

# Latest and Greatest in Heating and Cooling

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Tom Butcher  
Brookhaven National Laboratory

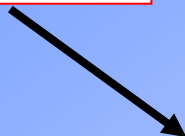
Affordable Comfort  
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Dr. Thomas A. Butcher  
Building 526  
Brookhaven National Lab.  
Upton, N.Y. 11973  
Tel. (631) 344 7916  
[butcher@bnl.gov](mailto:butcher@bnl.gov)

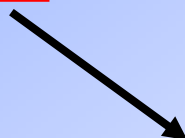
# Topics

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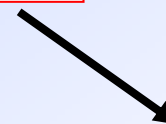
**Fuels**



**Burners**



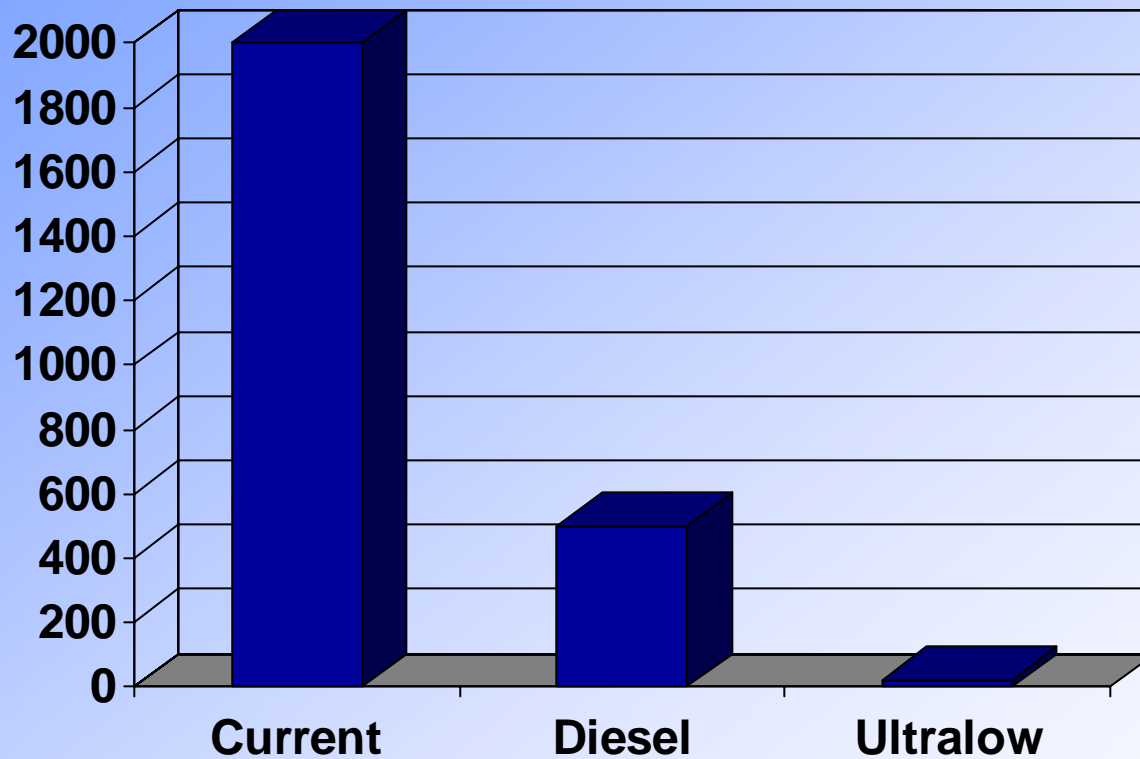
**Appliances**



**Monitoring**

# Fuel Sulfur Levels

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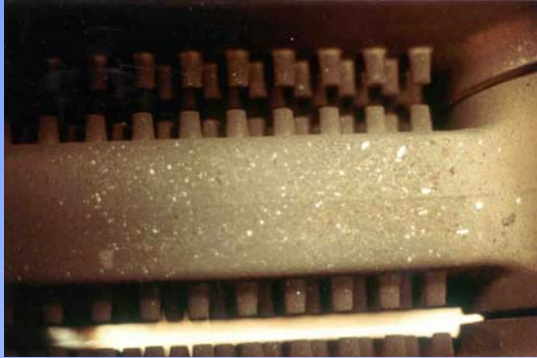
# Effects of Sulfur

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- During combustion a tiny fraction (1%) of the fuel sulfur forms sulfuric acid which corrodes heat exchanger surfaces, leading to boiler and furnace "sooting"
- While particulate emissions from oil-fired heating systems are very small, sulfur is the primary source.

# Effects of Sulfur

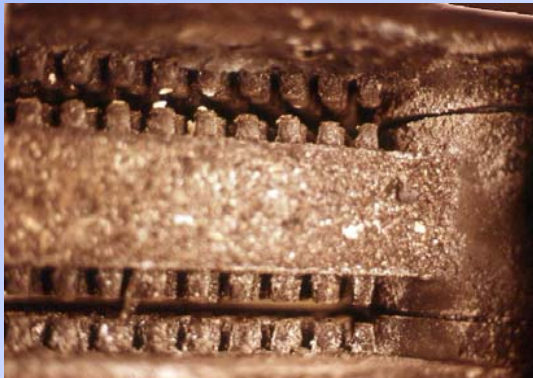
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No.2 heating fuel, 0.04% Sulfur by weight



No.2 heating fuel, 0.18% Sulfur by weight



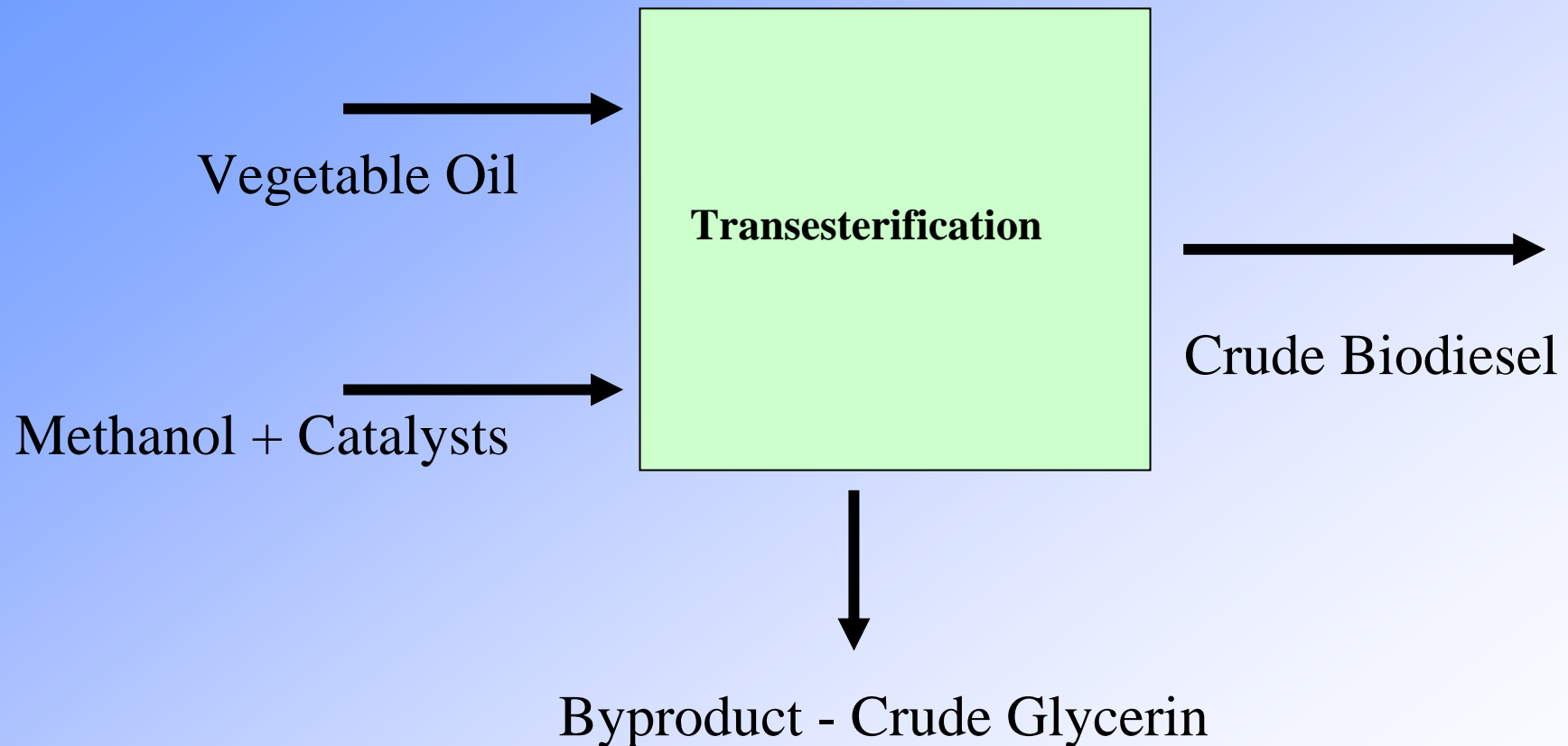
No.2 heating fuel, 0.34% Sulfur by weight



No.2 heating fuel, 1.08% Sulfur by weight

# Biodiesel – a renewable energy resource

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# Biodiesel Properties

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- **Biodiesel is a diesel-like fuel**
  - **Available from vendors now to ASTM D 6751-02**
- **Biodiesel is completely miscible with diesel or home heating oil (ASTM #2)**
- **Some Differences from #2 Fuel**
  - **Oxygenated by ~10% by weight**
  - **8-10% higher density**
  - **About 10% lower heating value**
  - **Very low sulfur and nitrogen content**

# Fuel Comparison

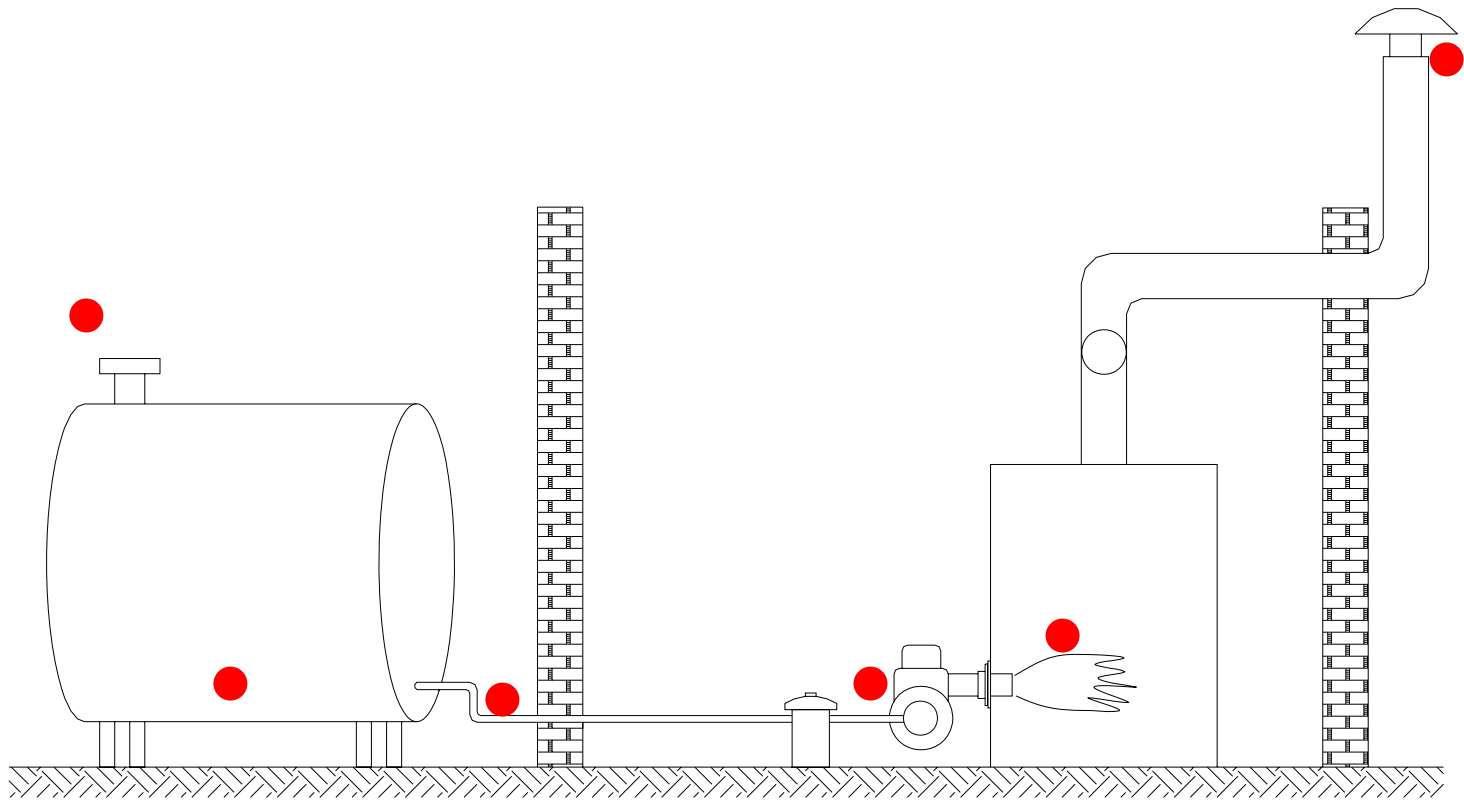
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Home Heating  
Oil

Soy Methyl  
Ester

# Biofuels



# Biofuel Projects

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- Demo of B 20 with National Park Service
- Tests of biofuel for power generation boilers
- Biofuel use in NYC multifamily buildings
- Development of a B100 burner

A report commissioned by the National Biodiesel Board.

# bioheat<sup>®</sup>

# Condensing Appliance Advantages

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- Increased efficiency
- Low temperature venting
- Reduced particulates?



# Latent Heat

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Latent heat loss:

Gas - 9.55 %

Propane – 7.99%

Oil - 6.5 %

# Condensing Furnace

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- NORA – supported development
- 98% reported
- Designed for service / access
- 409 stainless in primary, AL 29 4C Secondary
- Forced gas flow (no inducer)



# Condensing Boiler Types

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Floor Standing



Wall Hung

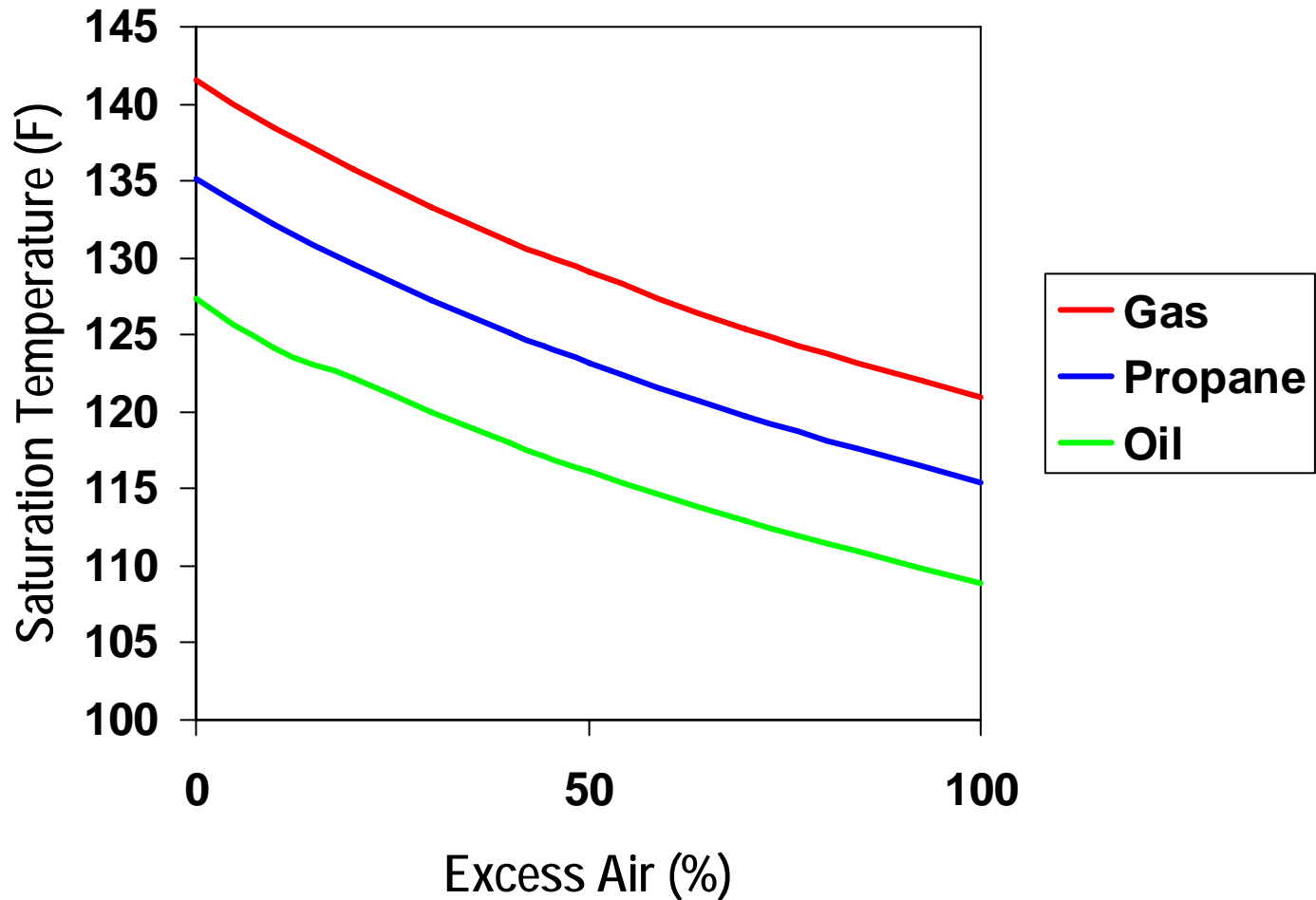


# Primary / secondary heat exchanger

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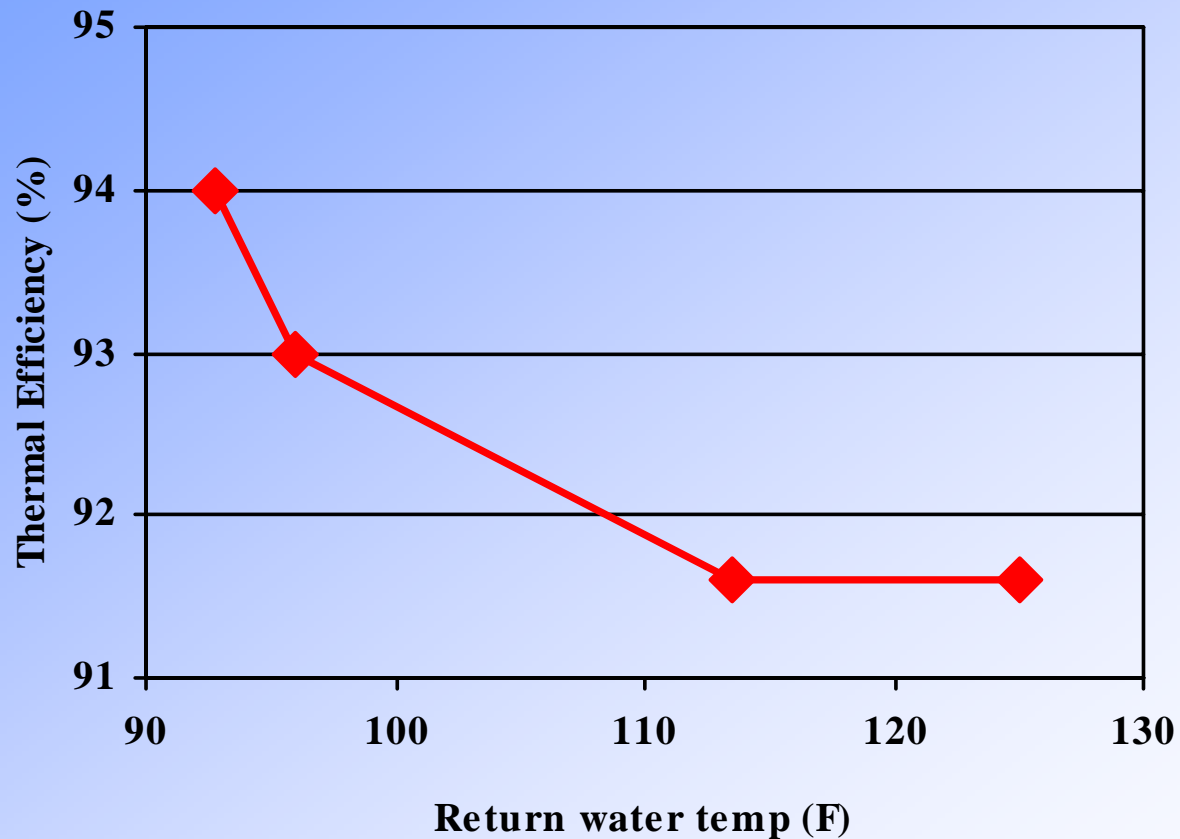
Some boilers have two heat exchangers – primary (non condensing) and secondary (condensing). Generally the primary is not designed for condensation and hydronic conditions need to be controlled to avoid this.

# Flue Gas Saturation Temperature

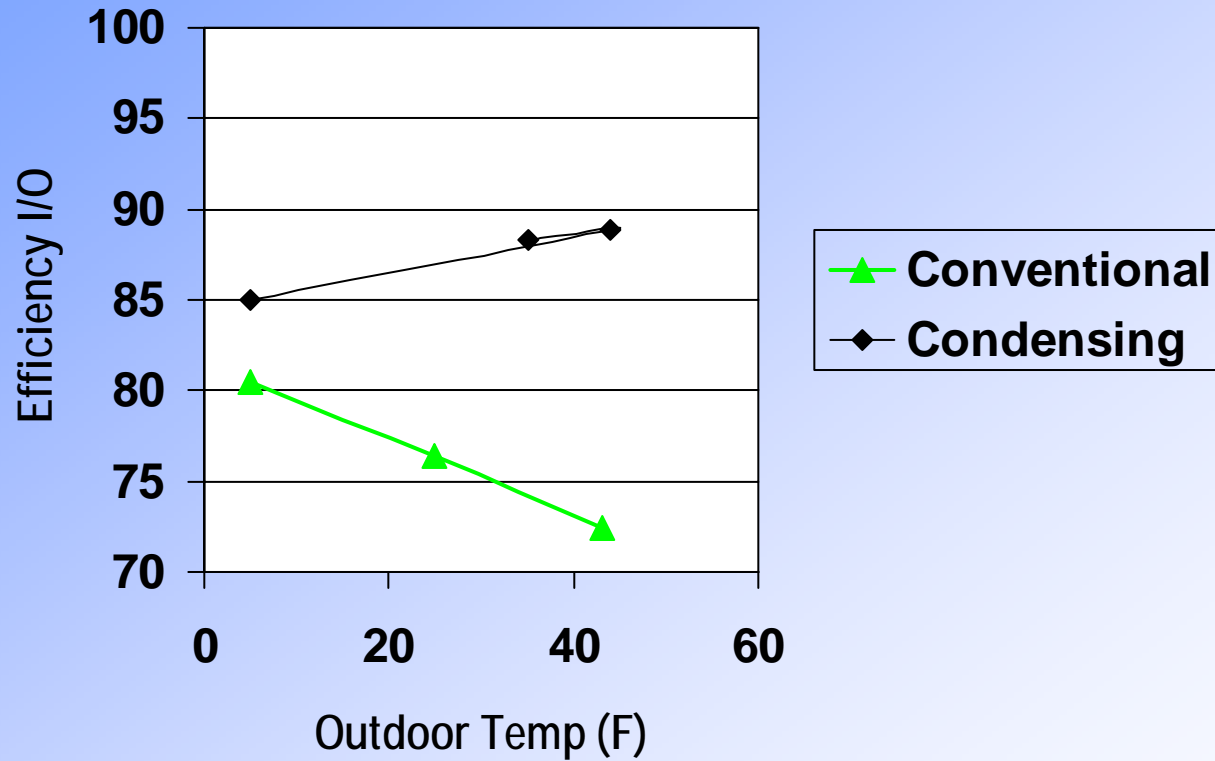


# Impact of return water temperature

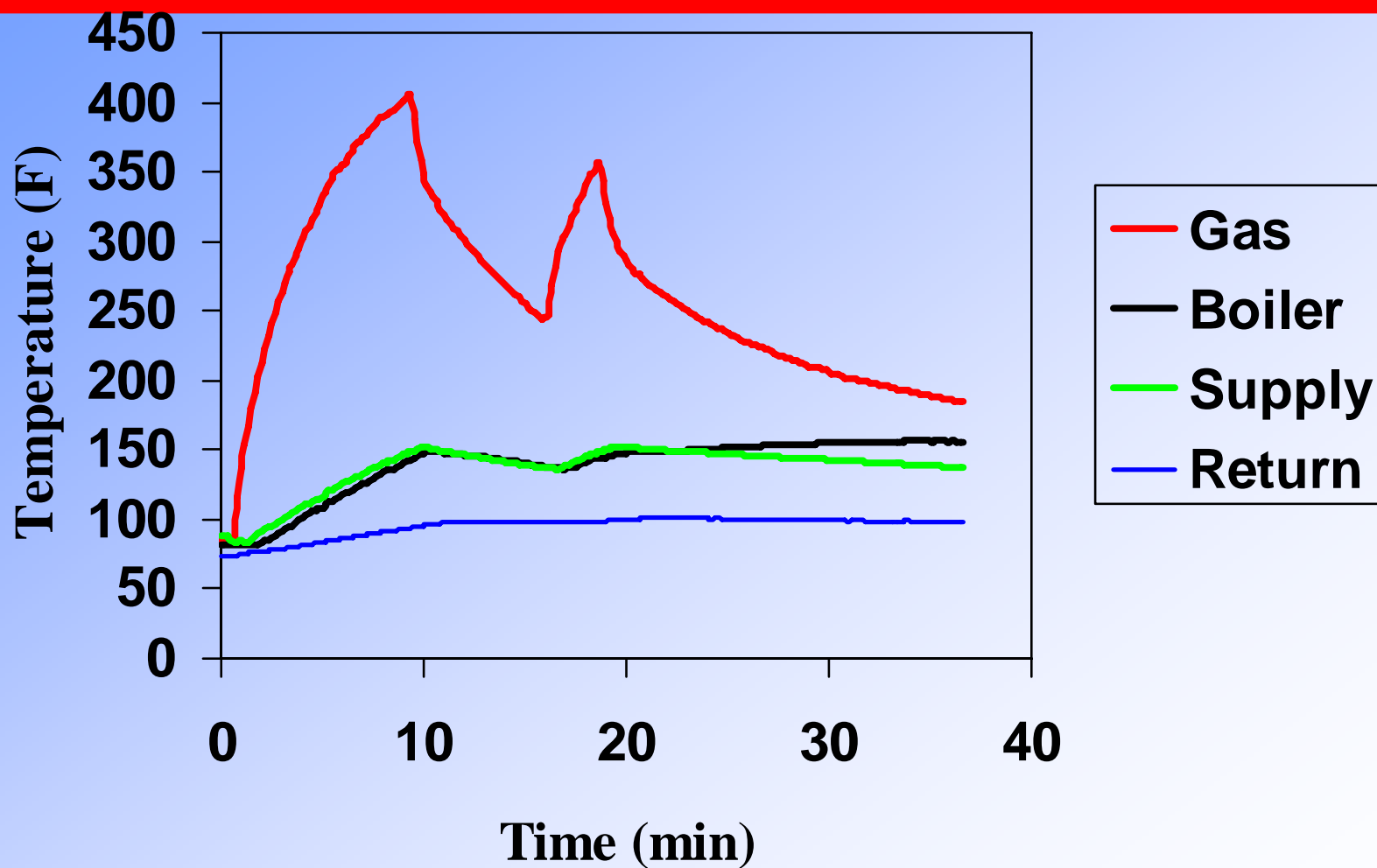
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# Boiler Efficiency Comparison



# Domestic Hot Water Mode

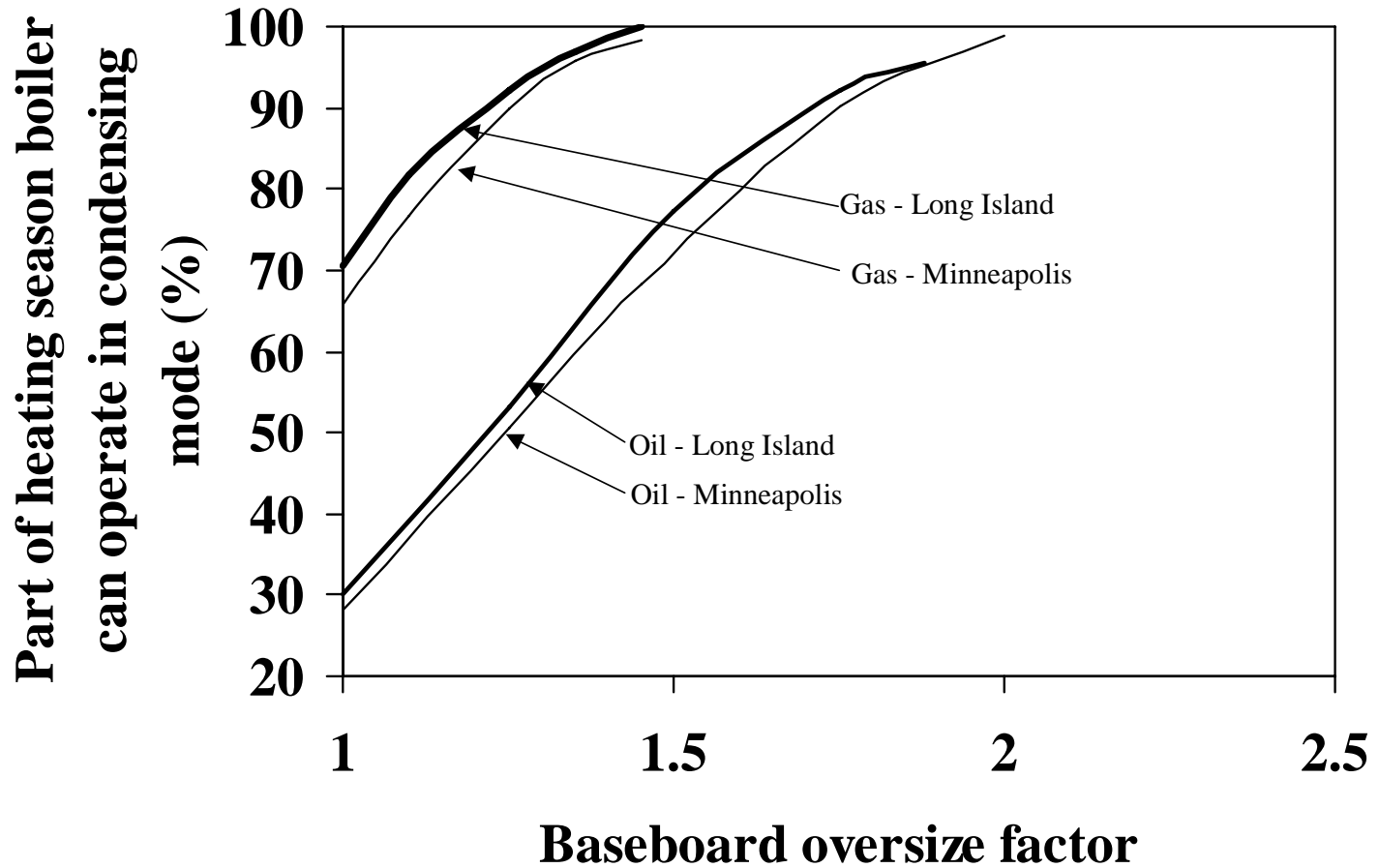


# Wall-hung, condensing boiler

- Advanced concept from Europe
- Very strong market intro in Europe
- Two stage firing, high/low pressure
- Nominal .35 gph / .6 gph
- Brushless DC combustion air fan
- Modified gas control with pc interface
- Outdoor reset
- Blue flame oil burner



# Condensing for Part of the Season



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Tom Butcher  
Brookhaven Lab  
(631) 344 7916

butcher@bnl.gov