

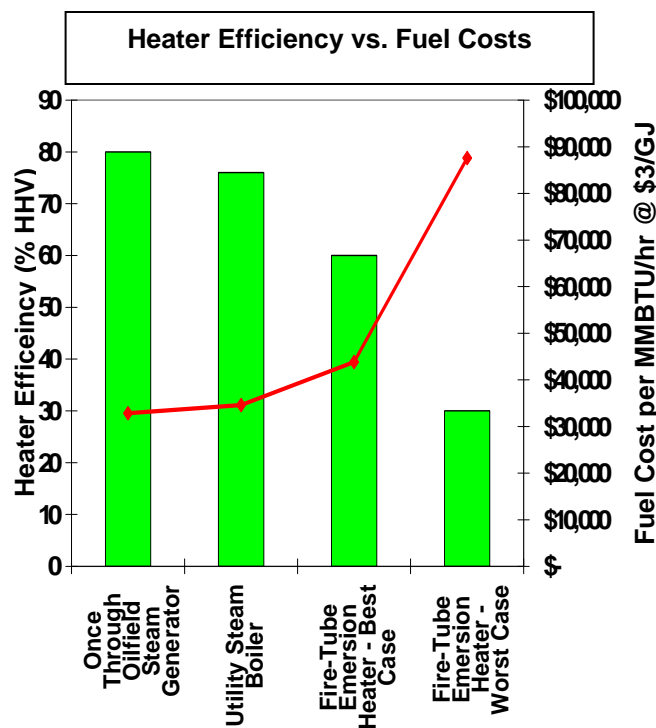


PTAC Knowledge Centre Upstream Oil and Gas Energy Efficiency

Fired Heaters = Maximize Fuel Efficiency and Reduce Heat Loads

1. Quick Facts¹:

- Total Fuel Burned in Alberta Line-heaters and Treaters 1979 = 70 bcf/yr
- Usual Fire-tube heater efficiencies between 30-60%
- Energy Cost 1979 est = \$320 M\$/yr
- GHG Emissions = 14 MtCO_{2eq}/yr
- Est. Cost of Inefficiency = \$150 M\$/yr
- Water takes twice as much energy to heat per m³ than oil
- Causes of lower efficiency:
 - a. Poor air control
 - b. Poor fuel quality
 - c. Fouling of tubes
 - d. Incomplete combustion
- Energy Values:
 - a. Electrical Power @ \$20/GJ
 - b. On-site Gas Used as Fuel or Lost as Fugitives @ \$3/GJ



2. Key General Documents on Heater Efficiency and Energy Issues

- a. **“Boilers and Heaters – Improving Energy Efficiency” Natural Resource Canada CIPEC Publication August 2001** – Generic calculations for industrial boilers and heaters to determine where energy losses are occurring. Available on the NRCAN website: <http://oee.nrcan.gc.ca/publications/infosource/pub/cipec/boilersheaters.pdf>
- b. **PTAC’s TERE project, EETR 0401 “Improved Fire-Tube Immersion Heater Efficiency Project** The project was funded by BP, EnCana, Husky, Nexen, Petro-Canada and CETAC-West. The project was performed by a consortium of ENEFEN Energy Efficiency Engineering Ltd., COEN Company and the Petroleum Industry Training Service (PITS). The executive summary <http://www.ptac.org/eet/dl/ExecutiveSummary.pdf> and the report <http://www.ptac.org/eet/dl/EETR200401.pdf> and appendix <http://www.ptac.org/eet/dl/EETR200401.app.pdf> are available for viewing on the PTAC website.
- c. **“Petro-Canada – Fire-Tube Immersion Heater Optimization and Field Heater Audit Programs”** – Presentation by Phil Croteau P.Eng. presented at the CETAC-West/PTAC Energy Efficiency Workshop 2007, available at <http://www.ptac.org/eet/eetw0701p.html>

¹ Most information sources from TERE documents such as <http://www.ptac.org/eet/dl/ExecutiveSummary.pdf>.

- d. **API Spec 12k, 7th Edition - Indirect-type Oilfield Heaters**, June 1, 1989, reaffirmed September 1999. Covers minimum requirements for the design, fabrication, and plant testing of indirect heaters that are used in the production of oil and gas, and that are located at the same point on the producing flow line between the wellhead and pipeline. Available from API: <http://api-ep.api.org/> or view at PTAC Knowledge Centre.
- e. **Furnace Draft Control Save Fuel, Maintenance**; Reed R. D., John Zink, Oil & Gas Journal, 1975, Volume: 73, Number: 23, Page: 65-66

3. Information on New Energy Options for Fired Heater Operations

- a. **Water Separation Upstream of Heaters** – Adding water knockouts or non-thermal water separators such as hydrocyclones, upstream of heater treaters can significantly reduce energy demand for oil clean-up. It takes two times more energy to heat water as it takes to heat a similar volume of oil. With industry WOR's averaging over 10 m³/m³, a lot of energy is used in heating water, which provides no significant benefit.
- b. **Shutdown of Unnecessary Heaters** – Many producers have found that often line heaters, dehydrators or other equipment needed for high-pressure operation of gas gathering systems become unnecessary as gas line pressure drop. BP Canada Energy has reported significant savings by shutting down or consolidating field dehydrators or converting to less energy intensive hydrate prevention methods.
- c. **Over-sized Heaters in Conventional Heavy Oil Tanks** – Tank heaters installed in heavy oil single well batteries are often sized based on an assumed maximum production rate that either doesn't materialize or soon drops to lower rates. Tank heaters normally can only be turned down to 30% of their nameplate output before efficiencies drop due to incomplete combustion, excess air and other issues that are independent of the quality of the burner.

4. Financial Support for Change

- a. Financial Assistance for Industry <http://oee.nrcan.gc.ca/industrial/financial-assistance.cfm?attr=24>.

5. Regulations Data Sources

- a. Alberta:
 - i. Alberta Municipal Affairs Interim Variance – Alberta Oil and Gas Industry for Gas-Fired Equipment used for Process applications in Petroleum Refineries and Upstream Oil and Gas Sites. CAPP Publication 2004-0011 for Approval. Recommended development of a handbook on safe design of oilfield heaters that would be acceptable in Alberta, Saskatchewan and B.C. <http://www.capp.ca>

6. Key Reports on Volumes, Trends and Environmental Impacts

- a. **CAPP 2005-0011 – Volume 1, Overview of the GHG Emissions Inventory** – September, 2004. Clearstone Engineering report estimating emissions from various sources including fired heaters. <http://www.capp.ca/raw.asp?x=1&dt=NTV&e=PDF&dn=86220>