

ABSTRACTS – 2016 INTERNATIONAL SYMPOSIUM, CASPER, WYOMING

lines were being constructed to connect many of the major oil fields to established refineries with cracking capabilities to secure maximum yields. The consolidation of major refiners to streamline operations and more efficiently compete for markets also became the trend.

Wyoming's refining landscape changed after World War II, with the shutting down of many of the smaller plants due to supply problems, the need for more efficient methods of refining, and larger operators committing production to their own refineries. At least 70 refineries, ranging in size from less than 100 barrels per day of processing capacity to as much as 80,000 barrels per day, have existed in Wyoming since 1895, with the simplicity of "tea-kettle" distilleries that sold fuels and lubricants to local markets to complex, fully integrated refineries capable of handling multiple grades of crude and refining the oils into a variety of products transported and sold worldwide.

This work focuses on when, where, and why these plants were constructed, and why they ceased to operate. There currently remain five active refineries in Wyoming, a stark contrast to the over 50 plants reported in operation throughout the state during the peak years of the 1930s.

**NATURAL GAS LESSONS IN PETROLEUM
HISTORY FROM UPTON SINCLAIR'S FICTIONAL
'OIL!' TO METHANE! AT PORTER RANCH**

Ann Mauer
P.O. Box 2093
Yorba Linda, CA 92885
annmauer@envirotechnicalimaging.com

In the late 1800's, inventors wrangled how to use powerful bursts of methane erupting after oil wells gushed. Burned off into the atmosphere at first, methane natural gas became a legally defined mineral separate but related to petroleum. The first natural gas pipelines in California were laid before the 1920's at a time when the Trumble Gas Trap became the world's best-selling device capturing methane at the wellhead. The Trumble cylinder featured top quality steel and smart pressure fittings. With this contraption or any safe, reliable gas trap, oil drillers large and small could sell methane from their wells. Pipes delivering this mineralized fuel to customers helped 'nat gas' catch on as a keen, clean power source. Shrewd marketing and grand energy deals anchored this carbonized energy in U.S. history.

Our peek at the old technology and ways of thinking to deliver natural gas are of interest now amid concerns about global methane. The safety of natural gas in Southern California

was generally acceptable to populations as the industry grew between 1916 and 2016. The process to update California's natural gas infrastructure was underway when the Aliso Canyon methane leak occurred between October 2015 and January 2016. Porter Ranch is the name of a master-planned community impacted by the storage facility leak. Porter Ranch and Aliso Canyon became event names that reference the leak.

This methane release signals an historic turning point one century after California's natural gas industry began. The industry functioned under regulations generally guided by expert operator self-governance, a condition that emerged in the 19-teens when producers such as M. J. Trumble and his peers politely acknowledged that the Bureau of Mines could never keep up with the skyrocketing inventive growth in American energy industries. California activist and one-time gubernatorial candidate, Upton Sinclair, wrapped his head around the oil industry in 1927 to illuminate pitfalls of the industry, but he did not approach the topic of natural gas. Today, environmental mitigations for the methane leak in Los Angeles County will be scrutinized on the world stage. Mitigations will be negotiated in the context of acknowledging climate impacts legally, and mitigations will mark an era of new technical criteria to monitor aging infrastructure upgrades. Airborne methane measured alongside weather modification and natural particulates will draw scrutiny reflective of spirited debates that raged in the time of M. J. Trumble and brought people a hundred years of visionary energy. A new day has dawned.

**DEVELOPMENT OF GLENROCK AREA FIELDS,
CONVERSE COUNTY, WYOMING**

Mark Milliken
1319 Hornchurch Ave.
Casper, WY 82609
mmilliken@blm.gov

In 1916, shallow Shannon Formation oil was discovered on an "oil claim" on University of Wyoming Land Grant acreage near Parkerton about 20 miles east of Casper. This discovery would become the huge Big Muddy field, rivaling the Salt Creek field in size and activity. Development soon included the Frontier 2nd Wall Creek, and Dakota Formations. Since then, the Glenrock fields have produced more than 140 MMBO. Revenues from Big Muddy State leases allowed University of Wyoming to survive the depression and construct several buildings at a time when their very existence was in doubt. Poor early-day production practices led to substantial waste. Conoco built the Glenrock refinery in 1925 to process crude from Big Muddy field and other areas.

A deep test to the Madison Formation in 1935 found no significant shows below the Dakota. By 1943, the Big Muddy field was essentially depleted after having produced about 30 MMBO. Dakota and Muddy Formation production was discovered in the South Glenrock fields around 1950, and water flooding began in the 1960s. Encouraged by a 1973 low-tension pilot test at Big Muddy, Conoco and DOE teamed up for an unsuccessful Frontier surfactant flood in the 1980s.

In 2007, Rancher Energy purchased the Big Muddy, South Glenrock and South Cole Creek fields for CO₂ tertiary recovery. Nitec LLC estimated that CO₂ flooding could potentially recover in excess of 10,000 b/d each from South Glenrock and Big Muddy fields. Rancher acquired a take-or-pay CO₂ contract and conducted pipeline and facility FEED studies. In 2009 Rancher attempted to join forces with Elk Petroleum, whom they saw as being likely to get a better CO₂ contract.

In 2011, Queensland-based Linc Energy purchased the fields from a reorganized Rancher, which was recovering from a hostile takeover. Best known for its underground coal gasification (UCG) technology, Linc hoped to conduct miscible floods using waste CO₂ from their UCG projects in the Powder River Basin. Linc acquired an interruptible CO₂ contract from Exxon, built a line tap, and planned to truck CO₂ from Jeffrey City to Glenrock. Linc planned CO₂ injection rates of up to 30 MMCFD after completion of the CO₂ injection infrastructure. In 2011, Linc unsuccessfully attempted a Dakota CO₂ cycling (huff-n-puff) project in South Glenrock using 500 tons of CO₂.

Linc has lost interest in the Glenrock fields, and has closed their Wyoming and Denver offices. The fields are under caretaker status while Linc attempts to market the properties. In what may be a sign of the future for the Glenrock area, Chesapeake is developing a Shannon horizontal resource play down dip from conventional production in the Cole Creek South field in the Barron Flats Unit.

A HISTORY OF TEAPOT DOME, NATRONA CO., WYOMING

Mark Milliken
1319 Hornchurch Ave.
Casper, WY 82609
mmilliken@blm.gov

FIELDTRIP DISCUSSION

At the turn of the 19th century, the U.S was comfortably ensconced in its supply of coal. Defense, transportation, and power generation were coal-fired from home-grown reserves

that knew no limits. That all changed early in the 20th Century when oil-fired battleships were perfected. To insure a strategic supply of bunker oil, four Naval Petroleum Reserves were set aside by Executive Orders in Wyoming, California, and Alaska. Located about 35 miles north of Casper, Teapot Dome was designated NPR3. Unknown at the time, the battleship was to be rendered obsolete by the airplane shortly after the NPRs were formed.

When it came time to dole out government leases, Secretary of Interior Albert Fall contacted his old friend Harry Sinclair. Sinclair leased NPR-3 with the expectation of establishing a central Wyoming oil storage facility and shipping point for eastern markets. Congress investigated Fall when he suddenly became quite wealthy from what turned out to be Sinclair's graft. Fall and Sinclair were subsequently imprisoned, and the Sinclair leases cancelled. Casper's Harding (later Garfield) School was named after the President under whom the famous scandal occurred. Hoping to avoid another scandal and with no demand for bunker oil, Congress shut the field in. The Navy developed only those areas of NPR-3 subject to drainage from offsetting properties.

With the '70s Arab oil embargos, the U.S. saw huge monetary assets in the NPRs. Both NPR1 (Elk Hills, CA) and NPR3 were opened to full field development in 1976. In 1977, NPR oversight was transferred from to the new Dept. of Energy. DOE raised NPR3 production to a maximum of 5000 BOPD in 1979. With rapidly declining production, DOE formed the Rocky Mountain Oilfield Testing Center (RMOTC) in 1995. The field became a government-sponsored test facility for new oilfield technology. By 2007, Congress began demanding that RMOTC become a profitable entity. Faced with such an impossible task, DOE sold the property to Stranded Oil Resources Corp. for \$45.2 million in 2015.

W. N. "NEIL" MCMURRY AND THE DEVELOPMENT OF WYOMING'S NATURAL GAS

Ann Chambers Noble
P. O. Box 36
Cora, WY 82925
ANoble1227@aol.com

KEYNOTE ADDRESS

W. N. "Neil" McMurry grew up in Casper, Wyoming, during the Great Depression, leaving shortly after high school to join the U.S. Army to serve his country during World War II. He was a B-17 gunner in Europe, flying two missions on D-Day. He returned home to a young wife, baby, and no job – but immediately set out to find work. His first job was operating