

# Furnace/Boiler/Radiant/Infra-Red/Patio Heater

## Furnace

### Summary<sup>1</sup>

Space heating is the 'bread and butter' of many gas utilities' annual sales volumes. The gas furnace is the heating system of choice in over 90% of small space heating applications in northern climates.

Gas furnaces are available in sizes from about 30,000 to 500,000 BTUs. The most common size in residential styled furnaces (the vertical standing box) is around 100,000 BTUs. The residential styled units max out at around 200,000 BTUs with a cooling section of about 5 tons. (400 CFM/Ton = 2,000 CFM total fan air flow.)

The most common size in commercial rooftop units is around 250,000 BTUs. Rooftop units tend to be sized for air conditioning loads. It takes a larger fan to move cooled air than heated air. Therefore, a combination rooftop HVAC unit may have 10 - 20 tons of cooling (4,000 - 8,000 CFM) with a heating section of 250,000 BTUs (3,000 CFM), or, a heating section that is over-sized for the heating load. New units use variable speed fans between heating and cooling modes. Older units just over-sized the heating section, which resulted in uncomfortable hot/cold cycles and inefficiencies.

All furnaces should only require standard gas delivery pressure of about 7" or 0.25 psi to operate. However, elevated delivery pressure is sometime requested to reduce over-the-roof gas pipe size.

### Strengths/Opportunities<sup>2</sup>

- Its simple operation
- Low first and operating costs simple operation

### Weaknesses/Barriers<sup>3</sup>

- Higher first cost than electric

### Market Niches

- Residential
- Commercial
- Small Industrial

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<sup>1</sup> Technology Profiles by DTE, Energy Inside Sales-Fundamentals of Heating Systems by GTI and Northeast Gas Association, 2003

<sup>2</sup> Technology Profiles by DTE Energy

<sup>3</sup> Inside Sales-Fundamentals of Heating Systems by GTI and Northeast Gas Association, 2003

## Space Heating Fact Sheet

### Competition

- Electric Resistance
- Heat Pumps
- Ground Source Heat Pumps
- Oil Furnaces

### Manufacturers

<b>Manufacturer</b>	<b>Representative</b>	<b>Phone Number</b>	<b>Website</b>
Carrier	Bob Curran	(860) 894-3361	<a href="http://www.global.carrier.com">www.global.carrier.com</a>
Comfortmaker	Devine Bros. Inc	(203) 866-4421	<a href="http://www.comfortmaker.com">www.comfortmaker.com</a>
Empire	Various Distributors in CT	(800) 851-3153	<a href="http://www.empirecomfort.com">www.empirecomfort.com</a>
Lennox	Various Distributors in CT	(800) 953-6669	<a href="http://www.lennox.com">www.lennox.com</a>
Trane	Various Distributors in CT	(203) 225-7700	<a href="http://www.trane.com">www.trane.com</a>
York		(717) 771-7890	<a href="http://www.york.com">www.york.com</a>

There are several different types of furnaces. They are explained in more detail below:

#### I. Non-Condensing (Standard) Furnace

##### Principles of Operation<sup>4</sup>

- Hot exhaust from gas burners heats up a set of tubes called the “heat exchanger”
- Tubes heat indoor air blown thru by a supply fan
- Exhaust is discharged at ~350 F to the chimney
- Efficiencies are typically in the 78%-82% range

##### Typical Costs (Not Installed)<sup>5</sup>

###### Standard Efficiency (80% AFUE)

90,000 Btu = \$850

110,000 Btu = \$1,000

135,000 Btu = \$1,100

155,000 Btu = \$1,200

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<sup>4</sup> Energy Inside Sales-Fundamentals of Heating Systems by GTI and Northeast Gas Association, 2003

<sup>5</sup> Carrier per Bob Curran 9/10/04

## II. Induced Draft Furnaces

### Principles of Operation<sup>6</sup>

- Same principal as standard furnaces
- Uses a fan to draw combustion products through heat exchangers
- Increases efficiency over older furnaces
- Most common type of new furnace

## III. Condensing Furnace (High Efficiency)

### Principles of Operation<sup>7</sup>

- Additional heat exchanger further cools exhaust
- Water condenses from exhaust
- Operates at greater than 88% efficiency-often as high as 95% efficient

### Typical Costs (Not installed)<sup>8</sup>

#### High Efficiency (93% AFUE)

60,000 Btu = \$1,800

100,000 Btu = \$2,150

120,000 Btu = \$ 2,200

110,000 Btu = \$1,000

## IV. Rooftop Units

### Principles of Operation<sup>9</sup>

- Outdoors on flat commercial roofs
- May include air conditioning and heating systems
- May or may not be gas on the heating
- Electricity typically used for the AC
- Provides outside ventilation air
- Standard furnace efficiency in heating
- Low efficiency in cooling

### Market Niches

- Commercial
- Industrial

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<sup>6</sup> Inside Sales-Fundamentals of Heating Systems by GTI and Northeast Gas Association, 2003

<sup>7</sup> Inside Sales-Fundamentals of Heating Systems by GTI and Northeast Gas Association, 2003

<sup>8</sup> Carrier per Bob Curran 9/10/04

<sup>9</sup> Inside Sales-Fundamentals of Heating Systems by GTI and Northeast Gas Association, 2003

**Typical Costs (Not installed)<sup>10</sup>**

**Gas/Electric Unit**

115,000 Btu with 5 tons of cooling = \$2,500

225,000 Btu with 10 tons of cooling = \$5,100

**Boilers (See Hot Water Fact Sheet)**

**Infra-Red Radiant Heating**

**Summary/Principles of Operation<sup>11</sup>**

There is a lot of controversy over the use of IR for space heating, regarding the savings potential as compared to forced air systems. Radiant heat does heat objects and not the air, but the objects heated by radiant DO heat the air by convection. Therefore, it comes down to a function of air temperature and the volume of air that is heated. If using radiant heaters allows a facility to heat less air to a lower temperature and still maintain comfort, then savings can result. However, if the same air mass is heated to the same temperature, it doesn't matter if the heat source is radiant or convection; a gas BTU is a gas BTU and they both cost the same. Therefore, radiant makes the most economic sense for large spaces that only need spot heating, or areas that have large amounts of air turn over, such as maintenance garages or heavily ventilated manufacturing shops.

Tube type units are typically 60,000 - 90,000 BTUs per burner; open face type will be 15,000 - 30,000 BTUs per grid section.

There are a variety of radiant heating systems that fall into two general categories: closed tube type and open surface combustion type. The closed tube type can be single units with one burner and one tube; they can be straight or "U" shaped, or they can be linked into a long pattern of multiple burners and multiple tubes. Tube type units will generally use outdoor combustion air and have a forced exhaust flue. Early units used plain, heavy black pipe; newer units use various more durable materials, including some ceramic type mixtures. The shape and type of reflectors used are critical as well, because the tube is hot in 360 degrees, but typically the heat is only wanted in about 180 degrees (down). Reflectors must be kept clean to be effective.

The open faced combustion type units will either be a ceramic or metal/ceramic fiber material full of thousands of holes that allows the gas to permeate the material and burn close to the face causing the material to become hot/radiant. They are typically constructed in grids to get any size needed. Only a small reflector around the edge is used. They use indoor air for combustion, and are not vented.

Therefore, they cannot be used in some environments.

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<sup>10</sup> Carrier per Bob Curran 9/10/04

<sup>11</sup> Technology Profiles by DTE

### **Strengths/Opportunities<sup>12</sup>**

- Can be more efficient at placing the BTUs where you want them – consider for spot heating and areas of high air turn over
- Less expensive than electric units to operate

### **Weaknesses/Barriers<sup>13</sup>**

- More expensive than air systems to buy
- Not really more efficient at producing BTUs

### **Market Niches**

- Commercial (auto body shops, car washes, nurseries, firehouses, sporting facilities, retail sales areas, loading docks, warehouses, hangars, woodworking)
- Industrial (steel fabrication, manufacturing process-drying, melting, welding)

### **Competition**

- Electric IR Heaters

### **Typical Costs (Not installed)<sup>14</sup>**

High intensity units = \$400-\$1,200  
(For outdoor heat and snow melting)

Low intensity units = \$700-\$1,800  
(When combustion air from outside is required)

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<sup>12</sup> Technology Profiles by DTE

<sup>13</sup> Technology Profiles by DTE

<sup>14</sup> Clover Corporation 9/15/04

**Manufacturers**

<b>Manufacturer</b>	<b>Representative</b>	<b>Phone Number</b>	<b>Website</b>
Detroit Radiant - Re-Verber-Ray		(586) 756-0950	<a href="http://www.reverberray.com/company/co1.html">www.reverberray.com/company/co1.html</a>
Enerco Technical Products, Inc.		(800) 922-0724	<a href="http://www.tarantin.com/enerco.htm">www.tarantin.com/enerco.htm</a>
Solaronics, Inc.		(800) 223-5335	<a href="http://www.solaronicsusa.com">www.solaronicsusa.com</a>
Superior Radiant Products		(905) 664-8274	<a href="http://www.superiorradiant.com">www.superiorradiant.com</a>
Schwank	Clover Corporation-Brian Cullinane	(860) 528-0081	<a href="http://www.schwankheaters.com">www.schwankheaters.com</a>

**Patio Heater**

**Summary/Principles of Operation<sup>15</sup>**

Patio heaters are a comfort product used to improve the enjoyment of outdoor spaces; they have nothing in common with energy management. However, clean burning natural gas heaters can greatly improve air quality as compared to charcoal and wood fires.

Patio heaters are manually lit via a safety pilot. A dial control sets the output. Natural Gas units can be permanently mounted and piped with rigid pipe or combinations of rigid pipe and short lengths of flexible connector.

Typically units are 40,000 to 50,000 BTUs.

**Strengths/Opportunities**

- Help to convert unused or underutilized outdoor space into a thriving year-round profit center
- Unique appeal and atmosphere to alfresco dining and lounging facilities
- No need to change tanks or run out of fuel while guests are enjoying their meal as with propane units

**Weaknesses/Barriers**

- Not as portable as propane units

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<sup>15</sup> Technology Profiles by DTE

## Space Heating Fact Sheet

### Market Niches

- Residential
- Restaurants
- Bars
- Hotel/Motel
- Country Clubs

### Competition

- Propane
- Electric

### Typical Costs (Not installed)

Prices typically range from \$300 to \$900.

### Manufacturers

<b>Manufacturer</b>	<b>Representative</b>	<b>Phone Number</b>	<b>Website</b>
Empire Comfort Systems	Various distributors throughout the state	(800) 851-3153	<a href="http://www.empirecomfort.com">www.empirecomfort.com</a>
Infrared Dynamics	Sunglow Industries	(703) 734-9577	<a href="http://www.infradyne.com">www.infradyne.com</a> <a href="http://www.sunglowind.com">www.sunglowind.com</a>