THE EXCHANGER | HTRI

2016 ISSUE

RISE *of the* PHOENIX

HTRI ***X****changer Suite*® has been expanded and enhanced over the past 20 years and, as with the mythological Phoenix, recently began a new evolution.

HTRI Acquires SmartPM™

The Next Level of Crude Oil Fouling Management

THE EXCHANGER

2016 ISSUE

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MESSAGE FROM THE PRESIDENT & CEO

EXTENDING OUR LEAD IN PROCESS HEAT TRANSFER

HTRI, a global for-profit company incorporated in Delaware, USA by 12 companies in 1962, now has a total of 808 member companies and 599 registered subsidiaries in 60 countries. We are a consortium, a unique business model that has fueled 27 continuous years of growth. Each member company and all employees of those companies who license and use our technology have contributed positively to our 54th year of business.

Our Global Conference & Annual Meeting of Stockholders in Seattle, Washington, September 2016, brought together participants from 16 countries plus our staff and consultants from around the globe. At this event we presented details of achievements during the past 12 months and showcased an exciting product acquisition, traction in collaborative enterprises, new partnerships, and a larger footprint in the fouling arena.

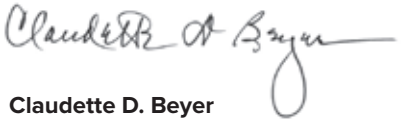
This year we were proud to announce:

- Acquisition of SmartPM™, monitoring data analysis, modeling, and predictive maintenance software for heat exchanger networks, which included hiring of Simon Pugh and Edward Ishiyama, primary IHS staff who spearheaded this product
- Licensing of Exchanger Optimizer™, a product owned by Agile Plant Solutions LLC, distributed by HTRI
- Contracts in the pipeline for our exclusive business arrangement with I_2 Air Fluid Innovations, Inc.
- Upcoming release of new product, ***X****fh*® Ultra, the first HTRI ***X****changer Suite*® Ultra product to be released from the Phoenix refactoring project
- Expansion of our alliance with Honeywell, enabling them to license HTRI programs in conjunction with their process simulator package, Honeywell UniSim® Design Suite
- Transfer and management of the Heat Exchanger Fouling & Cleaning Conference from Hans and Renate Müller-Steinhagen to HTRI
- Modification of three rigs at our Research & Technology Center (RTC), as well as a complete rebuild of one of our three fouling test rigs—all done in order to conduct tests that will lead to additional research data and improved methods in our software

The achievements of our staff, as well as the business acquisition and collaborative arrangements over the past year, result in access to unique technology, improved offerings to members, and opportunities for continued prominence in the field of process heat transfer.

As I write this, the USA baseball season is concluding with two underdog teams battling each other for the World Series title. Both teams played their best, gaining a position at the top of their leagues. At HTRI we are reviewing our operations and opportunities to ensure we are playing at the top of our game. Our staff, aided and supported by dedicated volunteers serving on the Technical Committee, the Board of Directors, the Crude Oil Fouling Task Force, and the 17 Communication Committees around the world, are focused on providing meaningful technology that offers value to all who use it.

We are still a small company on a global stage, but we rank at the top of the league in process heat transfer—a testament, in part, to the power of the consortium.



Claudette D. Beyer
President & CEO

RISE *of the* PHOENIX

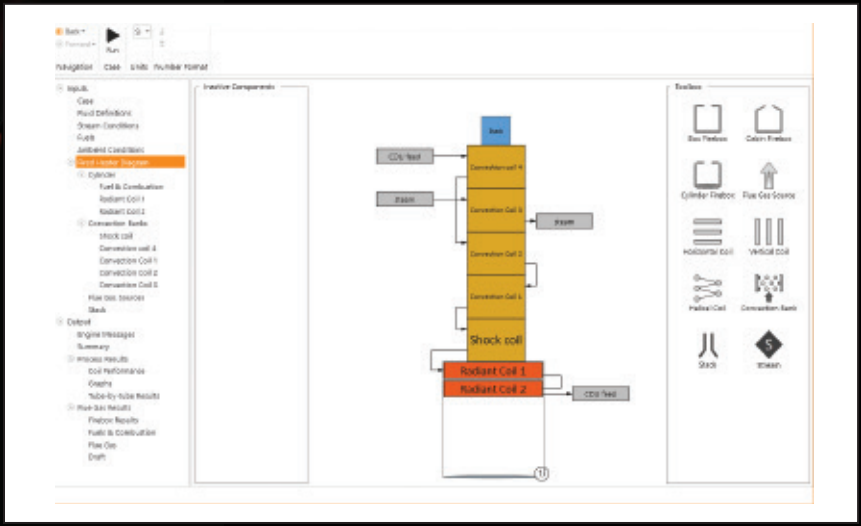
HTRI ***X****changer Suite*® has served as the industry standard thermal process design and simulation software for many years.

The software suite has been expanded and enhanced over the past 20 years and, as with the mythological Phoenix, recently began a new evolution. Three years ago HTRI began coding on the Phoenix initiative to refactor the aging ***X****changer Suite* code base using modern programming languages and current best practices for software design.

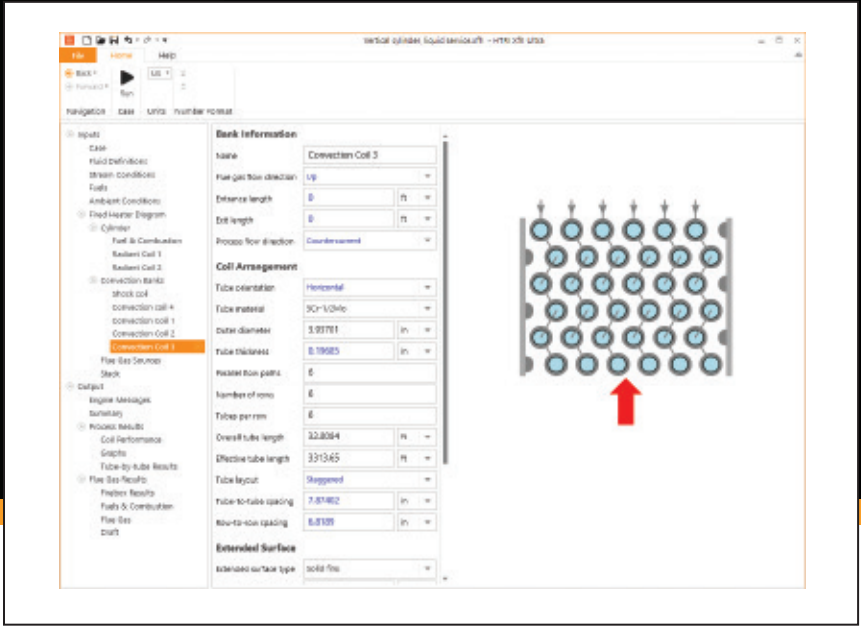
As re-envisioned in the Phoenix project, the software's new modular architecture allows for effective reuse of components across products, easier extension of capabilities, and more efficient application development and maintenance, while providing faster processing speeds. This code base will be the foundation for many new HTRI software products.

Newly branded as ***X****changer Suite* Ultra, the next generation of the software suite will be introduced with ***X****fh*® Ultra. The initial release includes a single-zone firebox model that calculates heat transfer to the tubes in the firebox, incorporating HTRI tubeside methods for heat transfer and pressure drop in both single-phase and two-phase boiling calculations. The software provides an improved user experience with a modern user interface, including interactive diagrams for configuring the fired heater equipment geometry and stream connections which will facilitate rapid case setup, execution, and analysis.

Members needing to model fired heaters using a multi-zone model will still have access to ***X****fh*. Furthermore,



*Interactive diagram of the fired heater in **X**fh Ultra*



*Convection coil geometry diagram in **X**fh Ultra*

***X**changer Suite* 7.3 and subsequent versions will continue to be supported as ***X**changer Suite* Ultra components are rolled out over the next few years.

The refactored code set is also the foundation for XSimOp™, which offers HTRI accuracy embedded within process simulator software. Released in August 2016, XSimOp ShellTube offers an alternative calculation engine within Honeywell's UniSim® Design R450, utilizing its interface and sharing data with native models. HTRI plans to develop XSimOp modules for additional equipment types as well as offer versions for other process simulators. For more on XSimOp, see the article *Modeling Shell-and-tube Exchangers using HTRI XSimOp™ ShellTube* on page 14.

With the next-generation ***X**changer Suite* Ultra, a new product line in XSimOp, and a robust software development road map, HTRI has ensured a long future providing advanced technologies to optimize heat transfer.

HTRI Acquires SmartPM™

HTRI recently acquired SmartPM, heat exchanger network analysis software for plant monitoring data reconciliation and performance prediction, including predictive maintenance scheduling. SmartPM includes dynamic fouling modeling of crude and other hydrocarbon streams and heat exchanger modeling using HTRI proprietary methods. With its methodologies for optimizing preheat train operation, SmartPM enables oil refinery operators to better manage and reduce maintenance, improve energy efficiency, and decrease emissions and operating costs. Two key developers of this product, Simon Pugh and Edward Ishiyama, are now employed with HTRI in order to facilitate continued improvements and added features in the software.

(see following page for details)

SIMON PUGH
Senior Product Lead: SmartPM

EDWARD ISHIYAMA
Senior Research Project Engineer

SmartPM™

THE NEXT LEVEL OF CRUDE OIL FOULING MANAGEMENT

SmartPM enables oil refinery operators to better manage and reduce equipment maintenance, improve energy efficiency, and reduce their emissions and operating costs.

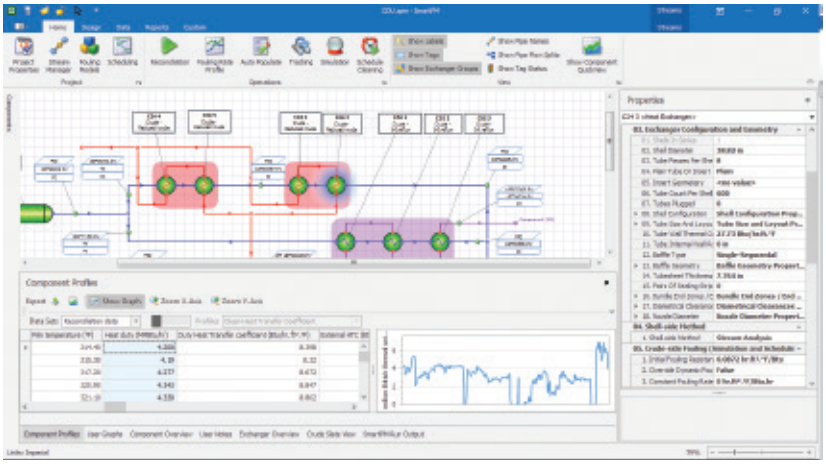
Many HTRI members are well aware of the huge energy losses that accrue as heat exchangers foul in service. HTRI established its Fouling Program to better understand the fundamental nature of fouling and to assist operating companies in their quest for better fouling management. HTRI recently acquired SmartPM software to complement this program, taking its understanding and management of crude oil fouling to the next level.

HTRI's SmartPM is the world's most advanced, validated thermo-hydraulic simulation software. Key applications include reconciliation of plant monitoring data and predictive performance modeling, which incorporates predictive cleaning maintenance schedules for heat exchangers.

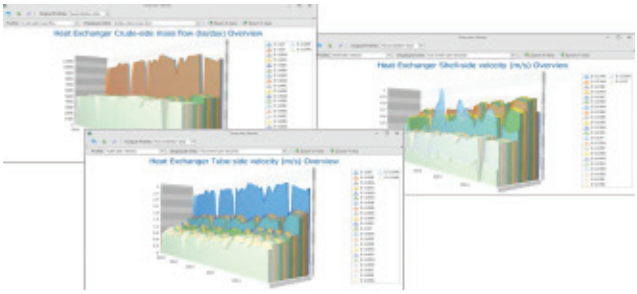
Developed in the United Kingdom in collaboration with major oil companies and the Department of Chemical Engineering at Cambridge University, SmartPM applies the results of decades of crude oil fouling research at HTRI and other leading research institutions to full-scale refinery applications.

SmartPM can be used by a wide range of engineers, including:

- **Process engineers evaluating current plant performance**
- **Planners allocating maintenance budgets for cost-effective future cleaning schedules**
- **Environmental engineers seeking emission reductions**
- **Design engineers predicting long-term performance of revamps and new designs**
- **Researchers evaluating fouling data from experimental rigs**



Detailed heat exchanger models for single- and two-phase flows are displayed in a graphics-rich environment.



Exchanger data, such as the crude flow rate and tubeside and shellside velocity overviews (shown here), can be viewed in a variety of tabular, spreadsheet, and graphical forms.

A key feature of SmartPM is the practical application of dynamic fouling models to relate time-dependent, local rates of fouling to the local surface temperatures and shear stresses within individual shell-and-tube heat exchangers. These conditions are calculated using HTRI proprietary methods. SmartPM applies dynamic fouling modeling to data reconciliation and simulation, allowing predictive maintenance schedules for maximum energy savings and minimum throughput losses. It also allows engineers to assess past, current, and future performance of exchanger networks in order to reduce operating costs and improve efficiency and environmental performance.

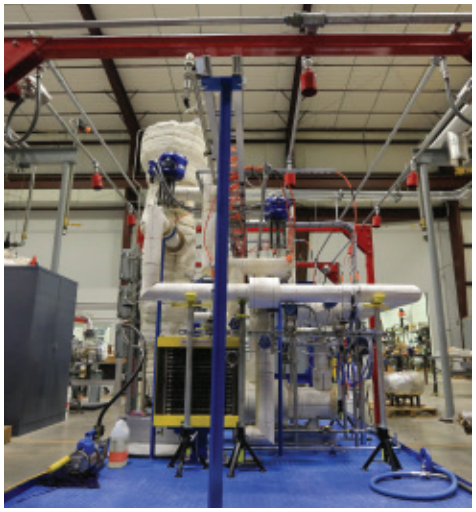
SmartPM is available both as software and services. Customer engineers can either build and maintain their own models or have HTRI do it as a service. At HTRI, our experts can build and maintain SmartPM network models to generate operational parameters for all network components. Additionally, the SmartPM calculation engines can be integrated directly into a refinery's data management system for automatic operation.

The addition of SmartPM expands HTRI's portfolio of products and services designed to predict, analyze, and mitigate crude oil fouling, which is one of the costliest problems facing the refining industry today.

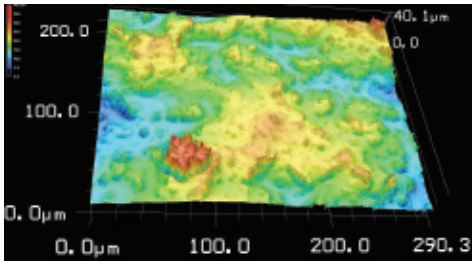
DAVID BURTON
Director, Research &
Technology Center (RTC)

RESEARCH & TECHNOLOGY CENTER UPDATE

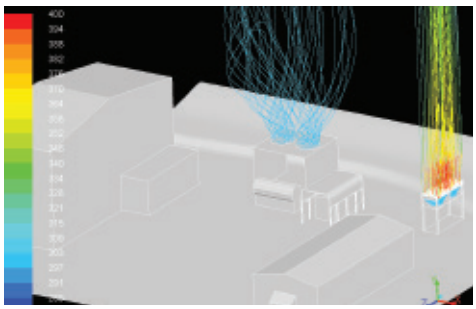
Focusing on High Quality Data



Our newest research unit, the HTFU-2



3D image of tube deposit from the laser microscope



CFD simulation showing air flow distribution for the proposed ACHE at the RTC

Significant improvements were made over the past year to enhance our testing capabilities and data reliability.

Expanded capability for fouling research

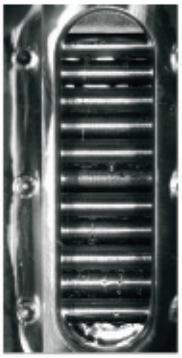
Shortly after commissioning the High Temperature Fouling Unit 2 (HTFU-2), we disassembled and rebuilt the High Temperature Fouling Unit 1 (HTFU-1) to new specifications. The two fouling test units are very similar in design, and the improvements to the HTFU-1 allow for quicker turnarounds and easier maintenance. Controls have also been added to automate startup and shutdown of the units.

New test sections used in these units feature a tungsten sleeve for reduced contact resistance between the sleeve and test section tube. In addition, the test section tubes are now used only for one test instead of being cleaned and reused. After each test, the tube is split open so that we can analyze interior surface deposits in detail with our 3D laser scanning microscope.

Upcoming research projects

Final specifications for the purchase of a forced draft air-cooled heat exchanger (ACHE) are being prepared. The ACHE will have two cells, each with a five-foot diameter fan. The heat source will be hot water. To validate our CFD analysis, we plan to obtain velocity profile data to gain a better understanding of air flow distributions and heat transfer performance. The new ACHE test unit expands our capability to evaluate customers' ACHE operation issues and propose more effective solutions.

Using the Low Pressure Condensation Unit (LPCU), we are conducting experimental research on condensation of immiscible mixtures. Hydrocarbon vapors mixed with steam are condensed in the LPCU shellside vacuum condensation test section. Experimental data are expected to provide better methods for calculating condensation heat and mass transfer for processes with immiscible mixtures.



LPCU used for experimental research, with visualization of shellside vacuum condensation (inset)

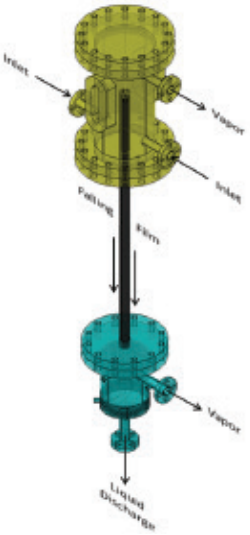
We have also constructed and installed a tubeside falling film evaporator in the Multipurpose Boiling Unit (MBU), including windows for visualization. The collected experimental data will help improve methods for determining heat transfer and pressure drop.

Three different geometries of plate-fin heat exchangers are the current focus of testing with the Tubeside Single-Phase Unit (TSPU). Experimental testing with various fluids will be used to validate CFD simulations and to improve methods for single-phase and two-phase heat transfer, pressure drop, and flow distribution. We will apply temperature sensitive paint, which allows for optical sensing of the temperature distribution of a remote surface, to the outer surface of the test section.

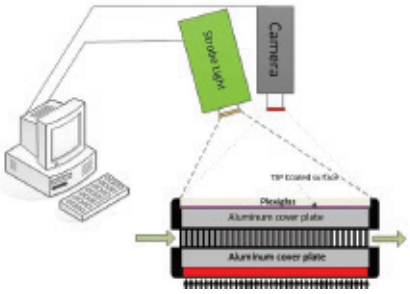
Thermosiphon reboiler installed in the PTU

Instability testing of a vertical thermosiphon reboiler is being conducted using the Prototype Test Unit (PTU) to identify conditions at which boiling instability occurs. Our goal is to develop operating criteria recommendations to avoid instabilities under turndown conditions.

Falling film evaporator test section plenum, and drawing of the entire test section

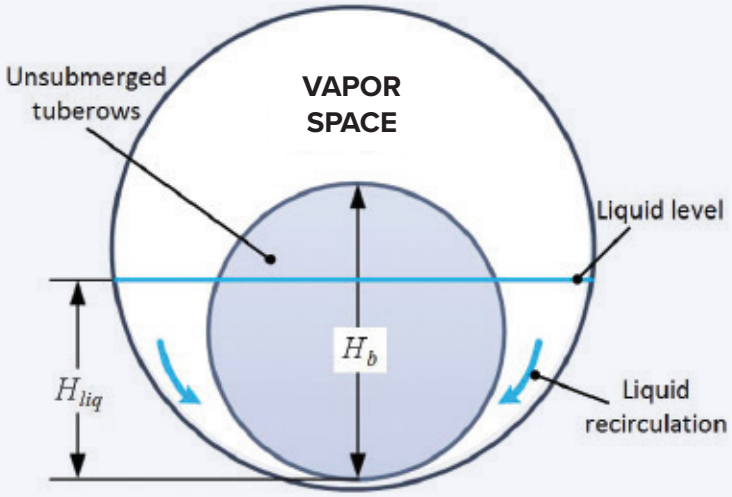


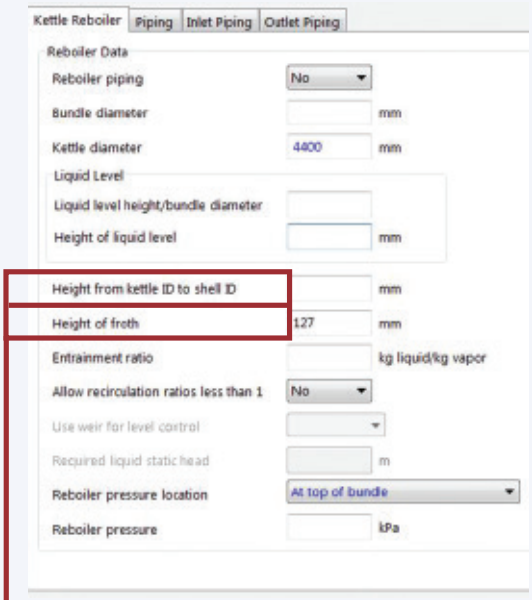
The TSPU with graphic representation of a plate-fin test section that is installed



Visit www.htri.net/rtc to learn more about all of the capabilities of the RTC.

LOWER LIQUID LEVEL IN KETTLES





Two options to specify liquid level on kettle reboiler panel
1) Fraction of bundle diameter
2) Height above bottom of shell ID

THOMAS G. LESTINA
Vice President,
Engineering Services

Kettles typically operate with a flooded bundle. However, some operators lower the liquid level to lower liquid entrainment. Doing so may cause operating problems such as reduced heat transfer and tube failures.

New features in ***X**ist*® facilitate evaluation of thermal performance at lower liquid levels. These features can provide valuable insight into kettle operation:

- **Recirculation:** A lower liquid level reduces recirculation. In some cases, the recirculation may be less than 1. ***X**ist* 7 introduced an option to allow calculation of a recirculation ratio less than 1 [1]. Users should enable this option when simulating performance at a lower liquid level.
- **Two-phase jet:** We conducted a study to evaluate the effectiveness of a two-phase jet at wetting unsubmerged tubes with a lower liquid level [2]. Wet-wall predictions match measured data when more than 60 percent of the bundle diameter is submerged. At lower liquid levels, the reduction in performance is sizable. ***X**ist* 7.3 will implement methods from this study to reduce the heat transfer capability due to unwetted tubes.

If you need help interpreting the results of your kettle case, contact our Technical Support team at support@htri.net.

References
1. L. Huang and C. M. Laird, *Modeling flat bundles in kettle reboilers*, Q 16-2 (2013).
2. L. Huang, *Heat transfer of kettle reboiler tubes above the liquid level,* BK1-14, Heat Transfer Research, Inc., Navasota, TX (2014).

WORD SEARCH
HTRI® MEMBER BENEFITS

Find the words representing member benefits that are hidden in this puzzle

DESIGN MANUAL

GLOBAL CONFERENCE

PUBLICATIONS

REPRESENTATION

RESEARCH

RTC

SOFTWARE

SUPPORT

TECHNICAL PLANS

TRAINING

WEBINARS

XCHANGER SUITE

B	J	W	G	X	J	A	G	H	R	D	S	U	P	P	O	R	T	Q	M	F	V	D
W	O	Q	J	H	E	D	T	T	H	K	W	Z	H	P	I	I	Y	P	K	R	S	G
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P	C	P	I	I	U	D	O	J	V	G	E	H	M	M	U	E	A	Q	U	I	L	T
M	S	K	N	N	I	W	G	U	V	D	Q	E	M	G	L	E	R	H	G	T	P	M
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D	U	R	P	F	R	F	S	O	F	V	I	I	H	L	Z	L	P	L	N	N	C	R
V	J	Y	S	K	G	M	A	G	R	E	S	E	A	R	C	H	W	B	I	E	I	R
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See solution on page 21.

Technical presentations at the conference covered new HTRI products and research results affecting the process heat transfer industry.

Hans Müller-Steinhagen, Rector of Technical University of Dresden, addresses members at the Annual Meeting of Stockholders.

Panelists representing different industry areas (engineering and construction, manufacturing, and processing) contributed their experience to lively discussions about heat transfer.

Simon Pugh, Senior Product Lead: SmartPM, discusses the product at one of the technical presentations.

Siddharth Talapatra, HTRI Senior Project Engineer, Research, is shown explaining his poster, Fired Heater Research: Two-phase Flow Visualization Inside a Vertical Serpentine Loop, to attendees.

HTRI President & CEO Claudette Beyer thanks Board Member Sam Chapple from Hudson Products Corporation at the evening reception, which was sponsored by Hudson.

ALL EYES ON SEATTLE

THE 2016 HTRI GLOBAL CONFERENCE PROVED TO BE INFORMATIVE AND FUN.

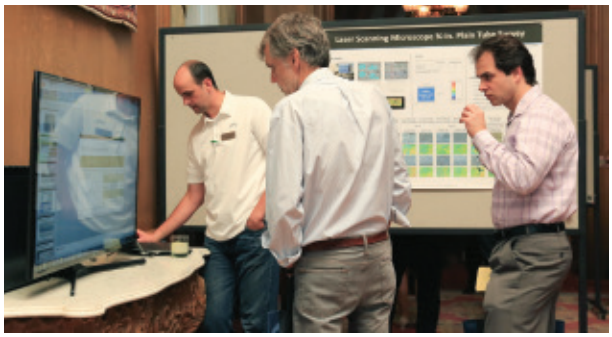
The HTRI Global Conference & Annual Meeting of Stockholders in Seattle, Washington, USA, in September, 2016, offered a full schedule of technical presentations, poster sessions, product demos, panel discussions, and two days of training courses—plus many opportunities for networking.

We continue to expand our product line. Software demonstrations, a key highlight of the conference, showed how our new or improved products can help optimize exchanger designs and performance. Demos included XSimOp™ ShellTube, HTRI ***X****changer Suite*® 7.3, Edgeview™, Exchanger Optimizer™ 2.0, ***X****fh*® Ultra, and the newly acquired SmartPM™.

Attendees had many chances to talk with the experts. New this year, our panel discussions brought industry experts into conversations about heat transfer phenomena and concepts related to optimizing tools. Once again, attendees were eager to interact with HTRI researchers during the one-on-one poster sessions.

Plan now to join us for the next **HTRI Global Conference & Annual Meeting of Stockholders, September 18 – 21, 2017, in Ottawa, Ontario, Canada.**

Blazo Ljubicic, HTRI Director, Research, presents one of his conference sessions.



Aaron Smith, HTRI Coordinator, Fouling, demonstrates HTRI's fouling testing capabilities at a poster session.

Ivan Olson, Board of Directors Chair, speaks at the Annual Meeting of Stockholders.

Michael O'Connor, Board of Directors Vice Chair, receives a gavel from HTRI President & CEO Claudette Beyer to begin the Annual Meeting of Stockholders.

World Scientific
Connecting Great Minds

ENCYCLOPEDIA OF TWO-PHASE HEAT TRANSFER AND FLOW

Set I : Fundamentals and Methods
Set II: Special Topics and Applications

edited by **John R Thome**

(Laboratory of Heat and Mass Transfer (LTCM), Switzerland & Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland)

The scope of the first set of 4 volumes presents the fundamentals of the two-phase flows and heat transfer mechanisms, and describes in detail the most important prediction methods, while the scope of the second set of 4 volumes presents numerous special topics and numerous applications, also including numerical simulation methods.

Key Features:

- The twin-set offers an all-in-one reference for two-phase heat transfer and flows
- The twin-set provides a comprehensive treatment of the subject with contributions from over 55 top researchers and experts
- The twin-set is relevant to researchers and engineers working on all types of heat transfer and cooling problems in a myriad of industries
- The twin-set covers not only conventional-sized cooling systems but also include a detailed focus on two-phase heat transfer and flow in microchannels, micro-evaporators, etc.

Set I: Fundamentals and Methods	Set II: Special Topics and Applications
Volume 1: Modeling of Gas Liquid Flow in Pipes	**Volume 1:** Section 1: Special Topics in Boiling in Microchannels Section 2: Micro-Evaporator Cooling Systems
Volume 2: Condensation Heat Transfer	**Volume 2:** Section 3: Enhanced Boiling and Plate Heat Exchangers Section 4: Boiling and Two-Phase Devices
Volume 3: Flow Boiling in Macro and Microchannels	**Volume 3:** Section 5: Special Topics in Condensation
Volume 4: Special Topics in Pool and Flow Boiling	**Volume 4:** Section 6: Numerical Modeling of Two-Phase Flow and Heat Transfer

Readership: Graduate students, researchers and professional in the fields of mechanical, refrigeration, chemical, nuclear and electronics engineering on the important topics of two-phase heat transfer and two-phase flow.

978-981-4623-20-9 (Set I, 1150pp)	Oct 2015	US$1350 £891
978-981-4623-27-8 (Set II, 1150pp)		US$1350 £891
978-981-4623-21-6 (Set I ebook)		US$1755 £1158
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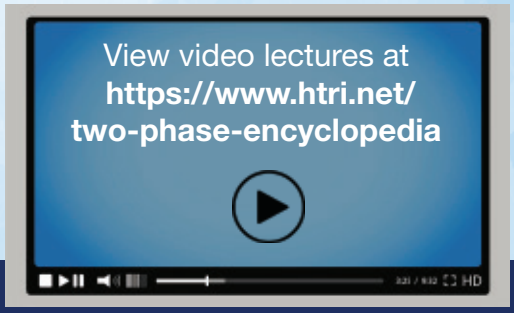


www.worldscientific.com

Why You Want HTRI *Xchanger Suite*® 7.3

HTRI recommends that you run the latest version of ***X**changer Suite;* however, we understand some users find it challenging to update from a version they are used to. Listed below are some new features of ***X**changer Suite* 7.3 that could make upgrading worthwhile.

JOSEPH W. HOLMES
Principal Engineer,
Research &
Software Integration

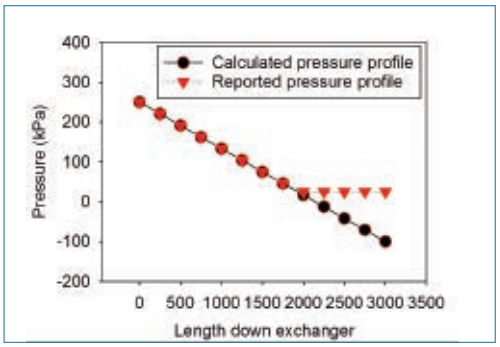


Figure 1. *Example of profile with pressure drop limited*

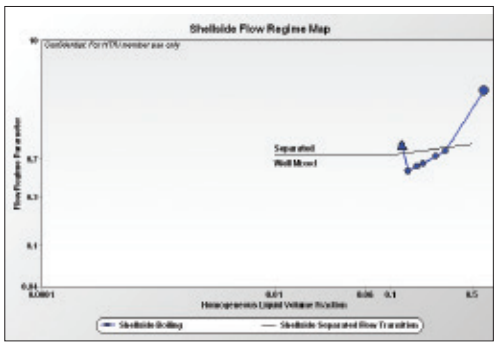


Figure 2. *Shellside flow regime map*

SPEED

Everyone likes speed. Your software can never be too fast. If you run simulation (unknown duty) cases in ***X**ist*®, you will likely see a significant improvement in runtimes with Version 7.3. In addition to improved estimates of duty, you can now specify initial guesses, which can improve runtimes even more.

FEWER FAILURES

Have you ever seen the runtime message "Pressure drop exceeds inlet"? This message often occurs when you run deep vacuum cases. Previous versions generated the error message and no results. Version 7.3 limits the allowed pressure drop to 90% of the inlet pressure (or another value you control with the allowable pressure drop input). The program calculates the full pressure, but stops changing the pressure profile after it reaches the 90% limit. You receive a full set of results for analysis. (Figure 1)

ACCURACY

You likely use ***X**changer Suite* because it provides the most accurate exchanger simulation available. To meet your expectations, we updated some prediction methods in Version 7.3 to make the simulation more accurate than ever, including improved methods for:

- *Shellside boiling for two-pass (F, G, and H) shells*
- *Two-phase pressure drop with helical baffles*
- *Axial flow heat transfer and pressure drop for non-baffled shells*
- *Pressure drop for low-finned tubes*
- *Prediction of flooding in shellside reflux condensers*
- *Pressure drop in U-bends*
- *Mist flow in tubeside falling film evaporators*
- *New flow regime map for shellside boiling*
- *Entrance area at rear head and over U-bends*
- *Kettles with liquid level below the top of bundle* (Figure 2)

OUTPUT OPTIONS FOR FIRED HEATERS

If you use ***X**fh*® software, several new output options in Version 7.3 will make your job simpler. The API 560 specification sheet is a more fully populated output report, now including:

- *Fuel efficiency*
- *Radiant section setting loss*
- *Draft at floor/burners*
- *Flue gas quantity*
- *Volumetric heat release*
- *Convection flux density*
- *Process mass velocity in radiant section*

Additionally, a new stack draft profile report can be graphed.

MULTIPLE LIQUID PHASES

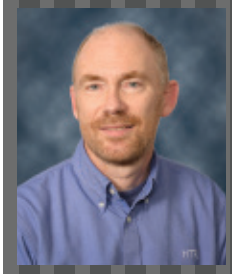
Long-time users of ***X**changer Suite* know that when you used fluids containing multiple liquid phases, you had to "hide" this fact from the software and manually mix properties to produce a single liquid phase. Version 7.3 gives you a hand with this chore.

With any grid of properties, the software provides a multiple liquids worksheet that allows you to specify properties for two liquid phases. The worksheet can automatically mix properties using various mixing rules, allowing you to see the mixed properties before running the case.

SUMMARY

Hopefully this article has summarized the must-have features of ***X**changer Suite* 7.3 This latest version contains more enhancements than described here. View or download the Release Notes on our website for a detailed list of new features and improvements.

Download your own copy to help make your job easier.



DAVID GIBBONS
Director, Engineering
Software Development

Modeling Shell-and-tube Exchangers using HTRI XSimOp™ ShellTube

HTRI research helps us provide the best predictions of heat exchanger performance in our software.

Traditionally focused on modeling specific heat transfer equipment, our software development is expanding to focus on requirements of process simulators.

We have designed HTRI XSimOp ShellTube specifically to operate within a process simulator's own interface. The initial release works with UniSim® Design Suite.

XSimOp provides fast and accurate heat transfer and pressure drop calculations for a shell-and-tube heat exchanger. The predictive model determines the outlet conditions from the inlet conditions, based on the exchanger geometry. The methods, backed by HTRI research, cover any appropriate combination of single-phase (liquid or vapor), boiling, and condensing calculations.

A number of process simulators currently use simple links to ***X**ist*® in their models of shell-and-tube exchangers. However, these links have presented challenges for users, including:

- slow calculation speed
- limited calculation robustness
- necessary use of two separate interfaces for a single activity *(see Figure 1)*

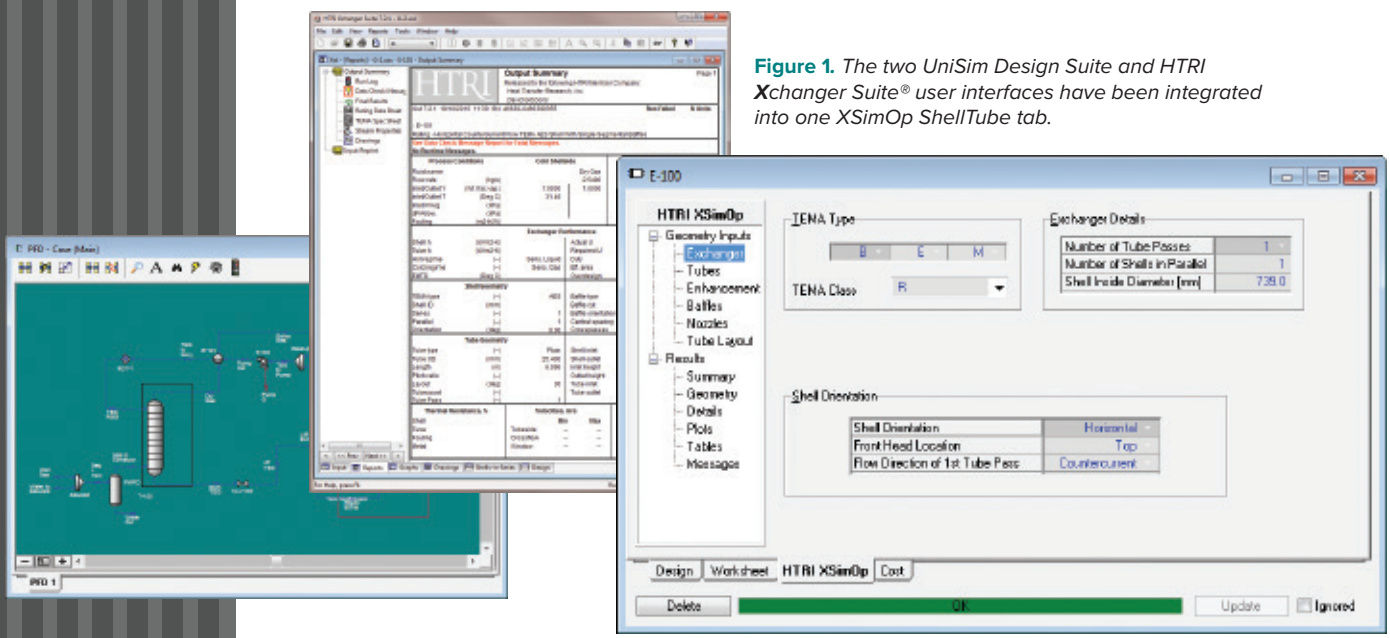


Figure 1. *The two UniSim Design Suite and HTRI **X**changer Suite® user interfaces have been integrated into one XSimOp ShellTube tab.*

XSimOp ShellTube is the first in a new family of HTRI products designed with a focus on the specific requirements of process simulators.

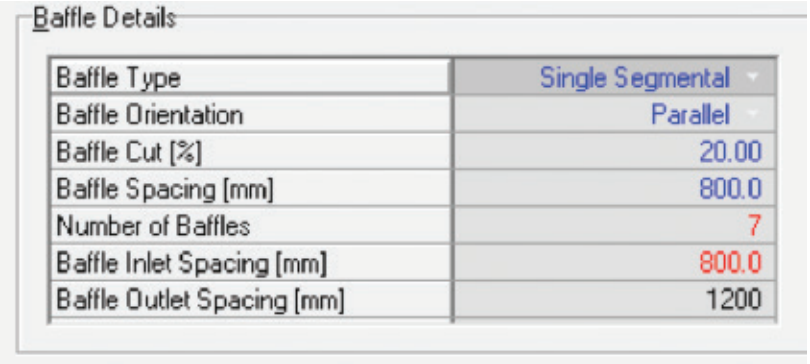


Figure 2. *XSimOp showing user-specified (blue), default (red), and calculated (black) inputs*

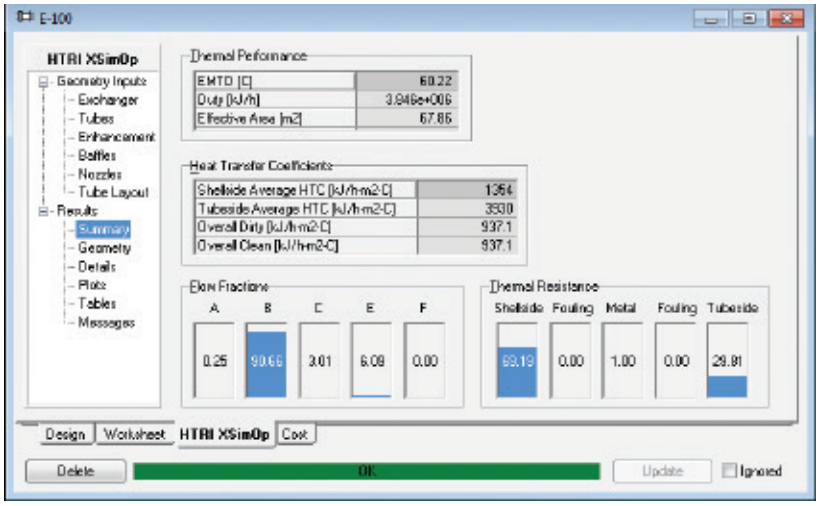


Figure 3. *XSimOp results summary*

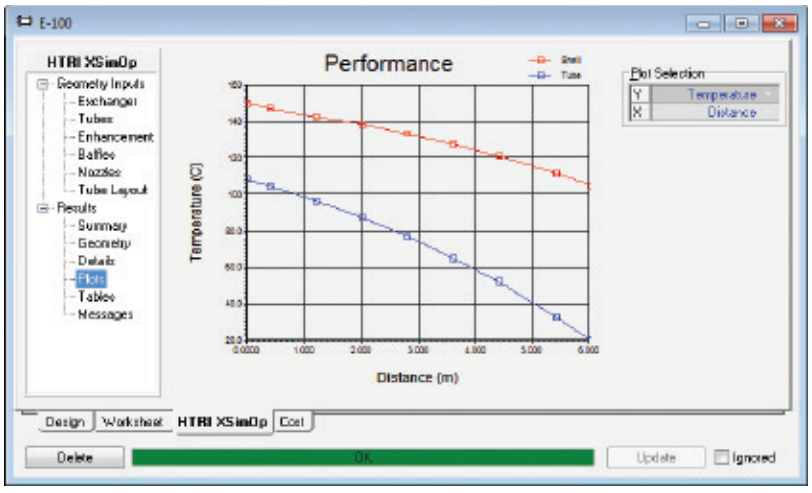


Figure 4. *XSimOp graphical representation of incremental results*

In creating XSimOp, our developers recognized that calculations should provide some form of results to allow the process simulator calculations to continue. XSimOp users can view calculation warnings alongside any other message in the process simulator.

The user experience is improved because the host process simulator, UniSim Design, provides the user interface required to enter data and view calculation results. Data defined in a native heat exchanger model is shared with XSimOp, so re-entering data is unnecessary. When the user first selects the XSimOp model, data already entered in other heat exchanger models become immediately available. UniSim Design includes user-specified inputs, defaults, and calculated values. Blue, red, and black indicators reflect how the data were originally entered.

In *Figure 2*, the baffle cut and inlet baffle spacing (in blue) have already been specified. The baffle spacing and tube length, specified elsewhere, determine a default for the number of baffles and the inlet baffle spacing (in red). A user can override these default values, and the program automatically recalculates the outlet baffle spacing (in black). Calculated values cannot be modified by the user.

Another part of the user experience is viewing the results. UniSim Design provides the views of both summary information and more detailed incremental results from XSimOp. Incremental data can be viewed either in tabular form or as plots.

While incorporating the HTRI correlations and models used in ***X****ist*®, XSimOp ShellTube has been developed for the faster speeds that process simulators require. The speed improvement depends on the particular problem being solved. Although it has fewer features than ***X****ist* and is not quite as rigorous, in one benchmark case using UniSim Design, XSimOp performed over 20 times faster than ***X****ist*.

The first version of XSimOp is now available and fully integrated in UniSim Design R450. Contact htri@htri.net for more information about this new, innovative product.

Changes to the Board of Directors and Technical Committee

FY 2017 BOARD OF DIRECTORS AND TECHNICAL COMMITTEE

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HTRI WELCOMES NEW MEMBERS OF THE TECHNICAL COMMITTEE

John Michelin, *Exchanger Industries Limited (EIL),* Vice President & General Manager – Commercial, Calgary, Alberta, Canada. Since joining EIL in 1989, Michelin has held several positions, including Design Engineer, Sales Manager, Engineering Manager, Engineering and Sales Manager, and Vice President & General Manager – Operations. He is currently responsible for the oversight and day-to-day support for Business Development, Sales & Estimating, Engineering, Drafting Design, and Project Management for the Engineering Department. Michelin oversaw new product development and successful piloting of an anti-fouling technology that was voted into Canada's Oil Sands Innovation Alliance (COSIA). BSc Mechanical Engineering, MS Engineering – Chemical and Petroleum Program, and Management Certificate Program, The University of Calgary, Calgary, Alberta, Canada. Communication Committee – Western Canada: Chair, 2009 – 2013; Member since 2003.

Toshiaki Momoki, *TonenGeneral Sekiyu K.K.,* Senior Manager and Heat Transfer & Combustion Expert, Process Engineering Department, Manufacturing Technology and Engineering, Kawasaki, Japan. Momoki has refinery-wide engineering experience to cover heat exchanger, fired heater, boilers, and utility facilities. As a heat transfer expert, he has served on committees for heat exchanger thermal design, troubleshooting, fouling mitigation, operation improvement for margin, and energy saving. He has handled several types of exchangers such as conventional shell-and-tube heat exchangers, air coolers, twisted tube bundles, helical baffle exchangers, weld and gasket-type plate heat exchangers, and spiral exchangers. BS and MS, Chemical Engineering, Waseda University, Tokyo, Japan. Communication Committee – Japan: Member since 2003. Crude Oil Fouling Task Force (COFTF): Member.

Our thanks to . . .

Marco A. Osorio Bonilla, HTRI Board of Directors: 2012 – 2016
Hiroyuki Ishiyama, HTRI Technical Committee: 2011 – 2016
Christopher Niederer, HTRI Board of Directors: 2015 – 2016
Florian Picard, HTRI Technical Committee: 2014 – 2016
Brigitte Ploix, HTRI Technical Committee: 2008 – 2016
Stanley Proctor, HTRI Executive Committee: 1988 – 1993, HTRI Board of Directors: 2010 – 2016
Cesar M. Romero, HTRI Technical Committee: 2012 – 2016
Len J. A. Zoetemeijer, HTRI Board of Directors: 2008 – 2016

CHANGES IN THE HTRI TECHNICAL COMMITTEE LEADERSHIP

On October 14, 2016, former Technical Committee Chair **Brigitte Ploix** left Technip to start her own company. While Brigitte was serving as Technical Committee Chair, she was appointed Deputy Vice President, Process and Technologies Division, Technip. Because she is no longer employed at a member company, she is not eligible to remain on the Technical Committee. We thank Brigitte for her valued commitment and contributions during her eight years of service as a Technical Committee member (2008-2016), including three as Vice Chair (2011-2014) and two as Chair (2014-2016).

Richard P. Casebolt, Team Lead – Heat Transfer Group, ExxonMobil Research and Engineering Company, has stepped up from his Vice Chair role to fill the position of Chair of the Technical Committee. Richard has been on the Technical Committee since 2009, and has served as Vice Chair since 2014. We are grateful for his continued service to this important committee.

The Nominating Committee will meet in April 2017 to determine a slate of candidates for the 2017 election.

In Memory of

MARCO SATYRO

Marco passed away Thursday, September 8, 2016. After a decades-long collaborative relationship with HTRI, including roles as a consultant, guest presenter, and trainer, Marco joined the staff in July as Principal Scientist, initially focused on improvements to our crude oil fouling research program. His passion for science and plans for the future lifted us up. His tenure at HTRI was brief in time, but large in influence.

Marco was one of the founders of Virtual Materials Group, Inc. (VMG), located in Calgary, Alberta, Canada, a company with which HTRI has had a long and valued relationship. He held many positions at VMG, including CEO, but wanted to return to the science of thermodynamics and research. He came to HTRI from Clarkson University in Potsdam, New York, USA, where he was a Professor of Chemical Engineering, having previously been on the faculty of the University of Calgary in Calgary, Alberta, Canada.

Marco was known around the world for his gregarious, energetic, and positive personality, his joy in mentoring, his passion for science and engineering, as well as his incredible intellect, curiosity, and kind heart. He and his wife of 28 years, Malu, have two grown children, Melanie and Conner.

We celebrate Marco's life and are grateful for his invaluable leadership in the field of thermodynamics.

I_2 Vapor Infusion Gaining Wider Acceptance

Successful test completed with major cruise line leads to new opportunities.

I_2 Vapor Infusion—a patented process that injects iodine-infused vapor bubbles into a cooling water system—has the potential to substantially reduce biofouling in heat exchangers. A successful 25-week test on one heat exchanger of a major cruise line was recently completed. It was found that the I_2 infusion protocol completely eliminated the need for back flushing, and when the infused heat exchanger was opened for inspection, it revealed no bio-fouling formation on the titanium plates. As a result, the cruise line ordered five devices to prevent fouling in ten onboard heat exchangers. We will install infusion devices on two of the cruise ships before the year end. We are currently in discussion with another shipping company in Scotland that runs both freight and ferry ships, as well as other companies supporting cruise and freight lines, to promote the I_2 infusion protocol.

In addition, our devices are being tested in a number of lobster farms, which resulted in a news announcement about the I_2 protocol in the well respected *Hatchery International* (Nov/Dec 2016 issue).

A lecture given at the Marine Bio-fouling Conference in Nice, France, led to opportunities with one of the world's preeminent aquaculture recirculating system suppliers and designers.

HTRI has an alliance with process developer I_2 Air Fluid Innovation, Inc. and is the exclusive provider of this environmentally friendly technology for heat exchanger and cooling tower applications. If you are interested in learning more about I_2 Vapor Infusion for biofouling control and how it may help with your applications, contact us at biofouling@htri.net.

UPCOMING EVENTS

TRAINING

HTRI WEBINAR

Research Update: Shellside Longitudinal Liquid-phase and Flow Boiling Heat Transfer for Vertical Plain Tube Bundles
January 19, 2017, 10 AM CST

Evaluating Heat Exchanger Economics using Exchanger Optimizer 2.0
February 9, 2017, 9 AM CST

We will be adding webinars for our new product, SmartPM™, and the upgrade to ***X****changer Suite*® soon on the Upcoming Events calendar.

HTRI TRAINING

HTRI Training – Europe
March 21 – 23, 2017
The Westin Valencia
Valencia, Spain
November 7 – 9, 2017
Double Tree by Hilton
Amsterdam, The Netherlands

HTRI Training – Global Headquarters
HTRI Conference Center
Navasota, Texas, USA
January 30 – February 3, 2017
- Process Heat Exchangers: Applications and Rules-of-thumb Short Course
- ***X****ist*® Workshop
- ***X****vib*® Workshop
- ***X****ace*® Workshop

April 17 – 20, 2017
- ***X****ist* Workshop
- Special Topics in ***X****ist* Workshop
- ***X****ace* Workshop
- Special Topics in ***X****ace* Workshop

August 7 – 10, 2017
- ***X****ist* Workshop
- Kettle Reboilers Short Course
- Heat Exchanger Fouling Short Course
- Two-phase Flow Short Course

November 7 – 8, 2017
- ***X****ist* Workshop
- Vibration Analysis Workshop

HTRI 2017 Global Conference & Annual Meeting of Stockholders – Training
September 20 – 21, 2017
Fairmont Chateau Laurier
Ottawa, Ontario, Canada

TRADESHOW/EXPO

China International Petroleum & Petrochemical Technology and Equipment Exhibition (CIPPE)
March 20 – 22, 2017
New China International Exhibition Center
Beijing, China

116th Asian Oil, Gas & Petrochemical Engineering Exhibition
July 11 – 13, 2017
Kuala Lumpur Convention Centre
Kuala Lumpur, Malaysia

CONFERENCE

Heat Exchanger Fouling & Cleaning Conference
June 11 – 16, 2017
Barceló Aranjuez Hotel and Spa
Madrid, Spain

HTRI 2017 Global Conference & Annual Meeting of Stockholders
September 18 – 21, 2017
Fairmont Chateau Laurier
Ottawa, Ontario, Canada

Visit www.htri.net/upcomingevents for more information and schedule updates.

NEW MEMBERS

November 2015 through October 2016

Ador Welding Limited
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Jiangsu Yongsheng Heat Transfer Technology Co., Ltd.
Taizhou, Jiangsu, China

JSC ZiO "Machine-Building Factory of Podolsk"
Podolsk, Russia

JW Equipamentos
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Tyler, Texas, USA

KRISO
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Redcar, United Kingdom

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Jubail Industrial City, Saudi Arabia

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NAVACEL
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Werhane Exchanger Design, LLC
Broken Bow, Oklahoma, USA

Woodfield Systems International Pvt. Ltd.
Thane (West), Maharashtra, India

Wyoming Refining Company
Newcastle, Wyoming, USA

Zhuhai Jutal Offshore Oil Services Limited
Zhuhai, Guangdong, China

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November 2015 through October 2016

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Air Liquide Global E&C Solutions Shanghai Co., Ltd.
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SOLUTION WORD SEARCH
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Contact HTRI

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