

CONNECT

Inside This Issue



- Global Solutions Symposium 2022 | Special Section
- **16** Commemorating Commitment
- 18 Albemarle Celebrates 40-Year Anniversary at MTI
- Oaks and Wadley Elected to MTI BOD
- George Donald Retires from BOD
- 23 MTI's Return to In-Person Meetings
- Piping Systems and Circuits EnhanceMechanical Integrity Programs
- Dual Laminate Program Provides Hands-on Learning Opportunity
- **30** PEKK and grafted PVDF
- MTI Associate Director Pradip Khaladkar Retires
- 35 Dale Keeler Hired as Associate Director
- 36 Project Champions Spotlight
- 38 Technical Bulletins Available for Public Download
- Last Call for 2022 Scholarship Applicants
- 48 MTI Launches Upgraded Technical Resource Library

ABOUT THIS PUBLICATION:

MTI CONNECT is published by the Materials Technology Institute, Inc. (MTI). MTI is a unique, cooperative research and development organization representing private industry. Its objective is to conduct generic, non-proprietary studies of a practical nature on the selection, design, fabrication, testing, inspection, and performance of materials and equipment used in the process industries.

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CALENDAR OF EVENTS:

AmeriTAC 137

February 28 & March 1, 2022 Orlando, FL

Global Solutions Symposium

March 1-3, 2022 Orlando, FL

AsiaTAC Spring Meeting

April 2022 Location TBD

EuroTAC Spring Meeting

May 17-19, 2022 Ludwigshafen am Rhein, Germany



PRACTICAL KNOWLEDGE AND INNOVATIVE SOLUTIONS FOR THE PROCESS INDUSTRIES



Letter from the 2022 Global Solutions Symposium Co-Chairs

Dear Readers:

As co-Champions for this Symposium, we would like to offer some guidance as to the valuable information and networking opportunities available to you by participating in Orlando in just a few short months.

The Symposium will begin on March 1 with an opening reception, and the learning tracks will take place over two days – March 2-3. As part of this special issue of MTI CONNECT, you will find the Keynote information, presentation information, where to find all the details and how to register online in the next few pages!

The schedule will feature presentations by technical leaders in the processing industries, as well as experts from academia and peripheral support industries. Our technical tracks include Sustainability, Additive Manufacturing & Emerging Technologies, Safety, Reliability & Maintenance, and High Temperature Damage Mechanisms. In addition, the Knowledge Management Track emphasizes how to work with Subject Matter Experts to expand,

maintain and preserve critical knowledge inside your company as changes in personnel and systems occur. Additionally, the global event will be preceded by the MTI Technical Advisory Committee (TAC) meeting on February 28, included with member registration.

Of course, the Symposium will feature the Global Solutions Market-place. The Marketplace is the hub for breakfast, coffee breaks, receptions and a special Casino Night, where participants can connect with exhibitors and other attendees throughout the event. Get a sneak peek of the 30-plus exhibitors (and growing), who will be available to network, answer questions and help you discover potential solutions.

We understand that your time is valuable and taking time away from your plant can be challenging, but the high-quality technical presentations and the opportunity to connect with other key subject matter experts will help you provide innovative solutions that improve the safety, sustainability, reliability, and profitability of your company.

For people managers, the knowledge management track will help you ensure valuable technical knowledge, skills, and expertise are maintained while facing the challenges of an aging and increasingly mobile workforce.

We are confident you will come away from the 2022 MTI Global Solutions Symposium with new information that will assist you and your company in meeting your technical and financial goals.

Please contact MTI if you have any Symposium-related questions at mtisymposium@mti-global.org. See you in Orlando!



Meghan Oaks BASF



Chuck Young *Tricor Metals*



PRACTICAL KNOWLEDGE AND INNOVATIVE SOLUTIONS

REGISTRATION

March 1-3, 2022 | Grand Caribe Convention Center | 8101 World Center Drive, Orlando, FL 32821

Get the 2022 MTI Symposium details at your fingertips—scan the QR code for quick access to registration, schedule, hotel, session info and much more!



Register

Symposium registration includes breakfast, lunch and receptions. AmeriTAC 137 registration is also included for MTI members. Early bird registration ends January 31, 2022. www.mti-global.org/mtisymposium/registration2022

	Early Bird	Regular	
Members	\$300	\$350	
Non-Members	\$600	\$700	

Accommodations

Caribe Royale Hotel
Group Rate: Starting at \$199/night
www.mti-global.org/mtisymposium/
hotel

Group Rate Deadline: February 3, 2022

GLOBAL SOLUTIONS MARKETPLACE

The Global Solutions Marketplace provides access to industry exhibitors. These industry experts will be showcasing their innovative products and services as well as answering questions on the latest solutions for processing industry plants.



Become an exhibitor—limited space is still available! Contact Kirk Richardson, Director of Sales and Marketing (krichardson@mti-global.org).



























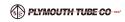




































FOR THE PROCESS INDUSTRIES

KEYNOTES

Refinery of the Future – Securing a Future through Integration Wednesday, March 2 Keith Couch, Honeywell Sr. Director of Global Technology Sales and Integrated Projects

In the past, refinery owner-operators have typically evaluated the worthiness of investment opportunities by using historical comparative analysis. This approach, however, assumes that the future will behave the same as the past. It also did not inform as to many of the tradeoffs inherent in an investment decision.

This reflective approach was also applied by traditional firms in historical markets. Markets are changing, and the hurdles have increased for access to cash. While the COVID-19 pandemic changed many aspects of daily life, it also created an environment in which investors and corporate boards accelerated their focus on Environmental, Social and Corporate Governance (ESG). It is no longer good enough for projects to simply have a strong financial return. Many projects now require a focus on decarbonization, carbon capture, utilization and sequestration (CCUS), incorporation of renewable feedstocks and/or plastic circularity to be bankable. This requires a different perspective on project development. It requires a new strategic framework and methodology that provides firms a better way to objectively



Keith Couch, Honeywell

quantify how well an investment opportunity will perform relative to six key resources: carbon, hydrogen, utilities, emissions, water—treated as a scarce resource—and capital.

As firms pursue increased efficiency, demand for fuels is projected to decline gradually, while demand for petrochemicals is forecasted to grow. This projected shift has stimulated innovations in technology that improve the economic prize for striking the optimal balance at each point in time.

The Refinery of the Future will have the flexibility to meet rapidly changing market needs—and integrate petrochemicals—to unlock additional value. Connected technologies will provide additional benefits through performance optimization. The Refinery of the Future provides a strategic and stepwise method to invest in new process technologies that target higher value uplift of distressed and merchant product streams. In this presentation, we will highlight recent advances in



Todd Hudson, Maverick Institute

crude-to-chemicals and provide some integration strategies that enable refiners to improve their economics in fuels markets, improve their market position through diversification into petrochemicals, or both.

Eliminate, Automate or Transfer? Create SME Knowledge Management Plans that Add Real Business Value

Thursday, March 3

Todd Hudson, Maverick Institute

The common thinking is that a Subject Matter Expert's (SME) knowledge must be transferred to another person to continue being valuable. But concepts like Lean and new technologies like Artificial Intelligence (AI) give organizations two additional powerful options to pursue. The keynote will present an overview of these three alternatives, their pros and cons, and how to determine the best path to pursue.

5

SCHEDULE OF EVENTS*

MONDAY, FEBRUARY 28				
12:00 – 1:00 PM	MTI AmeriTAC Lunch			
1:00 – 5:00 PM	MTI Projects — MTI Members Only or by Invitation			

TUESDAY, MARCH 1				
7:00 AM – 7:00 PM	Registration Open			
7:00 AM – 8:30 AM	MTI Member Breakfast — MTI Members Only or by Invitation			
8:30 AM – 4:00 PM	MTI Projects & AmeriTAC 137 — MTI Members Only or by Invitation			
2:00 – 4:00 PM	Exhibitor Set-up			
4:00 – 6:30 PM	Welcome Reception in the Global Solutions Marketplace			

	WEDNESDAY, MAR	CH 2				
7:00 AM - 6:00 PM	Registration Open					
7:00 – 8:00 AM	Informal Group Run — Open to Everyone					
7:00 – 8:30 AM	Breakfast & Global Solutions Marketplace					
8:30 – 9:30 AM	KEYNOTE — Refinery of the Future — Securing a Future Through Integration — Keith Couch, Honeywell					
9:30 – 10:00 AM	Break & Global Solutions Marketplace					
	TRACK: EMERGING TECHNOLOGY / ADDITIVE MANUFACTURING	TRACK: SUSTAINABILITY				
10:00 – 10:30 AM	ASME Code Acceptance of Additive Manufacturing (Page 9)	Integrity Operating Windows API584 (Page 11)				
10:30 – 11:00 AM	RFID Wear Monitoring (Page 10)	The Green Scorecard — Measuring ROI in Sustainability Initiatives (Page 11)				
11:00 – 11:30 AM	Revolutionary Technology for Surface Cleaning (Page 10)	Using Life Cycle Cost Analysis to Increase Operational Sustainability (Page 12)				
11:30 AM – 12 PM	Fuse Ring Welding (Page 9) How to Reduce Hydrogen Embrittlement in Titanium A					
12:00 – 1:30 PM	Lunch & Global Solutions Marketplace					
	TRACK: SAFETY / MAINTENANCE / RELIABILITY TRACK: HTHA / HIGH TEMPERATURE DAMAGE MECHANISMS					
1:30 – 2:00 PM	Systems and Circuits: Attaining Piping Inspection Efficiency (Page 13)	Insights from Creep Testing of Service Exposed Components (Page 14)				
2:00 – 2:30 PM	Damage Mechanisms Review: Cornerstone of Mechanical Integrity (Page 12) High Temperature Oxidation Performance of Sanicro 25 (Page					
2:30 – 3:30 PM	Break & Global Solutions Marketplace					
	TRACK: SAFETY / MAINTENANCE / RELIABILITY	TRACK: HTHA / HIGH TEMPERATURE DAMAGE MECHANISMS				
3:30 – 4:00 PM	Materials of Construction to Mitigate MIC Corrosion and Improve Sustainability (Page 13)	Thermal Mix Points — Developing Criteria for Using Sleeved Mixing Tees (Page 15)				
4:00 – 4:30 PM	UNS N08935 and UNS N08028, High Corrosion Resistance for Reactor Effluent Air Coolers in Hydroprocessing Units (Page 13)	Determining Inspection Intervals for Equipment at Risk of High Temperature Attack (Page 14)				
4:30 – 10:00 PM	RECEPTION AND CASINO NIGHT IN TH	E GLOBAL SOLUTIONS MARKETPLACE				



THURSDAY, MARCH 3							
7:00 AM — 1:00 PM	Registration Open						
7:00 – 8:30 AM	Breakfast & Global Solutions Marketplace						
8:30 – 9:30 AM	KEYNOTE — Create SME Knowledge Management Plans tha	KEYNOTE — Create SME Knowledge Management Plans that Add Real Business Value — <i>Todd Hudson, Maverick Institute</i>					
9:30 – 10:00 AM	Break & Global Sol	Break & Global Solutions Marketplace					
	TRACK: KNOWLEDGE MANAGEMENT	TRACK: HTHA / HIGH TEMPERATURE DAMAGE MECHANISMS					
10:00 – 10:30 AM		DetaClad Characterization for High Temp and High Pressure Hydrogen Service (Page 14)					
10:30 – 11:00 AM	Knowledge Management Workshop: Eliminate, Automate or Transfer? Create KM Plans that Add Real Business Value	New Insights on the High Temperature Resistance of UNS N08800, S30815 and S31009 Alloys (Page 15)					
	Todd Hudson, Maverick Institute (Page 9)	TRACK: SUSTAINABILITY					
11:00 – 11:30 AM		Improving the Performance, Reliability and Safety of Process Facilities through the Use of Aerogel Based Insulations (Page 11)					
11:30 AM – 12 PM	Measuring ROI in Knowledge Management (Page 8)	Case Studies for Non-Metallic Materials in the CPI (Page 10)					
12:00 – 1:30 PM	Lunch & Global Solutions Marketplace						
	TRACK: KNOWLEDGE MANAGEMENT TRACK: EMERGING TECHNOLOGY / ADDITIVE MANUFACTURING						
1:30 – 2:00 PM	Best Practices for Working with SMEs (Page 8)	Accelerating Adoption of Robotics for Inspection and Maintenance (Page 9)					
2:00 – 2:30 PM	Transforming Technology in Manufacturing (Page 9)	Lessons from COVID: Virtual QA Inspections to Increase Efficiency, Saving Time and Money (Page 10)					
2:30 – 3:30 PM	Break & Global Solutions Marketplace						
	TRACK: KNOWLEDGE MANAGEMENT	TRACK: SAFETY / MAINTENANCE / RELIABILITY					
3:30 – 4:00 PM	Active Books on Corrosion: Novel e-Book Technology (Page 8)	CCD as Foundation Elements of FEMI (Page 12)					
4:00 – 4:30 PM	Pyrophoric FeS — Case Histories and an Overview of a Classic Problem (Page 9)	Sustainable Use of DSS in Storage Tanks (Page 13)					

^{*} Subject to change.

TRACK DESCRIPTIONS



KNOWLEDGE MANAGEMENT TRACK

Active Books on Corrosion: Novel e-Book Technology

Walter F. Bogaerts, Boaerts, University of Leuven (Belgium)

Corrosion and materials knowledge management – including knowledge transfer – is becoming increasingly important with our aging plants (and workforce) in the chemical process industries. New training tools and facilities are often needed to facilitate transfer of knowledge and know-how, to ensure continued safe operation of our plants. New state-of-the-art information & communication technologies could provide significant help and opportunities. The authors have developed a new information technology (IT) environment, which provides a novel kind of "cross-over" between 'print' and advanced 'e-books'. These "Active Books on Corrosion" give the natural look-and-feel of a traditional text book (incl. browsing, super-realistic page turning, etc.) as well as all the possibilities of the most advanced e-books, such as in-page display of video and animated graphics, multi-lingual subtitles/closed captions with these videos, page and figure zoom facility (e.g., magnification of micrographs), various browsing methods and full-text search, database access, personal notes and annotations, etc. The presentation will demonstrate a few examples, such as a course dealing with Corrosion and Corrosion Types, and a training module on Materials Selection for the Chemical Process Industries.

Best Practices for Working with SMEs

Peggy Salvatore, Working with SMEs
Based on the progress of this unique Knowledge
Management project, Ms. Salvatore will present early
findings on the research she and the MTI Project Team
are conducting on Best Practices for Working with SMEs.
The presentation will include: the project design,
components, findings and accomplishments to date,
items to be completed, Q&A and feedback, and action
items from the presentation that require response or
integration into the project moving forward.

Measuring the ROI in Knowledge Management

Patti P. Phillips, Ph.D., ROI Institute Heavy investments in knowledge management have led to some concerns about the value of knowledge management. "Does it deliver value?" "Is it helping our organization deliver enough business value to justify its investment?" Some organizations spend millions of dollars on a knowledge management system—only to have the investment challenged by senior leaders with the question, "What's the ROI?" This session will describe how to measure the success of investing in knowledge management. This starts with building measurements into the process—resulting in convincing and compelling data that executives want and appreciate. This also requires a proactive approach to implementation and not waiting for the request to show the ROI after the project is implemented. This session will highlight a case study where the actual ROI was calculated on a knowledge management project.

Pyrophoric FeS – Case Histories and an Overview of a Classic Problem

Cathleen Shargay, Fluor Jorge Penso, Shell

In the refining industry, damage from pyrophoric iron sulfide (FeS) has been reported sporadically for many years as shown by the compilation of case histories in this presentation. The typical manifestation is a fire inside equipment during turnarounds, and the ramifications vary from minor smoking, to bulging of vessel shells, to a tower falling over. The case history summary lists the unit, type of equipment and relevant internal components, estimated process details, and outcomes of the pyrophoric FeS fire. Further discussion is then presented on the implications of different base materials, and the typical turnaround cleaning practices to avoid these fires. The purpose of the presentation is to help in predicting the conditions that could lead to pyrophoric FeS formation, and to allow proper cleaning steps to be implemented proactively.

Transforming Technology in Manufacturing

Robert Epperly, Webco Industries

Manufacturing has long been perceived as a blue-collar industry where hard work and sweat were considered the norms. People didn't want bells and whistles or advanced technologies, they just wanted to produce products. Now, new tools and technologies like 3D, virtual reality, and augmented reality are becoming more common place. We will share some of the original content created in 2011/2012 and then compare it with how we are delivering training now in 2021, including graphics, videos, 3D, and augmented and virtual reality content.

Workshop – Eliminate, Automate or Transfer? Create SME Knowledge Management Plans That Add Real Business Value

Todd Hudson, Maverick Institute

As a follow-up to the Knowledge Management keynote, this workshop will give participants a hands-on opportunity to more fully understand, and even start to create, a knowledge management plan that helps them determine which knowledge to eliminate, automate or transfer. Time will be allocated (most to least) in this order: transfer, eliminate, then automate.

EMERGING TECH/ADDITIVE MANUFACTURING TRACK

Accelerating Adoption of Robotics for Inspection and Maintenance

Steven Trevino, Sprint Robotics

The SPRINT Robotics Collaborative drives visibility to significant gaps where technology can be leveraged to fill the gap. Significant opportunities are addressed by first identifying the issue, developing solutions, qualifying and validation its performance, performing on-site trials, and comparing results versus the traditional method. Our Action Groups (AG) facilitate this process to author industry best practice documents aimed at eliminating significant barriers for deployment. This presentation will highlight our recently released guidelines and provide updates on our Strategic Roadmap, Robotic Comparison Reports, and our first Standardized Test Methods in collaboration with NIST.

ASME Code Acceptance of Additive Manufacturing

Ben Sprengard, Enerfab

Rick Sutherlin, Sutherlin Consulting
Enerfab, Sciaky, and Sutherlin Consulting are currently requesting an ASME Section VIII Code Case for using Titanium for pressure boundary parts using the Electron Beam Direct Energy Deposition Wire Fed Additive Manufacturing Process. The presentation will demonstrate why the Code Case is important to the industry, the process for requesting the Code Case, and applications for Electron Beam DED. We will also describe the Electron Beam DED process and its advantages.

Fuse Ring Welding

Paul Cheng, FuseRing.com

Joining metal without heat affected zones has been proven and accepted into ASME IX code case. The characteristics include fine grain base to base with no fusion line (not friction), no residual stress, and resists embrittlement. The Weld OD, ID in uniform compression technique opens a new branch of manufacturing with one limitation—one part is stationary, the other half rotates. How do you join the last joint? Resolution: this technique can be applied for flat, curved and tubular geometry, especially for cladded pipe. One major area for exploration is joining thick sections of aluminum.

9

TRACK DESCRIPTIONS

Lessons from COVID: Virtual QA Inspections to Increase Efficiency, Saving Time and Money

Pete Philippon and Lindsey Yungen, Tricor Metals During the last 18 months of the COVID-19 pandemic, Tricor Metals has worked with customers to develop a new way to facilitate meetings and inspections—a way that does not require face-to-face meetings. With the new virtual platforms (Zoom, Microsoft Teams, etc.), it is now possible to conduct meetings with customers/ inspectors in multiple sites without the need for extensive travel and waste of time. This presentation will discuss some of the ways that Tricor Metals has worked with a CPI company and the ASME inspectors to meet everyone's obligations for ensuring quality while being more efficient—saving time and money. The discussion will begin with kickoff meetings and specification reviews and work all of the way thru the final detailed inspection including hydro or other non-destructive testing required of a CPI fabrication. As these new methods become more developed and standardized, they will result in a significant savings to all of the parties involved in the QA inspection of fabrications.

Revolutionary Technology for Surface Cleaning

Tracy Anderson, Sonomatic

Patented laser technology clears away undesired material from a solid surface by irradiating it with a laser beam and preparing the surface for visual inspection, non-destructive testing and maintenance requirements. By absorbing the energy of the laser beam, the molecules of the targeted material are excited very quickly, making it break apart and ablate or vaporize off the surface. As the surface below does not absorb any energy, it remains unaltered. Cleaning with a laser means there are no chemicals involved, no danger of this type of cleaning doing any harm to the parent material. Any hazardous waste left from the ablation process (microns) is contained and filtrated via our HEPA and Active Carbon filtration system.

RFID Technology for Wear Monitoring of Non-metallic Pipes

Soon Moon, Syncrude Canada

Due to excellent wear performance and corrosion resistance, the use of non-metallic pipe components has been increasing in Canadian Oil Sands, and examples include rubber hoses and elastomer-lined pipes. Monitoring of liner thickness is critical for asset integrity management; however, limited technologies are available for non-metallic pipes. Syncrude Canada Ltd. developed a novel wear monitoring technology using radio frequency identification (RFID) tags, where liner wear can be monitored by scanning the embedded RFID tags. This technology has been successfully demonstrated with pilot- and commercial-scale rubber hoses. Syncrude Canada Ltd. has been collaborating with National Research Council in Vancouver to further develop a remote sensing system. This presentation covers the monitoring principles, field trials, and lessons learned throughout the development process.

SUSTAINABILITY TRACK

Case Studies for Non-Metallic Materials in the CPI

Michael Ye, RTConsults

Non-metallic materials use in industrial plants pertaining to piping and tanks can perform well in a corrosive environment with proper oversight. The design, fabrication, inspection, and maintenance of nonmetallic construction are important key requirements. Furthermore, qualification of materials and testing is necessary to complement the specification and material selection for optimum performance. In addition, the presentation will go into case studies and lessons learned from successful projects covering the importance of inspection and quality assurance for reliable service life.





The Green Scorecard – Measuring ROI in Sustainability Initiatives

Dr. Jack J. Phillips, ROI Institute

When global warming first made headlines in the 1980s, it stirred up concern and public debate throughout the world. Still, business leaders resisted the issue, expecting a high price tag to address the problem. While most agreed that climate change was occurring, views differed regarding its origins, and finding solutions was not a priority to many business leaders. Today, however, most (if not all) organizational leaders recognize that climate change must be addressed. Some are making great strides to solve it, resulting in a wave of sustainability and environmental projects. From an organizational perspective, going green offers employees, contractors, volunteers, and citizens the opportunity to influence this green movement through involvement and contribution. The challenge is to create the correct approach to involve stakeholders, including teaching, persuading, communicating, enabling, supporting, and encouraging participation in the process. And, most of all, a process must be in place to measure success with impact and ROI.

How to Reduce Hydrogen Embrittlement in Titanium Alloys

Elise Deloye, Neotiss

High hydrogen content in titanium alloys induces a modification of the mechanical properties, which can generate a premature rupture of the material. The study carried out within NEOTISS, in collaboration with two French university laboratories (ICB and UTINAM), aims to reduce the phenomenon of hydrogen embrit-tlement by applying different industrial processes, such as cold rolling, shot peening, anodization, and thermal treatment. The main targeted application is to protect titanium grade 2 tubes in specific heat exchanger environment, like in high conductivity brackish water conditions. Based on results, scenarios about hydrogen move and/or hydrogen preferred location will be proposed and discussed.

Improving the Performance, Reliability and Safety of Process Facilities Through the Use of Aerogel Based Insulations

Chase Tanner, Aerogel

For decades, the industrial insulation materials available relegated thermal insulation to design purgatory, necessary but little more than a box checking exercise. Designers understand these materials have a profound impact on the installed cost, construction schedule, performance and safety of the facilities they design and operate, but with scant alternatives, the same materials were specified and used. With the introduction of Aerogel based insulations, designers can specify products that install faster, have greater durability and significantly reduce the instance of corrosion under insulation (CUI)—a major industry reliability problem. These conclusions are shown by the test data and experience included in this presentation. The reduced insulation thicknesses with equal thermal performance are also beneficial in reducing the required clearances, which can be critical on revamp projects with spacing limitations or in reducing the required size of pipe racks. These next generation thermal, acoustic and passive fire protection materials provide bottom line value and unique design capabilities to the hydrocarbon process facility engineer, owner and operator.

Integrity Operating Windows API584

Clay White, Becht

This presentation will cover an outline and discussion of the key principles from the document in establishing an Integrity Operating Windows (IOW) program and cover the changes from the recently updated 2nd Edition. RP 584 represents a significant departure from the traditional inspection program approach by proactively focusing on, and trending, the operating conditions that can produce equipment damage. Originally released in 2014, RP 584 has been significantly improved and now includes multiple appendices covering examples of process variables by unit (most of which are refinery units, but it does include one example of a chemical process unit). In addition, examples are provided for specific utilities services and equipment types which will be reviewed. Furthermore, a list of common mistakes or "pitfalls" that have been found during the implementation of IOW programs, has been included and will be covered in this presentation. One of the conclusions from this presentation will be to highlight the need for additional development of examples for typical process units in the chemical industry for a potential MTI project.

11

TRACK DESCRIPTIONS

Using Life Cycle Cost Analysis to Increase Operational Sustainability

Pete Philippon and Dennis Lamberth, *Tricor Metals* When analyzing expenditures for process equipment, CPI companies have the opportunity to use accounting tools to determine which of the various options can make the most sense – in terms of long-term profitability and sustainability of a particular plant.

Companies can use "Life Cycle Costing" to develop the real impact of the decision on the sustainability of the chemical plant by comparing initial capital outlay with the actual total cost of a decision over the life of the plant. This presentation will briefly discuss what is involved in "Life Cycle Costing" for CPI equipment. This includes the initial cost of equipment, the cost of money or anticipated rate of return for capital, and the cost of maintenance in terms of actual labor, as well as the cost of planned or unplanned downtime. Company executive management, engineering and operations must agree on how often maintenance has to occur, and to what degree it has to be done. A projection of the rate of inflation is also required. Finally, the company must develop an anticipated life for each piece of equipment. Specific examples of how "Life Cycle Costing" can be used to make an informed decision will be shown and a spreadsheet showing how to do the "Life Cycle Costing" analysis will also be presented for attendees going forward.

SAFETY/MAINTENANCE/RELIABILITY TRACK

CCD as Foundation Elements of FEMI Matthew K. Caserta, P.E., Becht

Corrosion control documents (CCDs) have gained widespread use as an essential element of a high-functioning fixed equipment mechanical integrity (FEMI) program. First developed in the refining industry, these documents are seeing increased usage in the wider chemical process industry. CCDs tie together process operations and conditions, materials of construction, damage mechanisms, inspection requirements, integrity operating windows (IOWs), and other items into a comprehensive document that provides the necessary information for an effective FEMI program. Even when not required in a jurisdiction, CCDs are becoming recognized and generally accepted good engineering practice. This presentation will discuss key elements of a CCD program as defined in API 970 – Corrosion Control Documents, as well as industry best practices for implementing and maintaining a comprehensive damage mechanism assessment program.

Damage Mechanisms Review: Cornerstone of Mechanical Integrity

Nina Young, Chevron Phillips Chemical LP Clay White, Becht

A damage mechanism review (DMR) forms the basis for our most key mechanical integrity (MI) programs. This presentation will focus on the importance of that review and the integration of results into MI programs, including Integrity Operating Windows, Risk Based Inspection, Piping Systemization and Circuitization and ultimately inspection strategy development. For most companies, these key MI programs have been typically managed independently as a "one-off" system or efforts, where the results from one program are not typically utilized in other programs. The presentation will discuss the importance of integrating these programs primarily through the DMR process. A discussion and examples on the different levels of detail and data requirements to support these programs will be provided (e.g. a DMR executed as part of an RBI program will have different requirements and information produced than one developed for an IOW program). In addition, the importance of standardizing results to maintain consistency from both a corporate perspective (for multiple sites) and at the site level (for multiple units) will be discussed. Examples of template spreadsheets for the collection of data, corrosion and materials diagrams and others will also be reviewed.

Materials of Construction to Mitigate MIC Corrosion and Improve Sustainability

Chuck Young and Dennis Lamberth, Tricor Metals This presentation will briefly discuss the mechanisms behind MIC Corrosion and how to determine which may be the ultimate problem in a system. Sulfate reducing bacteria (SRB), acid producing bacteria (APB), iron reducing bacteria (IRB), as well as multiple types of algae can be found in water systems associated with chemical process heating and cooling systems. All of these, alone or in combination with each other, can result in significant MIC corrosion. To mitigate or eliminate the possibility of MIC corrosion, a CPI engineer must understand these mechanisms and how they interact with other design features of the system – in order to determine which material of construction can be successfully used in a chemical plant's water system. The resistance to MIC corrosion of common materials and design of construction used in the CPI will be discussed to show how the initial right choice in materials and design details can dramatically influence the plant profitability and the operations' sustainability. These design details, as well as materials including stainless steel, duplex stainless steel, nickel alloys, copper/nickel alloys and titanium, will be discussed – with key advice as to how to minimize MIC corrosion. Specific examples of MIC corrosion will also be shown, as well as its effects on the plant operation and how the issue was resolved to the benefit of the plant's reliability.

Sustainable Use of DSS in Storage Tanks Claes Tigerstrand, Outokumpu

What is the optimal material solution for a process equipment to be considered as sustainable over the whole life cycle? Let us identify key factors in the material selection and how they influence adequate performance metrics. A large storage or process tank is used as application case comparing the performance of carbon steels vs. duplex stainless steels. Potential factors to be addressed spanning from material utilization, corrosion protection, fabrication complexity, safe and reliable service to decommissioning and recycling, and how they in turn affect the environmental footprints, resources and cost. The limiting conditions for the comparison are set by the applicable design and fabrication practices using established assessment methods

Systems and Circuits: Attaining Piping Inspection Efficiency

Isaac O'Brien, The Equity Engineering Group The petroleum and chemical process industries continue to have more loss of containment incidents related to process piping than all other pressure equipment combined. Systems and circuits, when correctly applied to plant piping, offers ease of management, optimized corrosion monitoring, improved damage detectability, and improved mechanical integrity. Existing plant inspection strategies may not effectively target the anticipated damage mechanism, resulting in financial waste. Conducting a systems and circuits project will be described in detail with visual examples of past implementation. Defining the project scope, execution of the workflow, as well as typical deliverables will be discussed. Systems and circuits offer an excellent solution to capture and effectively manage plant piping so that safety and reliability are maintained.

UNS N08935 and UNS N08028, High Corrosion Resistance for Reactor Effluent Air Coolers in Hydroprocessing Units

Karen Picker, Sandvik

Hydroprocessing reactor effluent air coolers (REAC's) are highly demanding applications due to the array of corrosion challenges they encounter. Whether they are in service in traditional hydrocarbon units dealing with ammonium bisulfide (NH, HS) corrosion or in emerging technologies used in renewable diesel units dealing with fatty acids and high chlorides corrosion, the metallurgical challenges for these bundles demand the use of expensive high nickel alloys such as Alloy 825 and Alloy 625. Utilizing existing laboratory methodology, the corrosion performance of UNS N08935 and UNS N08028 have been tested and compared with other established alloys commonly used for these applications. Tests have been performed in organic acids, H2_s-dominated environments with different NH, HS concentrations, and high chloride environments. Results will be presented to demonstrate these alloys superior performance to traditional metallurgies used in Hydroprocessing applications.



TRACK DESCRIPTIONS

HTHA/HIGH TEMP DAMAGE MECHANISMS TRACK

DetaClad Characterization for High Temp and High Pressure Hydrogen Service

Olivier Sarrat, NobelClad

When it comes to considering high temperature damage mechanisms, one of the most challenging examples is related to heavy wall pressure vessels that operate at high pressure with hydrogen containing fluids. Thick wall pressure vessels often have an austenitic stainless-steel lining to protect the inner side from corrosion or exposure to hydrogen at high temperature and pressure that could result in stress corrosion cracking. In addition to the embrittlement of the carbon steel due to Hydrogen propagation in grain boundaries generating cracks, disbonding on the cladder interface can occur after reactors cool down when operating at these stringent conditions. Whether end users must address corrosion cracking or cladding disbonding, the cost of downtime or maintenance work on these pressure vessels is costly and restricts total output. The purpose of this presentation is to present findings from a study around characterizing the DetaClad Explosion bonded interface while under these extreme operating conditions. This presentation will cover various test protocols such as mechanical and disbonding tests that were conducted. The tests from this study benefit the most common reactor designs for various post weld heat treatment and welding internal supports.

Determining Inspection Intervals for Equipment at Risk of High Temperature Attack

Nathaniel Sutton, *The Equity Engineering Group* High Temperature Hydrogen Attack (HTHA) has been a recent area of focus for numerous industries, including fertilizer, petrochemical, refining, and others. Guidance regarding non-destructive examination (NDE) for HTHA has recently been updated in API RP 941, 8th Ed., Addendum 1 (2020). Ongoing work by MTI seeks to further optimize these techniques. Many owner-operator companies are inspecting equipment flagged as at-risk for HTHA. If the inspection demonstrates that no significant HTHA is present in the equipment, mechan-

ical integrity professionals must then identify the interval until the next inspection. Considering the time-dependent progression of HTHA damage, this may prove challenging. This presentation will focus on the method applied by E2G to establish inspection/reinspection intervals for equipment in HTHA service. The processes for (1) identifying equipment to be inspected, (2) determining the appropriate coverage and sensitivity needed for inspection, and finally (3) determining frequency of inspection will be demonstrated on example equipment. It will be shown that a quantitative approach can be used to set intervals, which considers both volumetric HTHA as well as the growth of crack-like-flaws due to HTHA. Application of this methodology is intended to allow users to balance the costs of repeat inspections with the risk of failure or loss-of-containment due to HTHA.

High Temperature Oxidation Performance of Sanicro 25

Luiza Esteves, Sandvik
Sanicro 25 (UNS S31035) is an austenitic
22Cr25NiWCoCu stainless steel material with
excellent high temperature properties that can be
applied in supercritical carbon dioxide (sCO₂), supercritical water as well in superheater and steam boilers
employing different fuel types. The material has been
specifically developed for applications up to around
700°C (1300° F) and has high creep strength, good
steam oxidation resistance, good flue gas corrosion
resistance, structural stability, good fabricability, and
weldability. The aim of this work is to compare the
corrosion performance of the main alloys used in sCO₂
and steam oxidation with Sanicro 25 as an interesting
option in higher pressure/temperature applications

Insights from Creep Testing of Service Exposed Components

Arun Sreeranganathan, Ph.D., P.E.,

Stress Engineering Services, Inc

Creep is one of the most common damage mechanisms of concern at elevated temperatures. Creep testing of service-exposed material is a valuable tool in extending the service lives of high temperature components. Often,

sample removal and creep testing are carried out in the event of operational upsets or anomalies leading to the component being exposed to temperatures far in excess of typical operating conditions, raising concerns about significant creep damage accumulation in the material. This presentation will focus on degradation in the creep properties of various alloys from long-term service under normal operating conditions as well as short-term exposure to higher temperatures due to operational upsets. Results from metallurgical assessment and creep testing of virgin and service-exposed materials will be used to try to correlate microstructural changes with the creep properties.

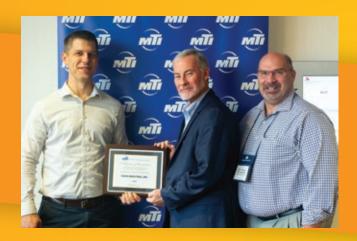
New Insights on the High Temperature Resistance of UNS N08800, S30815 and S31009 Alloys

Sandra LE MANCHET, Industeel – ArcelorMittal This presentation will provide new results on the high temperature corrosion resistance of several heat resistant stainless steels. The materials investigated in this study are UNS N08800 (800H), S30815 and S31009 (310S). The high temperature tests were conducted in gaseous environments representative of industrial applications, such as waste incineration, fuel combustion and chemical reactors / furnaces. A first series of trials was performed in 20% oxygen and 80% nitrogen gas mixture at 1000°C (1830°F), both in isothermal and cyclic conditions. A second series was conducted in a gas mixture of oxygen, carbon dioxide and water, containing hydrochloric gas and sulfur dioxide contamination in the temperature range between 500°C (930°F) and 800°C (1470°F). Special attention will be paid to the formation and adherence of the protective layer formed at the surface of the steels and to the influence of the alloying elements on the heat resistance, particularly silicon, aluminum, titanium and rare earth elements. Scanning electron microscope observations linked to X-ray diffraction analyses will be provided to support the results.

Thermal Mix Points – Developing Criteria for Using Sleeved Mixing Tees

Cathleen Shargay, Fluor Jeremy Nelson, Koch Industries Garry Jacobs, Fluor

Past references have highlighted that process mixing points with "delta temperature (ΔT)" exceeding certain thresholds will have risk of fatigue cracking, which is typically avoided by installing a sleeved thermal mixing tee. In reality, the risk of cracking is influenced by numerous additional variables, particularly the fluid or vapor properties, the relative flow rates, and any mechanical pulsations in the flow of the parent streams, as well as the piping materials of construction and layout. Research into predicting delta T limits for thermal fatigue and thermal shock mitigation, considering the additional variables, has progressed in both the nuclear and refining/petrochemical industries, but firm guidelines are still not available. This presentation will briefly summarize key literature references from these industries and show examples of failures due to both mechanical and thermal fatigue in order to advance industry awareness of the issues. Typical sleeved mixing tee design features are also described, and the benefits of adding a static mixer within the sleeve for the most severe delta T's are highlighted, along with examples of unit designs with these conditions. •













David Barber (Dow), MTI Chair, presents the MTI Anniversary plaques at AmeriTAC 136 in Atlanta, Georgia.

Top left: Jeremy Nelson (left) and Matt Thayer (right), Koch Industries. Top right: William Paden, Ascend Performance Materials.

Middle left: Wendy McGowan, Neotiss. Middle right: Adam Renstrom (left) and Chris Grice (right), Ward Vessel & Exchanger.

Bottom left: Edgar Vidal (left) and Steve Mabry (right), NobelClad. Bottom right: Tony Palermo, New Castle Stainless Plate.





COMMEMORATING COMMITMENT



MEMBER GOAL VISION FOR TEAMWORK SUCCESS

ELEVEN MEMBERS CELEBRATING MTI ANNIVERSARIES IN 2021

ne of the best measures of MTI's value as a technical community is the ongoing commitment of its members. Not only do company representatives take on leadership roles in short- and long-term projects, but they bring new ideas to its Project Development Committees (PDCs) with the power to impact materials engineering issues in the Process Industries.

As time management guru and author Steven Covey once put it, "The key is in not spending time, but in investing it." In 2021, eleven companies are celebrating their long-term investments in MTI membership. That impressive list includes one 40-year (see page 18), five 20-year, two 10-year, and three 5-year anniversaries (see page 19).

All were honored during a recent ceremony held at AmeriTAC 136 in Atlanta, Georgia.

Times Passes Quickly

Some members were caught by surprise when notified that their company had reached a major milestone so quickly. "Is it really 20 years already?" asks Maria Jose Landeira Oestergaard, who has led a number of projects and MTI's Board of Directors while acting as Haldor Topsoe's Designated Representative. "Time passes quickly in good company—as we say in Danish."

"For Topsoe, MTI means, first of all, a strong resource of reliable know-how not available elsewhere, simply because member companies are represented by specialists who have been in the field and have both theoretical and practical experience," explains Oestergaard, Haldor Topsoe's Senior Manager, Mechanical Department, Global Supply Unit. "This is only possible because of the culture of MTI and because of the extraordinary individuals willing to share this knowledge and experience."

MTI has also provided both Oestergaard and her colleague Anette Nørgaard Hansson with opportunities to use and improve their leadership skills. "Both Anette and I have gotten the opportunity to serve in leadership positions at EuroTAC and on the Board, which has contributed not only to technical but also to personal development."

COMMEMORATING COMMITMENT

In fact, Oestergaard was MTI's first non-American and female Chair. "That was a great challenge and a very rewarding experience," she adds.

"We have also benefited from many projects, but also from networking with other materials specialists, sharing ideas, and listening to others." Oestergaard provides an example of how being part of a network of industry experts paid off in recent years. When Haldor Topsoe's stainless steel nitric acid reactors corroded much faster than expected due to presence of specific corrosion-accelerating components in the liquid, they turned to a fellow MTI member for help. "NobelClad provided webinars to convey the necessary knowledge for Haldor Topsoe to make an appropriate material selection and tank design," she reports. This collaboration earned both companies an MTI Value Award.

NobelClad, a member of MTI since 2001, has realized at least as much value as it has delivered over the last 20 years. Edgar Vidal, Vice President of Marketing and Business Development, acknowledges that the international clad and composite metals company values being part of a worldwide materials engineering community. "Being a corporate member of a professional society is not only an opportunity to expand business contacts that can ultimately lead to increased revenue, but also learn from global industry leaders," he points out. "The social responsibility to expand the industrial know-how of different regions of the world is a staple for MTI members. Understanding what critical issues and concerns the industrial stakeholders are navigating is important for the proper allocation of time and resources."

Twenty years has provided NobelClad with plenty of chances to participate, and its representatives have made the most of those opportunities. "NobelClad has been actively monitoring the forum to assist member companies when they have questions that have or may have a clad solution," mentions Vidal. "We have also participated in the education of members with webinars like 'Introduction to **Explosion Cladding for Chemical** Processing & Refining Applications.' With other industry leaders, we have participated in the writing of chapters for books like 'Best Practices for Reactive and Refractory Metals' and 'Guidance for Failure Mechanisms,' to name a couple."

Project participation isn't the only thing that keeps NobelClad coming

ALBEMARLE CELEBRATES 40-YEAR ANNIVERSARY AT MTI

When Albemarle joined MTI way back in 1981, the four-year-old organization had just started work on Project #23, preparation of a manual on Bolted Closures for the Chemical Process Industries and had just launched a live forum to discuss technical problems at its March TAC meeting.

Four decades and many projects later, one of MTI's longest remaining members is still a major contributor to the technical community that it helped build. In fact, Albemarle's Designated Representative, Hardin Wells, was Project Co-Champion of the recently published "Best Practices for Reactive and Refractory Metals in the CPI" book.

Despite the significant work that Wells put into the publication, he



cites the project as the most recent example of Albemarle benefitting from MTI membership. "Taking a champion's role on a big project of this nature is most certainly a high value activity," he explains. "Not just in terms of being able to steer the project team's efforts to maximize the value to the champion's company, but also in developing leadership and teamwork skills for the champion and even for the rest of the team. And finally, in building or advancing subject matter expertise for all who participate. It truly is a win for the company, a win for MTI, and a win for our industry in the end."

Wells, who has been a leader of and key contributor to many other MTI Projects since he first started coming to MTI meetings in the early 1990s, is proud of his company's participation in this unique Materials Technology Institute. "Understanding that Albemarle has been involved as a member of MTI for such an extended period of time, is truly an impressive achievement - one that is undoubtedly the result of the commitment and passion of several generations of technical experts and an endearing appreciation of the great value that MTI brings," he notes. "It is an honor



back. "MTI has been an influential channel for NobelClad in not only presenting our thought leadership and innovation, but also providing a venue to develop strategic partners around the world," observes Vidal. "Collective intelligence is imperative to NobelClad's success, and MTI is a key component to driving positive change in the industry."

Jacob Rodriguez, Technical Sales Engineer and Metallurgist at Corrosion Materials, which is celebrating its 20th year as a member, says that being a part of MTI has really helped him become more familiar with aspects of the Chemical Processing Industry that he wouldn't have been exposed to otherwise. "The forum has proven to be an invaluable resource to me," he says. "As the technical materials expert at Corrosion Materials, I have leaned on the wide knowledge base of the membership for answers and suggestions to different situations that I did not have the experience to answer on my own. The MTI library alone is impressive and on par with other top technical resources available in the industry." Rodriguez adds that Corrosion Materials has established great relationships with current and former member companies, and MTI continually proves to be a good investment. "We are honored to be a part of one of the top technical organizations around the world."

The Future is Already Here

Jeremy Nelson, Fixed Equipment Engineer, Operations Excellence at Koch Ag & Energy Solutions, recognizes the value his company has realized in 10 years of membership but is also looking forward to what is next. "The projects we have worked on in MTI have helped us answer some internal questions, but also the relationships in MTI have improved our ability to run our plants safely and reliably," states MTI's current AmeriTAC Chair. "Many technical problems are not going to be solved or disappear in a year, so a decade feels like we have made some progress. But also, in comparison to the projects that the 30- and 40-year member companies have been involved in, it is clear that there is a lot more value to be gained from the membership going forward."

MTI projects have provided Nelson and his colleagues with insights into what might be possible improvement opportunities for many areas of Koch's business. "On a risk management front, MTI projects such as Carbonate SCC in Alkaline Sour Waters, Stress Relaxation Cracking #291, and Duplex REACS, MI of Structures #275, the various 20Cr32Ni projects, etc. have been valuable," he notes. "On a materials discovery front, the Additive Manufacturing roundtable and the HTHA roundtable have been good insights into the realm of the possible. And the forum discussions have helped us learn from the materials producers and the other operators. The combination of the technical knowledge share from both producers and suppliers is usually more relevant and valuable than what is shared in the wider industry forums."

What you do know can help you. "A lot at MTI is uncommon knowledge in the industry," maintains Nelson. "Sometimes when we use an MTI report to justify a materials selection or repair decision in the plant, it feels like opening a time capsule. You kind of have to explain how a group of people managed to get their heads together on the exact problem the plant is having and come up with a solution, then write a report on it. As William Gibson said, 'The future is already



here, it's just not very evenly distributed."

Although Ascend Performance Materials has officially been an MTI member for a decade, the company's roots can be traced to the organization's beginnings. "Originally the majority of Ascend was the Nylon division of Monsanto, so we have

COMMEMORATING COMMITMENT

a strong legacy relationship with MTI," shares William Paden, Principal Corrosion & Materials Engineering Specialist at Ascend. "Monsanto was sitting at the table when MTI was first envisioned and joined when MTI was formed. Monsanto spun off the business to Solutia, and when Ascend Performance Materials purchased the business, it was easy to show the value of MTI membership to the new management."

According to Paden, there are numerous reasons that Ascend has stayed the course and remained a member for the last ten years: "These include being involved in projects on issues affecting the company, having urgent questions answered in the forum, providing training and leadership opportunities for employees, and networking with other materials and fabrication SMEs. As Ascend has grown outside of North America, it has provided contacts for suppliers near our newly acquired manufacturing sites."

Over time, Paden and his colleagues have built connections that they have been able to rely on time and time again. "MTI brings together the people who can help solve problems," he stresses. "Because it is smaller than the other organizations, we are able to develop great relationships. With those great relationships comes the ability to directly call others who we see at the MTI meetings, who probably have already solved the same, or similar issue. In short, being a member of MTI is kind of like having a Central Engineering group with hundreds of Corrosion and Materials Engineering SMEs."

No Small Feat!

"It has been an honor for Neotiss to become an MTI member," says Wendy McGowan, Senior Manager of Business Development. "While five years has gone very quickly, especially with the pandemic over the past two years, we have been able to be very active in relatively a short time. I'm pretty sure we have not missed an AmeriTAC or EuroTAC meeting since we joined. We have participated in many worthwhile projects and have contributed to forum discussions in our field of expertise. We gave a presentation at EuroTAC and participated in the Global Solutions Conference." For this international tube manufacturer, participation clearly delivers value.

One project in particular made time pass quickly for McGowan: "For me personally, the highlight of my activity was being Co-Champion on the Best Practices for Reactive and Refractory Metals handbook project team and seeing this project through to publication." She joined the project team in 2016 and worked on the comprehensive reference book until it was finally completed in 2021.

Although that project team completed its mission and dissolved, McGowan knows that other opportunities to interact with members are right around the corner. Maybe it's another project, maybe it's answering a forum question, or maybe it's the next Zoom or live meeting. "The best benefit to Neotiss is the networking," she shares. "While we have expertise in our materials and in the applications where our tubing is used and can provide technical assistance in those areas, we do not typically have direct interactions with end users in the supply chain. MTI has allowed those connections." Of course, spending your first five years of membership as a very active participant helps.

"Given the current business climate it's no small feat to reach this type of milestone," reflects Adam Renstrom, General Manager –

Houston Operations, Ward Vessel & Exchanger. Despite the challenging times, strong connections developed within the MTI community have kept the Ward team coming back for more. "The relationships we've been able to build with other members has been invaluable to us," emphasizes Renstrom. "There is no doubt that we have enjoyed the networking from a sales perspective, but we've also been able to utilize those relationships to help solve problems we encounter during fabrication, R&D, creating weld procedures, etc." For example, "We had a project recently with some complex WPS testing requirements. It was extremely beneficial for us to have relationships already set in place with some of the brightest metallurgists in the industry, so we could gain some insights on the best path forward."

Five years is plenty long enough to experience the comradery members develop at MTI. "It does not take long to feel at home when you begin attending MTI meetings," shares Renstrom. "There is a real sense of teamwork and togetherness that is unparalleled by any other group like this. Ward Vessel & Exchanger is honored to be a part of this wonderful organization. We are definitely excited to continue this journey with MTI, and we look forward to celebrating the next milestone!"

Although New Castle Stainless Plate (NCSP) officially hit the 5-year mark in 2021, its affiliation with MTI stretches to the early 1990s involvement of its predecessors, Avesta Sheffield and Outokumpu Stainless Plate. "We became members of MTI then and remain so now because of our orientation to meet the needs of our customers," explains Tony Palermo, Regional Manager, New Castle Stainless Plate, LLC. "This membership milestone is a type of confirmation that the MTI community has satisfied this orientation as we better understand the challenges that our customers face and work with experts to develop cost-effective and practical solutions to their challenges."

Palermo points out that NCSP has also found value in being an MTI project team member and learning of the practical issues that the Process Industries face but believes that the greatest benefit has been in the development of mutual relation-

ships that can yield understandings and solutions. "MTI is a right-sized, practical community that really allows deep conversations to take place with people that you get to know," he continues. "NCSP appreciates the neutral forum that MTI provides for producers and suppliers/service providers to formulate actual solutions to real world problems without the biases encountered in the normal course of business interactions.

It really is an honor for New Castle Stainless Plate to be a part of the MTI community as we collectively solve difficult materials challenges for the Process Industries."

Congratulations to all of these members for their continued commitment to MTI, for helping each other solve the industry's toughest challenges, and for building on their organization's wealth of materials science knowledge and ensuring those critical resources are around for future generations.

ALBEMARLE CELEBRATES 40-YEAR ANNIVERSARY AT MTI

> CONTINUED FROM PAGE 18

to be a part of a company with this level of commitment."

It has been a worthwhile investment, according to Wells, and that is why Albemarle has continued as an active member for so many years. "I think the impressive part of MTI membership is the many ways that member companies benefit," points out Wells. "From an Albemarle perspective, there are several aspects that have made our participation so valuable. First and foremost is the opportunity to network with peer scientists and engineers in the interest of advancing materials science for our company. From these interactions, many of my colleagues have accelerated solutions, grown their own technical expertise, and even had the opportunity to contribute to many different industry projects that will benefit all of us in the CPI for years to come.

The vast technical knowledge gathered from those projects is retrievable from MTI's many books, final reports, and presentations. Those reliable resources continue to help Wells and his colleagues. "In addition to the developmental opportunities, is the incredible wealth of industry publications, best practices, training programs, and lessons learned that we have been able to take advantage of from the MTI Library," he continues. "This impressive body of knowledge is a powerful resource, which also helps member companies mitigate knowledge-base erosion that comes from turnover and retirements. Again, helping us accelerate our learning curve and bring better, more robust solutions to our manufacturing sites far more quickly."

Albemarle participates in other industry associations, but none guite like MTI, according to Wells. "The personal interaction that takes place at the MTI meetings and in the online forum is unlike most other organizations across the CPI," he observes. "There is almost a philanthropic nature across the MTI membership, in trying to help each other out with corrosion and materials challenges. While we all carefully respect the intellectual property aspects of what we each do, the mechanisms associated with corrosion processes are common to us

all. Being able to reach out directly or indirectly to the membership with specific corrosion and materials issues and get rapid, experienced, and insightful input is what I think really separates MTI from other industry organizations."

To be able to celebrate 40 years as a member of any institution is remarkable in this day and age of constant change. The pragmatic Wells boils down the reasons for Albemarle's long-term commitment with his materials engineering hardhat on. "At the end of the day, one of the often underappreciated benefits that MTI brings to the CPI is helping all of us make chemicals more safely and more cost effectively," he concludes. "Especially when we consider that the great majority of loss of primary containment events are related to corrosion or materials degradation mechanisms, I think it is easy to appreciate this value." MTI extends its own great appreciation to Albemarle for the company's four decades of membership and ongoing commitment to the improvement of the Process Industries. •

OAKS AND WADLEY ELECTED TO MTI BOD

EAGER TO BE A VOICE FOR THE MEMBERSHIP

here are two new, but familiar faces on the MTI Board of Directors (BOD) for the 2021-2022 term. Designated Representatives voted via electronic methods on the slate of Directors prior to the AmeriTAC 136 and Annual Meeting, and results were presented on Tuesday, October 26. The outcome includes Meghan Oaks (BASF) and Maurice Wadley (DuPont) joining the BOD.

Oaks and Wadley have both been involved in MTI for several years, and indicate they are looking forward to being a voice for the membership to continue steering the organization in the right direction.

Maurice Wadley

Wadley, a Materials Engineering Consultant at DuPont and the company's Designated Representative, has worked there for 10 years and says he has been attending AmeriTAC meetings for that same amount of time.

"I have taken a more active role in the past few years," explains Wadley. "I started to participate in MTI at the suggestion of one of my predecessors at DuPont and this same individual swayed my own decision



Maurice Wadley, DuPont

to take a more prominent role at one of the AmeriTAC meetings."

That also includes his involvement in projects. In the past, Wadley has been a team member on projects such as "Accelerated Testing of FRP" and "Design, Installation, Maintenance and Inspection of Metallic Lined Pipe." He has since stepped up to increase his participation and even taken on the role of Project Champion. Recently, he's been actively involved in the e-Library update project and is leading the "PTFE Bellows and Expansion Joint Integrity" project. He also wrote a



Meghan Oaks, BASF

Technical Awareness Bulletin on the latter, which was published earlier in 2021.

Now he is stepping up again to serve on the BOD. When Wadley was alerted by a current BOD member of a potential vacancy that would need filled, he took it under consideration. This member explained the duties and responsibilities required, he says, and told him he would be a great candidate so Wadley accepted the nomination. He remarks that he is looking forward to this opportunity to serve the membership.

> CONTINUED ON PAGE 44



GEORGE DONALD RETIRES FROM BOD

George Donald (NOVA Chemicals) is retiring from his company, which also marks his retirement from the MTI Board of Directors. George served on the MTI BOD since 2018. He has actively participated in the BOD Conflict of Interest, Finance & Audit, Operations, and Products committees. MTI appreciates his contributions and would like to thank him for serving the organization for the past three years!



GETTING BACK





TO TAC

MTI'S RETURN TO IN-PERSON MEETINGS

fter more than a year of virtual meetings and trainings, members have finally been able to return to a face-to-face environment. In June 2021, AmeriTAC 135 met in Louisville, Kentucky. This meeting marked the first in-person MTI event since the Global Solutions Symposium in February of 2020. MTI welcomed more than 35 in-person attendees who were happy to be back at the Technical Advisory Council (TAC) meetings.

MTI announced in July and August that all three regions—AmeriTAC, AsiaTAC and EuroTAC—would meet in person for their Fall meetings. AmeriTAC 136 began to make a larger comeback with 50 MTI members in Atlanta, Georgia in October. Highlights included an API training session on Refractory Ceramics; two Structured

Forum presentations: "Damage Assessment — Analyzing Fires, Explosions and Storm Damage Disruption in Chemical Plants" by Dale McIntyre, and "Field Residual Stress Measurement on Chemical Process Equipment" by Gregory Schmidt; a walkthrough of the new MTI eLibrary; the Annual Member Meeting; project team and committee sessions; and evening networking events.

The first in-person AmeriTAC meetings since early 2020 were a success considering the uncertainty surrounding the global pandemic, but the outlook is better in 2022. MTI will kick-off the year with AmeriTAC 137 and the Global Solutions Symposium, February 28 – March 3. This event is especially exciting for the return to "normal." The entire event will only be avail-



Left: AsiaTAC attendees happy to meet in person again during the Fall 2021 meeting in Shanghai, China.
Top right: Attendees of AmeriTAC 136 hear from Dale McIntyre on Damage Assessment in October 2021.
Bottom right: EuroTAC participants attend a demonstration at the Institut de Soudure during the Fall meeting in October 2021.

able for in-person participation in order for attendees to get the most out of the meeting, technical conference and exhibition.

AsiaTAC and EuroTAC also decided to return to in-person networking by hosting TAC meetings in person this fall. More than 20 participants convened in Villepinte, France for EuroTAC in mid-October.

PIPING SYSTEMS AND CIRCUITS ENHANCE **MECHANICAL INTEGRITY PROGRAMS**

iping systems and circuits have been used for many years to organize effective piping inspection programs. Piping incidents have been a concern in the process industries for many years. Circuitizing piping improves inspection effectiveness. The process for developing circuits will be described. It is not a complicated process, but it requires skill and attention to detail. Circuitization points inspectors to vulnerable locations, promotes the proper inspection intensity, and provides input on the techniques best suited to find the anticipated damage. Common pitfalls are described.

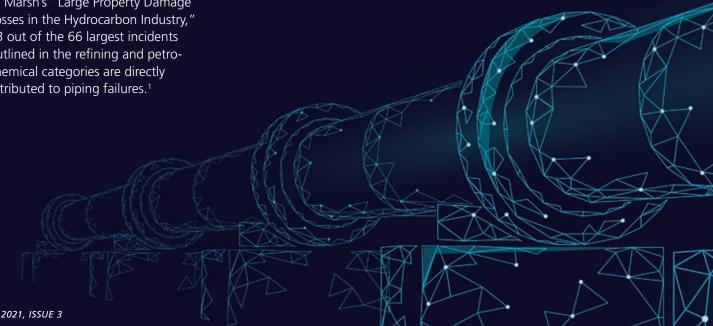
Piping Deserves Attention

The mechanical integrity importance of piping cannot be emphasized strongly enough. In the 25th edition of Marsh's "Large Property Damage Losses in the Hydrocarbon Industry," 33 out of the 66 largest incidents outlined in the refining and petrochemical categories are directly attributed to piping failures.1

Several of the significant failures that are attributed to inspection-related causes are briefly described here:

- Monitoring potentially corrosive injection points (IPs) became vital in 1988 when the extrados of an 8-inch carbon steel elbow failed immediately downstream of an IP at a gulf coast refinery. The vapor cloud explosion cost an estimated \$665MM in property damage as well as several lives.
- A similar incident four years later occurred at a refinery on the US west coast in which an explosion originating from a failed 6-inch carbon steel elbow was recorded as a sonic boom. The blast damaged buildings several miles away and caused a fire that burned for 3 days.
- A leak in 2000 in a condensate line at a Middle East refinery resulted in an explosion that damaged three crude units and destroyed two reformers. This failure, which resulted in \$718MM in property damage, was attributed to a lack of inspection and maintenance of the line.
- In 1997 an explosion and subsequent fire that burned for 10 hours occurred at an olefins plant on the gulf coast when a 36-inch high-pressure light hydrocarbon line failed.

The petroleum and chemical process industries continue to have more loss of containment incidents related to process piping than all other pressure equipment combined.2



The general industry approach to avoid a significant incident is to reduce the total number of incidents. For piping inspection-related incidents, this can be accomplished by implementing a robust inspection program that is described thoroughly in API 570³ with further specific guidance in API 574⁴. Piping circuitization is an important element of a robust inspection program.

Piping Systems and Circuits Demystified

API 570 defines a piping system as follows:

"An assembly of interconnected pipe that typically are subject to the same (or nearly the same) process fluid composition and/or design conditions." They are the first step in breaking down the miles of piping into more manageable blocks. Piping systems are usually identified by functionality. Systems are often broad such as "reactor feed," "absorber overhead," "flare gas," "rich amine," or "furnace effluent."

API 570 defines a piping circuit as follows:

"A subsection of piping systems that includes piping and components that are exposed to a process environment of similar corrosivity and expected damage mechanisms and is of similar design conditions and construction material where by the expected type and rate of damage can reasonably be expected to be the same." This categorization subdivides the system blocks

into smaller buckets with the same chemical, mechanical, and corrosion characteristics.

The elements of a systems and circuits project are as follows:

- System Drawings based on process flow diagrams (PFDs)
- System Legend with damage mechanisms (DMs)
- Damage mechanism review (DMR)
- Circuit Drawings based on piping & instrument drawings (P&IDs)
- Circuit Table that associates line numbers with circuits



For proper circuitization, a damage review is needed. The damage review can be documented at the PFD level in the system legend or in a more detailed fashion at the P&ID level in the circuit table. It is critical that the damage review be conducted by a corrosion SME to reap the benefits of a circuitization.

Other important terms are as follows:

Corrosion monitoring location (CML): CMLs are specific areas along the piping circuit where inspections are conducted. The nature of the CML varies according to its location in the piping system and the damage that is being investigated, such as local corrosion, corrosion under insulation (CUI), cracking, etc. Different inspection techniques are needed to find the specific damage.

Thickness monitoring location (TML): Discrete locations for measuring wall thickness. A subset of CML.

Piping circuits are the building block for developing inspection isometric drawings, including the number of CMLs and CML placement. These activities will not be addressed in this article.

What Piping Should be Circuitized?

A very important part of the work process is to establish which services and situations should be circuitized and which should not.

Services and situations always circuitized are main process lines API 570 Class 1-3.

Services that are sometimes circuitized include Class 4 services that are mission-critical to the process, higher pressure steam services, and utility-like Class 3 services, such as lube oil, hot oil systems, and tempered water systems like glycol water.

Services that are generally not circuitized are Class 4 services like air and nitrogen.

Situations that are generally not circuitized are normally idle lines like start-up only, infrequently used regeneration lines. These situations might contain Class 1-3 fluids when they flow, but they generally do not flow, and they are often ballasted dry. They can be service-tested for tightness before using them. Small bore piping that can be valved out and tubing are also not circuitized.

How Is it Done?

The services that will be included in the job scope are defined and delineated in the Systems agreed upon with the client. System drawings based on PFDs are colored to show the system boundaries, and a system table is developed. The circuit break criteria are then defined by the Materials & Corrosion SME on the project considering the process. Potential circuit criteria are listed in API 570.

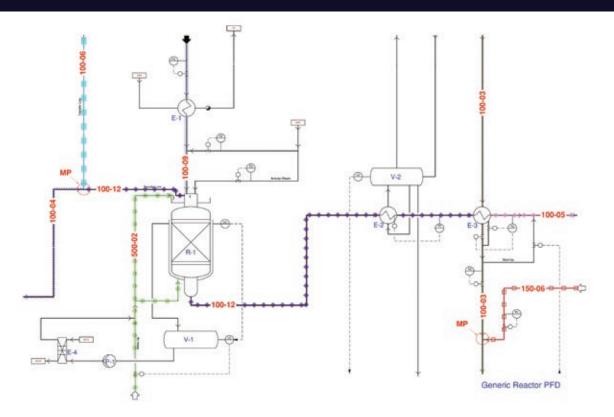
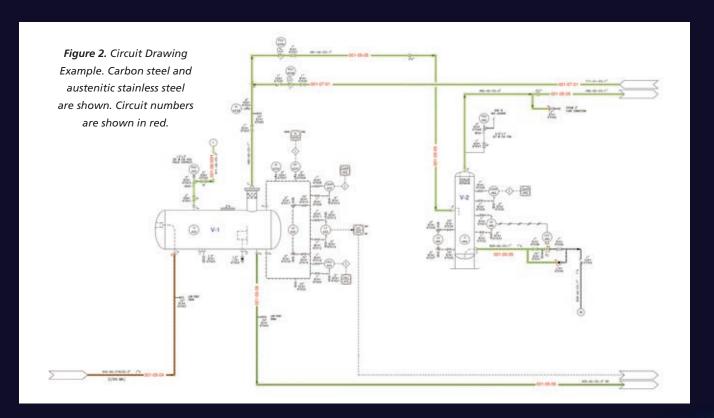


Figure 1. System Drawing Example. Systems are differentiated through line styles and colors. System numbers are shown in red.



After establishing the circuit break criteria, work can begin to delineate circuits on the P&IDs. The circuits can be color coded by material or by system. The drawings are reviewed for mix points (MPs), IPs, and dead legs.

The damage review can be documented at the PFD level in the systems table and drawings, or a more detailed damage review can be done in the circuit table. A cross reference between line numbers and circuits is provided.

Benefits to Piping Inspection Efficiency and Spending

Circuitization simplifies inspection management and data analysis, improves damage detectability, and reduces costs. By combining lines into circuits, fewer components need to be managed in the inspection data management system. Managing inspections at the CML level would be a difficult task at best. Larger plant sites may have tens of thousands of CMLs.

If the circuits are properly selected, corrosion rates and pipe wall thick-

nesses should be similar for many CMLs in the circuit. This will lead to the same inspection frequency and ultimately similar repair or replacement schedules.

Damage detectability is enhanced. Where local corrosion is expected, more CMLs are typically defined and inspection techniques that are more effective than discrete TMLs are used, such as RT or scanning UT.

Costs are reduced in two ways.

First, services and situations that do not require scheduled inspections are

> CONTINUED ON PAGE 29

Circuit Number	мос	Fluid	Avg. Op. T (°F)	Insulated?	Est. Corr. Rate (mpy)	Corr. Type	Internal DMs	Internal Cracking	Ext. Rate or Ext. SCC
100-03-03	CrMo	Gas	894	Yes	1	General		3/very low	0
100-04-01	CrMo	Gas	844	Yes	1	General		None	0
100-04-01-DL-1	CrMo	Gas	840	No	3	Local	85 (42)	None	0
100-04-01-IP-1	CrMo	Gas	840	Yes	2	Local		None	0
100-04-01-IP-2	CrMo	Gas	840	Yes	2	Local		None	0
100-04-01-MP-1	CrMo	Gas	840	Yes	2	Local		None	0
100-04-03	SS	Gas	1202	No	1	General		3/medium	None

Table 1. Circuit table example with detailed damage review documented. Selected columns deleted due to space constraints.

DUAL LAMINATE PROGRAM PROVIDES HANDS-ON LEARNING OPPORTUNITY

MARKS THE RETURN OF IN-PERSON MTI TRAININGS

TI is in a unique position to develop training programs with the collective knowledge of industry experts who are members. Recently, MTI hosted an in-person training session on Dual Laminate Equipment, which was the first program offered in person since 2019. Previously offered trainings on "FRP In-Service Equipment Inspection" and "FRP New Equipment Fabrication and Inspection" had been received enthusiastically by the membership, as well as non-members in the industry. Both courses provided the foundation, as Dual Laminate Equipment is made of a polymeric sheet lining and FRP as the structural reinforcement.

"Holding the Dual Laminate Course was a natural next step," remarks Heather Allain, MTI Associate Director, and staff facilitator of the training project. "The information presented is unique as it is not offered elsewhere."

Nearly half of the 60 attendees who participated in the Dual Laminate Course, held November 9 and 10 in Baton Rouge, Louisiana, were non-members. The instructors included Deb McCauley (Chemours), Dale Keeler (MTI) – formerly Dow (see page 35), Hardin Wells (Albemarle), Greg O'Brien (Superior Dual Laminates), and Brian Linnemann (RL Industries). This dream team of fabricators and producers, who specify and own the equipment and are extensively involved in the development of both ASME and company dual laminate and FRP standards for piping and process chemical equipment, has a combined 150-plus years of experience in the FRP and Dual Laminate industries.

"Their expertise is unparalleled," notes Allain. "And, throughout two years of preparations, the MTI project team created a comprehensive program that covered 'Material Selection' to 'Determining Repair or Replacement Options for Existing Equipment.'"

The course, presented in modules, included dual laminates materials of construction; design, including the design of associated piping; flanges and vessel details; fabrication and welding; testing and inspection; and

installation. Repair and Alterations were also discussed, as was qualification of a dual laminate fabricator. Recent technology advancements were presented, including the new RFID technology that MTI has developed to allow for measurement of permeation and evaluation of the integrity of a vessel while it is still in service.

Understandably, most everyone has an appreciation for aspects of virtual learning that made a surge during the last two years, but the benefits of being in person for this training were evident by the hands-on experiences and live question and answer sessions that followed each presentation. Instructor Debra McCauley remarked that when talking with attendees, the overall response was that attending in-person was crucial to creating an atmosphere for them away from their workplace distractions, allowing them to be able to fully absorb the concepts and materials presented.

"One of the benefits is that they could hold and see numerous



samples to understand the failure modes and how they appear in dual laminate materials," McCauley adds.

Another highlight was the opportunity for each person to try their hand at polymeric welding, which gave everyone an awareness of the time and effort required to create a quality weld joint.



Greg O'Brien (Superior Dual Laminates), a course instructor, shows Enhxi Marika (Chemours) how to weld polymer during the hands-on demonstration offered to attendees at the Dual Laminate Training.

All the slides for the training were posted on the website for attendees to reference before and after the training. In addition, video recordings were made of the modules and will be processed into short videos to be hosted on the MTI website for each topic. While not a substitute for attending in person, these will be a valuable reference for those that attended to review sections again in the future, and to capture the expertise of this team for knowledge transfer. However, there may be another chance to attend this training in person very soon.

"The Dual Laminate Training has been requested for our European membership, where dual laminate equipment is heavily used, and Renaud Veslin (Arkema) has agreed to Champion that effort," Allain concludes.

Watch for more information on that training as it develops! ■

PIPING SYSTEMS AND CIRCUITS ENHANCE MECHANICAL INTEGRITY PROGRAMS

> CONTINUED FROM PAGE 27

not circuitized. Second, the damage review identifies circuits with general corrosion and lower corrosion rates. These circuits will require fewer CMLs. Likewise, if RBI is used, the reduced probability of damage may reduce the inspection frequency. In the petrochemical industry where many dry non-corrosive streams exist, circuitization can provide significant savings via reduced inspections.

Common Pitfalls

There is a lengthy list of pitfalls that can occur from incorrect circuitization process. A few of the more common ones are listed below:

- Too many circuit breaks
- Mixed metallurgy in same circuit
- Circuitizing and inspecting all piping
- Nonexistent or inadequate damage review
- MPs/IPs not identified

Too Many Breaks: When breaks are made at every piece of equipment, this typically results in too many short circuits. Similarly, line number circuitization can result in too many circuits. Some of the inspection management benefits of circuitization are lost. On a recent job, 2500 line numbers were included in 320 circuits (excluding MP/IP and dead legs). On a smaller job, 250 line numbers were included in 60 circuits (excluding MP/IP).

Mixed Metallurgy in the Same Circuit: Metallurgy is always a circuit break criterion. It defines damage mechanisms and often influences the pipe schedule used.

Nonexistent or Inadequate
Damage Review: A cornerstone
of the circuit concept is to have
the same damage mechanisms
and understand the rates and
morphology of damage. An inadequate damage review undermines

the probability of detecting damage. It is still common to see circuits with only discrete TMLs. This is a sure sign of an inadequate damage review.

Circuitizing and Inspecting All Piping: Inspecting piping that is not included in the mechanical integrity program takes resources away from higher consequence piping. It also costs more to create circuit drawings. Utility systems like low-pressure condensate can be defined as a single circuit.

MPs/IPs Not Identified: API 570 has requirements for MP/IP CML placement and the frequency of inspection based on API fluid class. An MP/IP list for each unit is considered recognized and generally accepted good engineering practice (RAGAGEP) by most operating companies.

Summary

An effective piping inspection program is an important part of a mechanical integrity program. Establishing piping circuits will simplify inspection management and data analysis, improve damage detectability, and can reduce piping inspection costs. •

References

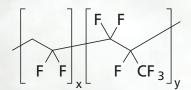
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PEKK AND GRAFTED PVDF

Two Innovative Chemistries Offering Primerless Coating Solutions for the Most Demanding CPI Applications

Grafted PVDF - What is It?

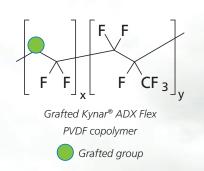
Polyvinylidene difluoride (PVDF) is a thermoplastic fluoropolymer, widely used in CPI industries due to a unique combination of chemical compatibility, thermal and UV resistance and mechanical properties.



Standard Kynar® Flex PVDF copolymer (Sigma Aldrich, s.d.)

PVDF-based copolymers are similar to homopolymer resins in purity and chemical resistance, but also have chemical compatibility in high pH solutions, increased impact strength at ambient and low temperatures.

The grafting technique consists in substituting one Hydrogen atom of the CF2H2 molecule by a reactive group, thus enabling the long-chain molecule to enhance reactivity with other substances.



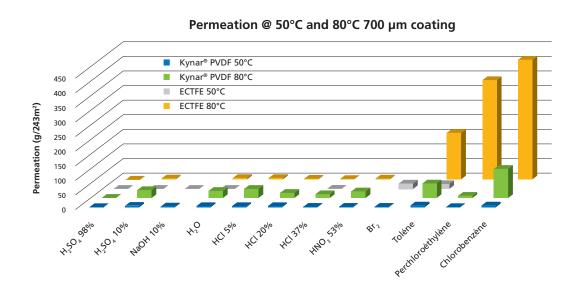
In particular, grafted-PVDF has a strong reactivity with metal. It makes

it an ideal choice for a coating resin. Direct adhesion with metal eliminates the need for a primer, which creates benefits in terms of productivity and exposure to hazardous substances.

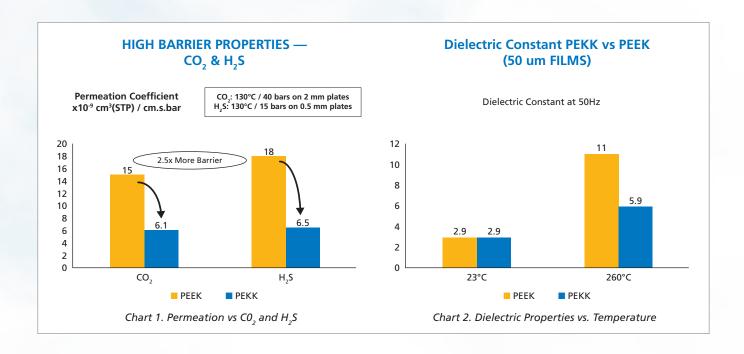
Superior resistance to chemicals

Kynar® PVDF resins are chemically resistant to a wide range of chemicals. Most acids and acid mixtures, weak bases, halogens, halogenated solvents, hydrocarbons, alcohols, salts and oxidants pose little problem for Kynar® PVDF.

At ambient temperatures, Kynar® Flex® copolymers are generally resistant to chemicals with a pH up to 13.5. Many factors can affect a material's chemical resistance. These







Resistance to nuclear radiation

The resistance of Kynar® fluoropolymers to nuclear radiation is excellent. The original tensile strength of the resin is essentially unchanged after exposure to 100 megarads (Mrads) of gamma radiation from a Cobalt-60 source at 50°C (122°F) and in high vacuum (10-6 torr). This resistance to effects of radiation, combined with chemical resistance, has resulted in the successful use of Kynar® components in nuclear reclamation plants.

Grafted PVDF for Chemical Processing Handling Industries

Because it has high temperature resistance, low permeability and high mechanical strength, Kynar® PVDF is used as a contact surface for the production, storage and transfer of corrosive fluids. Kynar® PVDF resin is used in mechanical components, fabricated vessels, tanks, pumps, valves, filters, heat exchangers, tower packing, piping systems, and many other applications.

Due to its unrivalled chemical resistance, fluorinated polymers offer a suitable alternative to phenolic epoxy when protecting iso containers. As a thermoplastic, the product is easy to apply and its

mechanical properties will not be affected by time or temperature change. Compared to phenolic epoxy resins, Kynar® PVDF offers increased *abrasion resistance*, easier and *safer* application process, with *no VOCs* involved. In addition, PVDF is *fire resistant* and complies with UL94 V-0 classification.

Maintenance is also easily facilitated with Kynar® PVDF. Thanks to a smooth and hydrophobic surface, Kynar® ADX Flex 281 G is easy to clean with water at 50°C, or hydro jetting up to 100 bar or 200 bar.

One potential drawback of thermoplastic polymers is that the maximum operating temperature is restricted by the melting point of the polymer. For operating at very high temperatures, other thermoplastic polymers exist, such as Poly Aryl Ether Ketones (PAEKs), which combine unrivalled heat resistance and chemical compatibility.

PEKK at the Top of the Pyramid

PAEKs are used in technically challenging industry sectors, e.g. aerospace industry, industrial equipment and oil and gas, for instance. PEKK exhibits very high mechanical properties, chemical and fire resistance and can withstand a continuous use

temperature above 240°C. Due to its high melt temperature, PEKK is also unique in terms of processing technologies due to its tunable crystallization speed.

Among PAEK family, one of the new comers is Poly Ether Ketone Ketone (PEKK), which shows best in class behavior. Due to its tunable crystallization speed, PEKK is also unique in terms of processing technologies.



PEKK general chemical structure

PEKK exhibits superior mechanical performance and a high temperature rating because of its high ketone/ ether ratio. In addition, thanks to its wide temperature processing window, this material is compatible with a large array of processes, which includes not only extrusion, 3D-printing, carbon-fiber reinforcement, but also compression molding and thermoforming.

The main features of PEKK include: Highest Tg of PAEK family, high tensile and compression strength/ high stiffness, high chemical resistance in harsh conditions, and excellent fire properties.

PEKK material is among the rare PAEK polymers to combine both exceptional mechanical properties, high temperature rating, and chemical compatibility with aggressive fluids. Additionally, properties such as permeation and creep make this polymer an ideal candidate for CPI and Oil & Gas applications, as shown in Chart 1.

On the other hand, Chart 2 shows that the properties are much more stable with increasing temperature compared to other PAEKs.

"What is most surprising about PEKK is not the unmatched perfor-

mance, but rather the consistency of those properties at temperatures above 200°C", says Pierre Gonnetan, PEKK expert at ARKEMA.

Benefits of Powder Coating for Protecting Containers

There are many reasons explaining why powder coatings are so attractive and growing at a global scale.

First, they are easy to apply. Process versatility allows adjusting thickness, which is usually around 500 µm. Two common ways to apply a powder coating film are by dipping in a fluidized bed or by spraying.

Even complex and large applications like the internal coating of

ISO containers or tanks with Kynar® PVDF are possible thanks to a unique proprietary process.

Secondly, both Kynar® PVDF and Kepstan® PEKK can be applied directly on the metal surface without primer, thanks to their inherent adhesion to metals.

It means no limited shelf life, no mixing steps and at no VOC, which represents significant progress in terms of health and safety for the coating process.

In addition, Kynar® PVDF is easily repaired (even in the field if needed) by melting Kynar® PVDF wire on the defect area with a gun like the one shown below¹. ■





Paul Whitcraft, MTI Executive Director (left) and David Barber, Dow – MTI BOD Chair (right), pictured with Pradip Khaladkar, MTI, commemorating his five years of service as MTI Associate Director.

Khaladkar was recognized during the AmeriTAC 136 meeting held October 2021 in Atlanta.

MTI ASSOCIATE DIRECTOR PRADIP KHALADKAR RETIRES

RECALLS MTI CAREER HIGHLIGHTS

TI has celebrated many Associate Directors (AD) throughout its rich history and, after five years of service, Pradip Khaladkar is joining that list. Khaladkar assumed the role of Associate Director in 2017 after retiring from DuPont, but his history with MTI spans nearly 40 years.

A few highlights include, initiating and leading the Polymers RAG (Resource Advisory Group, now Project Development Committee – PDC) in 1982; helping start the AsiaTAC group; and being part of

several groundbreaking projects, such as FRP Global standards, Permeation of Fluoropolymers, and FRP Training Programs, among many others.

He also served as the staff leader for many MTI projects. Ferrite Content in Duplex Stainless Steels; MIC of Super, Hyper Duplex Stainless Steels; and e-Learning Module for FRP Training are three he lists as among the most memorable.

"Although I was involved in the E-Learning project as a member and an instructor, working on it as an AD was still a challenge," Khaladakar explains. "It involved constant nudging of the contractor, their constant changes in personnel and our own internal problems. Ferrite Content of Duplex Stainless Steels, on the other hand, was by far the most satisfying. I inherited this from Jesse Chen, who was the AD at the time, and this was completed rapidly under the able leadership of Jim Fritz. It was very well received in the industry. The MIC of duplex stainless steels has been the biggest challenge



DALE KEELER HIRED AS ASSOCIATE DIRECTOR

COMMITTED TO SUPPORT MTI EFFORTS

TI is pleased to welcome Dale Keeler to the staff as an Associate Director (AD). Recently retired from Dow, his extensive background spans 47 years in the composites and thermoplastics industry, ranging from supplier to end user. As a supplier, Keeler's expertise includes FRP and dual laminate design, fabrication, inspection, repair and alteration. As an end-user, his vast knowledge includes company standards development, supplier evaluation and development, and project management.

He earned a BSME with a math minor from Michigan State University while working full time and raising a family, and his career began in 1974 working for a fiberglass fabricator.

"I started off with fabrication drawings and worked in the shop, which developed into design," Keeler recalls. "Then I became Director of Engineering."

The company grew from a small FRP shop to one offering FRP, Dual Laminates, and Stainless Steel equipment for food and pharmaceuticals. The company dissolved in 2004, and so began his career with Dow in 2005.

His industry involvement, however, began in the late 1980s when he worked on the FRP standards committee for ASME. He was chair of several subcommittees and chair of the main committee of ASME RTP-1.

"I worked on the ASME NPPS subcommittee for FRP piping that was issued in 2018," Keeler notes.



"I also participated in the development of repair and alteration of FRP portion of NBIC and I've been active in the ASME X committee."

After retiring in June, Keeler decided the AD job offered continued contact in the industry where he could leverage past experience.

"Plus, it required only a portion of the time I was used to working," he adds.

An active participant under Dow's membership, Keeler brings an understanding of projects and processes. He served as Champion on two projects and Co-champion for two more, as well as participation in numerous others. The most rewarding, he mentions, was the Repair and

Alteration of FRP Equipment project. He's also been an expert instructor for several of MTI's FRP Training courses and the Dual Laminate training, which was just offered in November. Now he is ready to take over some of the existing MTI projects of retiring AD, Pradip Khaladakar, new projects as assigned, and will also support AsiaTAC efforts.

"My preparation for MTI AD was supported and developed by being an active member in MTI and also my active committee work in ASME since 1987," Keeler explains. "I hope to provide valuable support to the PDCs (Project Development Committees) and projects I will lead by bringing organizational experience from work and ASME involvement."

He looks forward to his ongoing interaction within MTI where he's developed many friendships and professional contacts and plans to do his best on anything he commits to be a part of.

Although Keeler will have plenty of MTI work to keep him busy, he expects to have time for personal goals, such as relaxing and enjoying life more.

"This is something new to me now that I will not be working 60-plus hours a week and traveling for work. I now have time to revisit old hobbies and plan for travel/ vacations," he concludes.

Congratulations, Dale! We look forward to your ongoing commitment and contributions to MTI. •



PRUJEGT GHAMPIUNS

TI is at the forefront of providing global leadership in materials technology to improve safety, reliability, sustainability and profitability. Technical research projects play a vital part in the success of the MTI mission. While the goal and outcome of each project varies, the commonality is member leadership to develop and nurture each project from inception to completion. These member leaders, dubbed MTI Project Champions, have the unique opportunity to grow leadership skills, network and create tangible solutions alongside other industry professionals.

In this issue, CONNECT reached out to Karen Picker (Sandvik) and Bill Bieber (Webco Industries, Inc.) to learn more about their experiences with MTI and what to expect from the recently completed project 349 – Who Makes What 2.

Q: Please describe your roles at your companies.

A: Karen: I have worked for Sandvik as a Regional Technical Marketing Manager, Americas for the past four. My role is to serve as the link between the industry applications, sales group, and company R&D. Our group serves as application engineers and provides technical support to our customers. We identify industry needs for corrosion resistant alloys and present Sandvik alloys as possible solutions.

Bill: I have been working at Webco for a little over 11 years but have been involved in the tubing industry for over 38 years. My current function is primarily Business and Market Development and I also act as a liaison for Webco at MTI, API,

AMPP and ASTM. My previous experience includes operations, purchasing, international sales and senior management roles.

Q: How long have you personally been a member of MTI and how have you benefited from your involvement?

A: Karen: I have been an active member of MTI for almost four years. My first experience with MTI was as an intern for Sandvik. This experience gave me the opportunity to have a peek at what the Chemical Processing Industry was really like and how the industry Subject Matter Experts come together and support each other to solve corrosion related problems. Since then, I have evolved, and my knowledge has expo-

nentially increased in part due to the interactions, discussions, and projects I've been involved with at MTI.

Bill: I've been involved with MTI as Webco's DR ever since they became a member approximately 10 years ago. MTI is a unique organization and, in my opinion, is the only technical organization that truly provides significant value to its members. Participating in projects and being able to network with leading materials engineers has provided me with education and experience that is not available anywhere else. It has also taught me to listen more carefully to fully understand the concerns and material problems of producer members.

- Q: How have your fellow MTI members helped you grow in your career or in your involvement with MTI?
- **A:** Karen: My fellow MTI members have been a great resource for technical information and for personal growth. As a champion for two MTI projects, the community is always supportive and encouraging of my project management skills. As a young engineer the technical forum has also been a great resource to find information on topics I need to expand my knowledge on. Bill: The collaborative nature of MTI and the willingness of the members to assist others has greatly expanded my understanding of the process industry. Members of MTI have been willing to explain issues to me in a way that I can understand, and I am better equipped to apply that information to my work at Webco.
- Q: How did you become a project champion? Please tell us how you came to take on this role and what skills and/ or experience you believe helped you succeed in this role.
- **A:** Karen: This is a project that has been of interest to the MTI community for years. The idea was to create an online resource and the original project (Who Makes What) did not achieve this. I volunteered to become a champion on this project because I knew taking this project to a conclusion as an online database was the key to its success. I thought, as a young engineer with a lot of exposure to technology, coding, and Microsoft Excel use, I could be of benefit to the team.

- **Bill:** I was involved in the original Who Makes What project and was disappointed that it was not successful so, when this project started, I volunteered to be a Co-Champion. We reviewed the previous project and tried to determine the reason it was not used and aimed to correct those problems during this project. Having Co-Champions has been key to the success of this project and most of the credit belongs to Karen.
- Q: Similarly, explain what you have learned from your experiences as either a team member or project champion of previous MTI projects and how that has helped you as the Who Makes What 2 Project Champions.
- A: Karen: Working as one of the champions for What Makes What 2 has showed me the willingness of the MTI community to participate and share their experiences to make the deliverables of each project fit every member's needs. I saw how everyone puts the needs and interests of the community above their own. I think that is the key to success for every project at MTI.

Bill: I have managed projects within and outside of MTI in the past, but I learned a great deal participating in other MTI projects because managing a project for a volunteer organization is much more difficult. With that said, the support and participation by MTI members is what makes MTI unique.

- Q: Tell us about the project, Who Makes What 2 (349). What can members expect out of the final deliverable?
- A: Karen and Bill: The final deliverable is a simple database that was developed as a tool for producers to find the production capability and availability of many different alloys produced by MTI supplier member companies. The database is searchable and will be maintained with the help of the MTI staff. The data should help in sourcing required products primarily by product form, alloy, or UNS number. This should benefit producer members and their purchasing departments as well as helping train younger engineers. It also is a benefit to supplier members to list what they can supply.
- Q: Why is this project important and how do you see it benefitting all MTI members?
- A: Karen: This project will benefit the end-users and improve communications between the materials and procurement groups. It will also expand the opportunities for sourcing of different grades end-users might have.

Bill: This project is a tool that can be used by producer members. It should assist their purchasing people to locate suppliers of a particular product. The contact information provided in the database should also facilitate communications between producer and supplier members.

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MTI TECHNICAL BULLETINS PROVIDE UNIVERSAL INDUSTRY VALUE

echnical Awareness Bulletins published by MTI are brief industry-related topics that have evergreen value and deliver quick answers to potentially save MTI members time and money. The Bulletins Committee develops ideas to produce new topics that will have an impact on MTI members and the industry, as well as regularly reviews and revises past bulletins to keep them up to date with best practices and industry standards.

In this issue of CONNECT, MTI is sharing two updated bulletins, which were released in June 2021 – No. 22 Storage and Handling of Molten Sulfur and No. 23 Positive Materials Identification. Technical Bulletins are available to members by logging in to the member-only Technical Resource Library. They can be downloaded to edit for individual company needs. Publicly released bulletins can be downloaded as PDFs by visiting www.mti-global.org/participate/tac-bulletins.



Technical Awareness Bulletin

Storage and Handling of Molten Sulfur I No. 22

Many chemical process plants produce elemental sulfur from the collection of waste gases containing sulfur. The sulfur is generally stored in its molten state so that it can be more readily shipped to buyers. This can come with its own corrosion problems, as explained in the bulletin.

Storage of Molten Sulfur

Molten sulfur is normally stored in either concrete pits or steel tanks. Railcars are often lined with a polymeric or organic spray-applied liner due to frequent filling and emptying. These linings are seldom used in stationary tanks. Temperature is often maintained using steam coils with 50 psig (3.5 bars-g) steam. The saturation temperature of 50 psig steam is just under 300°F (149°C), which ensures adequate heating without the risk of overheating the molten sulfur. In railcars, steam jackets are used rather than internal coils.

Handling of molten sulfur in railcars is challenging unless dry nitrogen is used for all loading and unloading activities which is rare. Railcar linings in this service are most often epoxies, sometimes vinyl esters and occasionally metalizing. Most reputable lining manufacturers have a recommended product for molten sulfur. Currently, service life is short (i.e. about 3 years), but improved products are being developed.

Austenitic stainless steels, such as Type 304, are also resistant to molten sulfur. Type 304 stainless steel is used mainly for repairs but could be used for new construction.

Corrosion in Molten Sulfur Storage Equipment

Corrosion problems have been experienced in both carbon steel tanks and concrete pits that store molten sulfur.

In carbon steel tanks, the corrosion occurs primarily in the vapor space and high side walls because of corrosive gases coming out of the sulfur and because of the presence of air and moisture in the headspace over the bulk liquid. Depending on these specific conditions in a tank, corrosion can occur in a matter of a few years, but in some cases, steel tanks have lasted upwards of 30 years. On occasion, there has also been external corrosion under the insulation on the roof and roof nozzles reported.

Another site for corrosion is the bottom of the tank. It usually occurs in the form of pitting within 4 feet of the sidewalls and is due to hot metal in contact with moist ground or sand bedding. It typically occurs after 10 years of service and is difficult to detect. These leaks often plug themselves temporarily with sulfur that solidifies after it has begun to leak. However, if the leaks become too great or if the sulfur re-melts, then the amount and rate of leakage could be significant.

Carbon steel sulfur storage tanks are often large diameter vessels with steel pillars supporting a cone roof. In older tanks, the condition of the roof supports should be evaluated before any external inspection of the roof plates is performed.

Designing to Prevent Corrosion of Sulfur Storage Vessels

Two design features of sulfur storage tanks that protect sulfur storage equipment are the steam coils used maintain the temperature of the molten sulfur and the steam suppression systems used to extinguish fires.

Steam coils will occasionally leak and often fail due to corrosion, welding or other fabrication problems. Leaking coils raise concern about condensing steam that can lead to the formation of wet, corrosive gases that can damage the internal vapor space of storage vessel. However, corrosion can be prevented if the steam can be safely vented before it condenses.

Most sulfur storage equipment will also have a fire suppression system that uses steam to suppress fires. This is especially important because iron sulfide corrosion products that form on the sides of the tank are pyrophoric and can burn spontaneously in air. It is ironic that water is required for the formation of iron sulfide from the corrosion of steel by Hydrogen sulfide (H2S) but that steam is used to snuff the fires. Thus it is important to eliminate any unnecessary moisture intrusion into a sulfur tank. For instance, roofs have corroded badly because snuffing steam valves had minor leaks. Double block-and-bleed on steam lines has been used to eliminate this failure mode. Producers and some users employ a sparging system with either air or nitrogen to vent and reduce H2S, iron sulfide and other undesirable compounds in sulfur tanks.

Piping, Valves, and Pumps

Carbon steel piping is the economic material for molten sulfur. It needs to be insulated and traced to prevent solidification. Valves are normally cast steel and, also, must be kept above the solidification temperature. Cast steel is preferred for pumps.

Recommended gaskets are:

- Flexible stainless steel
- Filled polytetrafluorethylene (PTFE)
- Compressed non-asbestos-filled PTFE
 - Graphite fiber
 - Flexible graphite

References

- NACE Standard Practice SP0302, "Selection and Application of a Coating System to Interior Surfaces of New and Used Rail Tank Cars in Molten Sulfur Service"
- "Safe Handling of Molten Sulfur," published by Merichem Chemicals & Refinery Services, LLC, Gas Technology Products Division, August 24, 2005.
- Association of American Railroads M-1002 "Manual of Standards and Recommended Practices," Section C – Part III.
- Department of Transportation Regulations 49CFR172.
- Materials Technology Institute of the Chemical Process Industries, Inc. "Materials Selection for the Chemical Process Industries", 2004.

Properties of Molten Sulfur: According to NACE Standard SP0302, sulfur is a solid at room temperature, becomes molten at 230-250°F (110-120°C) and is typically stored at 265-300°F (130-150°C). It should not be allowed to go above 325°F (163°C) because sulfur undergoes a phase change in the liquid condition that makes it viscous and difficult to handle. If the temperature of the molten sulfur exceeds approximately 350°F (177°C), it can become unstable and liberate H2S which is highly toxic. Precautions must be taken to protect personnel during maintenance activities. If the temperature should exceed 475°F (246°C), it can auto-ignite.

Updated & Revised June 2021



Technical Awareness Bulletin

Positive Materials Identification | No. 23

What is it and when is it Used?

PMI (Positive Materials Identification) is the identification or analysis of metal alloys through nondestructive methods. Usually conducted in the field, PMI has various uses, such as:

- Receiving MRO (maintenance, repair, and operations) materials
- Welding on unknown metals
- · Verifying mix-ups in installed parts

Selection of a PMI technique depends on the need and the speed, coupled with the consequences of part failure.

Need is related to the level of accuracy required to distinguish an unknown metal. Complete chemical composition may be required for one purpose and separation of two metals for another. **Speed** depends on how quickly determination is required and what methods are available.

Types of Test Methods

PMI may be grouped into the following methods:



Photo of an XRF Alloy Analyzer (Niton)

- 1. Manufacturer's material analysis, such as mill test reports (1)
- Manufacturer's materials identifications, such as foundry marks on casting or stencil markings on piping (1)
- Qualitative characteristics, such as magnetic behavior, spark testing, or thermoelectric potential sorting.
- Quantitative analysis, such as portable x-ray fluorescence (XRF) or laboratory analytical techniques

Each technique requires evaluation of the risk involved against the need and speed. See table for further details.

Extent of Testing Required by Regulations

PMI programs are usually based on assessment of the consequences of failure from material mix-ups. Process safety management regulations such as OSHA 1910.119 require that equipment in critical service is made to the proper materials of construction and imply that they must be verified both for new fabrication and replacement parts. The methods of verification are not spelled out.

Incidents have led some agencies to mandate PMI. The necessary extent of PMI testing also depends on how well the user is in control of the materials supply chain, which includes accurate specifications, use of audited and approved suppliers, effective receiving inspections, and field verification.

1) API 578 does not include these methods in its definition of MPI because API considers PMI to include only physical testing. Nevertheless, these methods do provide a measure of quality assurance to the user of these materials.

Listing of PMI Techniques

Grouping	Method	Risk of Error	Comments
Manufacturer's Material Analysis	Certificate of Heat Analysis	Low for certified documents	Contains only manufacturer's or distributor's assertion that material is correctly labeled
	Certificate of product analysis	Low for certified documents	Contains only manufacturer's or distributor's assertion that material is correctly labeled
	Mill test report	Low for certified documents	Contains only manufacturer's assertion that material is correctly labeled
	Certificate of compliance	High. No hard data and is not legally binding	Contains only vendor's assertion that material is correctly supplied. Not based on any test data.
Manufacturer's Materials Identification	Pressure vessel nameplate	Low, verified by authorized inspector	Degree of confidence dependent on amount of inspection done by inspector.
	Castings – foundry marks	Low, verified by foundry	Confidence assumes actual composition meets specification
	Wrought products – color coding	Moderate, open to interpretation	Accuracy can be variable. Depends on vendor's QA system
	Wrought products – stencil marks	Low, verified by manufacturer	Accuracy can be variable. Depends on vendor's QA system
	Color	High, depends on individual judgment	Test often lacks precision
	Density	Moderate, requires procedure	Test may not be sufficiently precise for its intended purpose
	Magnetic behavior	High, depends on individual judgment	Test may not be sufficiently precise for its intended purpose
Qualitative Characteristics (for Material Family grouping)	Chemical spot testing	Moderate, depends on individual judgment	Test is also time consuming
	Spark testing	Moderate, depends on individual judgment	
	Thermoelectric potential sorting	Low, requires procedure	Test may also lack precision, e.g. cannot distinguish between 304 & 316 SS
Quantitative Analysis	x-ray fluorescence analysis - isotope	Low, does not detect every element	Cannot detect lighter elements. Difficult to transport by air.
	x-ray fluorescence analysis - x-ray tube	Low, does not detect every element	Cannot detect lighter elements
	Optical emission spectroscopy - field	Low, does not detect every element	Slower than XRF techniques
	Optical emission spectroscopy - laboratory	Low, complete analysis	
	Mass spectroscopy inductively coupled plasma (MAS-ICP)	Low, complete analysis	
	Combustion furnace for carbon and sulfur	Low, specific to carbon or sulfur	Analysis cannot be done in situ

Updated & Revised June 2021

PROJECT CHAMPIONS SPORT LIGHT

> CONTINUED FROM PAGE 37

Q: What have you gained from this experience as a project champion?

A: Karen: Working on this project has been a positive experience for me. I enjoyed the level of collaboration, the respectful contributions during discussions, and the willingness of the group to find the best solutions that will benefit the community as a whole.

Bill: Working on this project reinforced my opinion that MTI is one of the most unique and valuable technical organizations that I have been involved with. The cooperation, support and knowledge of the members is incredible.

Q: Just for fun, what is the best city you have ever visited and why?

A: Karen: I'm not sure it is the best city I have ever visited but it is the most impressive location I've ever seen. Pompeii is by far one of the most impressive sites I've ever visited. Touring the grounds and seeing the devastation and preservation is incredible. It is a reminder of the vulnerability of humankind.

Bill: Every city I have ever visited is different and has its own culture, so it is impossible to say which one is "best." I find the cities that I have visited in Asia tend to be the most intriguing

so different than the USA. Traveling and experiencing the differences is something I truly enjoy.

Every city has something to offer—even New York City (I grew up in NYC in case you didn't know).

because their culture is

Q: Briefly talk about one exciting experience in your professional career.

A: Karen: Working the night shift as a field engineer in the oil field was one of the most exciting experiences in my career. It was my first job out of college and a great learning experience that made me a strong professional and value my career choice and work opportunities today. **Bill:** Perhaps not exciting but one of the most interesting experiences in my career was an early assignment I had while working at GE. The company was on a 15-week strike, so they needed individuals to work in the on-site power plant to provide heat to the plant located in Erie, PA. During that time, I learned the following:

- Operate a bulldozer, compacting the coal pile
- Run a locomotive to move coal cars and ash handling
- Water treatment and analysis of boiler water
- Watching and operating soot blowers on the boiler

 After the strike was over.

After the strike was over,
I was assigned as a liaison
for GE and B&W which was
installing a new cyclone fired
boiler in the power house. =



Last Call for 2022 Scholarship Applicants

ollege students who show an interest in pursuing a career related to Materials Engineering in the Process Industries only have a short time left to apply for the 2022 MTI Scholarship opportunity. MTI will select two applicants to receive the award, which includes \$5,000 each to help cover educational expenses.

Undergraduate students from around the world are eligible to submit their qualifications for the scholarships. Qualified applications include students enrolled in Materials Engineering, Materials Science, Corrosion Engineering, and other relevant programs; relevant coursework (completed or scheduled); list of academic achievements; personal and professional activities; work experience; and letters of recommendation.

Recipients of an MTI Scholarship are also offered the unique opportunity to network and build future working relationships with some of the most notable engineers in the process industries. For most students, the chance to attend an AmeriTAC Meeting to meet members is a highly regarded advantage of winning the MTI scholarship.

Applications, requirements, instructions, selection process details, and more are available at www.nace-foundation. org. To enter, all required paperwork must be received no later than January 1, 2022.

MTI ASSOCIATE DIRECTOR PRADIP KHALADKAR RETIRES

> CONTINUED FROM PAGE 34

and will continue to be for the next AD. However, there is light at the end of the tunnel."

Khaladkar also served as a supporting Associate Director for the AsiaTAC region. He was involved in helping to plan meeting locations, identifying and recruiting potential members and developing the programs and training to occur at each event. Recruitment continues to pose various problems, among them the cost of dues. He has proposed ideas to the BOD in the past to help mitigate this particular challenge and would encourage the BOD to take another look.

"AsiaTAC is very important since it validates MTI's claim to be a truly global organization," he cautions. "Although it is not clearly expressed [by the companies], the dues are intimidating for most candidates. I had suggested that we needed to go 'local,' meaning forming MTI chapters in Europe and Asia with their own dues structure. I understand the legal and logistical challenges. However, to be truly global and to bring in new ideas and abilities this needs to be pursued."

Although Khaladkar feels there is much to be done. He has made the decision to leave it in the capable hands of those currently leading the organization and those to follow.

"Deciding to retire from MTI was not easy. However, I also became involved with a Lifelong Learning Institute in Delaware concurrently with MTI," Khaladkar remarks. "Learning history, political science, economics, and languages has opened a whole new world for me. This is taking a lot of time – learning and now teaching and joining the Executive Council. Continuing both was untenable so I made a difficult choice of retiring from MTI."

But, this is not "good-bye." Khaladkar received the prestigious MTI Fellow designation in 2014, which allows him lifetime access to MTI so we might be hearing from him on the TAC Forum. He is also actively involved in the MTI Fellows forum, led by Emory Ford (MTI Fellow 2015), and participating in future meetings is not out of the question either, he notes.

Thank you, Pradip, for your dedication, collaboration and continued support of the organization. We wish you the best in retirement!

OAKS AND WADLEY ELECTED TO MTI BOD

> CONTINUED FROM PAGE 22

"I hope to best serve the MTI BOD by being the voice of both an end-user and producer in the Chemical Process Industry and the challenging materials needs that are presented," he concludes. "There is a rich history of MTI working with DuPont, and I would like to continue that tradition going forward the best that I can."

Meghan Oaks

Oaks, a Senior Materials Engineer at BASF, started participating in MTI in 2015 while attending her first MTI event – EuroTAC in Ludwigshafen, Germany. It was held at the BASF site, which was right across the street from her office.

"The sheer volume of technical expertise in that room astounded

me," Oaks recalls. "I became more actively involved in June 2018, after we had moved back from Germany to the US. The technical resources MTI provides are invaluable, but it's the people that really drew me into fuller participation."

With her more recent participation, Oaks has been Project Co-champion for the 2020 and 2022 Global Solutions Symposium events. She also transitioned to the role of Designated Representative for BASF a few months ago. She says she was happy to accept the nomination and appreciates serving on the BOD.

"MTI has some of the best-in-class technical resources available that are well-written, relevant, and, most of all, full of solid information," Oaks explains. "I want to help steer the organization to ensure that we keep providing high quality technical resources to our members."

She adds that listening to members is the best approach to serving the organization and working with the membership will help make MTI the best it can be.

"I hope to listen to members—both praises and criticismss—and find solutions that benefit the organization as a whole," she closes. "The organization has changed, and will continue to change, and I hope to be involved with setting the direction to ensure it remains relevant and valuable to our members."

Thanks to both Meghan and Maurice for serving MTI! •

MTI'S RETURN TO IN-PERSON MEETINGS

> CONTINUED FROM PAGE 23

Some of the highlights included a Non-Destructive Evaluation
Training, technical presentations, dedicated PDC sessions, and MTI project updates and idea generation. Hosting certain sessions, such as the NDE Training, in-person only, allowed for attendees to gain immense value unhindered by online technology challenges. Certain project team meeting updates were held through Zoom to allow for those that could not attend an opportunity to participate so no member was left out of the meeting.

Similarly, AsiaTAC was able to meet in person for the first time

since 2019. The group was excited to welcome back MTI members faceto-face in Shanghai, China, in early November. Attendance was less than a typical Fall meeting, but attendees found immense value from the four-panel discussions on Material Application and Selection, Failure Analysis, Testing and Inspection, and Corrosion Prevention. On the second day, attendees heard from Dr. Lei Zhang, Professor at the Institute of Advanced Materials and Technology, University of Science and Technology Beijing, on Stress Corrosion Cracking and Environmentally Induced Cracking. The region looks forward

to continuing in-person meetings in the Spring and anticipates higher attendance with the ongoing meetings.

MTI would like to thank every member who joined us in person this year as we make the transition back from virtual meetings, trainings, and networking to face-to-face connecting. We look forward to seeing more of you in person at our upcoming Global Solutions Symposium, TAC meetings and more! •



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MTI LAUNCHES UPGRADED TECHNICAL RESOURCE LIBRARY

REPLACES E-LIBRARY VENDOR ENDING HOSTING SERVICES

n November 2, 2021, MTI members received an announcement on how to access the new online Technical Resource Library hosted by new vendor TIND. The system replaces former vendor GVPi, who was ceasing library hosting services on December 31, 2021. GVPi alerted MTI of the change in services two years ago. Given the time it would take to identify a replacement and complete the implementation process, MTI acted quickly to begin researching potential vendors.

A project team formed with Eileen Chant (former member who Championed the first e-Library project) as the Champion; Curtis Huddle (Eastman) later assumed the role when Chant resigned from her member company. The team developed a request for proposals based on the e-Library features and identified new features MTI would like to see. Three vendors were selected to present their systems, which the team thoroughly vetted. Throughout the past year, the team has been working with TIND to implement the system and make certain customizations to meet the organization's needs.

The new system is robust in comparison to the previous library and additional features are already

coming in 2022, including Single Sign-on and a watermarking capability. There could be others down the road as well. The Technical Resource Library can be located by members under the "Resources" menu at www.mti-global.org. Although tested at length before launch, there is always the possibility of potential issues that were not discovered. If you come across any problems or have questions, please notify MTI at mtiadmin@ mti-global.org. ■

