallel shaft gearbox yielding a design that is robust, cost effective, and dependable.

Chad Brown graduated West Texas A&M University with a Bachelor of Science for Mechanical Engineering in 2008. He has had the opportunity to work for Amarillo Gear since 2004 as an Engineering Intern, Metallurgical Laboratory Technician, Gear Engineer, Research and Development Supervisor, and now is the Gearbox Designer. For three years after college, he worked various positions at Xcel Energy as an engineer as well. Chad has received the Advanced Gear Engineering Certificate from American Gear Manufacturers Association and currently serves as a Director for Access Community Credit Union and the engineering advisory board for West Texas A&M University. Most importantly, he loves spending time with his family of 3 young girls and wonderful wife of 12 years. He especially enjoys camping and the outdoors.
New CTI Members for 2017

Aero Solutions SAS
Wesley Bradley Costain
Joe Cuellar
Deseret Power
Dezhou Beitai Refrigeration Equipment Co., Ltd
ExxonMobil
Galebreaker Industrial Limited
Guntner U.S. LLC
Inmas Klima Sogutma Makina Sanayi Tic Ve Müm As
Laborelec
Liyang Conlen Cooling System Co., Ltd
Metrix Instruments Company
Poon Cheon Vina Company Ltd*
ProChemTech International, Inc.
Qinyang Zhonghe Zhida Technology Co., Ltd
Radical Polymers, LLC
Richard Aull Cooling Tower Consulting, LLC
SAI Industrial Techno-Service*
Siemens Industry Inc
Stone Cold Cooling Towers
Super Tower Industries Pte Ltd
Synergy Services Co., Ltd
Tavan Afzar Company*
United Water Consultants
VIRIDIS Engineering
*reinstated members

Ask the Expert
Tuesday, February 6, 2018
2:00p - 4:30p

Make plans for the Ask the Expert session to be held Tuesday, February 6, 2018 starting at 2:00p and going to 4:30p. Do you have a nagging question that concerns any aspect of your cooling tower operation? Maybe you have a question concerning one of the technical papers you heard at the conference. This is the place to get those questions answered. Put your question on cards provided or on a piece of paper and place it in the receptacle at the registration area. As with last year the questions will appear on a monitor helping all to understand what is being asked.

Cooling Technology Institute’s 2018-2019 President Elect
Helen Cerra

Helen is a Technical Staff Consultant with ChemTreat, Inc. located in Richmond, Virginia. She has over thirty years of professional experience in all aspects of water treatment, including boiler, cooling, waste treatment and environmental/regulatory affairs.

She has authored/co-authored papers for and made presentations at various trade organizations including, American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE), Cooling Technology Institute (CTI), Electric Utility Chemistry Workshop (EUCW), International Water Conference (IWC), Virginia Society of Healthcare Engineers (VSHE) and National Association of Corrosion Engineers (NACE).

With a concentration on Legionella minimization, Helen is Secretary of the ASHRAE Standing Standard Project Committee 188 as well as Chair of the ASHRAE Technical Committee 3.6, Water Treatment. In addition, she is active on the Water Treating and Program Committees with Cooling Technology Institute (CTI), having been a past member of their Board of Directors. She is currently Chair of GDL-159, the task group 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) and ASHRAE.
CTI Thanks The Following Sponsors For Their Contributions To The Hospitality Suites For 2018

Full Conference(s) Sponsorship

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2. Amarillo Gear Company
4. Bedford Reinforced Plastics
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25. Rexnord Industries
26. C.E. Shepherd Co., LP
27. Special Pathogens Laboratory
28. SPX Cooling Technologies
29. Strongwell
30. Tower Engineering, Inc.
31. Tower Performance, Inc.

CALL FOR PAPERS
2019 Annual Conference
February 5-9, 2019
Sheraton New Orleans
New Orleans, LA

The following schedule will begin the process for papers presented at the 2019 Annual Conference:

2018
May 7: Deadline for Abstracts
June 11: Authors Notified by Program Chair
Aug 6: Copy of the first draft must be sent to CTI office for review
Nov 12: 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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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.

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Attend the Committee Meeting of Your Choice  
February 5-7, 2018

Below are the agendas - look to see with what committee you can be an active participant

Engineering Standards and Maintenance Agenda

Philip Poll - OBR Cooling Towers, Inc., Vice Chair & Scheduler  
John Ahern - EvapTech, Inc., Vice Chair & Secretary  
James F. Blake - American Lightning Protection, Vice Chair & Roster  
Ken Mortensen - SPX Cooling Technologies, Chair  
Jon Bickford - Alliant Energy, AdHoc Coordinator

I. Review Minutes from the Summer 2017 ES&M Meeting
II. Task Group Meetings by category
   • Wood, Metal, and Concrete Materials Task Group [Bill Howard] - ESG-123 Concrete Restoration; ESG-153 Portland Cement, ESG-164 FRC Panels
   • Mechanical and Electrical Task Group [Craig Burris] - Chapter 11 Electrical Components

Make your plans to attend Future Meetings for CTI

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

- Committee Workshop  
  July 15-18, 2018  
  La Cantera Resort  
  San Antonio, TX

- Annual Conference  
  February 3-7, 2019  
  Sheraton New Orleans  
  New Orleans, LA

- Committee Workshop  
  July 7-10, 2019  
  The Peabody  
  Memphis, TN

- Annual Conference  
  February 9-13, 2020  
  The Westin Galleria  
  Houston, TX
Press Release

Contact: Chairman, CTI Multi-Agency Testing Committee

Houston, Texas 2-November-2017

CTI Licensed

Cooling Technology Institute, PO Box 681807, Houston, Texas 77268 - The Cooling Technology Institute announces its annual invitation for interested thermal testing agencies to apply for potential Licensing as CTI Thermal Testing Agencies. CTI provides an independent third party thermal testing program to service the industry. Interested agencies are required to declare their interest by March 1, 2018, at the CTI address listed.

Call to Order/Announcements

I. Introduction of Attendees

II. Approval of 2017 Summer Workshop P&T Minutes

III. Task Group Meetings – Overview of Key Issues & Meeting Schedule.
   a. ATC-128 - Sound Test Cod
   b. STD-204 - Sound Certification Task Force
   c. STD-202 - Publication of Custom Tower Thermal Performance Results
   d. PFM-143 - Airflow Testing
   e. ATC-105 - Thermal Performance Acceptance Test Code
   f. STD-201 - Thermal Performance Certification
   g. Water Usage and Measurement Task Force
   h. ATC-140 - Drift Measurement Test Code
   i. STD-105SS - Acceptance Testing for Closed Circuit Coolers
   j. STD-106 - Acceptance Testing for Evaporative Condensers
   k. STD-107 Acceptance Testing for Air-Cooled Condensers
   l. ATC-150 - Acceptance Testing for Wet-Dry Plume Abatement Towers
   m. PGT-156 Thermal Performance Test Preparation

IV. New Business

Adjourn

A Complete Power Transmission Package to Keep You Cool.

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Lower total cost of ownership — properly maintained, the cost-effective Addax Composite Couplings can last the life of the cooling tower, while its lower weight results in less wear on other system components.

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Same-day, emergency delivery of gear drives and couplings for many applications are available to maximize your uptime.

Jared Medlan - McLure & Associates, Inc., Vice Chair
Kent Marins - SPX Cooling Technologies, Chair
Chris Lazansky - Southern Company, Vice Chair

Performance & Technology Agenda

Water Treating Committee Agenda

Phil Kiser - PQ Corporation, Chair
Charles Kuhfeldt - Athlon Solutions, Vice Chair
Brian Corbin - Dow Microbial Control, Secretary

Monday (Feb 5) Session (3:45p - 5:00p)
   • Water Treatment Committee Full Committee Meeting
     • WTG-161, Best Practices for Cooling Water Systems, Jack Bland, Chair

Tuesday (Feb 6) Session (10:00a - Noon)
   • 10:00a - 10:30a - WTG-126 - Brian Corbin Chair
   • 10:30a - 11:00a - WTG-130C - Pete Elliott, Chair
   • 11:00a - 11:30a - WTG-142 - John Zibrida, Chair
   • 11:30a - Noon - WTG-155 - Jim Kanuth, Chair (concurrent sessions)
   • 11:30a - Noon - WTG-158 - Mark Winter, Chair (concurrent sessions)
   • Noon - 1:00p - (Lunch) WTG-168 - Paul Puckorius, Chair

Wednesday (Feb 7) Session (1:30p - 5:00p)
   • Noon - 2:00p - GDL-139 - Legionella
   • 2:00p - 3:00p - WTG-130B - Bob Cunningham, Chair
   • 3:00p - 4:00p - Final Committee Wrap-up
THE 2018 CTI ANNUAL
Again this year the Technical Sessions will run simultaneously between

Sunday, February 4, 2018

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 - Bill Howard, 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 Wowack, Raphael Ballroom A

9:30a - 10:00a - RAPID Session, Raphael Ballroom A
9:30a - 10:00a - Emerging Technologies, Raphael Ballroom A
9:30a - 10:00a - Emerging Technology, Raphael Ballroom A
9:30a - 10:00a - Service, Raphael Ballroom E

9:30a - 12:30p - Salon 1
Raphael Ballrooms A&B (E&S&M and P&T Sessions)

9:30a - 12:30p - Salon 1
Raphael Ballrooms A&B (E&S&M and P&T Sessions)

9:30a - 12:30p - Salon 1
Raphael Ballrooms A&B (E&S&M and P&T Sessions)

9:30a - 12:30p - Salon 1
Raphael Ballrooms A&B (E&S&M and P&T Sessions)

continued on page 11

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

Monday, February 5, 2018

7:00a - 10:00a - Registration and Paper Sales, Atrium
7:00a - 5:00p - Speakers’ Breakfast, Photo Session & Prep Room, Salon 1
7:30a - President’s Address - Bill Howard, 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 Wowack, Raphael Ballroom A

8:30a - 9:00a - TP18-01 Be Very Cautious When Removing a Biofilm
Edward T. Ott Sr., ProMinten Fluid Controls, Inc.

Edward T. Ott Sr. is a Senior Technical Consultant for ProMinten Fluid Controls, Inc., a major global instrumentation and control water treatment segments of business. He is based in the Pittsburgh, Pennsylvania American headquarters and has provided technical support expertise in the chemical metering and monitoring field for the past 37 years. Most of us understand that a biofilm could have several layers with a protective film or slime between each layer. When we are treating a biofilm different bacteria and viruses might be uncovered in each layer gets exposed. This could become a Pandora’s box if we are not careful. In this paper, we will look at the various methods of treating a process that contains a biofilm, methods of addition and control of the chemicals used and what might happen if the biofilm is removed too quickly.

9:00a - 9:30a - TP18-03 Determination of Service Life of Wood Framed Cooling Towers
Dennis R. Moran, CM Towers, Inc.

Dennis attended Milwaukee School of Engineering and graduated from Newark College of Engineering in 1974 with a Bachelor of Science Mechanical Engineering. He is a registered Professional Engineer in the State of New Jersey since 1978. Served as Vice-President & General Sales Manager of Tower Performance, Inc., 1972-1979. President of CM Towers, Inc., formed in 1980, serving the repair and thermal upgrade of existing towers and construction of new towers the Cooling Tower industry. Has been involved in Cooling Technology Institute conferences and committee work since 1974. Previously authored and presented technical papers and workshop sessions for CTI. The Cooling Tower Industry has a large population of older wood framed towers servicing power plants, petro-chemical and other process applications. As these installations age, they succumb to deterioration from natural aging and operational affects diminish strength. Combining a wood sampling program, physical properties analysis, detailed structural inspections and computer structural software analysis the current structural analysis can be determined.

9:30a - 10:00a - TP18-05 A Case for Structural Health Monitoring for Cooling Towers
Mark E. Williams, Ph.D., P.E., Narendra Gosain, Ph.D., P.E. and Matthew Pavelchak, P.E., Walter P Moore and Associates

Mark Williams, Ph.D., P.E., S.E., is a Principal and Senior Project Manager in Walter P Moore Diagnostics Group. He has 15 years’ experience in structural engineering analysis, design and management, as well as software engineering research and development. Dr. Williams has been involved with the restoration of several cooling towers as well as the repair of several bridges and garage projects that have used state of the art carbon fiber reinforced polymers for structural enhancements. This paper will explore the current state of the art in Structural Health Monitoring (SHM) concepts and instrumentation for evaluating the structural behavior of cooling towers. The process of SHM project planning, sensor selection, remote and wireless sensing technology, data collection and acquisition systems to capture specific behaviors will be addressed in simplified and usable terms. Sensor technologies will also be demonstrated. Case studies of SHM executed successfully on different types of structures will be provided along with an instrumentation plan for a cooling tower structure as well. SHM has a tremendous potential in cooling tower structures to economically address restoration and maintenance challenges facing engineers, facility managers and owners.

10:00a - 10:30a - TP18-06 Importation of Corrosion Monitoring in Cooling Water Systems
Michael Dorsey, AquaCorr Services

Prior to AquaCorr Services, Dorsey was a Senior Specialist in the Corporate Engineering Materials Group at E.I. DuPont de Nemours and Company, where he had a successful career for over 36 years. While at DuPont, he initiated and led the development of a Corporate Water Treatment Initiative. He was the lead consultant for water-treatment and brine-treatment support to multiple plants globally across the company. He has authored papers and led committees around corrosion and water treatment practices at various associations. Corrosion monitoring in cooling water systems is used primarily to insure adequate water quality and plant performance. Protecting the owner’s equipment should be the primary goal. In many instances, there hasn’t been enough importance placed on accurately measuring and reporting corrosion results. Most corrosion systems are installed in conve- nient locations and not ready of those locations are not properly provide adequate assessment. This paper will describe various methods and programs from standard corrosion coupons to various online corrosion monitoring systems and other techniques.

The CTI Office has worked hard to schedule a program that fits everyone’s needs. Incidents arise that may change and or omissions to parts of the program that are out of our hands. Our apologies if this happens.
Again this year the Technical Sessions will run simultaneously between

**CONFERENCE PROGRAM**

Lloyd B. Aanonsen, P.E., General Rubber Corp.

Lloyd B. Aanonsen is President of General Rubber Corp. General Rubber is best known for their performance rubber expansion joints used primarily in the Power and Industrial markets. He is a licensed Engineer with 30-years of direct product development experience. He received a Bachelor of Science degree in mechanical engineering from Clarkson University and a Master’s in Business Administration from Dowling College. He has authored numerous articles on the design and application of performance expansion joints. Within the Fluid Sealing Association, he has held multiple terms as division chair and technical committee chair, as well as being on their board.

It is a fundamental principle that all piping systems require support and some degree of flexibility. Today’s pipe stress engineer must go beyond checking for just allowable pipe stresses but must also check for load limitations on the equipment and/or support structure. In this regard, it is helpful to look at several alternative solutions for the same application and compare the different end loading results. Four alternative solutions can include rigid pipe loops, traditional expansion joints, as well as two other more advanced rubber expansion joint arrangements. An example application of a 36” diameter carbon steel pipe with a 100° axial run under 90 psi with temperature fluctuation of 100°F will be used. Each solution will restrain the pressure thrust forces, absorb the axial thermal movement of 0.8” and keep the piping system within allowable stresses. However, each solution will have very different end loads.

**Thermal Performance Assessment Through Cooling Tower Modelining: Retrofit Case Salvador Avila Filho, Jean Marcel Prazeres Silva, Ivan Costa Passos, Jade Spinola Ávila, Federal University of Bahia**

Chemical Engineer and Petrochemical Processing has actuated in Chemical Industry. Salvador specialized as: statistical techniques to investigate abnormalities in the industry and as Organizational Consultant for transforming culture. As manager of a small facility he set model for clean management. As teacher, he actuated at University level and in the areas of Risk Management, Organizational Culture, Human Reliability, and Process and Operational.

Water is currently a major object of interest in industries because it has a great applicability, mainly as a refrigerant fluid and in parallel there is a need to develop mechanisms that optimize its use. Cooling towers are the equipment responsible for reducing the temperature of hot water from the process. In this work, we will use the mathematical modeling as methodology for the determination of the thermal performance of a cooling tower located in an oil refinery in the state of Bahia, using design data and historical data for the related temperatures.

**Cost/Performance Tradeoffs Among Wet, Dry and Hybrid Cooling Systems**

John S. Maulbetsch and Michael N. Difilippo, Maulbetsch Consulting

Since 1999, Dr. Maulbetsch has been a private consultant to government and industry. Most of his work has been on water use and conservation in electric power production. He has published two major studies on alternative cooling systems for power plants for the California Energy Commission and the Electric Power Research Institute. Prior to establishing his consulting practice, he was at the Electric Power Research Institute for 23 years where he was involved in defined and related issues as well as hydrogen. As manager of a small facility he set model for clean management. As teacher, he actuated at University level and in the areas of Risk Management, Organizational Culture, Human Reliability, and Process and Operational.

Dr. Maulbetsch is a Life Fellow of the ASME, a former Council Delegate from the California Energy Commission and the Electric Power Research Institute. Prior to establishing his consulting practice, he was at the Electric Power Research Institute for 23 years where he was involved in defined and related issues as well as hydrogen. As manager of a small facility he set model for clean management. As teacher, he actuated at University level and in the areas of Risk Management, Organizational Culture, Human Reliability, and Process and Operational.

Cost/Performance Tradeoffs Among Wet, Dry and Hybrid Cooling Systems

John S. Maulbetsch and Michael N. Difilippo, Maulbetsch Consulting

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been replaced twice. These results and operating changes for both the cooling towers and for management of circulating water pipelines as well as technologies being implemented standard practice. While power plants have historically taken a reactive approach to manage-ment of their pipelines, there has been an increase in commitment to proactive approaches in circu-lating water pipelines is highlighting a need for proactive approach to pipeline manage-ment. This paper will help in gaining insight regarding pipeline owner’s shift in approach for management of circulating water pipelines as well as technologies being implemented for condition assessment and structural rehabilitation of circulating water pipelines.

Since pipelines comprise only one component of many systems managed within a power plant, in many generating stations regular inspection of pipelines has historically not been a standard practice. While power plants have historically taken a reactive approach to manage-ment of their pipelines, there has been an increase in commitment to proactive approaches in circulating water pipelines is highlighting a need for proactive approach to pipeline manage-ment. This paper will help in gaining insight regarding pipeline owner’s shift in approach for management of circulating water pipelines as well as technologies being implemented for condition assessment and structural rehabilitation of circulating water pipelines.

Pat Schwartz, Great River Energy; John Ahern, EvapTech, Inc.; and Chris Ahern, Kansas

Changes Through the Years, Great River Energy Coal Creek Station

Pat Schwartz, Great River Energy; John Ahern, EvapTech, Inc.; and Chris Ahern, Kansas State University.

Pat is a Senior Systems Engineer at Coal Creek Power Station in Un-derwood, ND and has worked with Great River Energy for 35 years. Pat has a BS in Mechanical Engineering from Drexel University in Philadelphia and an MBA from Loyola College in Maryland. Frank is a member of ASHRAE, voting member of ASHRAE SSPC 90.1, Chair of ASHRAE TC9.6 Standards Committee, and Past Chair of ASHRAE TC3.6 (Water Treatment). He currently serves as Chair of the AC/EC Committee of the Industrial Refrigeration and Heat Transfer Section at AHRI. He is active in the Cooling Technology Institute, currently serving as Chair of the CIT Marketing Committee. Frank is an inventor or co-inventor on ten U.S. patents and has authored numerous ASHRAE Journal articles and technical papers. Closed loop cooling systems deliver many benefits compared to traditional open loop systems, such as reduced fouling, less risk of fluid contamination, lower maintenance, and increased system reliability and uptime. Several methods are used to close the cooling loop, including the use of an open circuit cooling tower coupled with a plate & frame heat exchanger or the use of a closed circuit cooling tower. This study examines the total installed cost us-
ergating large diameter pressure pipelines. Mike has provided numerous presentations to Owners & Consulting firms in addition to numerous industry conferences, which include the Structural Engineers Association, ASECE, AWWA, NASTT, ACI and other organizations.

Less than 20% of all deposit control polymer offerings for water treatment incorporate non-ionic functionality. Where utilized, non-ionic monomers are typically incorporated into polymers at levels between 5-10% on a molar basis. A new polymer containing a greater incorporation level of non-ionic monomer has been recently introduced to the water treatment market with exceptional lab, pilot and field performance results. The new polymer has noticeably enhanced properties in a wide variety of areas such as performance for phosphate and transition metal stabilization, expansion of functionality to include organic degris and deposits, on-line cleaning, silica and magnesium silicate control, and surface tension reduction/wetting. This paper will detail the performance benefits of non-ionic monomer incorporation and provide lab, pilot and field data to sup-port its differentiated efficacy.

Adam Green, lawyer who served as lead counsel for the target defendant in the Gross v. Baltimore Aircoil case. Over the past 16 years, he has suc-cessfully defended high value, catastrophic failures of building water systems across the country arising from a myriad of different causes. Over the same period, he has routinely defended wrongful death and personal injury actions arising from a litany of exposures to various toxins and hazardous substances. He has represented many of the nation’s foremost attorneys in cooling water systems and chemical water treatment. This publication addresses the highly complex nature of the legal, mechanical and microbiological factors underlying the landmark decision in the Gross v. Baltimore Aircoil, et al. case believed to be the first reported Legionnaire’s disease case wherein a chemical water treater was alleged to owe a general duty to the public to protect it from Legionella related illness. The fundamental legal issues include: (1) the existence of a legal duty by a chemical water treater to prevent the formation of a ubiquitous bacterium; (2) the existence of a legal duty by a chemical water treater to test for or “control” Legionella bacterium; (3) the lack of any statute or regulation establishing the appropriate legal standard of care regarding Legionella prevention or control; (4) the extent of the treater and its customer with respect to the scope of services; (5) the existence of a legal duty for a chemical treater to warn a premises owner about Legionella; and (6) the Plaintiff’s burden of proving that insufficient treatment was the legal cause of the injuries. Adam Green served as lead counsel for the target defendant in the Gross v. Baltimore Aircoil case. Over the past 16 years, he has suc-cessfully defended high value, catastrophic failures of building water systems across the country arising from a myriad of different causes. Over the same period, he has routinely defended wrongful death and personal injury actions arising from a litany of exposures to various toxins and hazardous substances. He has represented many of the nation’s foremost attorneys in cooling water systems and chemical water treatment. This publication addresses the highly complex nature of the legal, mechanical and microbiological factors underlying the landmark decision in the Gross v. Baltimore Aircoil, et al. case believed to be the first reported Legionnaire’s disease case wherein a chemical water treater was alleged to owe a general duty to the public to protect it from Legionella related illness. The fundamental legal issues include: (1) the existence of a legal duty by a chemical water treater to prevent the formation of a ubiquitous bacterium; (2) the existence of a legal duty by a chemical water treater to test for or “control” Legionella bacterium; (3) the lack of any statute or regulation establishing the appropriate legal standard of care regarding Legionella prevention or control; (4) the extent of the treater and its customer with respect to the scope of services; (5) the existence of a legal duty for a chemical treater to warn a premises owner about Legionella; and (6) the Plaintiff’s burden of proving that insufficient treatment was the legal cause of the injuries.
If you are new to our conference and seem to be a little overwhelmed Tuesday's Technical Sessions running simultaneously between Raphael Ballrooms A&B and the Donatello Room

3:00p – 4:00p Water Treating, Raphael Ballrooms A&B

Strategies for Reducing Uncertainty in Legionella Analysis
Brian Swalla, IDEXX Laboratories, Inc.

3:00p – 3:30p Rental Cooling Towers and CTI Certification
Billy Childers and Atul Swamy, Aggreko

Donatello Room (Water Treating Sessions)

3:00p – 3:30p Facts and Myths Associated with Choosing the Right Materials of Construction for Your Evaporative Condenser
Robert J. Cunningham, International Water Consultants, Inc and Zan Liu, Johnson Controls

THE 2018 CTI ANNUAL CONFERENCE
PROGRAM continued

THE 2018 CTI ANNUAL CONFERENCE
PROGRAM

Tuesday, February 6, 2018

3:00p – 3:30p Visual Inspection by Drone
Anne Vacque, EDF

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.
Comparative Evaluation of Pitot Tube Designs for Water Flow Measurement Devices

Joe Evans and Jim Baker, SPX Cooling Technologies

This paper evaluates the performance of various Pitot tube designs for water flow rate measurements. The authors compare the results of different Pitot tube designs using a wide range of flow conditions, highlighting the importance of choosing the right design for accurate measurements.

Preventing Degradation and Improving Efficiency in Cooling Towers, How? "Wind Screens"

James L. (Jim) Baker and Jaime Wilde, Galebreaker Industrial Limited

This presentation discusses the benefits of using wind screens in cooling towers to prevent degradation and improve efficiency. The authors present data on the effectiveness of these screens and discuss their potential applications in various industries.

Cooling Tower Sound: Data Comparisons and Recommended Improvements

Jean-Pierre Libert and Jennifer Hamilton, Evapco, Inc.

This paper compares data from various cooling tower manufacturers and presents recommendations for improving sound levels. The authors discuss the importance of noise reduction in cooling towers and propose solutions to achieve this goal.

Fundamentals of Testing Cooling Tower Fill Packs for Load Capacity

Joe Evans and Bob Petterson, SPX Cooling Technologies

This paper covers the fundamentals of testing cooling tower fill packs to determine their load capacity. The authors discuss the testing methods and provide guidelines for selecting the right fill pack for a given application.

A Cost Effective and Robust Non-Phosphorous Corrosion Scale Control Program for Cooling Systems

Bingrui Chen, Nalco Water, An Ecolab Company

This presentation introduces a cost-effective non-phosphorous corrosion scale control program for cooling systems. The authors discuss the benefits of this program, including reduced maintenance costs and improved system performance.

Novel Galvanized Cooling Tower Corrosion Inhibitor

Mary Jane Felipe and Bingrui Chen, Nalco Water, An Ecolab Company

This paper presents a new corrosion inhibitor designed for galvanized cooling towers. The authors discuss the inhibition mechanisms and field test results, demonstrating the inhibitor's effectiveness in preventing corrosion.

The 2018 CTI Annual Conference Program continued

THE 2018 CTI ANNUAL CONFERENCE PROGRAM continued

Raphael Ballroom A&B (ESCM and P&T Sessions)

Donatello Room (Water Treating Sessions)
4:00p - 8:30p - Table Top Exhibits & Hospitality Suite (Bar Closes @ 9:30p)

Atrium

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Wednesday, February 7, 2018

7:00a - 10:00a
Technical Committee Work
• Engineering Standards & Maintenance
  Raphael Ballrooms A&B
• Performance & Technology
  Donatello
• Water Treating
  Salon 2

Noon - 2:00p
Owner Operator Seminar (w/box lunch)
  Raphael Ballroom D

Noon - 2:00p
Lunch on your own

2:00p - 3:00p
Services

2:00p - 4:30p
Raphael Ballroom A&B

Do you have a nagging question that concerns any aspect of your cooling tower operation? Maybe you have a question concerning one of the technical papers you heard at the conference. This is the place to get those questions answered. Put your question on cards provided or on a piece of paper and place it in the receptacle at the registration area. As with last year the questions will appear on a monitor - helping all to understand what is being asked.

4:00p - 8:30p - Table Top Exhibits & Hospitality Suite (Bar Closes @ 9:30p)

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Thursday, February 8, 2018

Thursday's activities involve the Board of Directors and Committee Chairs only

7:30a - 8:15a
Board of Directors' (includes Committee Chairs) Breakfast, Campobello Room

8:30a - 2:00p
Board of Directors' Meeting, Salon 3

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continued activities for Tuesday, February 6, 2018

7:00a - 10:00a
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Standing Committee Minutes from July 2017

Engineering Standards and Maintenance

Philip Poll – OBR Cooling Towers, Inc., Vice Chair & Scheduler
John Ahern – EvapTech, Inc., Vice Chair & Secretary
James F. Blake - American Lightning Protection, Vice Chair & Roster
Ken Mortensen – SPX Cooling Technologies, Chair
Jon Bickford – Alliant Energy, AdHoc Coordinator

I. ES&M Summer 2017 – opening attendees 50, closing attendees 27

II. Minutes for Winter 2017 ES&M were accepted

III. Lead Task Group Chair Reports

Wood, Metal, and Concrete Materials Task Group [Bill Howard]
- STD-112 Pressure Treatment, and ESG-117 Maximizing Life of Lumber, Joe LaBove, Philip Poll – AdHoc complete; awaiting submittal for BOD Approval
- ESG-153 Recommended Guidelines for Portland Concrete, Narendra Gosain and Tom Kline – AdHoc review is expected after summer meeting for this document.
- ESG-160 Corrosion of Concrete, Narendra Gosain, Tom Kline – AdHoc complete; awaiting submittal for BOD Approval.
- ESG-162 Cleaning Cooling Towers, Philip Poll, Don Zelek - This document is in AdHoc.
- Chapter 9 Materials of Construction, Ethan Chesnut, Augie Peterson – AdHoc complete, awaiting submittal for BOD Approval.
- ESG-166 Fiber Reinforced Cement Board, Joe Labove – In work.

Mechanical and Electrical Task Group [Craig Burris]
- STD-111 Speed Reducers - Craig Burris – This document is in AdHoc.
- Chapter 11 – Electrical Components, Craig Burris - Working.
- ESG-164 on Thermoplastic Fill, Nina Woicke – The document is in major rework.
- STD-136 Thermoplastic Material for Fill, Chris Bowman, Ken Mortensen – Working; discussion on the burn testing methods; discussion of plastics, their properties, and testing methods.
- Information, R Seismic Factor, Bill Howard, Tom Toth – Update on the status of the LRFD code. Looking into test plans.

Tower Operations Task Group [Phillip Poll]
- STD-203 - Industrial Cooling Tower, Terry Ogburn, Tom Toth – This document is in AdHoc.
- Chapter 1, Richard Hebert, Geoff Eddy – Members recruited and voting members established. Working.
- Chapter 4, Winter Operations – John Ahern – This document has been re-affirmed, awaiting submittal for BOD Approval.

Hazard & Environmental Protection Systems Task Group [James Blake]
- Chapter 8 (ES&M) Environmental Aspects of Cooling System Operation, Helen Cerra, Ken Mortensen – Chapter 7 has been obsoleted by CTI. Chapter 8 being reviewed for revision or reaffirm.
- ESG-120 Lightening Protection, James Blake – AdHoc complete, awaiting submittal for BOD Approval.
- Chapter 12, Fire Protection – In AdHoc.
- Field Erection – Tom Toh, Ken Pate – Working.

Old Business
- None

New Business
- None

IV. Adjourned

FRP and Plastics Task Group [Jamie Bland]
- STD-131 FRP Siding Panels, John Ahern, Brian Faqua – This document has been re-affirmed, awaiting submittal for BOD Approval.
- ESG-157 Wood to FRP, John Ahern, Ken Mortensen – AdHoc complete, awaiting submittal for BOD Approval.
- ESG-164 on Thermoplastic Fill, Nina Woicke – The document is in major rework.
- STD-136 Thermoplastic Material for Fill, Chris Bowman, Ken Mortensen – Working; discussion on the burn testing methods; discussion of plastics, their properties, and testing methods.
- Information, R Seismic Factor, Bill Howard, Tom Toth – Update on the status of the LRFD code. Looking into test plans.

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Since 1957, our primary business has been innovation!
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Shepherd Standard High Quality products for cooling towers include:
- PVC Coated Hanger Grids
- Stainless Steel Hanger Grids
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- V-Bar Splash Fill Slats
- Film Pack
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www.ceshepherd.com
sales@ceshepherd.com

Whether your project requires new construction or retrofit, standard products or custom solutions, Shepherd Tower Components are a perfect fit.
Standing Committee Minutes from July 2017 continued

Performance and Technology

Jared Medlan - McHale & Associates, Inc., Vice Chair
Ken Martens - SPX Cooling Technologies, Chair
Chris Lazenby - Southern Company, Vice Chair

Task Group Chair Reports

• ATC-105 – Acceptance Test Code for Water Cooling Towers (Larry Burdick, Chair)
  o Reviewed Ad-Hoc comments to main document and some appendices and voted to approve.
  o Discussion on Appendices K, L, M N & O; Ad-hoc review still pending for these.
  Plan to have complete prior to Annual Meeting.
  o Discussed impact of recent Pitot Tube Study.

• Water Usage Task Group (Zan Liu, Chair)
  o Purpose and scope was defined and discussed. Scheduled to vote/approve at next Annual Meeting

• Sound Certification (Doug Randall, Chair)
  o Now identified as STD-204
  o Began development of Data of Record (DOR) format and discussed content
  o Working in parallel with ATC-128 as revisions are made.
  o Teleconference planned in advance of next Annual Meeting.

• STD-202 Standard for Publication of Custom Cooling Tower Thermal Performance Test Results (Paul Lindahl, Chair)
  o Reported on the changes that were recently approved.
  o Discussed definitions of qualifying versus candidate tests to address confusion.
  o Clarified administrative details.

• STD-201 Standard for the Certification of Water Cooling Tower Thermal Performance (Mike Lippy, Vice Chair)
  o Reviewed and addressed/approved Ad-hoc review comments which were sent to the CTI Board for approval.
  o Discussed impact of implementation of the new pitot tube design.
  o Made editorial changes to 201-OM (Operations Manual).

• PFM-143 Recommended Practice for Airflow Testing of Cooling Towers (Mike Daley, Chair; Sander Venema, Vice Chair)
  o Continued page-turn review of standard. Expect to have a final draft by the next Annual Meeting.

• ATC-128 Code for Measurement of Sound From Water Cooling Towers (Larry Burdick, Chair)
  o Reviewed presentation on surface area considerations for sound power computation.
  o Discussion regarding concerns that ATC-128 is not as recognized globally as STD-201.
  Other codes were discussed (Chinese GB5 7190, ISO 3744).
  Action item: collect package tower sound data per ISO 3744 for comparison to ATC-128.
  o Developed draft wording to alter far field measurement positions when there is interference from obstructions or background noise.
  o ATC-140 Drift Measurement Test Code (Chris Lazenby, Chair)
    o Debated the use of conductivity measurement, which is not currently included in the code
    o Discussed need for an R&D project to address surface tension measurement.
  Will work with Water Treatment Committee. Plan to have a draft proposal in time for the next Annual Meeting.

• STD-146 Standard for Water Flow Measurement (David Wheeler, Chair)
  o Discussed impact of completion of the pitot study.
  o Discussion on possible re-definition as a guideline rather than a standard.
  o Targeting a vote before the end of 2017.

• Documents due for review cycle
  o CTI Bylaws require that each document is reviewed every five years to determine if updates are needed. The following documents were discussed, and task group assignments were made on a voluntary basis:
    o STD-105S Closed Circuit Coolers
    o STD-106 Evap Condensers
    o STD-107 Air Cooled Condensers
    o Air-cooled Fluidcoolers (New document: no current code or standard)
    o ATC150 Plume Abatement
    o PGT:156 Thermal Performance Test Preparation
    o CTI Manual Chapter 2 Intro to Thermal Design
    o CTI Manual Chapter 3 Performance Variables
    o CTI Manual Chapter 5 Field Test

Attention Owner/Operators of Heat Transfer Systems*!

(Water Cooling Towers, Air Cooled Condensers, Evaporative Condensers and Fluid Air/Evaporative Coolers)

Benefits of CTI Membership:

• Networking with industry peers/experts in all aspects of heat rejection equipment, including water treatment, mechanical equipment, structural design and testing/certification procedures.
• Exclusive access to the Owner/Operator Council which provides a forum to meet with other Owner/Operator’s to discuss problems and issues related to your specific operation.
• The knowledge gained can help set priorities for solving specific problems. Industry standards and guidelines optimize the operation, maintenance of the equipment; maximizing value for the Owner/Operator.
• Two CTI meetings a year, an Annual Conference and Summer Committee Workshop. The Annual Conference includes the presentation of Technical Papers, Owner/Operator Seminar, Education Seminar, Committee Meetings and a Technical Exchange Exhibition.
• CTI Annual Conference provides a platform to publish and present technical papers.
• CTI offers an opportunity to all members to participate in developing standards and guidelines for their industry.

Become a Member of the Cooling Technology Institute (CTI)
Visit www.CTI.org to Sign Up

At the Owner/Operator Council meeting an attendee told us:
“It helped solve a recurring problem which saved the company over $100,000.”
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.
DON’T SETTLE FOR LESS THAN BEDFORD.

UNPROVEN IMPORTS PUT YOUR COOLING TOWER AT RISK.
Choose FRP materials from Bedford. Made in the USA under controlled quality-assurance conditions, Bedford PROForms® profiles meet rigorous testing requirements, including the Cooling Technology Institute’s STD-137 code. For quality you can count on, the choice is Bedford.

800-377-3280 • BEDFORDREINFORCED.COM
Earn PDH Credits while meeting and working with others in the industry. (Information when you register)

Owner/Operator Seminar
(box lunch included)
Tuesday
February 6, 2018
Noon - 2:00p
Raphael Ballroom D
lead by:
Jeffrey Parham w/Xcel Energy
(details on page 3)

Prizes at Monday’s Luncheon

This year instead of drawing ticket stubs for the prizes given at Monday’s luncheon CTI will be drawing names from those who have downloaded the CTI Conference App. Get the app for the possibility of winning a prize but use it as a tool for staying updated on any changes throughout the conference.
As of October 31, 2017, the following companies have reserved their space for exhibiting:

1. Eurovent Certita Certification
2. SPX Cooling Technologies
3. Arvind Composites
4. Amarillo Gear company
5. Structural Group
6. Baker Hughes, a GE Company
7. Hewitech GmbH & Co KG
8. FasTec International
9. International Cooling Tower
10. Enduro Composites
11. Midwest Cooling Tower Services
12. C.E. Shepherd Co., LP
13. Galebreaker Industrial
14. Moore Fans, LLC
15. Sunbelt Rentals, Inc.
16. Cooling Tower Technologies
17. Cool Water Technologies LLC
18. Bedford Reinforced Plastics
19. Resolite
20. Gaienne Lumber
21. ChemTreat, Inc
22. Proco Products
23. McHale Performance
24. Brentwood Industries
25. Environmental Safety Tech
26. Midwest Cooling Towers, Inc
27. Aggreko Cooling Tower Services
28. CleanAir Engineering, Inc
29. G&G Marine
30. Denso North America
31. Dynamic Fabricators
32. Baltimore Aircoil Company
33. Rain for Rent
34. Enexio US, LLC
35. Polser Fiberglass
36. IMI Sensors / PCB
37. Gaienne Lumber
38. Resolite
39. Rexnord Industries
40. Composite Cooling Solutions
41. West Texas Cooling Tower & Fab
42. General Rubber Corp
43. EvapTech, Inc
44. Hudson Products Corporation
45. Cofimco USA, Inc
46. ProMinent Fluids
47. Buckman
48. Global Treat, Inc
49. Howden
50. IDEXX
51. Iwaki America

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
at 281.583.4087
or vmanser@cti.org
Value means a product you can rely on, a team of experts available when you need them, and a partnership beyond the sale.

Invest in a supplier who invests in you.
Press Release

Contact: Chairman, CTI Multi-Agency Testing Committee

Houston, Texas 2-November-2017

Cooling Technology Institute, PO Box 681807, Houston, Texas 77268 - The Cooling Technology Institute announces its annual invitation for interested thermal testing agencies to apply for potential Licensing as CTI Thermal Testing Agencies. CTI provides an independent third party thermal testing program to service the industry. Interested agencies are required to declare their interest by March 1, 2018, at the CTI address listed.

Licensed CTI Thermal Certification Agencies

<table>
<thead>
<tr>
<th>Agency Name / Address</th>
<th>Contact Person / Website / Email</th>
<th>Telephone / Fax</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clean Air Engineering</td>
<td>Kenneth (Ken) Hennon</td>
<td>800.208.6162 or</td>
</tr>
<tr>
<td>7936 Conner Rd</td>
<td><a href="http://www.cleanair.com">www.cleanair.com</a></td>
<td>865.938.7555</td>
</tr>
<tr>
<td>Powell, TN 37849</td>
<td><a href="mailto:khennon@cleanair.com">khennon@cleanair.com</a></td>
<td>(F) 865.938.7569</td>
</tr>
<tr>
<td>15325 Melrose Dr.</td>
<td><a href="http://www.cttai.com">www.cttai.com</a></td>
<td>(F) 913.681.0039</td>
</tr>
<tr>
<td>Stanley, KS 66221</td>
<td><a href="mailto:cttakc@aol.com">cttakc@aol.com</a></td>
<td></td>
</tr>
<tr>
<td>Cooling Tower Technologies Pty Ltd</td>
<td>Ronald Rayner</td>
<td>+61.2.9789.5900</td>
</tr>
<tr>
<td>PO Box N157 Besley North</td>
<td><a href="mailto:cooling@ttai.com">cooling@ttai.com</a></td>
<td>+61.2.9789.5922</td>
</tr>
<tr>
<td>NSW 2207 Australia</td>
<td>Dr. Ing. Meinolf Gringel</td>
<td></td>
</tr>
<tr>
<td>Cooling Tower Technologies Pty Ltd</td>
<td><a href="mailto:meinolf.gringel@dmt-group.com">meinolf.gringel@dmt-group.com</a></td>
<td>+49.201.172.1164</td>
</tr>
<tr>
<td>15325 Melrose Dr.</td>
<td><a href="http://www.mchaleperformance.com">www.mchaleperformance.com</a></td>
<td></td>
</tr>
<tr>
<td>Knoxville, TN 37912</td>
<td><a href="mailto:cittesting@mchaleperformance.com">cittesting@mchaleperformance.com</a></td>
<td></td>
</tr>
<tr>
<td>DMT GmbH &amp; Co. KG</td>
<td>Jacob Faulkner</td>
<td></td>
</tr>
<tr>
<td>Am Technologiepark 1</td>
<td><a href="http://www.mchaleperformance.com">www.mchaleperformance.com</a></td>
<td></td>
</tr>
<tr>
<td>45307 Essen, Germany</td>
<td></td>
<td></td>
</tr>
<tr>
<td>McHale Performance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4700 Coster Rd</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knoxvillle, TN 37912</td>
<td></td>
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</tr>
</tbody>
</table>

CTI Standard 201... "sets forth a program whereby the Cooling Technology Institute will certify that all models of a line of water cooling towers offered for sale by a specific Manufacturer will perform thermally in accordance with the Manufacturer's published ratings..." By the purchase of a "certified" model, the User has assurance that the tower will perform as specified, provided that its circulating water is no more than acceptably contaminated and that its air supply is ample and unobstructed. Either that model, or one of its close design family members, will have been thoroughly tested by the single CTI-licensed testing agency for Certification and found to perform as claimed by the Manufacturer.

CTI Certification under STD-201 is limited to thermal operating conditions with entering wet bulb temperatures between 12.8°C and 32.2°C (55°F to 90°F), a maximum process fluid temperature of 51.7°C (125°F), a cooling range of 2.2°C (4°F) or greater, and a cooling approach of 2.8°C (5°F) or greater. The manufacturer may set more restrictive limits if desired or publish less restrictive limits if the CTI limits are clearly defined and noted in the publication.

Those Manufacturers who have not yet chosen to certify their product lines are invited to do so at the earliest opportunity. You can contact Virginia A. Manser, Cooling Technology Institute at 281.583.4087, or vmanser@cti.org or PO Box 681807, Houston, TX 77268 for further information.

As stated in its opening paragraph, CTI Standard 201... "sets forth a program whereby the Cooling Technology Institute will certify that all models of a line of water cooling towers offered for sale by a specific Manufacturer will perform thermally in accordance with the Manufacturer's published ratings..." By the purchase of a "certified" model, the User has assurance that the tower will perform as specified, provided that its circulating water is no more than acceptably contaminated and that its air supply is ample and unobstructed. Either that model, or one of its close design family members, will have been thoroughly tested by the single CTI-licensed testing agency for Certification and found to perform as claimed by the Manufacturer.

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Cooling Technology Institute
Licensed Testing Agencies

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 Multi-Agency Testing 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 A, B*</th>
<th>Agency</th>
<th>Address</th>
<th>Contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clean Air Engineering</td>
<td>7936 Conner Rd, Powell, TN 37849</td>
<td>800.208.6162 or 865.938.7555</td>
<td><a href="http://www.cleanair.com">www.cleanair.com</a> / <a href="mailto:khennon@cleanair.com">khennon@cleanair.com</a> / Kenneth (Ken) Hennon</td>
</tr>
<tr>
<td>Cooling Tower Technologies Pty Ltd</td>
<td>PO Box N157, Bexley North, NSW 2207 AUSTRALIA</td>
<td>+61.2.9789.5900 / 61.2.9789.5922</td>
<td><a href="mailto:coolingtwtech@bigpond.com">coolingtwtech@bigpond.com</a> / Ronald Rayner</td>
</tr>
<tr>
<td>Cooling Tower Test Associates, Inc.</td>
<td>15325 Melrose Dr., Stanley, KS 66221</td>
<td>913.681.0027 / 61.4.938.5009</td>
<td><a href="http://www.cttaei.com">www.cttaei.com</a> / <a href="mailto:cttaiac@aol.com">cttaiac@aol.com</a> / Thomas E. (Tom) West</td>
</tr>
<tr>
<td>McHale Performance</td>
<td>4700 Coster Rd, Knoxville, TN 37912</td>
<td>865.588.2654 / 865.934.4779</td>
<td>Contact: Jacob Faulkner</td>
</tr>
</tbody>
</table>

* Type A license is for the use of mercury in glass thermometers typically used for smaller towers.

Licensed CTI Drift Testing Agencies

<table>
<thead>
<tr>
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</tr>
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<tr>
<td>Clean Air Engineering</td>
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<tr>
<td>McHale Performance</td>
<td>4700 Coster Rd, Knoxville, TN 37912</td>
<td>865.588.2654 / 865.934.4779</td>
</tr>
</tbody>
</table>

Cooling Technology Institute
Sound Testing

Cooling towers are used extensively wherever water is used as a cooling medium or process fluid, ranging from HVAC to a natural draft cooling tower on a power plant. Sound emanating from a cooling tower is a factor in the surrounding environment and limits on those sound levels, and quality, are frequently specified and dictated in project specifications. The project specifications are expected to conform to local building codes or safety standards. Consequently, it may be in the interest of the cooling tower purchaser to contract for field sound testing per CTI ATC-128 in order to insure compliance with specification requirements associated with cooling tower sound.

Licensed CTI Sound Testing Agencies

<table>
<thead>
<tr>
<th>Agency</th>
<th>Address</th>
<th>Contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clean Air Engineering</td>
<td>7916 Conner Rd, Powell, TN 37849</td>
<td>800.208.6162 or 865.938.7555</td>
</tr>
<tr>
<td>McHale Performance</td>
<td>4700 Coster Rd, Knoxville, TN 37912</td>
<td>865.588.2654 / Fax 865.934.4779</td>
</tr>
</tbody>
</table>

Make your plans to attend Future CTI Meetings

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

Committee Workshop July 15-18, 2018
La Cantera Resort San Antonio, TX

Annual Conference February 3-7, 2019
Sheraton New Orleans New Orleans, LA

Committee Workshop July 7-10, 2019
The Peabody Memphis, TN

Annual Conference February 9-13, 2020
The Westin Galleria Houston, TX
The Industry’s Most Trusted Source in Components!

Dynamic Fabricators
We are known for providing dynamic solutions resulting in quality advantages and competitive pricing. Providing excellent customer service is our #1 priority. It’s what keeps our customers coming back.

Your Complete Cooling Tower Supply Source with Locations In Wapato, WA & Elmore, AL.

- Header, Bypass, Riser and Lateral Distribution Syst.
- Fan Stacks, Fan Ring, Inlet Bells, FRP Basins.
- Fiberglass Pipe Saddles, Tanks, Access Hatches, Doors, Molded Stairs & Distribution Splash Boxes.

Your dynamic partner in cooling tower components...

Dynamic Fabricators
Toll-Free 877.604.6525
www.dynafab.net • Email us at: sales@dynafab.net
Cooling Technology Institute
Annual Conference, February 4-8, 2018

HOTEL INFORMATION

HILTON HOUSTON NORTH, HOUSTON, TX

Make reservations at 866.577.1154 or go to the CTI Website to register on-line

Hotel Cut-Off Date - January 19, 2018

• CHECK-IN TIME IS 3:00PM  • CHECK-OUT TIME IS 12:00PM

Standard Accommodations (Subject to Availability):

Single - $132++ / Double - $142++
Registration Form for the
CTI 2018 Annual Conference
February 4-8, 2018

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):  _______________  Annual Conference News    _______________  Website

   Last Name: ______________________________________  First Name: _________________________________________
   Company: ________________________________________________  Address: ______________________________________________________________
   City/State/Province: _________________________________________  Zip or Postal Code/Country: ______________________________________________
   Phone (Country Code/Area/Number) ___________________________  Fax (Country Code/Area/Number) __________________________________________
   Email: ________________________________  (E-mail addresses are used for communicating conference updates, session pre-work and to send any other pertinent information.)

   First-time Attendee: ________

   Badge Information -  First Name or Nickname (as you wish it to appear on your badge) _________________________________________________________
   Spouse’s Name: Only if they accompany you to the Conference: __________________________________________________________

   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 26, 2018 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:  Conference Rate after:
   January 26, 2018  January 26, 2018
   CTI Member (Includes technical sessions Monday, Tuesday & Wednesday) $875  $975
   Non-Member (Includes technical sessions Monday, Tuesday & Wednesday) $975  $1,075
   Owner/Operators (Includes technical sessions Monday, Tuesday & Wednesday) $550  $650
   One day  Mon Tues Wed (circle one) $600  $600
   Exhibit Hall Pass Only  $95  $95
   Speaker (one for each paper only) N/C  N/C
   Press (one attendee per company only / ID Required) N/C  N/C
   Honorary Life Member N/C  N/C

   Section 4a Subtotal US$ ________

4b. CONFERENCE EVENTS / OTHER FEES: (Full-conference or one-day registrants)
   Check Appropriate Category:  
   Conference Rate:
   Additional luncheon ticket(s), Monday, February 5, 2018 (for spouse/guest)  $50
   Monday Night / Hospitality combined February 5, 2018  N/C
   (For those paying the 3 day registration fee)
   Set of Papers - Hard Copies (mailed) Available after conference  $175
   Set of Papers - Flash Drive (mailed) Available after conference  $175
   Set of Papers - Emailed Available after conference  $160

   Section 4b Subtotal US$ ________

   Total Amount Due US$ ________

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

   There will be a 15% charge on any credit card refund made - no exceptions!
50% MORE COOLING CAPACITY THAN ANY OTHER COOLING TOWER IN THE WORLD*

ENERGY SAVINGS
Use up to 35% less fan power* and achieve higher energy savings.

REDUCED COSTS
Reduce piping and electrical costs and realize greater installation savings because NC Everest’s ambitious design minimizes piping and electrical connectors.

LOW DRIFT RATE
Patent-pending Markey™ Drft Eliminator achieves the lowest measurable exit rate, down to 0.00019% of circulating water flow, so less water escapes the tower*. 

CERTIFIED SOUND
NC Everest’s sound level is independently verified, per CTI ATC 128, by a third-party, certified acoustical engineer and CTI-licensed test agent.

UNRIVALED ACCESS
7-foot high doors and interior service decks yield unrivaled access and make inspections and maintenance easier and safer.

Take Cooling To A Higher Level – spxcooling.com/NCEverest

* Compared to other single-cell, factory-assembled cooling towers.