

Recommended Practice on the Operation of Solution-Mined Underground Storage Facilities

API RECOMMENDED PRACTICE 1115
FIRST EDITION, SEPTEMBER 1994

REAFFIRMED, OCTOBER 2012



AMERICAN PETROLEUM INSTITUTE

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Manufacturing, Distribution and Marketing Department

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FOREWORD

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Recommended Practice on the Operation of Solution-Mined Underground Storage Facilities

SECTION 1—INTRODUCTION

1.1 Scope

This recommended practice provides basic guidance on the operation of solution-mined underground hydrocarbon liquid or liquefied petroleum gas storage facilities. This document is intended for first-time cavern engineers or supervisors, but would also be valuable to those people experienced in cavern operations. This recommended practice 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 operation, including cavern hydraulics, brine facilities, wellhead and hanging strings, and cavern testing are covered. Users of this guide are reminded that no publication of this type can be complete, nor can any written document be substituted for effective site-specific operating procedures.

This recommended practice 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.

1.2 Overview

Storage of products in solution-mined salt caverns has been utilized in the United States since the late 1940s. Today, storage of hydrocarbon liquids and liquefied petroleum gases in caverns developed in both domal and bedded salt formations is utilized throughout the world.

Salt caverns can act independently as long term, seasonal storage vessels; or they may serve as short term, operational storage. Caverns can also be inserted into the production plant/pipeline systems to prevent supply interruptions when maintenance or emergency shut downs occur or to “float” on pipelines to optimize operations.

Storage of products in a salt cavern may require careful review to ensure that the product is compatible with the salt. Chemical and physical properties of the salt at the cavern depth and at the pressure anticipated should be reviewed to verify that unwanted chemical or physical reactions will not occur. Incompatibility of product and salt is rarely a problem for most hydrocarbons. Examples of exceptions are storage in bedded salt caverns where sulfides are present and storage of jet fuels with de-icing agents that absorb water.

In summary, storage of products in salt caverns can provide an economical, safe, and environmentally sound method to store large quantities of compatible materials.

1.3 Regulatory Requirements

Federal, state, and local regulations should be consulted for specific permitting and operating requirements. In most cases, regulations will have specific record keeping requirements (i.e., casing pressure, annulus pressure, total injection rate, etc.) and will also have mechanical integrity test requirements (see Section 8).

1.4 Referenced Publications

The latest editions or revisions of the following documents form a part of this recommended practice to the extent specified in the text.

API

RP 5C1 *Recommended Practice for Care and Use of Casing and Tubing*

Specification *Specification for Casing and Tubing*

RP 114 *Recommended Practice for the Design of Solution-Mined Underground Storage Facilities*

RP 2220 *Process Contractor Safety Performance*

DOT¹

49 *Code of Federal Regulations*, Part 192 “Transportation of Natural and Other Gas by Pipeline” and Part 195 “Transportation of Hazardous Liquids by Pipeline”

NFPA²

13 *Standard for the Installation of Sprinkler Systems*

15 *Standard for Water Spray Fixed Systems for Fire Protection*

1.5 Definitions

1.5.1 brine: a saltwater solution, said to be saturated when maximum salt per unit weight has been dissolved (approximately 26 percent by weight at 20°C).

1.5.2 caprock: a mantle composed chiefly of anhydrite, gypsum, and limestone.

1.5.3 casing shoe (casing seat): a cement base formed at the bottom of the casing which provides both an anchor and pressure containment area.

¹U.S. Department of Transportation. The *Code of Federal Regulations* is available from the U.S. Government Printing Office, Washington, D.C. 20402.

²National Fire Protection Association, 1 Batterymarch Park, Quincy, Massachusetts 02169-7471.