



## COMPANY PROFILE

Since 1976, **AVION** has been a successful provider of high-quality spare parts for heat treatment equipment. We work with costumers from a diverse base to fit the needs of their heat treatment facilities. Achieving an export share of more than 50%, we are an internationally oriented company and deliver to customers in more than 20 countries.

**AVION** provides comprehensive service to the heat treatment industry focusing on supplying high quality spare parts for industrial furnaces. Our company is especially successful in the development of energy-saving heating systems made of alternative materials (Si/SiC).

Our innovative customers benefit from **AVION's** policy of providing products with an exceptionally developed price/performance ratio.

**AVION** is specialized in meeting specific customer demands, from the improved burner tip to the complete modernization of existing product lines.

**AVION** has been a long-time partner to many customers. The competent consultancy by our experts in Brunswick, OH and the local attention by our international partners makes us an asset to both new and long-term customers.

## COMPANY PROFILE

- GRAFBOARD®
- BURNER SYSTEMS
- SI/SiC RADIANT TUBES
- FINNED RADIANT TUBES
- MUFFLES
- FURNACE CHAINS
- VENTILATING FANS
- STOP-OFF COATINGS
- BURNER TIPS
- SPYROCOR™



**AVION** Manufacturing Company

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 web www.avionmfg.com  
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## GRAFBOARD®

### Combined heat conduction, protection and insulation lining for vacuum furnaces

**GRAFBOARD®** is a newly developed composite material made of the most modern graphite materials, combining the advantages of graphite insulation and armouring in one easy to handle board. By means of a specially developed crystal welding process, both materials are joined. More expensive CFC boards can be replaced economically.

The advantages of **GRAFBOARD®** are:

- Possible energy reduction of 20% by reduced heating and cooling intervals
- High mechanical protection with high insulation properties
- Reduction of lining intervals
- No reduction of insulation properties after damage of robust protective layer
- Considerable reduction of dusting
- Easy assembly, simply cut with standard wood-working tools
- One board = triple effect



Maintenance of the insulation properties even after damage – here 500 cycles after damage by forklift truck.



Available in  
24" x 47" and 40" x 60 "  
as well as 1", 1.5", and 2" thickness



*Some like it  
no P.P.S.*

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**GRAFBOARD®**

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## RECUPERATIVE BURNER ECOMAX®

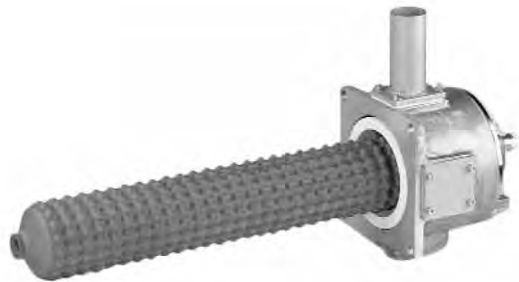
- High efficiency through optimized recuperator shape
- High flame speed
- Designed to facilitate maintenance
- Five sizes with range of performance 51,000 – 850,000 BTU (15 – 250 kW)
- Suitable for all types of gas including natural gas, liquid gas and with a special modification for low calorific gases.
- Direct electrical ignition
- Flame supervision by ionization of UV Cell
- Minimal Nox emissions through incremental combustion

### Use

- maximum application temperatures 2100 – 2375°F (1.150°C – 1.300°C) depending on the model
- use as radiant tube burner (metallic or fully ceramic radiant tube) for heat treatment plants with protective gas or other critical atmospheres

Possible lengths in mm						
0C	395	475	556		636	
1C			545	593	641	689
2C			545	613		681
3C			545	617		689

Possible lengths in Inch						
0C	15 ½"	18 ¾"	22"		25"	
1C			21 ½"	23 ⅜"	25 ¼"	27 ⅛"
2C			21 ½"	24 ⅛"		26 ¾"
3C			21 ½"	24 ⅓"		27 ⅓"



Recuperative burner **ECOMAX®**

*Easy - tight - affordable.*

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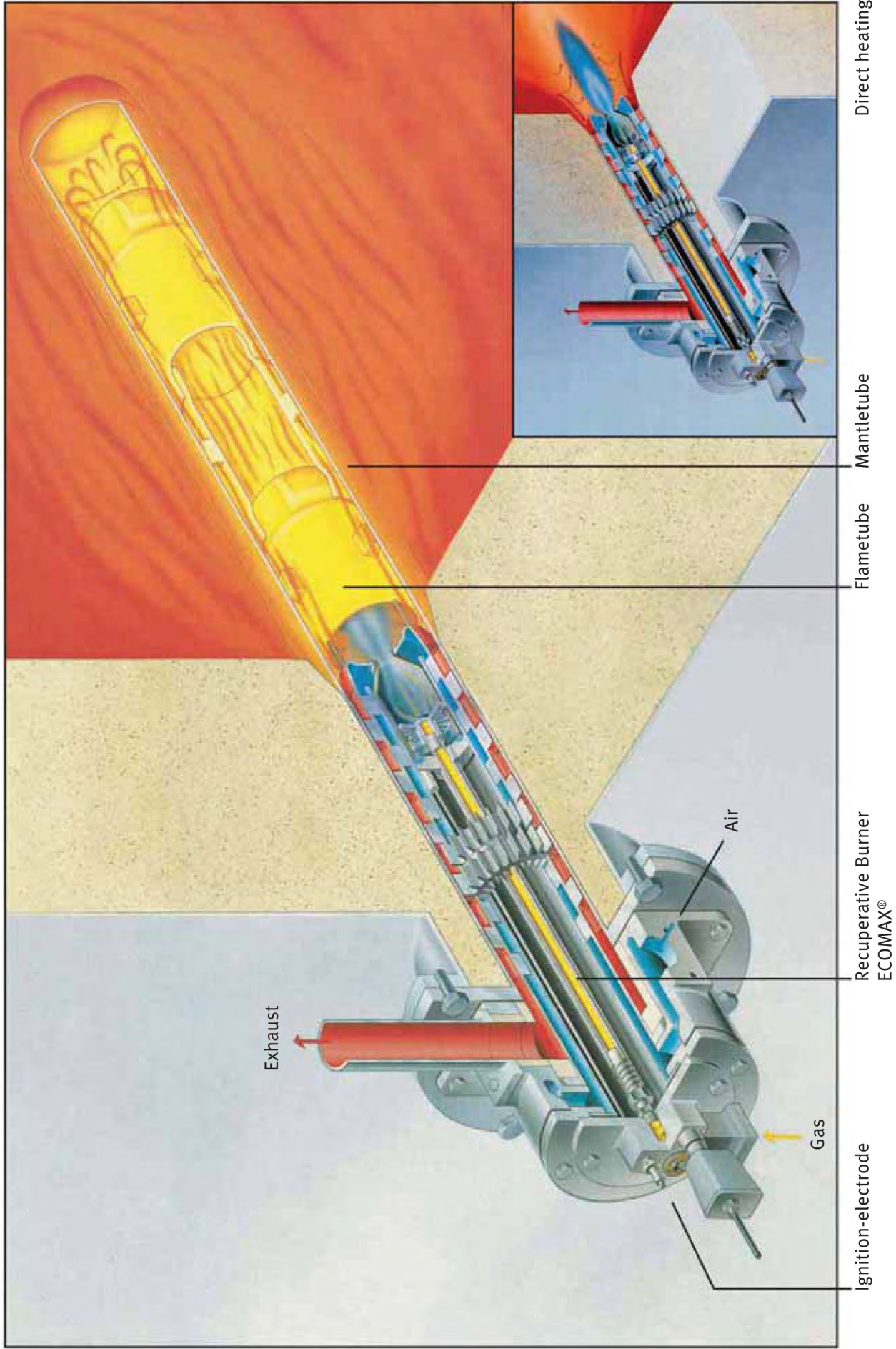
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**BURNER SYSTEM ECOMAX®**



## SI/SIC RADIANT TUBES

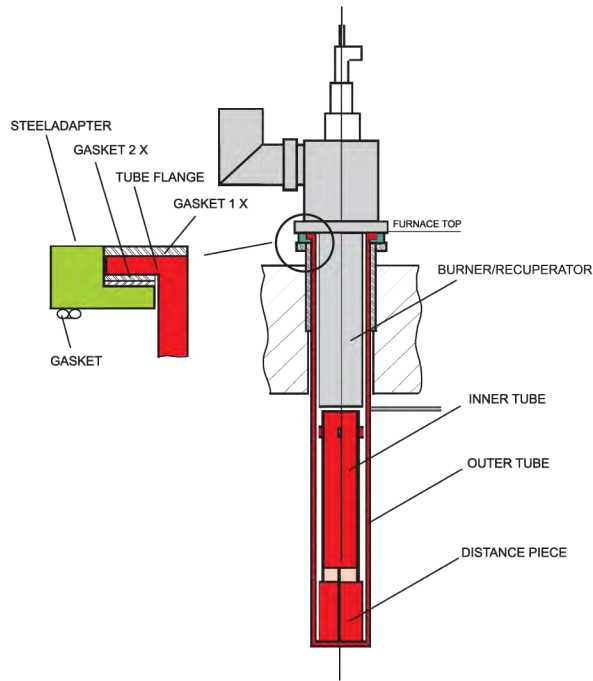
**Si/SiC radiant tubes offer unsurpassable physical properties, faster heating times, longer life and higher efficiency at competitive prices.**

An innovation in the radiant tube technology – without changing your burners.

Si/SiC radiation tubes are made of natural raw materials according to a specific process. Their advantages over conventional tubes made of heat-resistant high-quality steel or monolithic ceramics include:

- Durability and reliability at temperatures up to 2450°F
- outstanding resistance against:
  - thermal shock
  - overheating
  - oxidization
  - carburizing
  - creep elongation
  - corrosive atmospheres
  - vibration
  - magnetizing
  - residues of detergents

heat flow: **110 BTU/in<sup>2</sup>**



Si/SiC radiant tubes can be used in all heat treatment processes in gas or electrically heated hardening or tempering furnaces and adapt to your existing burners.

The tubes can be supplied with open ends, closed ends (recuperative system) and with corresponding flanges.

Exchange systems ready for installation with radiant and flame tubes up to **6" diameter** made of Si / SiC composite material for recuperative burner equipments are available immediately.

**Si/SiC recuperative radiant tubes are absolutely maintenance-free.**

*Silicon carbide & Avion flange systems = reliable partners*



**SI/SiC** tubes – vertically + horizontally

## FINNED RADIANT TUBES

Open tube systems have been used for many decades, primarily for tempering furnaces. The recuperative burner systems, however, are relatively new.

**AVION** finned radiant tubes offer a larger surface area considerably improving their heat efficiency and distribution.

Because the fins are thread-shaped, an optimum flame distribution from the burner tip to the tube exit is achieved.

Further advantages of Si / SiC radiant tubes are:

- durability and reliability at temperatures up to **2450°F**
- outstanding resistance against:
  - thermal shock
  - overheating
  - oxidization
  - carburizing
  - creep elongation
  - corrosive atmospheres
  - vibration
  - magnetizing
  - residues of detergents

heat flow: **125 BTU/in<sup>2</sup>**

Finned radiant tubes in sectional view



*Avion finned tubes  
+ uniform temperature  
= considerable energy  
saving*



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## MuSiC

### Furnace hearth and muffle parts made of silicon carbide/Mullite composition

The relatively new generation silicon carbide and Mullite (**MuSiC**) mixture demonstrates essential advantages in comparison to pure forms of SiC or Mullite muffle parts, primarily used for furnace construction or repairs.

The essential advantage is the excellent resistance against so-called “**glazing**,” the hardening of the surface by means of glassy type residues.

Pure SiC shows a long life and a high resistance against thermal shock. However, it is very susceptible to the “**glazing effect**” causing irregular granular growth, reduced passage and consequently early failure.

Pure Mullite is almost totally resistant to glazing, however, it only has a very short life, particularly with exposure to frequent temperature changes.

In cooperation with our partners we succeeded in mixing these two materials to a very specific recipe which combines the advantages of both components in one material. The result is a high-quality material with long life at an extremely attractive price.



IPSEN T4 brickwork and MuSiC



*A nice couple:  
low price &  
great job*

### T65 MuSiC

Max. process temperature	2450°F
Density	160 – 170 lbs/ft <sup>3</sup>
Porosity/permeability	14 – 18 %

Excellent properties for frequent temperature changes.

### EXAMPLES FOR USE:

T65 is recommended for use where a long life, high resistance against abrasion as well as a high thermal conductivity are required.

### AVAILABLE FOR FOLLOWING TYPES:

T4	TQ 4	RTQ 8
T 7	TQ 5	
T 9	TQ 6	
T 11	TQ 7	
T 13	TQ 10	

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## FURNACE CHAINS FOR MULTIPURPOSE CHAMBER FURNACES

**Type EURO:** The standard chain, same design as IPSEN-chains, globally approved. Highly heat-resistant chain, mainly for use in carburizing, carbonitriding and hardening work.  
**(Material 50 % RA 310 / 50 % RA 333)**

**Type ULTRA:** The reinforced chain for universal use at quenching and tempering, hardening and carbonitriding. **The charge weight can be increased by at least 25 % depending on the equipment.** Only one alloy is used for the chain.  
**(Material RA 310 / 1.4845)**

**Type DELUXE:** The light one, mainly for the use at quenching and tempering of relatively low weights and high volume.  
**(Material RA 310)**

All links are welded, except 3 end links which are splinted at one side for easy shortening of the chains.

**AVION** transfer chains – specifically designed for multipurpose chamber furnaces, sized to your individual batch weights.

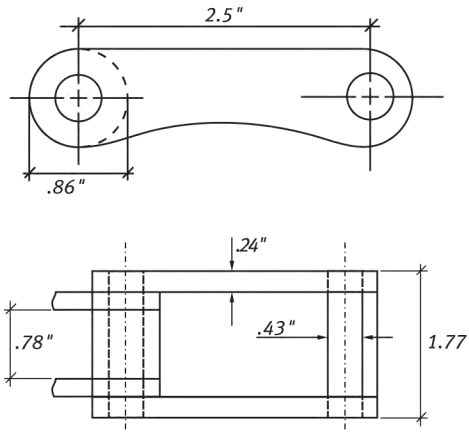
### LENGTHS/PITCH:

100 links	1 5/8"
76 links	2 1/2"

Further lengths and repair links upon request.

Schematic views

### Type ULTRA



*Your choice :  
expensive - or Avion.*

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## VENTILATING FANS

**AVION circulating fans ULTRA – the low-priced ventilation unit without the vibration.**

ULTRA fans are made of heat-resistant alloy RA 330. ULTRA ventilating fans are always heat treated, x-rayed and examined for smooth operation prior to delivery.

**The life of the fans of 520 mm and 610 mm may be considerably increased by reduction of the motor revolutions to 750 rpm.**

### EXTENT OF SUPPLY / DIAMETER:

18 1/2"	470 mm
20 1/2"	520 mm
24"	610 mm

### MATERIAL:

Heat-resistant stainless steel, US standard RA 330 (1.4864)



**AVION** ventilating fan ULTRA

All circulating fans are always available ex stock.

### MOTOR WITH COOLING FLANGE

2 speed settings



5 kW	1430 rpm	10,9 A
1,7 kW	960 rpm	4,7 A

suitable for fan diameters

Ø 480 mm	Ø 530 mm	Ø 610 mm
----------	----------	----------

*The wind  
of change*

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## STOP-OFF COATINGS

### GREEN-LABEL stop-off coating against carburizing – water-based

Highly effective stop-off protection for use with vacuum or gas carburizing: **temperatures up to 1900°F and depth up to 0,125"** depending on the coating thickness. Applied by painting, dipping and spraying (airless system).

To clean parts after carburizing simply wash them with soap and water. The tools can be cleaned the same way. Removal of the product is ecologically safe.

#### EXTENT OF SUPPLY:

Plastic bucket 3,8 l	11 lbs
Barrels 209 l	571 lbs



GREEN-LABEL stop-off coating

### BLUE LABEL stop-off coating against nitriding – water-based

Highly effective protection against nitriding by one or more applications depending on the requirements. The product should not be heated above 400°F without a protective gas atmosphere. After nitriding, the residue may be removed with a cloth or stiff brush. Clean up tools with soap and warm water.

#### EXTENT OF SUPPLY:

Pints and quarts
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BLUE-LABEL stop-off coating

Both products are ecologically safe. Tools can be cleaned with soap and warm water and hazardous waste removal is unnecessary.

*Eco.? of course!  
... and effective.*

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## CYCLONIC BURNER TIPS

In the **CYCLONIC** burner tip design, the drill holes are shaped in an angled fashion to produce a helical flame pattern. The swirling motion heats the radiant tube more efficiently and heat accumulation at single points is reduced; this provides more uniform heat distribution and better tube life.

**Additional flame breakers are no longer necessary and consequently subsequent costs are avoided!**

By improved design the CYCLONIC burner tip increases the **heat efficiency** of the burners by **at least 10 %**; with adjustment an improvement of **more than 25%** is possible. By using the highly heat-resistant high-grade steel RA 330 the resistance of the CYCLONIC burner tip against oxidization is quadrupled in comparison with other products and the melting point is higher.

### MATERIAL:

Heat-resistant high-grade steel  
US standard RA 330 (1.4864)

Type <b>ACB-10</b>	connection 3/4" and 1"	<b>85,500 BTU</b>
Type <b>ACB-20</b>	connection 1"	<b>102,000 BTU</b>

All sizes are immediately available.

### CYCLONIC burner tips:

- flame breakers are unnecessary
- easy exchange
- more efficient heat effect

### CYCLONIC burner tips



*Get the twist!*

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## SPYROCOR™

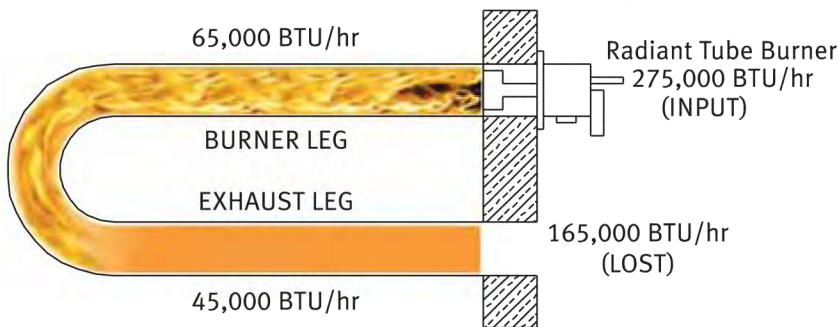
### SILICON-CARBIDE INSERTS for Radiant Tubes

**AVION Mfg.** is the exclusive supplier of radiant tube inserts made of Silicon-Carbide.

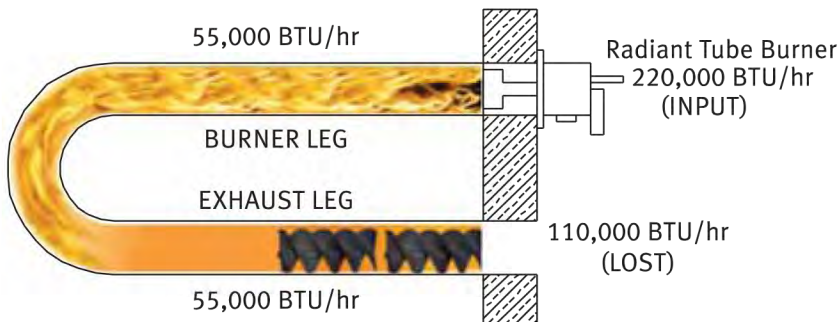
The patented twisted "Y" design produces non-turbulent high convection flow. The subsequent radiated heat from the **SpyroCor™** results in the highest rate of uniform heat transfer possible.

In a traditional radiant tube, 45% more energy is released in the burner leg than the exhaust leg due to the highly luminous flame. Both radiation and convection heat transfer are present in the burner leg. The hot gases in the exhaust leg have an emissivity of less than .05. Thus, convection heat transfer is dominant in the exhaust leg.

Heat transfer is driven by temperature and is limited by heat transfer surface area. The patented multi-fin twist design of the **SpyroCor™** doubles the amount of surface area available.



To Save Fuel, **SpyroCors™**, with an emissivity of .95, are installed in the last 2/3's of the exhaust leg. Radiation and convection heat transfer are now present. The exhaust leg and burner leg are now balanced from a heat transfer standpoint. Input into the radiant tube burner is reduced by 20%. Energy available to the load is maintained.



*...pimp your furnace!*

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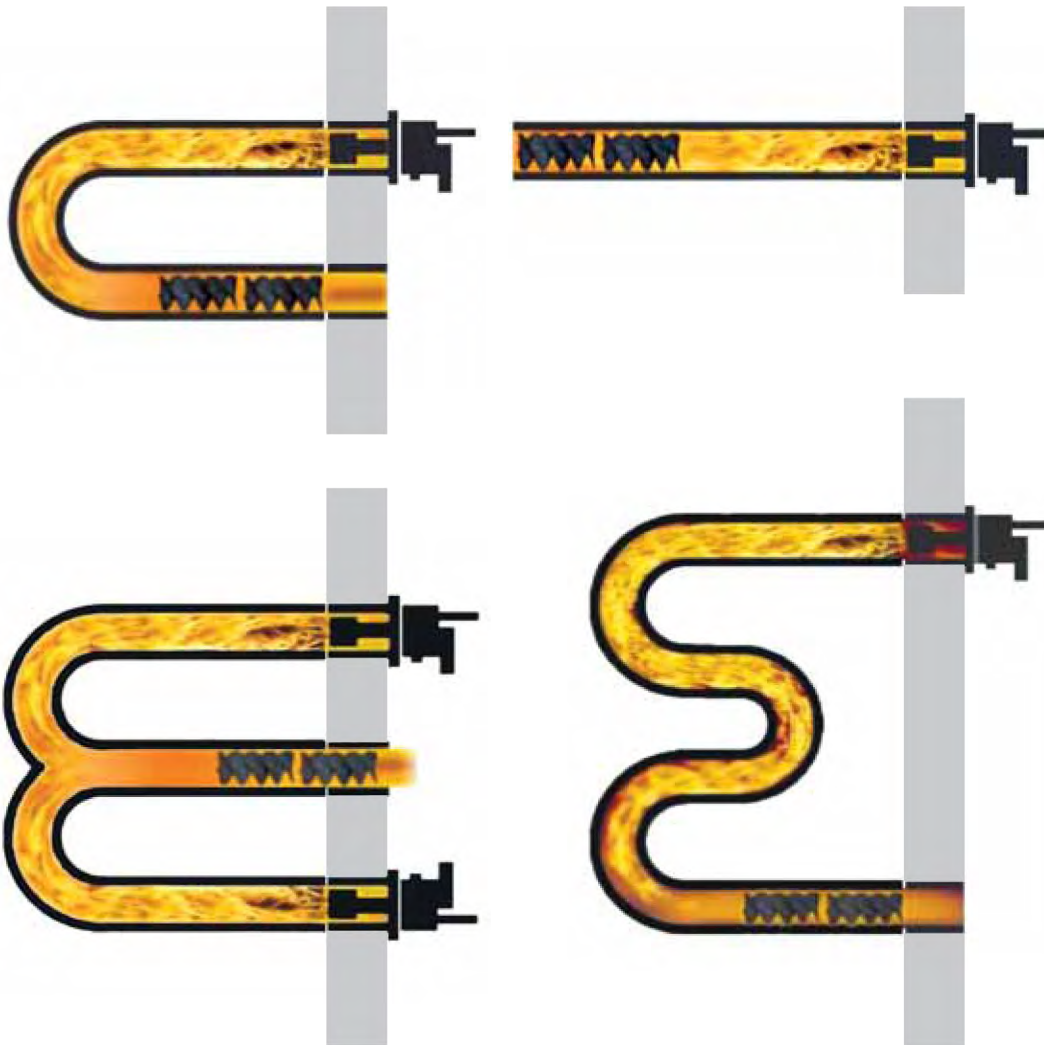
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## SPYROCOR™

What kind of tubes do they work in?



That's how they look like in operation.

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