

Energy Efficiency in the United States

Gas Fired Furnaces, Boilers and Water Heaters

Presented By

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Energy Efficiency in the United States

- ◆ Discuss two aspects of energy efficiency in the U.S.
 - ◆ Federal minimum efficiency regulations
 - ◆ Energy Star Program

Energy Efficiency in the United States

- ◆ Two significant federal laws
 - ◆ National Appliance Energy Conservation Act of 1987
 - ◆ Energy Policy Act of 1992

Energy Efficiency in the United States

- ◆ U.S. Department of Energy (DOE) responsible for:
 - Establishing minimum efficiency requirements for residential and commercial appliances
 - Test procedures to measure efficiency

Energy Efficiency in the United States

- ◆ Federal regulations require all products manufactured for sale in the U.S. to comply with applicable minimum efficiency requirements.
- ◆ Existing efficiency requirements apply to
 - ◆ Residential and Commercial Heating and Cooling Equipment
 - ◆ Residential and Commercial Water Heaters
 - ◆ Residential Cooking and Laundry Equipment

Energy Efficiency in the United States

- ◆ Specific Products to be discussed
 - ◆ Gas and Oil Boilers
 - ◆ Gas and Oil Furnaces
 - ◆ Gas, Oil and Electric Water Heaters
 - ◆ Gas Vented Room Heaters

FURNACES AND BOILERS

- ◆ Efficiency requirement for residential models
 - ◆ Furnace: 78% AFUE
 - ◆ Boiler: 80% AFUE

FURNACES AND BOILERS

- ◆ AFUE is a measure of seasonal efficiency. Measures efficiency for cyclic, not steady-state, operation
- ◆ Furnace AFUE measured under assumption that furnace is not installed in conditioned space
- ◆ Boiler AFUE measured under assumption that boiler is installed in conditioned space

FURNACES AND BOILERS

- ◆ Efficiency requirements for commercial models:
 - ◆ Gas Furnace: 80% combustion efficiency
 - ◆ Oil Furnace: 81% combustion efficiency
 - ◆ Gas Boiler 80% combustion efficiency
 - ◆ Oil Boiler 83% combustion efficiency

FURNACES AND BOILERS

- ◆ Combustion efficiency for commercial furnaces and boilers is a basic “100% - flue loss” measurement under steady state operation

WATER HEATERS

- ◆ Efficiency Requirements for Residential Models

Gas Storage EF = $.67 - .0019V$

Gas Instantaneous EF = $.62$

Oil Storage EF = $.59 - .0019V$

Electric storage EF = $.97 - .00132V$

“V” is rated volume. As models increase in size,
requirement becomes lower

WATER HEATERS

- ◆ EF is energy factor, an efficiency measure that represents the overall efficiency of the model to both heat water and retain the heat in the water stored in the tank

Efficiency Requirements for Commercial Models

Gas Storage And Instantaneous	80% thermal efficiency $Q/800 + 110(V)^{1/2}$ Btu/h standby loss
Electric Storage	$0.3 + 27/v$ percent per hour standby loss

Efficiency Requirements for Commercial Models

Oil Storage	78% thermal efficiency $Q/800 + 110 (V)^{1/2}$ Btu/h standby loss
Oil Instantaneous	80% thermal efficiency

WATER HEATERS

- ◆ Thermal efficiency measures the amount of heat transferred to the water
- ◆ Standby loss reflects the ability of the storage tank to keep the energy in the heated water during periods of non-use
- ◆ The standby loss value actually is the energy consumed to replace the heat lost during the standby period

VENTED ROOM HEATERS

Gas Room Heaters, Wall Furnaces
and Floor Furnaces - 50% to 74% AFUE

- ◆ Specific requirement depends on type of heater and capacity

Energy Efficiency in the United States

- ◆ DOE regulations and Federal Trade Commission labeling rules for residential appliances require reporting of efficiency information
- ◆ DOE has authority to do enforcement testing but relies on industry certification program to check for efficiency of products
- ◆ GAMA conducts efficiency certification program for furnaces, boilers, vented room heaters and water heaters

ENERGY STAR PROGRAM

- ◆ This is a labeling program started in 1992 by the U.S. Environmental Protection Agency (EPA)
- ◆ Program identifies products that are more energy efficient than standard models

ENERGY STAR PROGRAM

- ◆ Objective is to influence consumer to purchase and use more efficient products
- ◆ Also provides manufacturers with a means to promote higher efficiency models

ENERGY STAR PROGRAM

- ◆ Participation is voluntary. All models that meet Energy Star efficiency criteria qualify to show the label
- ◆ Manufacturers self certify and join program by submitting “Qualified Product Information” form

ENERGY STAR PROGRAM

- ◆ Program covers home appliances, heating and cooling appliances, home electronics, lighting, office equipment, commercial food service equipment and new homes
- ◆ For some appliances, U.S. DOE and EPA share responsibility for Energy Star Program

ENERGY STAR PROGRAM

- ◆ Energy Star Criteria For Residential Heating Appliances
 - ◆ Gas or Oil Boilers 85% AFUE
 - ◆ Gas or Oil Furnaces 90% AFUE
- ◆ These criteria were selected to represent models in the upper end of the range of available efficiencies

ENERGY STAR PROGRAM

- ◆ Estimated energy savings of Energy Star models compared to minimum efficiency models

Boiler

10% Savings

Furnaces

15% Savings

ENERGY STAR PROGRAM

- ◆ Some organizations use Energy Star as basis for programs to encourage purchase of more efficient furnaces and boilers.
- ◆ No federal incentive program at this time
- ◆ In U.S. sales of gas furnaces in 2003 were about 3,250,000. Of those, one third were units complying with Energy Star program

ENERGY STAR PROGRAM

- ◆ No energy star program for residential water heaters. Considered in 2003 but not finalized because:
 - ◆ New federal efficiency requirements reduced the range of efficiency for most popular water heaters
 - ◆ Higher efficient, new technology water heaters not yet established products