

Updating Purchasing Specification for Energy-Efficient Commercial Boilers for the Federal Energy Management Program

Arturo Avila Meza¹, James Lutz², Peter Biermayer²
¹California Polytechnic State University; ²Lawrence Berkeley National Laboratory

Abstract

The Federal Energy Management Program (FEMP) and the Environmental Energy Technology Division (EETD) at Lawrence Berkeley National Laboratory (LBNL) are conducting a research project that aims to update the current purchasing specification for energy-efficient commercial boilers. Data available on the internet was used to document the efficiencies, prices and other relevant data on commercial boilers. Boiler models were classified according to their fuel use (gas or oil) and if they produced hot water or steam. Boilers were ranked from highest to lowest thermal efficiency. The results show that the gas-water and oil-water boiler types have higher thermal efficiencies than steam boilers; however, steam boilers are available in larger capacities. The gas-water boiler category has higher thermal efficiencies is due to the higher number of condensing boiler types in it. Condensing boilers are more efficient because heat is captured from water vapor in the exhaust gases. Because the life-cycle cost and the number of manufacturers with qualifying products must be taken into account when recommending boilers for FEMP's performance requirements, further analysis will need to be conducted before a final recommendation is made.

Introduction

Commercial boilers are mainly operated by oil, natural and propane gas. Federal agencies are required to consider energy conservation measures such as efficiency when purchasing or upgrading existing boilers. FEMP, part of the U.S. Department of Energy (DOE), publish efficiency requirements known as Acquisition Guidance and Efficiency Requirements. These Guidelines and Efficiency Requirements help federal agencies acquire the most energy-efficient products. Currently, FEMP and the EETD are conducting an internet-based research project which aims to identify the most energy-efficient commercial boilers in the current market.



Source: Peerless Boilers

Methods

FEMP and EETD employ the following steps as part of the internet-based research project:

1. Selecting model numbers from AHRI and GSA Advantage! databases
2. Classifying boiler types by applications
3. Ranking products from highest to lowest thermal efficiency
4. Analyzing data by creating scatter plots
5. Determining the boilers that are ranked in the top 25% with respect to efficiency



Results

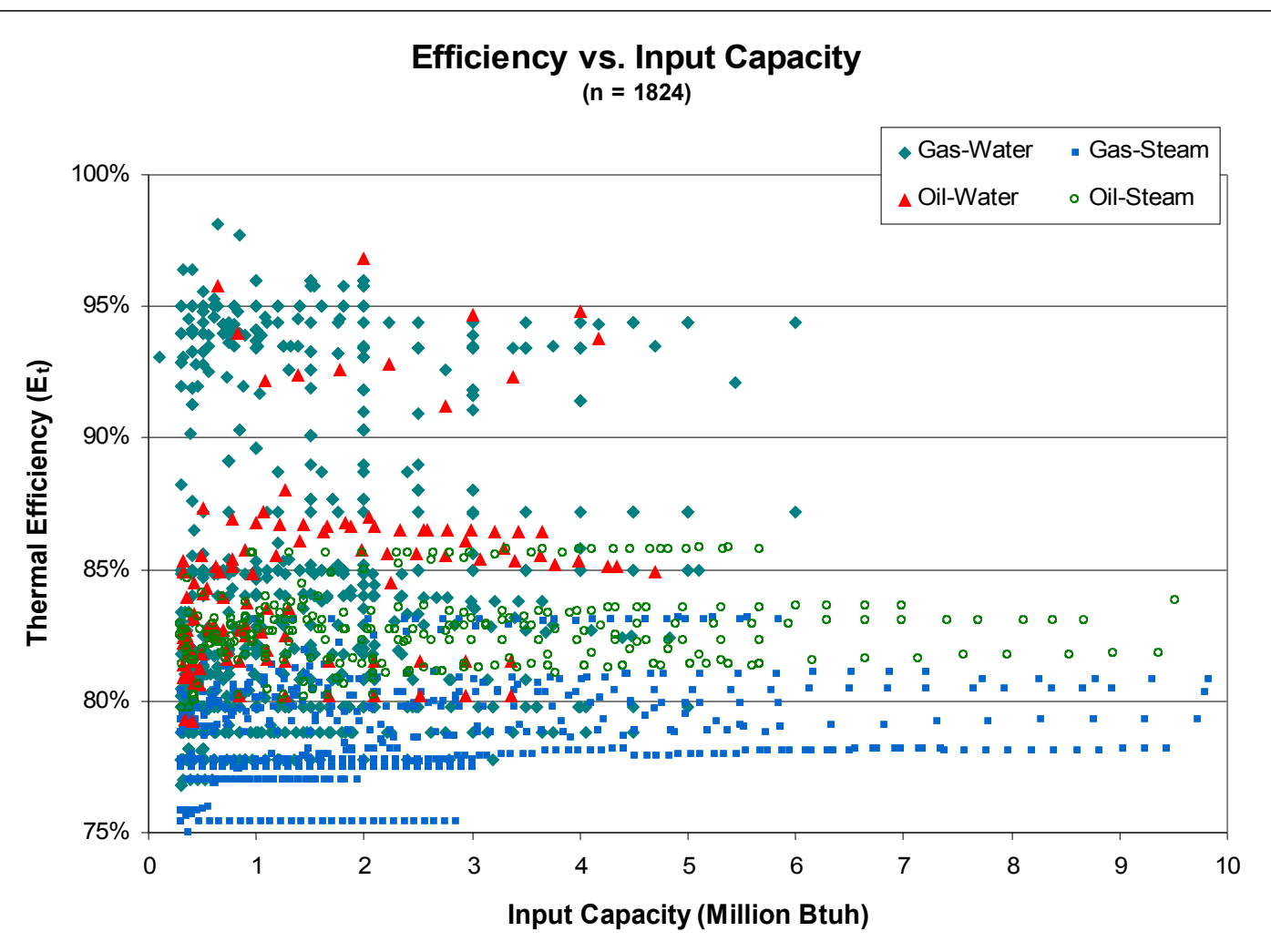


Figure 1- All commercial boilers

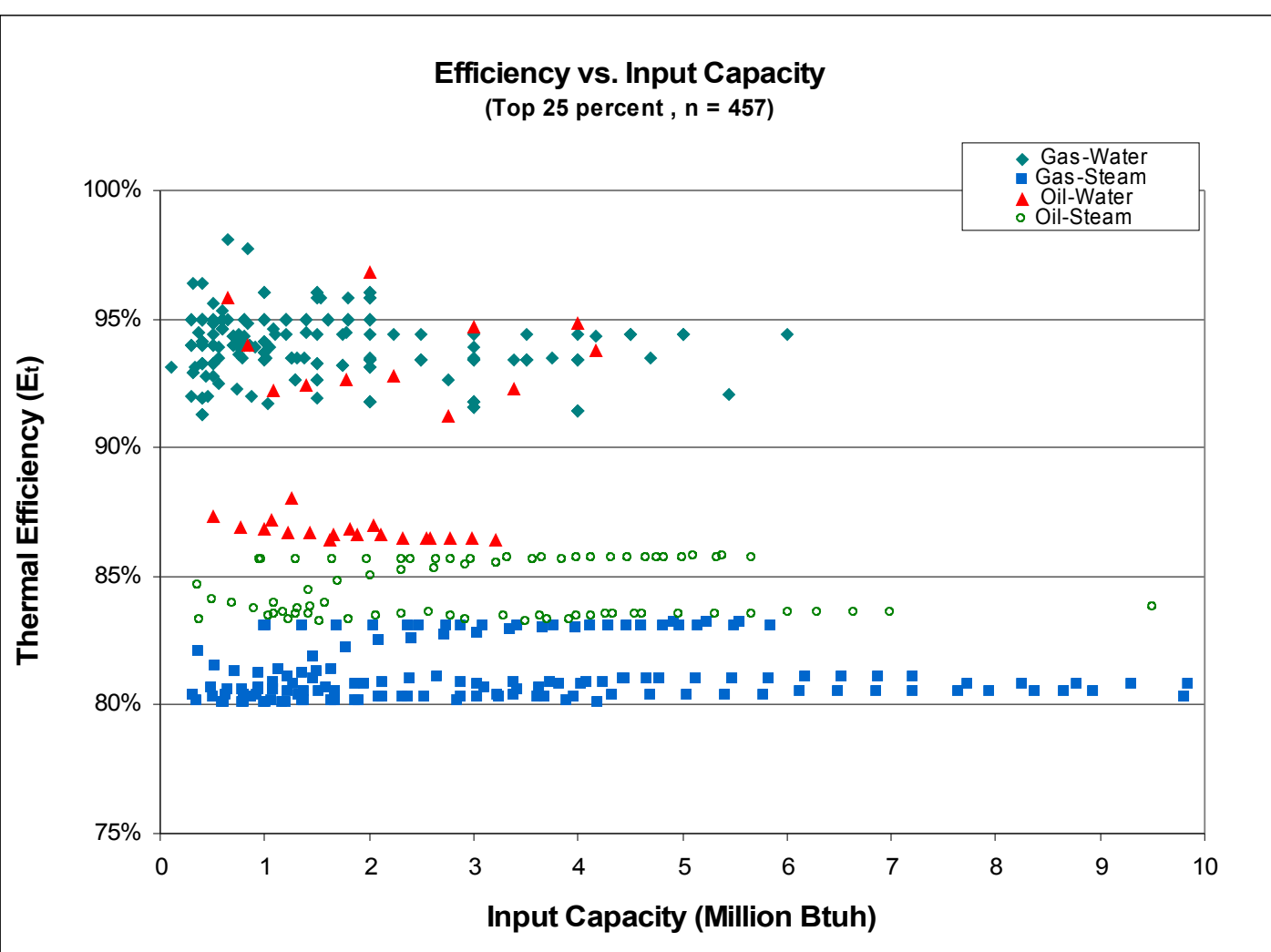


Figure 2- Top 25% commercial boilers

Figure 1 and Figure 2:

- Gas-water and oil-water boiler type have higher thermal efficiencies.
- Gas-steam and the oil-steam boiler type have lower thermal efficiencies.
- Gas-steam and the oil-steam boiler type have higher input capacities.

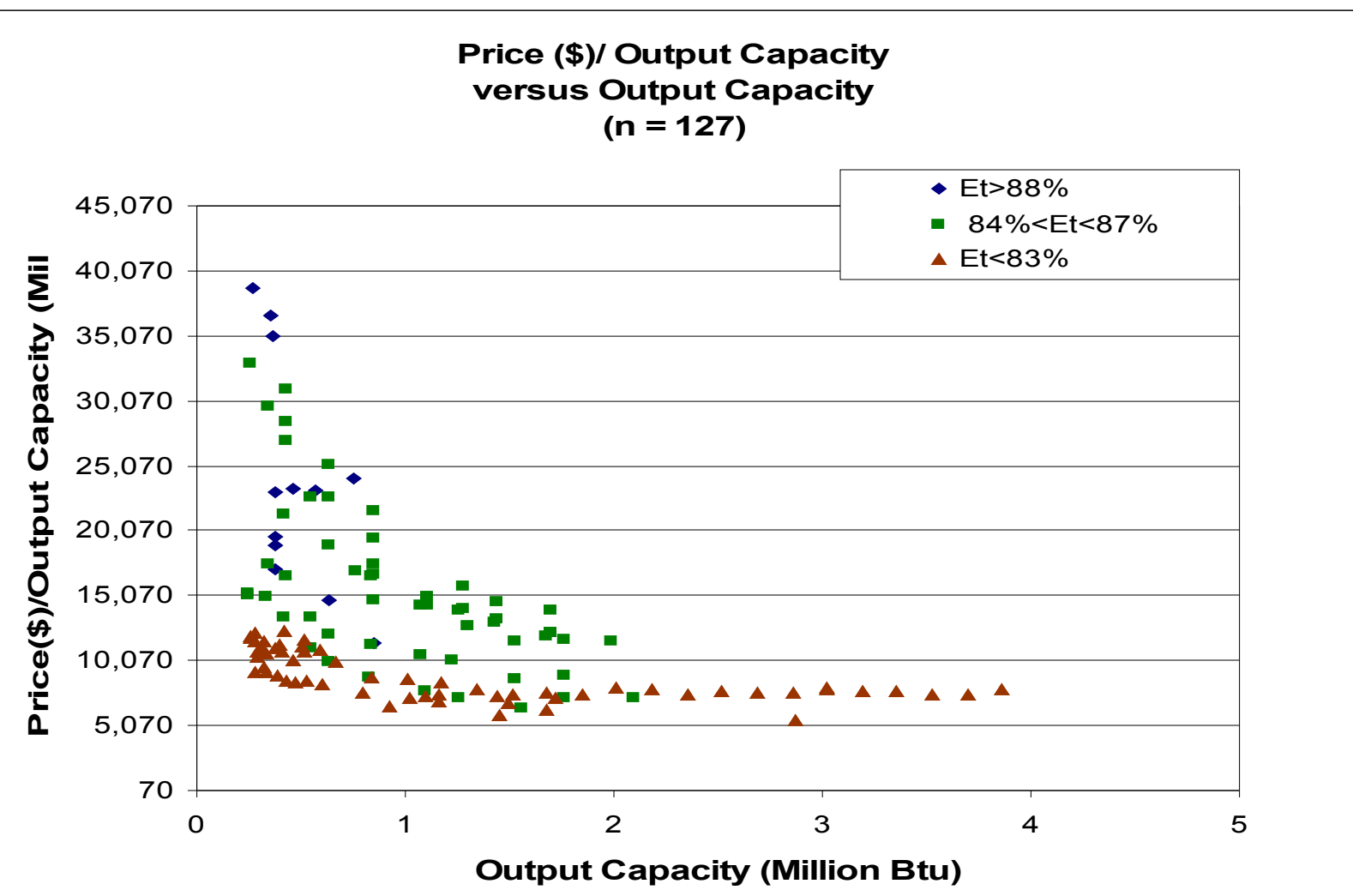


Figure 3- Price/output capacity versus Output Capacity

Boiler Type	Number of Condensing Boilers	Number of non-condensing Boilers	Total of condensing and non-condensing Boilers	Number of Manufacturers	Average Thermal Efficiency (%)
Gas-Water	188	0	192	15	94.0
Gas-Steam	0	160	160	6	81.3
Oil-Water	12	19	31	5	89.4
Oil-Steam	0	74	74	4	84.4
Total	200	254	457		

Table 1- Data Summary (top 25% boilers)

Figure 3:

- Boilers with lower thermal efficiencies have lower prices compared to the medium and higher efficiency boiler types.

Table 1 :

- Summary of the top 25% commercial boilers.

Conclusion

- Gas-water boiler category has higher thermal efficiencies because it is composed mainly of condensing boiler types.
- Further analysis including cost-analysis needs to be considered before a final recommendation is made.



Source: A.O. Smith Water Products Co.

References

- "AHRI." *AHRI*. Version 2011. Air Conditioning, Heating, and Refrigeration Institute, n.d. Web. 8 Aug. 2011. <<http://www.ahrinet.org/>>.
- "GSA Advantage! " *U.S. General Services Administration*, Web. 8 Aug. 2011. <<https://www.gsaadvantage.gov>>
- Payne, Christopher , and Amanda Sahl. "Federal Energy Management Program: Energy-Efficient Product Procurement." Online seminar, August 4, 2011. <<http://www1.eere.energy.gov/femp/>>

Acknowledgments

Environmental Energy Technology Division at Lawrence Berkeley National Laboratory
 Department of Energy's Workforce Development of Teachers and Scientists, Center for Science and Engineering Education

This material is based upon work supported by the S.D. Bechtel, Jr. Foundation and by the National Science Foundation under Grant No. 0952013. Any opinions, findings, conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the S.D. Bechtel, Jr. Foundation or the National Science Foundation.