WATER CONSUMPTION

Why does the oil and gas industry need water in the exploration and development of unconventional resources?
Drilling **wellbores** into the ground and preparing them to produce oil or gas is a highly technical and specialized process which may require the use of water-based fluids during the drilling and well bore stimulation stages.

During the drilling process water-based fluid (drilling mud) is used in a number of different ways including lubricating the drill bit, circulating the drill **cuttings** out of the hole, containing **formation fluids** and facilitating the operation of sophisticated formation evaluation tools.

Hydraulic fracturing operations may require large volumes of water, particularly in horizontal wells, when multiple fracturing stages are conducted.

For more information about hydraulic fracturing please see CSUR's *Understanding Hydraulic Fracturing.*

Where can the oil and gas industry obtain water?
There are six primary sources of water the industry can consider for its operations;

- Surface (rivers, lakes and run-off)
- Shallow **subsurface aquifers** containing **potable** water
- Deep subsurface aquifers (which generally contain saline water)
- Recycled water from fracturing fluid flow back
- Produced formation water
- Other industrial sources

Surface water also includes water that collects in man-made structures such as dugouts or borrow pits. Several factors influence water sourcing choices including volumes available from each source, location of the development and the interests and needs of other water users. Costs associated with obtaining, treating and transporting the water to the well site must also be considered.

In regions where surface water supplies are abundant, there may be sufficient surface water for unconventional resource development. In other areas, particularly where water supply varies seasonally, supply concerns are much greater and scarcity must be considered. In these cases subsurface supplies or recycled water

TERMINOLOGY

Wellbores: a hole drilled into the ground to obtain samples for geologic study or to release or extract gas or oil.

Cuttings: Small pieces of rock released during the drilling process.

Formation Fluids: Any fluid that occurs in the pores of a rock. Strata containing different fluids, such as various saturations of oil, gas and water, may be encountered in the process of drilling an oil or gas well.

Subsurface Aquifers: a layer of permeable rock, sand, or gravel through which ground water flows.

Potable: suitable for drinking because it is clean and uncontaminated.

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options need to be considered. The oil and gas industry is increasingly relying on reuse and recycling of fluids to reduce consumption of fresh water and minimize environmental impacts and costs.

What is recycled water (in unconventional resource development)?
There are sources of water which are typically only suitable for industrial use due to the fact that they have already been used for industrial purposes. These sources can include municipal waste water and produced water. The most common water source suitable for recycling and reuse with hydraulic fracturing activities is produced water. Produced water is water trapped in underground formations that is brought to the surface along with oil or gas. The water has been in contact with the hydrocarbon-bearing formation for centuries and will contain some of the chemical characteristics of the formation and the hydrocarbon itself. Produced water may include water from the oil or gas reservoir and water injected into the formation during the drilling or completion process. Produced water is sometimes called “brine” or “formation water” and may contain salts (measured as: salinity, total dissolved solids, electrical conductivity), various natural inorganic and organic compounds, which may include oil from the reservoir or chemical additives used in drilling and operating the well, and/or naturally occurring radioactive material **(NORM)**, dissolved from rock in trace amounts. Currently, several recycling methods are being used by companies to recycle produced water in an effort to reduce the oil and gas industry’s consumption of fresh water.

What quantities of water are required by the oil and gas industry?
Water use will vary significantly between different jurisdictions and within individual basins where unconventional hydrocarbon resources are being developed, and as a function of the development practices of individual operators.

Hydraulic fracturing operations which use water as the primary fracturing fluid can require thousands of cubic metres of water. These large volumes of water are required to stimulate each section of the length of the lateral and to carry the **proppant** material into the newly created fractures.

To put this in perspective, an unconventional gas well that requires 20,000m^3 of water will have used the same amount of water as a golf course uses every 28 days.

Naturally Occurring Radioactive Material (NORM): Materials typically found in certain types of barium or strontium scales that may be deposited in the wellbore or production tubulars, or transported up the wellbore in fluids or cuttings.

Proppant: Naturally occurring sand grains or man-made or specially engineered beads mixed with fracturing fluid to hold fractures open after a hydraulic fracturing treatment.