

Course Content



Title: Nitric Acid / Ammonium Nitrate (NAAN) Plants - Preventing Fixed Equipment Failures

Potential PDH: 40 **Code:** BTT067

Description:

One of the biggest concerns for owners and operators of NAAN plants, is a loss of primary containment event, which brings with it the potential for personnel injury, significant equipment damage, and plant downtime.

Ultimately, all equipment failures are preventable, so why do fixed equipment failures still occur? Basically, equipment failures occur because there are gaps in a plant's equipment 'failure prevention controls'. Controls are what manufacturing facilities put into place to ensure continued safe and reliable operation of plant.

For example: Plant A suffered an on-stream failure of a fire tube waste heat boiler in the heat train loop of a nitric acid plant. What was the root cause and what remedial actions should be implemented to ensure this doesn't happen again?

- (a) Design and Construction: Were there gaps in the original manufacturing specification, such as post weld heat treatment?
- (b) Process Operating Controls: Is NOx condensing during plant trips and transient periods and what impact did this have on the formation of stress corrosion cracks?
- (c) Maintenance Controls: Are the NOx drains effectively maintained?
- (d) Inspection Controls: Why did the boiler inspection program not pick up the damage prior to through wall cracking in the tubes forced the plant off line for repair? How effective is your RBI program?

Outline:

Training program participants will have an opportunity to take a deep dive into the metallurgy, damage mechanisms and failure prevention controls applicable to equipment on your NAAN plants. Participants are invited to submit questions for discussion during the 5-day program. An outline of the program is detailed below.

Nitric Acid Manufacturing Plants

- N1 Nitric Acid Plants overview
- N2 Ammonia Vaporisation, Air Compression & Heating
- N3 Conversion & Heat Train
- N4 Cooling, Condensation, Absorption & Bleaching
- N5 Tail Gas & NOx Emission Control
- N6 Acid Storage

Ammonium Nitrate Manufacturing Plants

- N7 Ammonium Nitrate Plants overview
- N8 Ammonia Evaporation & AN Synthesis
- N9 Concentration, Prilling, Conditioning & Scrubbing
- N10 Process Steam & Condensate

Who Should Attend:

Course Content

This highly interactive and hands-on training caters for inexperienced as well as experienced engineers and inspectors. This program is very beneficial to Fixed Equipment Reliability Engineers, Process Engineers, Materials Engineers, Mechanical Engineers, Inspectors and Design / Construction Project Engineers (QA/QC) who work on or support NAAN Manufacturing Plants.

Benefit to participants and their facilities:

This experiential training program will provide participants with a much broader and deeper working knowledge of:

- Materials and damage mechanisms applicable to your NAAN plant, including potential for and consequence of equipment failure.
- What damage mechanisms should be included in your sites RBI program to ensure effectiveness of inspections and condition assessments.
- What critical process controls need to form part of your plant's integrity operating windows program.
- What gaps may be present in your current fixed equipment failure prevention controls..
- What equipment may be approaching end of life and what actions would be needed to quantify remnant life.
- The importance of linking damage mechanisms with manufacturing specifications to ensure equipment does not fail from design and construction gaps.
- Equipment integrity focused operation of critical plant equipment such as converters, waste heat boilers, superheaters, tail gas heaters, cooler condensers and absorbers.

Instructor:

David Keen is a qualified Metallurgist with over 46yrs domestic and international experience in Syngas manufacturing facilities. David is a Subject Matter Expert (SME) on fixed equipment integrity management and has in recent years downloaded this knowledge into a series of training modules focused on preventing equipment failures through experiential learning and team problem solving sessions.

He has held various positions including Global Company Chief Engineer, VP Global Reliability & Risk, Company Engineer Fixed Equipment, Reliability Manager, Operations Manager, Maintenance Manager, T/A Manager and Plant Metallurgist. David has worked as a consultant to Hydrogen, Ammonia and Methanol plants in 12 countries globally. He has been involved in implementing RBI programs, IOW programs, auditing fixed equipment management, completion of failure investigations, root cause analyses, fixed equipment repairs and design and construction of new fixed equipment.

David has worked on 33 steam methane reformers and is a recognized subject matter expert in the integrity management of SMRs.

Monika Ko has 15 years-experience as a materials and corrosion engineer involved in asset integrity management in operating plants as well as consulting in the oil and gas, petrochemical and power industries. Monika has a Bachelor of Engineering and a PhD in CO₂ Corrosion of Pipeline Steel, both from the University of Auckland, NZ.

She is experienced in failure and root cause investigation, material selection, fitness for service, identification of damage mechanisms and development of corrosion management programs for fixed

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equipment and pipelines, implementation of RBI and IOW programs.

Monika has held site-based positions on hydro-carbon plants, such as Senior Expert Integrity and Pipeline Engineer, and Senior Materials and Corrosion Engineer. She has also worked as a materials and corrosion consultant to hydrogen, ammonia and methanol plants globally.