

## Underground Storage Integrity Management

In response to recent industry events, natural gas storage operators are seeking a comprehensive approach to assess the integrity of their storage facilities. Recently published API 1170 and 1171 Recommended Practices, as well as PHMSA Advisory Bulletin ADB-2016-02, provide guidance to operators when developing and implementing an Underground Storage Integrity Management Program.

EN Engineering has the experience to design integrity programs including risk assessment, preventive and mitigative measures, continual monitoring, physical assessment, and data management. EN Engineering also offers design services for above and below grade facilities, maintenance, and remediation.



### Integrity Risk Management

EN Engineering's team of code compliance, integrity management, and gas storage specialists evaluate existing integrity programs and recommend adjustments to comply with API Recommended Practice Documents and PHMSA Advisory Bulletins.

- **Overview**

- Gap analysis against requirements of API 1170, 1171, and other industry documents
- Recommendations on how to modify existing programs to further enhance integrity management principles and/or maintain regulatory compliance
- Procedure review and development
- Data collection, record retention, and performance metrics

- **System Baseline**

- Data collection
- Service pressure rating verification and documentation

- **Risk Management**

- Threat identification
- Risk prioritization
- Remediation and reassessment triggers



## Integrity Verification and Monitoring

EN Engineering assists with the ongoing evaluation and monitoring of gas storage wells and reservoir fluids.

- **Ongoing Risk-Based Evaluations**
  - Data integration and analysis
  - Updates to threat and risk evaluations
- **Corrosion Control**
  - Corrosive potential of fluids
  - Cathodic protection (CP) current flow (E-Log I) and interference testing
  - CP system design and remediation
- **Metallurgical Analysis**
  - Materials assessment
  - Fitness-for service
  - Mechanical inspection analysis
  - Metallurgical failure analysis

## Gas Storage Operations

New regulations could impact gas storage operations from a standpoint of work prioritization, documentation, well configuration, and remediation requirements. EN Engineering's experienced engineers assist with operation planning, program implementation, and project detailed design that address these needs.

- **Program Development**
  - Drilling and completion programs
  - Injection and withdrawal programs
  - Well logging programs
  - Well workovers and remediation programs
  - Emergency response plans
- **Engineering**
  - Pressure drawdown and buildup testing
  - Gas volume calculations
  - Flow erosion and hydrate potential at operating conditions
  - Water production analysis and volume control
- **Design Capabilities**
  - Wellhead maintenance and modifications
  - Gathering systems
  - Gas processing facilities
- **GIS Analytics & Mapping**
  - 3D geographically referenced modeling
  - Database asset management and analysis

