API 936

Refractory Personnel Certification

For Inspectors & Engineers

Applicable Sectors: Petro-Chemical & Energy.
Expertise: Beginner. Intermediate.
Training Setup: Class.

An API accreditation gains you the required competence and global industry confidence that inspections are conducted professionally and attest to one's competence and knowledge of the applicable industry codes, standards and recommended practices. The course is designed to develop the knowledge base of the attendees with special emphasis on exam preparation methods to aid a one-time success in Inspector examinations.

Course Structure

The Training provides participants with:

1. Knowledge of API publications and other complimentary standards. This include:
   - ≡ API Standard 936, Refractory Installation Quality Control Guidelines.
   - ≡ API TR 979, Applications of Refractory Lining Materials.
   - ≡ API TR 980, Monolithic Refractories: Installation and Dryout.
   - ≡ American Society of Mechanical Engineers (ASME), Standards:
     - C113-14 Standard Test Method for Reheat Change of Refractory Brick.
     - C133-97 Standard Test Methods for Cold Crushing Strength and Modulus of Rupture of Refractories.
     - C181-11 Standard Test Method for Workability Index of Fireclay and High-Alumina Plastic Refractories.
     - C704-15 Standard Test Method for Abrasion Resistance of Refractory Materials at Room Temperatures.
2. Maintenance, rating, inspection, repair and alteration of in-service above ground storage tanks.
3. Information of API Individual Certification Program and API 936 Inspector certification process.
4. Practical tests simulating the API 936 ICP exam.
5. Competence and confidence to complete the API 936 ICP qualification and recertification.

Who should attend?

The course is a five days training designed for plant personnel who are engaged in the design, inspection, maintenance and repair of process piping equipment. This course is particularly targeted for preparations of the API 936 certification examination. The structure entails the exam body of knowledge and the API936 publication effectivity sheet. Course Attendees are responsible for the documents listed as per the API ICP Effectivity Sheet. A general working knowledge of pressure equipment and their usual construction materials is a requirement to attend this course.

Plant personnel would typically include experienced:

- ≡ Unit inspectors
- ≡ Plant engineers
- ≡ Asset integrity specialists and engineers
- ≡ Operations engineers
- ≡ Maintenance engineers
- ≡ Welding engineers and allied personnel.

Certificate & Credits

Upon completion of this course, a certification of completion will be issued. This earns the attendee at the end of the course 80 professional development hours (PDHs).

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Topics Covered

Day 1

Refractory Pre-Qualification & Installation Testing Procedures – Laboratory

- Test methods (e.g., C704, CCS, PLC, and Density) and related calculations.
- Material Qualification.
- Testing equipment, sample preparation techniques, dimensional requirements for test specimens.
- Various materials utilized (for example, plastic, ceramic fiber, anchor, metal fiber, corrosion coatings, etc.)
- Curing and firing procedures.
- Acceptance/rejection criteria.
- Responsibilities of personnel and documentation requirements.

Day 2

Applicator methods and refractory Material Qualification

- Installation methods (e.g., gunning, casting, ramming, and hand packing).
- Sampling and sample preparation procedures.
- Procedures for determining optimal water content and mixing.
- Applicable formulation and manufacturing information.
- Applicable knowledge of equipment and qualification process.
- Applicable test panel/mock-up requirements.
- Applicable environmental controls.
- Surface preparation requirements.
- Responsibilities of personnel and documentation requirements.

Day 3

Installation of Refractory based Systems Material Qualification

- Responsibilities of personnel and documentation requirements.
- Detailed execution plan including design details and quality standards.
- Packaging and storage requirements.
- Surface preparation and cleanliness requirements.
- Anchor: welding, layouts, patterns, materials.
- Frequency and methods of production sampling: gunning, casting, hand packing.
- Water addition: quantity and temperature, mixing procedures.
- Fiber addition: percentage, material, mixing.
- Installation environmental controls (minimum and maximum temperatures).
- Gunite procedures and equipment, including variables that affect gunite quality.
- Casting procedures and equipment (e.g., air vibrator, vibrator frequency, vibrator sizing, forming, and setup).
- Ramming / Hand packed procedures and equipment.

Day 4

Refractory Inspection Methods

- Terminology, job specifications, application standards.
- Inspection and data collection procedures.
- Lining design and installation requirements.
- Visual and non-destructive test methods and qualification testing methods.
- Application/limitation for various inspection techniques.
- Material verification and traceability.
- Acceptance and rejection criteria.
- Repair procedures.
- Curing and dry out procedures.
- Inspectors’ and contractors’ responsibilities.
- Record keeping systems and requirements.

DAY 5

Post-Installation Integrity Activities.

- Responsibilities of personnel and documentation requirements
- Dryout requirements
- Sealing requirements (for example, water mist, covering, membrane, curing) .
- Application and time limits for applying membrane curing compounds
- Environmental conditions required for curing.
- Heating equipment, methods and procedures (e.g., gas fired burner, stress relieving heating elements).
- Placement of temperature sensing probes.
- Reviewing manufacturer’s recommended heatup and cooldown schedules
- Applicable heating rates for various classes of refractories.
- Lining integrity inspection techniques.

500 example questions for practice to be reviewed during the training and open/close book exams at various stages.