

How is a salt cavern made?

Salt formations are found in many parts of the world, but not everywhere. These geologic gifts are found as both salt "domes" and "bedded salt". Salt Domes, common in the US Gulf Coast, are formed when salt rose up through the rock layers making pillars or columns of salt deposits. Bedded salt is layers and layers of evaporated salt ocean waters. Bedded salt formations are common in Canadian geographies including Alberta, Saskatchewan, Ontario and Nova Scotia. Both types can be used to create a void for storing pressurized gases or liquids. Bedded salt is typically less thick and deep so caverns tend to be smaller — say, one million barrels — versus domal salt caverns that exceed ten million barrels.

So how are they made? With water! As strong as the walls of these salt caverns are themselves and supported by the rock formations around them, they melt with fresh water. A drilling rig is used to pierce into the salt formation and fresh water is injected and melts the solid salt into brine water. The brine water is brought to the surface creating a void.

Salt has an amazing self-healing property. Small cracks and fissures will seal with time but an empty void in salt is likely to collapse if not managed properly. This void must contain pressure to stop the cavern from closing in on itself. If storing a gas like natural gas, ethane, helium or hydrogen a minimum pressure is left in the cavern and storage is created by pressuring the gas then allowing it to release when being withdrawn always making sure the minimum pressure is intact.

For liquids like propane, butane, condensate and oil the brine is used to maintain pressure. Most caverns are too deep below the earth's surface (1.6 kilometres or more) to use a submerged pump so a displacement process is used. Some of the brine from the washed cavern is stored in large brine ponds on the surface above the cavern site. When liquids are injected deep in the cavern, the brine is displaced into the brine ponds. To retrieve the liquids from the cavern, the brine is released back down into the cavern which displaces the liquids back out of the cavern for use.

It is this amazing geology and some smart engineers who have created a storage system that allows the midstream industry to economically store large product volumes to respond to the various markets and seasonal demands (more on this soon.)

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