Fiberglass Reinforced Plastics Institute, Inc.

Syllabus

Course: FRP401 – Introduction to Design, Manufacturing, Inspection, Standards and Specifications

Duration: Two (2) days totaling sixteen (16) hours, with continuing education PDH credit opportunities.

Description:

This course provides a hands-on detailed look at how Fiberglass Reinforced Plastic ("FRP") laminates used in the fabrication of chemical storage tanks plus odor and air pollution control equipment are designed and manufactured, what their properties are and how premature failure occurs. Both theory and practical experience are blended together with case histories to demonstrate equipment reliability risks that can be mitigated during specification development, submittal review, manufacturing and installation. Courses are conducted in the FRPI training and demonstration theater, with a maximum of twelve (12) participants per one (1) instructional leader. The one-hundred-twenty (120) inch projection screen with stereo sound, supplemented by dozens of hands on demonstrations integrating actual production materials, laminate cutouts and runouts, specimens extracted from equipment taken out of service, laboratory test remains plus inspection tools, provides for a tremendously interactive learning involvement. FRP laminate identification, visual imperfections, damage mechanisms, industry standards review plus specification writing makes up a significant portion of this course.

Key Learning Objectives: After attending this course, participants should be able to:

1. Identify all types and compositions of laminates.
2. Describe laminate defects in new and degradation ("corrosion") in used equipment.
3. Implement visual inspection practices for new and used equipment.
4. Correlate deficiencies in new equipment to failure mechanisms observed in used.
5. Explain typical nondestructive and destructive test methods.
6. Differentiate and specify good, better and best FRP laminate designs.
7. Choose industry standards for design, fabrication and inspection purposes.
8. Recognize and address poorly written equipment specifications.
9. Apply concepts to sound specification writing that balance cost and risk.
10. Determine which industry certification programs to apply when and where.

General Course Content and Outline:

DAY 1 – Introductions. Overview of course content, agenda and learning objectives. See, handle and learn about primary raw materials that go into laminating finished components of FRP equipment. Observe raw material processing such as resin formulation and reinforcement cutting plus hand layup, spray-up, filament winding, vacuum infusion, compression molding and pultrusion laminating methods. Explore basic equipment fabrication techniques, where welding through secondary bonding is shown. Review laminate finishing touches involving heat treating via postcure and cleaning procedures. Discuss quality control practices via visual inspection plus nondestructive and destructive testing consistent with latest industry standards. Inspect sample production run material passed around. Learn how to identify and describe FRP laminates plus quantify visual imperfections. Best practices are outlined for writing a good, better and best laminate specification. Participate in a physical learning exercise centered around topics presented.

DAY 2 – Standards review, comparison and contract plus inherent controversaries are presented for discussion. Sections of ASTM and ASME standards including scope, materials, design, fabrication details, inspection practices, test methods, documentation plus compliance

procedures are introduced. ASTM standards reviewed cover laminates (C582), classifying defects (D2563), filament wound tanks (D3299), hand layup tanks (D4097), pipe (D6041), ductwork (D3982) and flanges (D5421). ASME review focuses primarily on pressure vessels less than 15 psig (RTP-1), with mention of vessels greater than 15 psig (Section X) and pipe (B31.1 and B31.3). Various decision areas within and limitations of standards often overlooked by specifiers are revealed. Performance based industry certification programs will be introduced, including AMCA, FM, FRPI and UL. Specification issues such as typical errors, omissions, conflicts, supply dynamics and enforceability challenges are addressed. Basic in operation inspection coupled with past research and case histories pertaining to actual FRP equipment premature failure are shared to highlight typical leading root causes to mitigate. A master specification exemplifying best engineering practices is summarized to provide insight for improved mechanical reliability and competitive bidding. Participate in a learning exercise centered around topics presented.

NOTE – Each day involves practical exchange of experience, with discussion of individual participant challenges and opportunities as time permits.

Who Should Attend:

- Designers, Engineers and PE's
- Specification and Regulation Writers
- Owner/User and Resident Engineers
- Project Managers and Planners
- Purchasing Agents and Buyers
- Inspectors (new & used equipment)
- Product, Sales and Market Managers
- Those New to the FRP Industry

Prerequisites: No prior knowledge, special areas of study or experience are required. A general understanding of FRP laminate design, industry standards, manufacturing and inspection may result in establishing a broader and deeper learning experience. Although not required, it is suggested to review any ASTM and/or ASME standards referenced in this course syllabus.

Recognition: A course completion certificate will be issued to all attendees who participate in the entire program, with sixteen (16) Professional Development Hours ("PDH's") recorded for licensed professional engineers. FRPI has been vetted and is recognized by RCEP (www.rcep.net) since 2011 as a provider of continuing education for licensed professional engineers. Participants desiring PDH credits will be required to complete a program evaluation survey at the end of course. See Terms and Conditions of Course Registration for more information pertaining to PDH credit opportunities.

Skills Assessment: A simple interactive quiz will be conducted at conclusion of last session each day, with answers discussed live within the group as an ungraded learning confirmation exercise.

Instructional Leader: Gary L. Arthur – FRPI Executive Director and President (see Bio/CV)