



*Rochester Committee  
for Scientific Information  
Rochester, NY*

*RCSI Bulletin 57  
Deep Well Disposal*

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August 1969*

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Summary

Surface disposal of several waste materials has become more difficult because of space limitations and the establishment of anti-pollution statutes. There has been a great increase in disposal to wells which are at least 1000 feet deep. No effective Federal regulation exists for the practice, and only two states have dealt specifically with the problem. The practice has had disastrous consequences in Lake Erie and has been blamed for an earthquake in Colorado. Potential damaging effects for the future are predictable. Reclamation of wastes on the surface is the ecologically sound alternative.

Background

With the advent of stricter enforcement of pollution control laws by the federal and state regulatory bodies, it has become necessary for industry to find "new" methods of waste disposal. The "new" method is in reality an old one, deep well disposal, which has been used in Texas for a number of years as a method of disposing of brine from oil wells, by pumping the brine back into the ground. This was an out-growth of water flooding to improve crude oil recovery in nearly depleted oil fields.

In essence the requirements for a deep well are relatively simple. A well is drilled into the ground sufficiently deep to contact a porous sedimentary rock strata such as sandstone which is permeable enough to accept large amounts of liquids. A second requirement is the porous reservoir must be capped above and below by impermeable strata. A 100 ft. thick strata of 10% porosity has the volume to hold  $2 \times 10^9$  gallons of liquid per square mile, the same amount of water which enters Cayuga Lake. In 1964 there were approximately 55 such wells in the United States which were used for industrial waste. By June 1968 the number had doubled, to 110.

Materials Being Disposed of in the Wells

Today's deep wells are used to dispose of a wide variety of chemicals. Metal pickling liquor is a common one. U. S. Steel barges its pickle liquor 50 miles for deep well disposal. Other firms do similarly, although a number of excellent processes exist for treatment and reclamation. The spectrum of waste pumped into such wells is wide: alkalis, acids, radioactive wastes, alcohols, ketones, chlorinated hydrocarbons, chromates and others. Two such wells are operating on the Niagara Frontier. One serves a steel mill; the other serves a chemical complex.

The Problem

A considerable number of experts believe a number of the deep wells are not properly designed. The U.S.G.S. geologists suggest that hydrodynamics of underground formations are not sufficiently understood to permit deep well techniques as they are presently carried out. A number of geologists have placed the blame for the Denver earthquakes of 1962 on the 1200 ft. deep well of the Rocky Mountain arsenal.

A second deep well definitely failed in 1964. The well was 1600 ft. deep and approximately 5500 bbls. of spent sulfite liquors were pumped into it each day. On Easter Sunday 1968 the well erupted spilling 150,000 gal/day of the waste into Lake Erie until the well was capped. This failure was blamed on the material of construction.

A third problem is the unknown interactions of the waste being pumped beneath the surface. These chemicals can intermix. Radioactive materials can raise the temperatures of the confining area. Although the need of regulation is apparent, as of April 1969, only Texas had specific legislation aimed at deep wells. Ohio has amended its Oil and Gas Laws to cover deep well disposal. Congress restricted the Water Quality Act of 1965 almost completely to surface water, thereby leaving a loop hole for the deep well method. In most states, if feasibility can be shown, a permit must be granted. To our knowledge no specific legislation on deep well construction or disposal restrictions exist in New York State.

Discussion

1. Environmental protection requires that legislation should be founded in New York State as soon as possible. These regulations should specify the design criteria for deep wells and the materials which may be disposed of in such wells.
2. All efforts should be made to correct the pollution problems at the surface and not to bury untreated materials beneath the surface.

If "dirt" is swept beneath the earth's carpet now, some day the carpet may be pulled away. Voltaire's words "a man who pours drugs of which he knows little into a body of which he knows less," might aptly fit our present deep well situation.