



AMERICAN PETROLEUM INSTITUTE

## Storing Oil and Natural Gas Safely

### **Natural Gas Storage – Industry Standards**

The oil and natural gas industry is fully committed to safe operations. To fulfill this pledge, the industry has established a series of Recommended Practices for the storage of natural gas that go above and beyond the current regulatory requirements. These standards were developed in collaboration with state and federal regulators, technical experts, and other interested stakeholders in an open and transparent, ANSI-accredited process.

In September 2015 and July 2015, respectively, the American Petroleum Institute (API) published recommended practices (RP) 1171 entitled “Functional Integrity of Natural Gas Storage in Depleted Hydrocarbon Reservoirs and Aquifer Reservoirs,” and 1170 “Design and Operation of Solution-Mined Salt Caverns Use for Natural Gas Storage.”

- The American Gas Association (AGA), the Interstate Natural Gas Association of America (INGAA), and their respective members were active and crucial participants to the development of both standards.
- API RP 1170, *Design and Operation of Solution-mined Salt Caverns Used for Natural Gas Storage*:
  - Provides the functional recommendations for salt cavern facilities used for natural gas storage service and covers facility geomechanical assessments, cavern well design and drilling, solution mining techniques and operations, including monitoring and maintenance practices.
  - This RP is based on the accumulated knowledge and experience of geologists, engineers, and other personnel in the petroleum and gas storage industries and promotes public safety by providing a comprehensive set of design guidelines.
  - This RP recognizes the nature of subsurface geological diversity and stresses the need for in-depth, site specific geomechanical assessments with a goal of long-term facility integrity and safety.
- API RP 1171, *Functional Integrity of Natural Gas Storage in Depleted Hydrocarbon Reservoirs and Aquifer Reservoirs*:
  - Applies to natural gas storage in depleted oil and gas reservoirs and aquifer reservoirs, and focuses on storage well, reservoir, and fluid management for functional integrity in design, construction, operation, monitoring, maintenance, and documentation practices.
  - The scope does not include pipelines, gas conditioning and liquid handling, compressors, and ancillary facilities associated with storage. Storage design, construction, operation, and maintenance include activities in risk management, site security, safety, emergency

preparedness, and procedural documentation and training to embed human and organizational competence in the management of storage facilities.

- This RP embodies historical knowledge and experience and emphasizes the need for case-by-case and site-specific conditional assessments.

### **Liquid and Liquefied Petroleum Gas Storage – Industry Standards**

A few years prior to the development of the natural gas storage documents, API, in its effort to ensure safe operations, reviewed existing guidance on liquid underground storage and, in January 2013, published an updated version of RP 1114, “Recommended Practice for the Design of Solution-mined Underground Storage Facilities.” Also, in October 2012, API confirmed the direction given in RP 1115, “Recommended Practice on the Operation of Solution-Mined Underground Storage Facilities,” was still sufficient through reaffirmation of the document.

- API RP 1114, *Recommended Practice for the Design of Solution-mined Underground Storage Facilities*:
  - Provides basic guidance on the design and development of new solution-mined underground storage facilities. It is based on the accumulated knowledge and experience of geologists, engineers, and other personnel in the petroleum industry.
  - All aspects of solution-mined underground storage are covered, including selecting an appropriate site, physically developing the cavern, and testing and commissioning the cavern. Additionally, a section on plug and abandonment practices is included.
  - This RP does not apply to caverns used for natural gas storage, waste disposal purposes, caverns which are mechanically mined, depleted petroleum reserve cavities, or other underground storage systems which are not solution-mined.
- API RP 1115, *Recommended Practice on the Operation of Solution-Mined Underground Storage Facilities*:
  - Provides basic guidance on the operation of solution-mined underground hydrocarbon liquid or liquefied petroleum gas storage facilities. This RP is based on the accumulated knowledge and experience of geologists, engineers, and other personnel in the petroleum industry.
  - This document is intended for first-time cavern engineers or supervisors, but would also be valuable to those people experienced in cavern operations. All aspects of solution-mined underground storage operation, including cavern hydraulics, brine facilities, wellhead and hanging strings, and cavern testing are covered.
  - This RP does not apply to caverns used for natural gas storage, waste disposal purposes, caverns which are mechanically mined, depleted petroleum reserve cavities, or other underground storage systems which are not solution-mined.

### **API ANSI Accredited Standards Process:**

- The process to develop and publish API standards is accredited by the American National Standards Institute (ANSI). This oversight helps ensure that these documents are developed, reviewed and approved following a rigorous and well-defined process.
- The process is open and balanced, and as such, the federal and state regulators, academia, experts from industry, and others from the public with an interest or expertise in the subject matter are critical authors, contributors and reviewers of the content of these documents.
- Once the document is complete, it is available for public comment. Each comment must be considered and addressed appropriately.
- Finally, ANSI accreditation requires that a representative group of affected stakeholders must review and approve the document. ANSI also requires as part of its accreditation process that API regularly review each document with the stakeholders to help ensure it remains relevant and incorporates the latest information.