

# Bulk Liquid Storage Tank Management

## Life Cycle Optimisation for Above Ground Atmospheric Storage Tanks (AST)

### Major Benefits of Attending

- **APPRECIATE** the fundamentals of Atmospheric Storage Tanks (AST) design
- **BE MADE AWARE** of innovative technologies designed to reduce / eliminate man-entry into the confined space
- **UNDERSTAND** how to dramatically reduce the time required to prepare your AST for inspection and repair
- **CONSIDER** the application of Non-Destructive Examination to assess the condition of your AST in both the on-stream and off-stream situation
- **ADDRESS** the decisions to be made when optimising your in-service storage life-cycle against the Repair Plan
- **EVALUATE** the scope of mechanical repairs to foundation, tank bottom, tank shell and roof
- **COMPARE** the value of upgrading your AST during the maintenance project.
- **LEARN** how it is possible to recover the valuable element of tank residues thereby reducing the volume / cost of off-site waste disposal and benefiting from the value of recovery

### Why you Should Attend?

Failing to maintain your AST's can have catastrophic results: - loss of asset, loss of product, cost of environmental remediation, adverse publicity and falling foul of your Government's Environment Agency to name a few, and we could add to this list the potential to cause loss of life.

In the recent past, 4 personnel were killed in an AST related incident in the UK, 8 in Kazakhstan, 2 in Singapore. How can our industry justify such a track record in the 21<sup>st</sup> century?

Learn how to avoid such incidents by effectively managing your above ground storage tanks.

### Who Should Attend?

This training is highly recommended for Managers and Engineers involved in the following capacities:

- ✓ Corrosion Control
- ✓ Health, Safety and Environment
- ✓ Inspection
- ✓ Loss Prevention
- ✓ Operations and Maintenance
- ✓ Technical and Mechanical
- ✓ Plant
- ✓ Production and Process
- ✓ Project Planning
- ✓ Tank Design
- ✓ Tank Farm
- ✓ Tank Repair
- ✓ Terminal Operations

It is also crucial for personnel involved in the operation and maintenance of storage tanks in these industries:

- ✓ Chemical and Petrochemical
- ✓ Oil and Gas
- ✓ Refineries
- ✓ LNG Terminals
- ✓ Power

Organized by: \_\_\_\_\_

Our course will commence with a look at the factors influencing the performance and lifecycle of AST's. This will be followed by a work-through of the fundamentals of AST design according to **API 650**. Once our AST is in service, the relevant code switches to **API 653** but we cannot even consider inspection and maintenance before we have cleaned the tank to hot-work condition – current methodology for non-man entry tank desludging along with techniques designed to reduce man-entry will be debated.

The importance of an accurate and comprehensive Inspection cannot be underestimated. The application of NDT to assess Suitability for Service and the creation of a Repair Plan will be illustrated with worked examples.

Finally, tank repairs and upgrades will be considered and their value assessed.

## Outline

### DAY 1

#### SESSION 1 – FACTORS AFFECTING THE PERFORMANCE OF BULK LIQUID STORAGE TANKS

- **Dynamic;** loading, mass of product, internal pressure, forces, site classifications, stability
- **Meteorological;** wind loads - buckling, precipitation
- **Chemical / Electrical;** volatile vapour emissions, product contamination, electrical potential – corrosion, earth bonding
- **Geological;** seismic zone factor

#### SESSION 2 – FUNDAMENTALS OF STORAGE TANK DESIGN TO API 650 & FIRE PROTECTION

- **Foundations;** sub-surface investigations, soil structure, typical foundation types
- **Tank Shell;** materials, plate thickness, reinforcing plates, manholes
- **Tank Floor;** types, materials, sumps, joints, annular or sketch plates
- **Roof Design;** types, materials, joints, corrosion allowances, manholes, venting
- **Sources of Ignition;** human factor, minimising spark generation, lightning, grounding
- **Fire Protection Technology;** local or remote impoundment, water and foam, fire systems, ring seals

#### SESSION 3 – FREQUENCY OF INSPECTION & NON-INVASIVE CONDITION MONITORING

- **Techniques for Extending the In-Service Period;** intelligent observations, on-stream inspections, acoustic emission testing
- **Topographical and Analytical Surveys;** physical and ultrasonic

#### SESSION 4 – CONFINED SPACE ENTRY & WORKER SAFETY

- **Operating Instructions;** Conditions
- **Attendant Responsibilities;** Emergency Evacuation and Rescue
- **Entry into confined spaces;** working in hazardous atmospheres, handling hazardous materials are situations encountered by tank cleaning personnel on a regular basis
- **Worker safety;** the Hazards and their Effective Control, UK's C.D.M. Regulations and C.O.S.H.H. (Control of Substances Hazardous to Health), selection of P.P.E. (Personal Protective Equipment), Breathing Apparatus, R.P.E

#### SESSION 5 – THE TANK CLEANING, TANK DESLUDGING WITHOUT MAN ENTRY & GAS-FREING PROCEDURE

- **Tank Cleaning and Sludge Disposal;** health and safety and environmental legislation, assessment of technologies and contractors
- **Formulating the Scope of Work;** selecting the contractor, commercially available systems, resuspension Solvent Extraction, remote mechanical methodology
- **Man-Entry;** forced and natural ventilation criteria for man-entry, Explosion Risk and LEL Outline

#### SESSION 6 - SITE ESTABLISHMENT AND MAN-ENTRY

- **Number of personnel entering the tank;** should be kept to a minimum
- **Review of Techniques;** minimise the duration
- **Commercially available tank desludging equipment and methodology;** review

#### Day 1 - CASE STUDIES:

Tank lining systems - 75 metre diameter crude oil tank, floating roof and 30 metre diameter fuel oil tank, fixed roof

**DAY 2**

**SESSION 7 – DEGREASING, HIGH PRESSURE AND ULTRA HIGH PRESSURE WATER JETTING**

- **Alternative Products;** environmentally acceptable solution, cost, gas free, jetting, removal of residual contaminants
- **Types of removal;** ultra high pressure blasting, gas oil wash, grit-blast

**SESSION 8 – SURFACE PREPARATION**

- **Roof Repairs;** ancillary repairs
- **Bottom plate repairs;** welding preparations
- **Tank Jacking;** foundation improvement

**SESSION 9 – CORROSION MECHANISM & CATHODIC PROTECTION**

- **Corrosion mechanism;** external and internal corrosion
- **Cathodic Protection;** benefits, types and cost
- **Internal floor corrosion;** identification, monitor, monitoring condition, sulphate Reducing Bacteria (S.R.B.)
- **Coatings;** protective materials applied to or bonded to tank surfaces, paint, protective metals (e.g. galvanizing or cadmium plating), adhered plastic or polyolefin materials

**SESSION 10 – NON-DESTRUCTIVE TESTING (NDT)**

- **Leak Testing;** welded areas, vacuum box and magnetic particle inspection
- **Ultrasonic Examination;** floor, shell and roof applications, online
- **Magnetic Flux Leakage;** tank floor evaluation, lasers to determine out of verticality, edge settlement, and others

**SESSION 11 – SUITABILITY FOR SERVICE; REPAIR OPTIONS & TANK UPGRADES**

- Tank Roof Evaluation
- Tank Shell Evaluation
- Tank Bottom Evaluation
- Tank Foundation Evaluation
- Floor Repairs
- Shell Repairs
- Secondary Containment Leak Detection
- Cathodic Protection upgrades
- Lightning Protection upgrades
- Fire Systems

**SESSION 12 – SLUDGE; DISPOSAL, CONTROL STRATEGY & OPTIMIZING OIL RECOVERY FROM SLUDGE**

- **Disposal Routes;** project cost, local environment, effective routine sludge control, minimisation of time, risks and costs
- **Tank Cleaning;** routine sludge control strategy; effects on internal corrosion
- **Sludge treatment;** traditional methods, equipment for achievable standards; types of treatment, maximizing oil recovery, effective treatment including advantages of on-site treatment problems, commercially available hydrocarbon recovery, waste processing systems, alternative technology options

**Day 2 - CASE STUDIES: West Africa Oil Refinery Tank Farm, Oil and Fuel (including aviation fuel) above ground storage tanks** - repair evaluations for scoping and preparing ITT proposal BOQ (Bill of Quantities), proposal repair methodology. Technical repair bid evaluations, planning and scheduling the repairs, repair methodologies, contractor mobilisation, repair workforce and supervision.

**CLOSE OUT**

- Methods and Considered
- Contaminated Grit
- Disposal

**program schedule**

08:30	Registration
09:00	Morning Session Begins
10:40 - 11:00	Refreshments & Networking Break
12:45	Luncheon
14:00	Afternoon Session begins
15:30 - 15:50	Refreshments & Networking Break
17:00	Course Ends



**Robin Dargavel**

**Key Expert – Engineering, Construction and Maintenance Training  
DARGAVEL ENGINEERING LIMITED**

**Robin Dargavel** is a versatile and highly skilled, BEng (Hons) Degree Qualified Engineer - Project Manager, Senior Facilities Engineer, Chief Surveyor, Consulting Engineer and founder at Dargavel Engineering Ltd. Robin has over 25 years experience in Oil & Gas, Petrochemical, Process and Nuclear Power Generation industries. That experience includes Engineering, Project Management, Independent Expert Witness/ Adviser on Engineering Issues, positions with responsibility for the engineering, design, procurement, construction, commissioning, and start-up of a variety of projects both in the UK and worldwide. In recent years, Robin has been working extensively in Aberdeen, Scotland on North Sea offshore and associated onshore assets as a consulting Senior Facilities Engineer for major oil and gas operators, since returning to the U.K. after twenty years of working overseas for oil companies in mechanical/ process disciplines in Yemen, Kazakhstan, Vietnam, most of West Africa, Libya, Israel, Qatar, U.S.A. (and others). Robin is an active member of an assortment of Engineering Institutes within the U.K.

Experienced in Storage Tank Maintenance and Repairs;

- ✓ HSE – Workers Safety
- ✓ Safety Systems
- ✓ Fire protection
- ✓ Floor Tank Bottom Replacement
- ✓ Secondary Containment
- ✓ Fire Fighting Foam Systems
- ✓ Roof Repairs
- ✓ Tank Shell Repairs
- ✓ Man-ways, Shell Nozzles, Vents and Miscellaneous Appurtenances
- ✓ Rolling Ladders & Stair Treads
- ✓ Tank Foundations
- ✓ In-Service Tank Repair
- ✓ Tank Cleaning Methods
- ✓ Corrosion Engineering
- ✓ Condition Monitoring
- ✓ Coatings and Painting
- ✓ Cathodic Protection & Leak Detection
- ✓ Bespoke Repairs
- ✓ Bund Maintenance

Industry Sectors Experience:

- ✓ Bulk Liquid Storage Terminals
- ✓ Oil & Gas
- ✓ Fuel Storage and Distribution
- ✓ Chemical & Petrochemical
- ✓ Renewable Energy
- ✓ Environmental
- ✓ Power Generation & Utilities

## ▶ Professional Memberships: MIPlantE, MIET, MWeldI, MInstNDT, SOE

Industry	Action	Results
Oil and Gas - LNG Plant	Developed a more efficient system to renew LNG Storage Tank Bund Pearlite.	Highly effective reduction in Plant Shutdown durations.
Oil and Gas – Offshore Production	Established a Maintenance Project Costs Control Procedure.	Improved project efficiencies for offshore production projects.
Oil and Gas - Pipelines	Established an Evaluation system for Technical Bid Proposals.	Highly effective Technical Bid Evaluations.
Oil and Gas – Refinery	Developed Oil Storage Tank Repair Engineering Procedures and Method Statements.	Improved repair efficiencies, reduced production shutdown.

## ▶ Partial List of Clients

- ✓ Jacobs
- ✓ Qatar Petroleum
- ✓ BP
- ✓ Zuetina Oil Company
- ✓ Yemen LNG Company
- ✓ Khazzan
- ✓ Lloyd's Register

## ▶ Testimonials

"Robin's training on Plant and Pipeline Maintenance (including Storage Tanks) was extremely appreciated by my team, very knowledgeable."

**Andy Band, Director, Band Consulting Ltd.**

"Robin's method of training is from hands-on experience, specifically regarding Oil and Gas Flow Fiscal metering."

**Daniel Delahaye, Consultant Pipeline Engineer, Delahaye Engineering Ltd.**

"Robin's training on Storage Tank Maintenance and Operation is from in the field experience, which covers all aspects of the construction, maintenance, operations, trouble shooting, including Cathodic Protection and repairs including coatings"

**Vasiliki Tsopele, Consultant, VSLK Engineering, Athens, Greece.**

"Robin's training on Storage Tank Maintenance was from solid maintenance experience, covering all aspects of the maintenance with cost saving operations tasks"

**Andrew Davis, Consultant E&I, ADAVIS LTD, U.K.**