Institute of Energy Professionals

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Energy Issues

IEP Newsletter

INSIDE THIS ISSUE:

Cleaver-Brooks Package Boilers

Steam Leak

Ten Methods for Saving Thousands in the Boiler Room (Part 3) –

(The following is the third part in a series of ways to improve boiler efficiency courtesy of the American Society of Power Engineers - ASOPE)

Method 6 – High Efficiency Motor Utilization (By: Byron Nichols)

When new motors are identified for purchase or when older motors require replacement, it is wise to consider the purchase of high efficiency motors.

The efficiency of a motor is the ratio of the energy output (mechanical power produced) vs. the energy input (electricity required). It may be expressed simply as:

EFFICIENCY = OUTPUT/INPUT

Design changes, better materials, and manufacturing improvements reduce motor losses, making premium or energy efficient motors more efficient than standard motors.

Reduced losses basically mean that an energy efficient motor produces a given amount of work using less energy than a standard motor.

Assuming a constant motor speed; the formula to calculate cost savings is expressed as:

S = (hp x 0.746) x L x C x N x
[(100/Estd) –(100/Eee)]

Where:
S=$ Savings (annual)
Hp= Motor horsepower
L= %Load
C= Energy Cost($/kWh)
N= Operating hours(annual)
Est =% Efficiency standard motor
Eee=% Efficiency high efficiency motor

Example: A 100 hp boiler Feedwater pump runs continuously at 85% load with an electrical cost of $0.065/kWh. What would be the annual savings when replacing this standard efficiency (90.2%) motor with a high efficiency (93%) motor?

S = (100 x 0.746) x 0.85 x $0.065 x 8760 x
[(100/90.2)–(100/93.0)]

S = **$1,205/year**

Extending this figure out by projecting a 10 year motor life, we can expect a savings of **$12,050** by replacing the standard efficiency motor with a high efficiency for the ten year period.

Method 7 – Repair Steam Leaks
(By: Larry Tarvin)

Steam is a high value commodity; the higher the pressure, the higher the equipment expenses. Make every effort to repair steam leaks as soon as they occur.

In addition to wasting energy, steam leaks waste boiler water and chemicals, and can be dangerous to people and equipment. The longer the steam leaks the bigger the leak will get.

Example:
The table below illustrates the potential cost of an unrepaired steam leak from a sharp edge orifice with $9.50/1,000lbm of steam at @ 150 psig and 500ºF.

Leak Size (Inches)	Monthly Energy Cost ($US)	Total Cost Per Year ($US)
1	$26,083	$312,996
3/4	$14,668	$176,016
1/2	$ 6,519	$ 78,228
1/4	$ 1,630	$ 19,560
1/8	$ 409	$ 4,908

Re: Steam System Survey Guide ORNL/TM-2001-263. P 6-2

Fracking – Economic Boom or Environmental Bust?

By: Thomas D. "Dan" Mull, PE, PEM, CEM

According to some recent news articles and television advertisements, one would think that the process of hydraulic fracturing (fracking) is a relatively new technology that can only result in an environmental disaster. While, as with any technology (steam generation, jet airplanes, etc.), if not properly applied there can be ugly consequences, hydraulic fracturing is neither new nor inherently unsafe. Hydraulic fracturing has been around since the 1940s. It has been successfully used in more than one million wells in the United States (alone) to release oil and natural gas deposits. If the technology has been in use for over sixty (60) years, why all the controversy now? To answer that question we need to step back and sort out fact from fiction.

In June of 2013 the US Energy Information Administration (EIA) stated that of the 2,300 trillion cubic feet of natural gas that was technically recoverable in the United States, almost 25% is held in shale rock formation. It has only been within the past decade, with the combining of two technologies (hydraulic fracturing and horizontal drilling) that companies have been able to economically extract the natural gas from the rock deposits. According to EIA *natural gas from shale has grown to about 35 percent of U.S. gas production during that time. According to EIA estimates, this resource could account for nearly 50 percent of U.S. production by 2035.*

Companies both large and small have invested millions of dollars in procuring the rights to deposits and physically extracting the natural gas. As a result, this expansion in the energy industry has created an economic boom in selected locations with significant deposits on lands not owned by the federal government. In North Dakota production in the Bakken and Williston deposits *(see EIA map on following page.)* is being hampered by a lack of skilled and unskilled labor. Production companies are paying high wages and willing to train personnel. All of this has translated into a stimulated economy for the region.

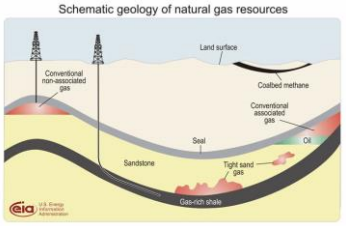
It has been proven that there are sufficient fossil fuel resources (natural gas, oil, and coal) within the United States that the country could become energy self-sufficient*. Unfortunately, political considerations and, to some extent, valid environmental concerns are holding back further production.

The benefits of more fully implementing this technology can be significant:

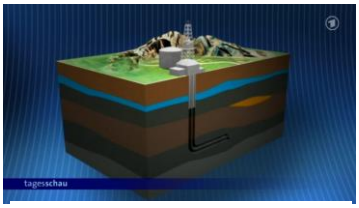
- Expansion of U.S. energy resources would be the major factor in reviving a floundering economy.
- The increased use of natural gas would displace other fossil fuels that have a more significant environmental impact.
- By becoming energy self-sufficient (like Brazil), the U.S. would not be as subject to the volatile price swings created by speculation of perceived, or real, future energy shortages in other parts of the world.
- The U.S. could potentially export liquefied natural gas to Europe and other parts of the world, thereby improving its balance of trade.

**The USA is essentially already there with natural gas and coal.*

Shale Oil and Natural Gas Deposits in Lower 48



Schematic of Natural Gas Resources

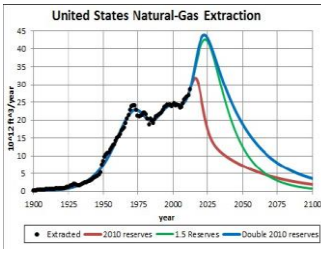


Typical Fracking Operation

Fracking – Economic Boom or Environmental Bust?

(Continued)

Pennsylvania Fracking Operation (courtesy the Huffington Post)



Projected U.S. Natural Gas Extraction

Fracking Rig in Pennsylvania

The U.S. Environmental Protection Agency has recognized the benefits of the increased use of natural gas. The following is a quote from their website.

"Natural gas plays a key role in our nation's clean energy future. The U.S. has vast reserves of natural gas that are commercially viable as a result of advances in horizontal drilling and hydraulic fracturing technologies enabling greater access to gas in shale formations. Responsible development of America's shale gas resources offers important economic, energy security, and environmental benefits."

EPA is working with states and other key stakeholders to help ensure that natural gas extraction does not come at the expense of public health and the environment.

The key word in the statement above is "Responsible". Some of the problems facing the fracking industry appear to have been self-inflicted. Concerns over issues such as water contamination and radon have given rise to both legitimate and exaggerated concerns. Opponents to energy expansion have tried to convince the general public that all fracking is a threat to the environment.

While water contamination and radon concerns are real, they are very manageable and are not the threat opponents would have most believe. However, the industry must do their part to minimize the environmental risks.

The headline of a recent article in the Wall Street Journal highlighted a problem with radioactive waste from fracking. However, the article stated that the exposure risk from the low level radon extracted in the "oil sock" sediment was minimal; *"… a person could stand for a year by a dumpster full of them and receive less skin irritation than a dental X-ray."* The problem resulted from companies improperly disposing of the waste, even though approved sites were available.

Water contamination concerns and the inadvertent release of natural gas are actually the results of piping problems. Fracking takes place well below the aquifer. As the natural gas, oil, fracking solutions and sediment are extracted, if the integrity of the piping is not intact, there will be leakage. The most common issue cited for leakage is a problem with the cement placed around the wells to prevent fluid or gas migration upward. Therefore, it is in everyone's best interest if companies make sure that each well follows sound engineering and construction practices.

Another article in the Wall Street Journal entitled *The Smart Way to Do Fracking* noted three (3) items that would significantly lessen environmental concerns, while allowing for increased utilization of fracking technology.

1) *Fix leaks in the piping systems* – Currently, we do not know how much natural gas is leaking from wells. Since leakage is loss, companies are very interested in plugging existing leaks. Fortunately, this is a plumbing issue that is being addressed.

2) *Secure better data* – The issues of contaminates for those that live near the sites is a major concern.

Fracking – Economic Boom or Environmental Bust?

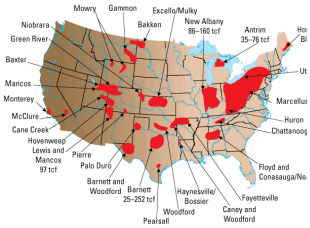
(Continued)

However, there is very little definitive data. Independent testing both before and during fracking would provide better information that would likely benefit both the companies and the public.

3) *Assure well integrity through better construction* – Recognized engineering experts in hydraulic fracturing have stated more can be done to build safe and secure wells that will last for decades. Since the U.S. is drilling about 100 new wells per day, if we did not apply the best practices in well construction it would be monumental problem.

The bottom line, at least from this energy engineer, is that fracking can be a major factor in making this country energy independent. While technology offers us the opportunity to provide the U.S., and potentially others, with clean burning lower cost fossil fuel, the burden is upon us to make sure that the best engineering practices and construction techniques are utilized. This will optimize production, while assuring minimal impact on the environment.

Thomas D. "Dan" Mull, PE, PEM CEM is the President of the Carolina Consulting Group, Inc., Executive Director of IEP, and Director of the Energy Management Diploma Program.



Major U.S. Shale Gas/Oil Deposits

Energy Management Loses Another Leader

In March the Energy Management profession lost another pioneer. Walter (Walt) E. Johnston passed away unexpectedly, while recovering from an illness. Starting his Energy Management career in the mid-1970's, Walt became one of the profession's strongest educators and advocates. Over 30+ years he served as Energy Manager for several companies before becoming Director of the North Carolina State University (NCSU) *Energy and Preventive Maintenance Program*. During his tenure Walt was elected International President of the Association of Energy Engineer and appointed Director of the *Energy Management Diploma Program,* currently taught at NCSU. After retiring Walt continued training and was instrumental in the development of the *Institute of Energy Professionals*, serving on its Board of Directors.

Be a Contributor

The goal of the IEP Newsletter is to provide PEMs with timely useful information to help them better manage energy resources and control utility expenditures. To that end we would like your input. Let us know what type of information, articles or updates you would like to see in future Newsletters. Also, if you would like to contribute an article about a recent project or application of technology, all submittals used *will apply towards PEM renewal accreditation*. For additional information on being a contributor or recommending future topics contact Dan Mull with your suggestions.

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