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## WHAT INDUSTRY LEADERS EXPECT IN 2009

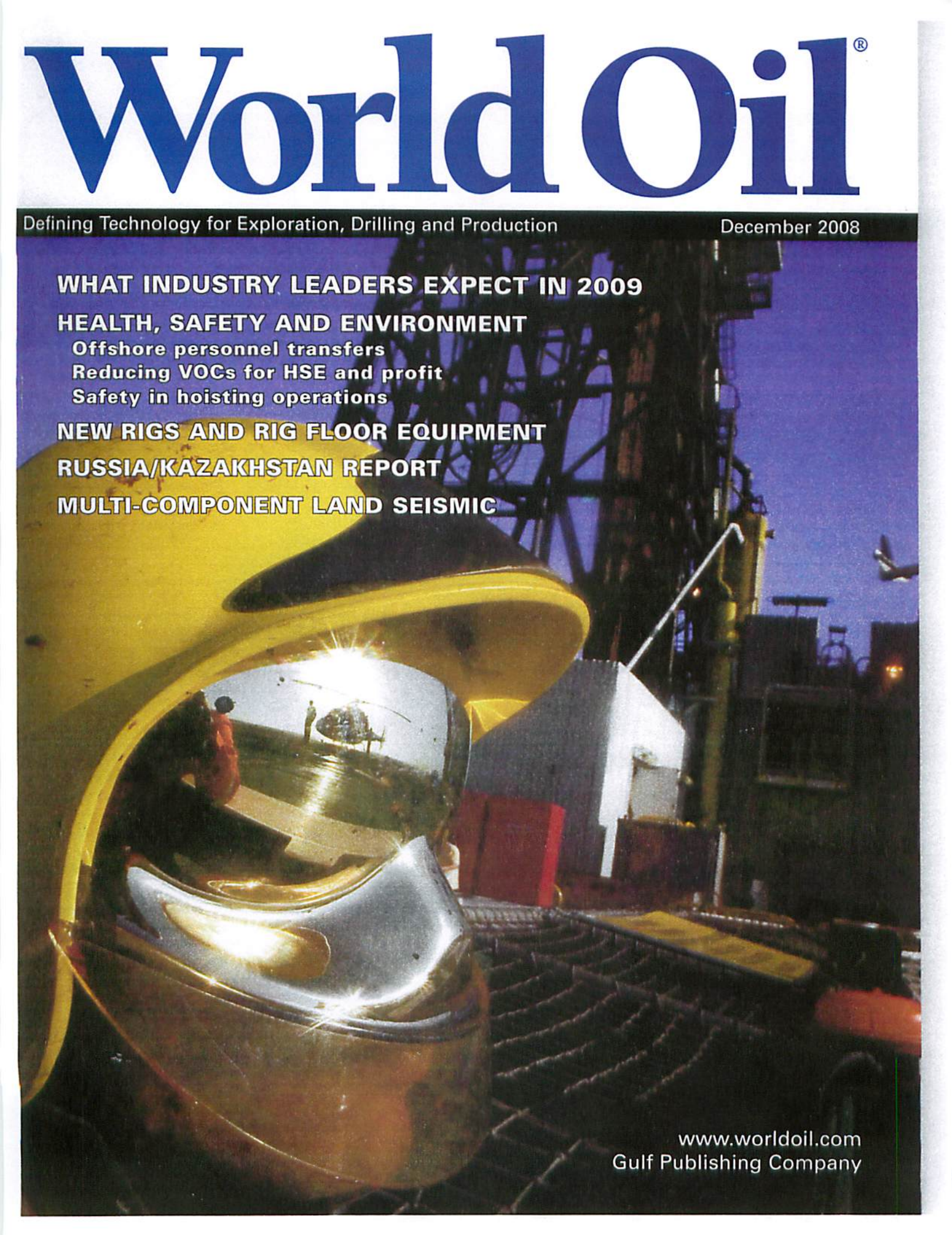
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# What's new in production



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## Who said oil and water don't mix?

Production engineers know all too well that the old adage about oil and water just isn't so; if it were, their jobs would be a whole lot easier.

But it's not only in the production stream that oil and water are intertwined—water is an integral part of hydrocarbon development in all its forms. It is a critical ingredient of many drilling muds. It is injected into mature fields to push hydrocarbons to production wells. It is pumped downhole as steam to liquefy tar sands and heavy oil. As fracturing fluid, it cracks shale to allow the free flow of natural gas from the rock—requiring about 1–5 million gallons of water per fracture.

Of course, extracting oil and gas produces a lot of water as well—about 10 barrels per barrel of oil in mature areas such as the US. In the Western US alone, more than 5 billion gallons of water is produced every day during oil and gas extraction. But the water used by the industry is a valuable asset, while the highly saline and/or oily water it produces has historically been treated as a liability.

Produced water is typically disposed of either by injecting it deep into the earth or by treating it to remove contaminants and then discharging it to the environment, both at great cost to the operator. Injection wells must be sited for geologically isolated formations that do not communicate with underground sources of drinking water. Water must often be hauled away to the disposal site, and sometimes requires pre-treatment to avoid plugging of the receiving formation and damage to injection equipment. In the US on land, injection is regulated under the Safe Drinking Water Act. Produced water discharge, regulated in the US on land under the Clean Water Act, requires separation of hydrocarbons and removal of salinity through reverse osmosis, thermal distillation, ion exchange and/or other processes. These methods can require expensive power supply and maintenance personnel at remote locations.

Injected water is often used to maintain reservoir pressure and enhance production, but treated and discharged produced water has not historically been seen

as an asset to the operator, even when it is used beneficially, such as for irrigating the landowner's crops or for livestock or wildlife watering. Generally, the operator is simply happy to be rid of the stuff.

**Produced water as an asset.** This traditional relationship with produced water has been flipped on its head by a small produced water treatment company operating in the Piceance Basin of northwestern Colorado. Matthew Bruff, chief development officer and general counsel for Altela Inc., presented the case last month at the 15th annual International Petroleum & Biofuels Environmental Conference in Albuquerque, New Mexico.

In Colorado, as in other western states, water rights are created when water is placed or appropriated to "beneficial use." Dewatering an oil or gas well usually doesn't create a water right in the state because the water is not classified as being put to beneficial use. However, earlier this year the state issued precedent-setting permits allowing Altela to discharge its treated produced water from a Piceance Basin project into the Colorado River Basin for beneficial re-use, generating valuable in-stream flow rights for the treated water. The water is treated at the wellhead using the company's low-energy thermal distillation process, which in this case dramatically reduced the amount of wastewater that had to be trucked away for disposal, saving the company money.

The company had to prove, using a stream depletion model, that the produced water being treated from its producing wells was non-tributary, which according to Colorado statute means that its withdrawal would not, within 100 years, deplete the flow of any natural water stream within the state at an annual rate greater than 0.1% of the stream's annual depletion rate.

The permits, in effect, create water rights that the company can then use to supply water downstream of its operations for industrial, commercial and irrigation purposes. This is not the first time that an operator or service company in the US has used produced water

as an asset, to be sure. But it may be the first time that a state government has legally classified a produced water stream as an asset.

**The produced water industry.** With this simple legal re-definition, an enormous waste stream could potentially become a viable revenue stream for oil and gas companies. Treated produced water already finds many important uses, including oilfield applications such as feed water for steam-assisted gravity drainage, or SAGD, and fracture fluid. Other applications being pursued for treated produced water include cooling water for power plants and warming liquefied natural gas for regasification. Why shouldn't these and other valuable re-uses of oilfield produced water generate water rights and, therefore, revenue for the producers?

Beyond the dollars and cents, if companies consistently pursue the regulatory classification of their clean, treated produced water as a water asset instead of a waste, it will do much to reform our industry's image vis a vis water resources—so that we are seen not only as massive users of and polluters of water, but as partners in conserving and reclaiming this most precious resource.

If you don't mind following me on a brief flight of fancy, in the long run, issues of water scarcity will far outlast the present controversies surrounding our industry, and indeed the oil and gas industry itself. The treatment of water from deep underground, which in our time is done strictly to facilitate the extraction of oil and gas, may one day become a crucial project in and of itself, as traditional sources of freshwater become increasingly stressed by growing populations and increasing industrialization, especially in developing countries. In addition, oilfield personnel such as production engineers, drilling contractors and exploration geologists would be necessary parts of this new water industry.

Wouldn't it be deliciously ironic if our industry, so maligned in the past century for its negative impacts on the natural environment, became a key element of its preservation in the next? **WO**