



Produced Water Facts

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Just What is Produced Water Anyway?

According to Michael De Felippo of the San Juan River Generating Station:

Produced Water comes from the process of lifting oil and gas from water-bearing formations—typically ancient sea or lake beds. As oil and gas is lifted to the surface, water is brought along with it. Here are some facts about Produced Water:



- In 1993, 1.09 trillion gallons of produced water were generated - enough water to flow over Niagara Falls for 9 days.
- 65% of the produced water generated in the US is injected back into the producing formation, 30% into deep saline formations and 5% is discharged to surface waters.
- Produced water salinity in the US ranges from 100 mg/l to 400,000 mg/l (seawater is 35,000 mg/l).

The US Department of the Interior defines produced water as follows:

• Produced water is mainly salty water trapped in the reservoir rock and brought up along with oil or gas during production. It can contain very minor amounts of chemicals added downhole during production. These waters exist under high pressures and temperatures, and usually contain oil and metals. Because of this, they must be treated prior to being discharged overboard. As with drilling muds, following treatment, they must be tested for toxicity and cannot exceed set discharge rates. In the Gulf of Mexico area west of the Mississippi River, where elevated levels of naturally occurring radioactive material (NORM) have been detected, radium must be measured and bioaccumulation monitored if the produced water is to be discharged overboard.



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Dan Caudle defines produced water and provides us with an explanation of treatment objectives.



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The treatment of produced water is a major component of the cost of producing oil and gas. Wells may start out producing little water but sooner or later all oil wells produce a much larger volume of water than oil. The ability to efficiently and economically dispose of this water is critical to the success in the oil production business. The Produced Water Society was formed to address the processes and technology for treating produced water for reuse or disposal.



A mixture of performance standards for the disposal processes and regulations limiting discharges mandates the standards for treatment of produced water. Produced water must be either reused or disposed of. It can be used as a source of water for waterfloods or pressure maintenance or pressure maintenance projects. If reuse is not an option produced water is disposed of by discharge to the sea or injection under ground. Standards of treatment for reuse or set by industry technical organizations such as the American petroleum Institute (API) and its member companies, the Oil Producers Association (OPA) (formerly the E&P Forum) and other industry groups. Standards for produced water disposal are determined by State, National and international regulatory bodies.

In the United States produced water defined by the EPA. One version of their definition is: 63. "Produced Water" means the water (brine) brought up from the hydrocarbon bearing formation strata during the extraction of oil and gas, and can include formation water, injection water, and any chemicals added downhole or during the oil/water separation process." This definition is found in a number of EPA documents and was taken from the 2004 Region VI Gulf of Mexico general permit for the discharge of wastes from the oil and gas operations in the Gulf of Mexico.

Most produced waters contain some subset or mixture of:

- Dissolved inorganic salts,
- Dispersed oil droplets,
- Dissolved organic compounds (dissolved "oil"),
- Treatment and workover chemicals,
- Dissolved gases (particularly hydrogen sulfide and carbon dioxide),
- Bacteria and other living organisms, and
- Dispersed solid particles.



However, the particular concentrations of these components vary over an extremely wide range.

Produced water has several properties that are frequently not well understood and ignorance of them complicates the treatment of it. Some of these are:

- It contains chemical equilibrium systems that shift with changes in temperature and pressure and cause reactions to occur. These reactions may result in mineral scales being formed, solid hydrocarbon deposition (paraffin formation) and changes in pH.
- Produced water does not normally contain oxygen and some of its components are in a chemically reduced state and will react with oxygen if the water is allowed to contact air. This can result in deposition of iron compounds and elemental sulfur.



Problems associated with produced water include:

- Plugging of disposal wells by solid particles and suspended oil droplets,
- Plugging of lines, valves, and orifices due to deposition of inorganic scales,
- Corrosion due to acid gases and electrochemical reactions of the water with piping and vessel walls,
- Exceeding discharged oil concentrations, and
- Growth of bacteria that plug lines and valves or result in the formation of harmful products.

Treatments for produced water usually fall into one the three following categories:

- Phase separations,
- System control and design, or
- Chemical treatments.

Filtration:

- Multi Media
- Nut Shell
- Cartridge
- Bag Filters

The Produced Water Society addresses produced water treatment in an annual seminar each January. Participants are all the stakeholders:

- Operators,
- Equipment suppliers,
- Engineering companies,
- Chemical suppliers, and
- Consultants.



The seminar includes presentation of papers on new technology and experience, and round table discussion of problems. The goal of the seminar is a non commercial sharing of knowledge and experience with a goal of understanding and teaching more effective water treatment.

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The Produced Water Society is a collection of engineers and industry professionals with the common purpose to study and improve the separation,

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treatment, and analysis of Offshore and Onshore Produced Water with the goal to meet the discharge and reinjection requirements of the industry and the environment.

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