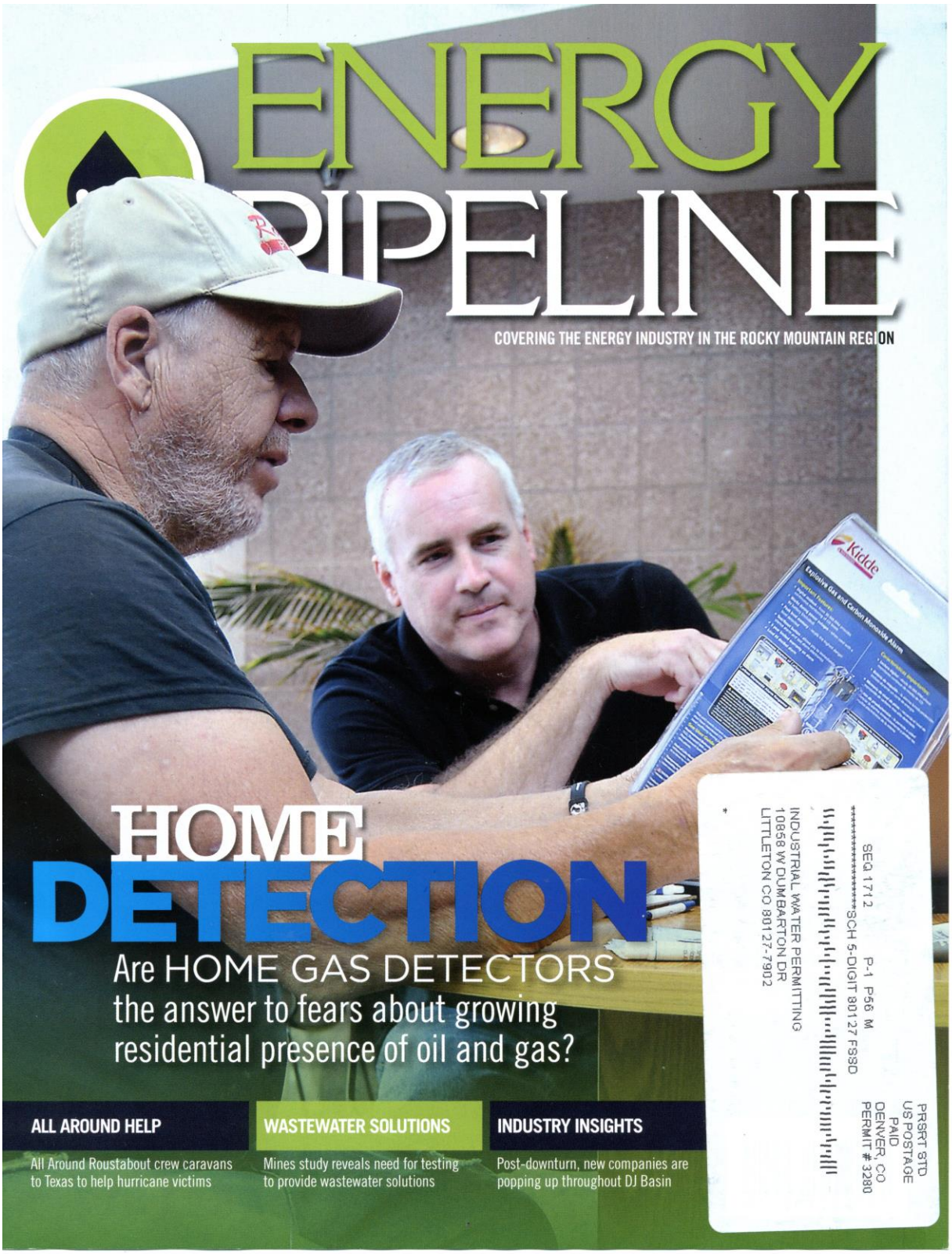
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TECH TALK

Are oil-based drill cuttings valuable?

BY GARY BEERS • FOR ENERGY PIPELINE

SUPER-PADS GENERATE SUPER VOLUMES OF DRILL CUTTINGS

Major oil companies are drilling at least 25 horizontal wells, each up to 10,000 feet in length, from a single pad (a super pad) within a month or two. Since the volume of cuttings from each well is approximately 300 cubic yards, the total volume of cuttings generated at the superpad is approximately 7,500 cubic yards, or about 375 truckloads.

The conventional approach to disposing of these cuttings is to haul them to the nearest industrial landfill, which is an expensive option costing millions of dollars and consuming valuable landfill volume.

What if the drill cuttings are a resource?

Since the cuttings come from an oil-rich horizontal formation (i.e., Niobrara), they contain valuable oil. An estimated ratio is about 0.8 barrels oil per cubic yard of cuttings.

When single vertical wells were drilled from pads, the resultant cuttings volume was less than 250 cubic yards and little thought was given to small volume of oil (i.e., less than 100 barrels or less) due to expected high processing cost.

This assumption needs to be re-examined when drilling at superpads since about 6,000 barrels of oil are contained in the total cuttings. At the current price of oil ($47.44/barrel), this asset is worth about $284,000. This money could fund oil recovery and, also, the disposal of water and solids from processing the cuttings. Certainly, this approach would significantly reduce the cost of cuttings disposal.

SEPARATING OIL FROM DRILL CUTTINGS

The operation of oil platforms in the North Sea faced a significant expense for transporting drill cuttings to onshore facilities for disposal.

In innovative technology (Thermomechanical Cuttings Cleaner, TCC) was proposed by a Norwegian firm (ThermTech) to separate oil from the cuttings without denaturing the oil, which supports oil recovery. A version of this technology was sized to operate on an oil platform with outputs of recovered oil, recovered water and inert drill cuttings. The recovered oil can be reused in platform operations. The cuttings (an inert powder) can be disposed into the sea, since the chemical content meets environmental regulations.

The key concept behind the TCC is the internal generation of temperature (250 degrees F) just high enough to flash evaporate oil (i.e. desorption from the cuttings), without denaturing the oil, and routing this vapor to condensation processes (Figure 1). This process concurrently separates water from the cuttings. Detailed descriptions of this process can be accessed on various industrial websites (i.e., Thermtech, TWMA, and Halliburton).

The internal generation of temperature is accomplished inside a cylindrical hammermill (Figure 2) by mechanical energy (i.e. friction creates heat as hammers crush cuttings). Incidentally, the TCC technology, as applied to drill cuttings by TWMA, recently won two awards from the UK's industry : 2016 (Export Achievement Award) and 2014 (Environmental Innovation Award).

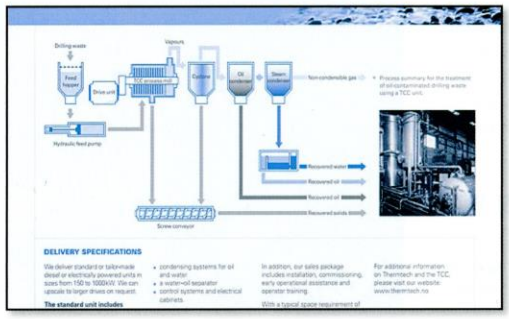

Figure 1. Thermomechnical Cuttings Cleaner or TCC, was proposed by a Norwegian firm (ThermTech) to separate oil from drill cuttings without denaturing the oil, which supports oil recovery. The key concept behind the TCC is the internal generation of temperature (250 degrees F) just high enough to flash evaporate oil (i.e. desorption from the cuttings), without denaturing the oil, and routing this vapor to condensation processes.

For over 50 years, **GARY BEERS**, has worked in numerous fields of environmental science as a consultant, regulator and educator. This career included senior management position with major consulting, nonprofit and public organizations. He has founded several successful firms to capture emerging resource management markets. One of his latest ventures, EnviroScienceINFO, provides content for public media.

Table 1: Cost Comparisons

Entry			Current Disposal	Portable TCC
Oil-based drill cuttings processed			430 ton	430 ton
Cuttings encapsulation per well			$90,223	-
Process drill cuttings	TCC unit $175/ton		-	$75,357
	Diesel to power unit		-	$17,395
	Mobilization/Demobilization		-	$4,000
	Total cost to process cuttings		-	$96,752
Recovered oil	Volume (bbls)		0 bbls	349 bbls
	Value at $147/bbl		$0	$51,376
Net cost to process drill cuttings			$90,223	$45,375
Net Cost per ton			$209	$105
Savings ($104/ton)		1 well		$44,848
		25 wells		$1,121,200

PORTABLE TCC FOR PROCESSING DRILL CUTTINGS

A British company (TWMA) has incorporated the TCC process into a truck-mounted unit (TCC RotoTruck) to process drill cuttings near drilling sites in oilfields. There have been several applications in the Western states, including locations in Wyoming and Colorado.

The recovery oil can lead to significant cost savings when compared to current disposal costs. Table 1 provides data for these comparison based on the TWMA project in Wyoming. These economic data are for conditions in 2010 and need to be updated for present conditions.

The recovered oil was reused in the drilling fluid. This cost savings is not reflected in Table 1.

The recovered water was used to rewet the drill cuttings powder which was buried and covered on location in accordance with BLM regulations. The total petroleum hydrocarbon (TPH) level in this mixture was less than 10 mg/kg and the Sodium Adsorption Ratio (SAR) ranged from 9.7 to 18.2. This expense is not reflected in Table 1.

LOWERING CUTTINGS DISPOSAL COST WITH REVENUE FROM OIL RECOVERY

The approach based on the services of a mobile TCC unit certainly offers worthy advantages, including revenue from oil recovery and elimination of trucking cost to transport cuttings to a landfill.

When the oil industry experiences an improving economic climates and expands use of superpads and accompanying drilling of dozens of well, there will be an increasing need to reduce the increasing expense of managing the huge volumes of drill cuttings. Hopefully, the oil recovery option will be considered as a means to lower these disposal costs.

Figure 2: Cylindrical mill with hammers.