



Innergytech inc.

# Thermogain

HEAT EXCHANGER



THE MOST RELIABLE  
AIR-TO-AIR  
ENERGY RECOVERY  
COMPONENT

Since the 70's, heat recovery has proven to be an excellent way of reducing energy consumption and costs.

Innergy Tech **THERMOGAIN** unit is a highly efficient air-to-air heat recovery device that controls heat loss in both commercial and industrial applications.

This passive heat exchanger has no external power requirements and provides the owner with an economical alternative to more expensive heat recovery methods.

## **THERMOGAIN**

### **Features and benefits**

- High heat recovery efficiency for rapid pay back
- No operating costs
- No external power requirements
- Wide selection of custom made models for different applications
- No moving parts for virtually maintenance free operation
- Easily cleaned, due to integral fin construction
- Fin tube design minimizing the effects of metal expansion
- Physical separation of air streams preventing cross contamination
- Various coatings available to protect the unit against a variety of exhaust air conditions
- Temperature capability up to 450° F
- Software is available for easy selection and design characteristics

**YOUR GUIDE TO THE ENERGY RECOVERY WORLD**

## WHAT IS A THERMOGAIN HEAT PIPE?

The Thermogain heat pipe is a self-contained self-maintaining passive energy recovery device. It has a very high coefficient of thermal transfer utilizing vapor liquid flows. What's more amazing is that heat pipes have no moving parts, require no external energy (other than the heat they transfer), they are reversible in operation and are completely silent. Like any other piece of tubing or pipe, they are rugged and can withstand a lot of abuse.

A heat pipe consists of three elements: a sealed container, a capillary wick structure and sufficient working fluid to saturate the wick structure. Because the container is vacuum sealed, the working fluid is in equilibrium with its own vapor. Heating any part of the external surface, causes instantaneous evaporation of the working fluid near that surface (the evaporator region) with the latent heat of vaporization absorbed by the vapor formed. The rapid generation of vapor at any point on the tube wall area creates a pressure gradient within the heat pipe which forces the excess vapor to a remote area of the pipe having a lower pressure and temperature. Here the vapor condenses on the tube wall and the latent heat of vaporization is transferred (the condenser region).

Heat is removed from the surface at the point of condensation by conduction, convection or radiation. A continuous process is established by the capillary pumping forces within the wick structure, thus returning the fluid to the evaporator section. In effect, we have a perpetual motion machine with no moving parts and requiring no energy of its own. Each heat pipe has a transfer efficiency of 99.3%.

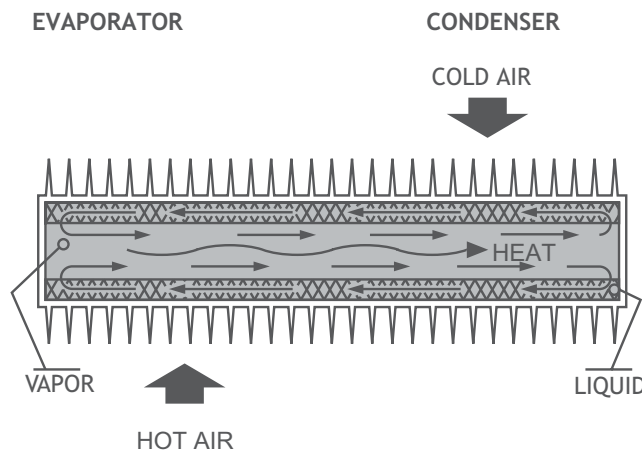
## HOW DOES A THERMOGAIN HEAT RECOVERY UNIT OPERATE?

The Thermogain heat pipe heat exchanger is constructed of individual heat pipes, each tested and inspected to insure peak performance. These exchangers provide a simple efficient and compact method of air-to-air heat recovery. They resemble conventional heating and cooling coils, however have several important differences:

- 1-A partition divides the exchanger into two sections, thus insuring the separation of supply and exhaust air flows.
- 2-Each heat pipe is an individual heat exchanger not dependent on any other part to insure operation. The exchanger formed by these heat pipes is a counter flow design. In operation, exhaust air passed across one section of the exchanger (exhaust side) and supply air is ducted in counter flow direction across the other section (supply side). Heat is transferred from the hot air to the cold air stream by the heat pipes.

While Thermogain can recover up to 82% of exhaust air heat under ideal conditions, the economical heat recovery rate is between 60 and 70%. This represents a tremendous saving of energy. In addition, the heat pipe is reversible and can cool outdoor air in summer. Innergy tech Thermogain is a year round energy savings device.

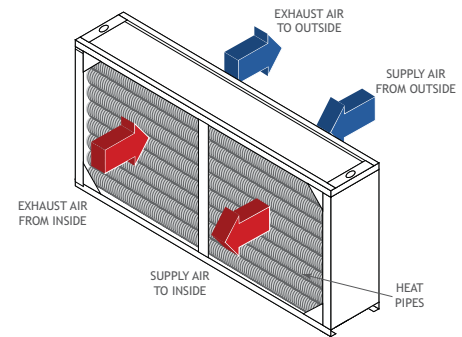
Heat pipes are also best suited to recover heat from moisture laden air. This, in effect, is done through the action of condensing the vapor in the exhaust stream into water; this has the effect of increasing the capacity of the exchanger while minimizing the danger of frost formation.



## HVAC HEAT RECOVERY

### APPLICATION

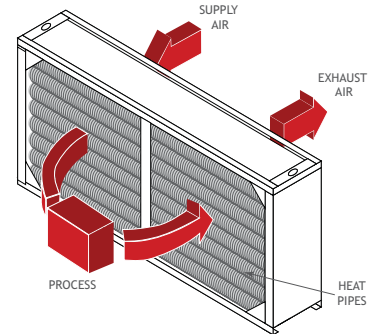
The Thermogain heat exchanger installed in a ventilation system recovers the heat from the stale outgoing air and transfers it to the fresh incoming air. It is simple, yet effective way of providing continuous fresh air in the building throughout the winter and summer.



## INDUSTRIAL HEAT RECOVERY

### APPLICATIONS

Because industrial applications have higher exhaust temperatures, they waste more heat and thus have greater waste heat recovery value. In addition of having higher exhaust temperatures, many industrial applications are in operation 24 hours a day, 7 days a week. It is for these reasons that Thermogain has designed recovery units to meet these requirements. Thermogain industrial heat pipe exchanger are designed to operate in exhaust applications up to 450°F (232°C), and because they are available with an Heresite coating they can operate in otherwise corrosive environments.

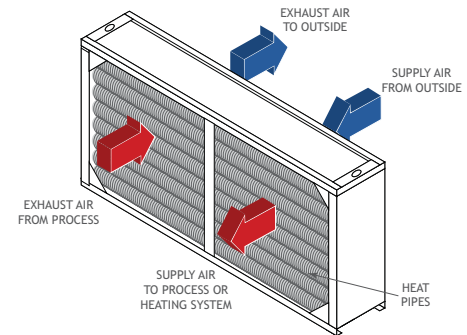


### Return to process heat recovery

Heat from the exhaust is recovered and returned as preheated air to the process (oven, dryer, etc.)

### Process to process heat recovery

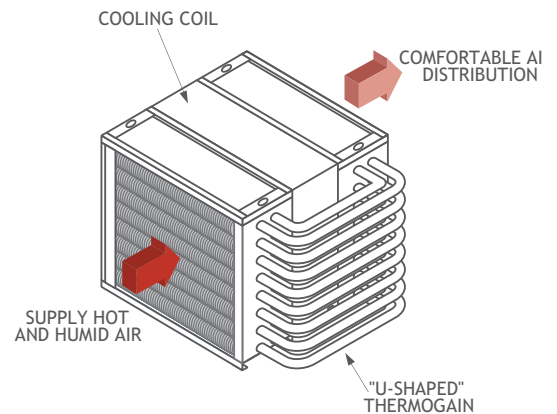
Recovered heat from one process is returned to another process or heating system. It is sometimes possible to completely heat a second process with the recovered heat from the first and totally eliminating power source.



## AIR DEHUMIDIFICATION FOR

### AIR-CONDITIONING

The “U-Shaped” dehumidifier heat pipe increases the moisture removal capabilities of an air-conditioning system and eliminate the need for reheat overcooled air. The “U-Shaped” Thermogain precool air close to its dew point before entering the cooling coil. After that, the second section of the Thermogain will reheat air up to a comfortable temperature. This process of precool and reheat air is done without the use of energy or pumps. The “U-Shaped” Thermogain will reduce the tonnage of the system and provide a lower operating cost.



# THERMOGAIN

## HEAT RECOVERY UNIT CONSTRUCTION

### FEATURES

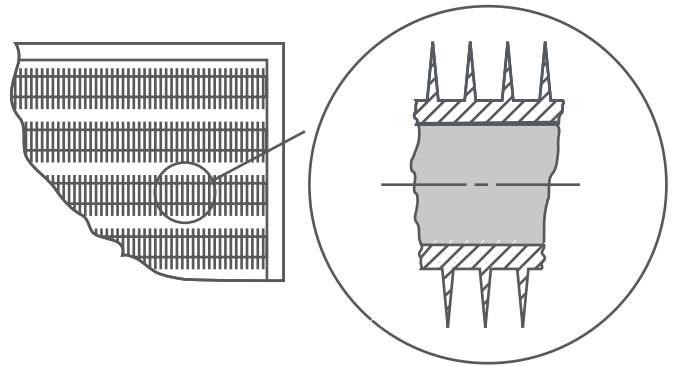
Thermogain units are constructed with aluminum tubes which have an inside diameter of 1 inch (2.5 cm) and a thickness of .166 inch (.422 cm). A unique feature of the heat pipe is that the fins are of an integral spiral fin design.

Integral fin construction gives significant advantages over plate fin or duplex finned designs. These advantages are extremely important. The fins are an integral part of the heat pipe container wall, the fin material is continuous with the tube and thereby eliminates bond resistance, uneven thermal expansion, and significantly decreases maintenance. The integral fin heat pipe provides maximum heat transfer with minimum pressure drop while providing extended life without fear of fin tube separation due to thermal cycling.

The entire assembly is contained in a rugged galvanized steel frame and comes supplied with galvanized steel dust covers at both ends. Design features of the Thermogain heat recovery unit are:

1. Individual heat pipes generate higher reliability because each pipe is not depending upon another for operation.
2. Ease of cleaning because integral fin construction allows for greater fin spacing without loss of efficiency.

3. Thermal expansion - Each heat pipe is individual within the frame, thereby eliminating bonding problems found in expanded tube design. Pipe distortion is also eliminated.
4. Counter flow design provides maximum efficiency.
5. Exchanger size reduced because of transfer efficiency (99.3%) of heat pipes.
6. Large selection of sizes and efficiencies to meet customer needs.
7. Rugged design to reduce maintenance requirements.
8. Bi-directional for use in HVAC applications.
9. Silent. Does not add to the noise in the plant.
10. Passive recovery device, no energy to save energy.
11. Anti-corrosive phenolic coating is available for designs requiring protection against corrosive exhaust air.



## MODEL NUMBER SELECTION

Select Heat Exchanger Model #

Exchanger :	IFA	22TF	108L	9FPI	4R	Note
	1	2	3	4	5	Note
1. Integral Finned Aluminum _____	_____	_____	_____	_____	_____	_____
2. Number of Tubes in Face of Exchanger _____	_____	_____	_____	_____	_____	_____
3. Finned Length of Exchanger _____	_____	_____	_____	_____	_____	_____
4. Fins per inch _____	_____	_____	_____	_____	_____	_____
5. Row depth of Exchanger _____	_____	_____	_____	_____	_____	_____
<b>Note:</b> C if coating is required. _____	_____	_____	_____	_____	_____	_____
U for U-shaped configuration						

## INSTALLATION CONSIDERATIONS.

### Installation of the unit:

Recommendation for installation: The Thermogain unit should be installed so that both fluids will be drawn up through the recovery cell.

### Leveling exchanger:

The Thermogain heat exchangers could be installed with a slight slope, according to the manufacturers specifications. The exhaust section must be installed lower, when used only for heating or ventilating.

### Supporting structure:

The exchangers should be secured rigidly, not to allow more than 1/8 inch (.32 cm) total deflection. The supply duct must never be fixed directly to the Thermogain frame.

A support structure could be made to slide the unit for cleaning and installation purposes. We recommend the following practices:

1. Blades on face dampers should always be perpendicular to the tubes.
2. Electric preheat coils, when required, should be a minimum of 3 feet (.9 m) upstream from the exchanger face on the supply side.

### Filtration requirements:

Performance specifications are based upon clean air and a clean surface. It is required that adequate filtration be used in both air streams to insure optimum performance and minimum maintenance.

### Access doors:

Access doors should be provided to allow periodic inspection of the exchanger and to facilitate cleaning when necessary.

### Drain pans:

Sloped drain pans are recommended under the entire exchanger both as a condensed collection system and for cleaning purposes.

### Code requirements:

The installation of the exchanger should conform to all codes, laws and regulations applying at the job site.

## HVAC HEAT PIPE HEAT

## EXCHANGER SPECIFICATIONS.

### 1. GENERAL SPECIFICATIONS:

- a) Furnish and install the Thermogain heat recovery units of the heat pipe air-to-air type as shown in the schedule, to be manufactured by Innergy Tech inc., Drummondville, Quebec, Canada.
- b) Thermogain heat recovery units shall transfer heat between outgoing and incoming air streams in counter flow arrangement.
- c) Thermogain heat recovery units must be installed with 1/4 inch/ft exhaust end down when used for heating and ventilating.
- d) Thermogain heat recovery units are labeled for direction of air flows, exhaust inlets and outlets and supply flange connections and a tilt angle.

### 2. HEAT PIPE HEAT EXCHANGER SPECIFICATIONS:

- a) Tube core shall be 1 inch (2.5 cm) ID seamless, integrally finned aluminum 1050 tube with .166 inch (.42 cm) wall thickness. Tube spacing has a maximum of 2 1/8 inches (5.4 cm) between the center of each tube and has 1 7/8 inch (4.8 cm) between each row.
- b) Fin surface should be integral to the tube wall and should have a minimum of .017 inch (.043 cm) between fin thickness. Fin density is 11, 9, 7 or 5 fins per inch. Fin surface from root to the tip of the fin should have a minimum of .437 inch (1.11 cm) between fin height.
- c) Circumferencial capillary wick structure shall be integral to the inside wall of the tube. Capillary structure shall not interfere with the integrity of the wall of the tube.
- d) Working fluid used shall be selected on the basis of heat pipe operating temperature and compatibility with tube and wick materials. Tubes shall be individually processed, charged, hermetically sealed and factory tested.
- e) The exchanger frame shall be fabricated from minimum of 14 gauge galvanized steel. The frame shall be supplied with minimum 2 inches (5.1 cm) wide flanges on all four sides. Intermediate tube supports shall be furnished as required.
- f) A partition shall be provided to isolate the outgoing and incoming air streams; there shall be no cross contamination. The partition shall be at the center unless specified. Partition shall be fabricated from a minimum 18 gauge galvanized steel and shall extend beyond the finned surface with 4 inches (10.2 cm) flanges [2 inches (5.1 cm) to supply side and 2 inches (5.1 cm) to exhaust side]. Both front and back to be flush with the frame.
- g) End covers shall be provided to protect tube ends. Covers shall be fabricated in 18 gauge galvanized steel.
- h) Each individual heat pipe shall be charged and tested at the actual maximum design air temperature before being installed within the frame.

# EXCHANGER

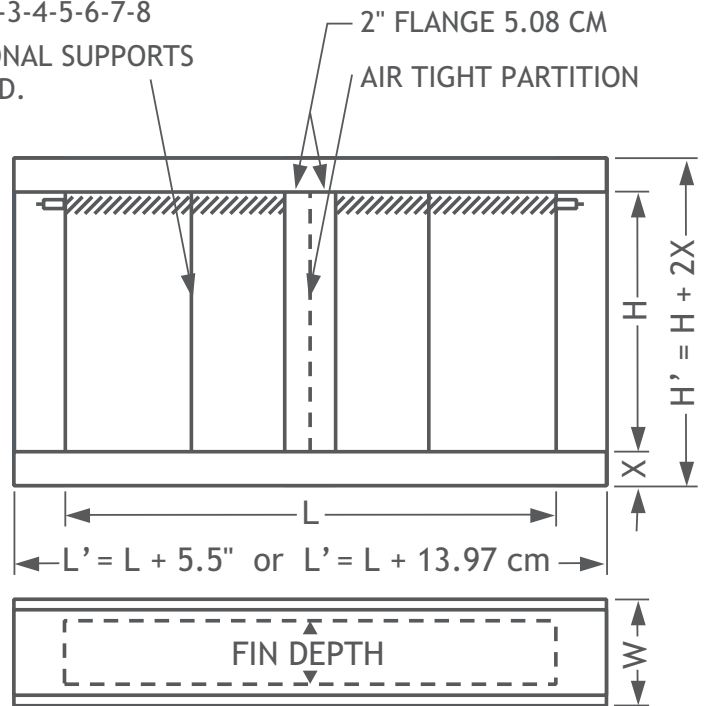
## DIMENSION DATA

L		Overall length L'	
Inch	Cm	Inch	Cm
24	61.0	30	76.2
36	91.4	42	106.7
48	121.9	54	137.2
60	152.4	66	167.6
72	182.9	78	198.1
84	213.4	90	228.6
96	243.8	102	259.1
108	274.3	114	289.6
120	304.8	126	320.0
132	335.3	138	350.5
144	365.8	150	381.0
156	396.2	162	411.5
168	426.7	174	442.0
180	457.2	186	472.4
192	487.7	198	502.9
204	518.2	210	533.4
216	548.6	222	563.9
228	579.1	234	594.4
240	609.6	246	624.8

TYPE IFA (1" I.D.)

ROWS 2-3-4-5-6-7-8

ADDITIONAL SUPPORTS AS REQ'D.



ROWS	OVERALL LENGTH W		FIN DEPTH	
	Inch	Cm	Inch	Cm
2	5 7/8	14.9	4	10.16
3	7 3/4	19.7	5 7/8	14.9
4	9 5/8	24.4	7 3/4	19.7
5	11 1/2	29.2	9 5/8	24.4
6	13 3/8	34.0	11 1/2	29.2
7	15 1/4	38.7	13 3/8	34.0
8	17 1/8	43.5	15 1/4	38.7

VALUE OF X		
L =	FEET	2' - 14'
	M	.609 - 4.26
X =	IN.	2"
	Cm	5.08

Tubes in face	H		Overall height			
			L = 2' à 14'		L = 15' à 20'	
	Inch	Cm	H'		H'	
7	14 7/8	37.8	18 7/8	47.9	20 7/8	53.0
10	21 1/4	54.0	25 1/4	64.1	27 1/4	69.0
13	27 5/8	70.2	31 5/8	80.3	33 5/8	85.4
16	34	86.4	38	96.5	40	101.6
19	40 3/8	102.6	44 3/8	112.7	46 3/8	117.8
22	46 3/4	118.7	50 3/4	128.9	52 3/4	134.0
25	53 1/8	134.9	57 1/8	145.1	59 1/8	150.2
28	59 1/2	151.1	63 1/2	161.3	65 1/2	166.4

## STRIVING FOR EXCELLENCE

**Innergytech - a market leader in energy recovery components.** Innergytech, a company based in Canada, has 11 years of experience in research, development and production of energy recovery components. Our units are highly efficient air-to-air energy recovery devices reducing energy losses in HVAC and industrial process applications. Our product line includes plastic and aluminum plate exchangers, heat pipes and energy recovery wheel. Our products offer innovative and cost effective solutions that can be easily integrated to any energy recovery ventilation system.

### **Guaranteed effectiveness with ARI Certification Seal.**

Innergytech components are tested independently and proven to be one of the most efficient energy recovery devices on the market. Our units are ARI certified under the Air-to-Air Energy Recovery Ventilation Equipment Certification Program and bear the ARI 1060 Performance Certification seal.



Innergytech factory (Drummondville, Canada)

### **Certified quality with ISO 9001.**

The Innergytech quality system is tested and certified under ISO 9001. This means that optimized procedures are adhered to in development, fabrication and distribution - to guarantee the Innergytech quality.

### **Automatic production to customer specification.**

Innergytech components are manufactured to customer specification. State-of-the-art machinery ensures constant high quality products.



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