



COLMAC HEAT PIPE COILS

Air-to-Air Heat Exchangers
for Commercial & Light Industrial Markets



- Heat Recovery
- Frost & Temperature Control
- Enhanced Dehumidification
- Indirect Evaporative Cooling

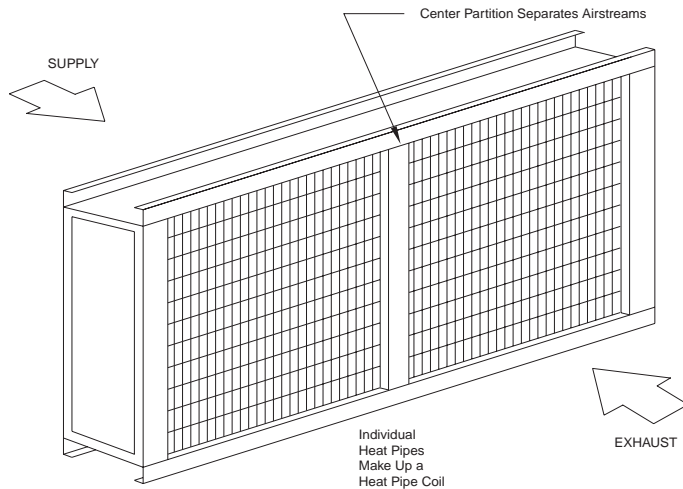
A Tradition of Quality

Since 1971



**COLMAC
COIL**

HEAT PIPE COILS



Colmac heat pipe coils are air-to-air heat exchangers that transfer heat from one air stream to another. Their basic uses include heat recovery, frost and temperature control, IAQ, enhanced dehumidification, and indirect evaporative cooling applications for the commercial and light industrial markets.

Colmac heat pipe coils consist of a bundle of individual heat pipes made of 1" inside diameter aluminum tubes with an internal capillary wick formed into the inside wall and with integral extruded fins on the outside of the tube. Colmac's standard construction allows for heat pipe coils up to 8 rows deep, 28 tubes high, and 20 feet in length.



**COLMAC
COIL**

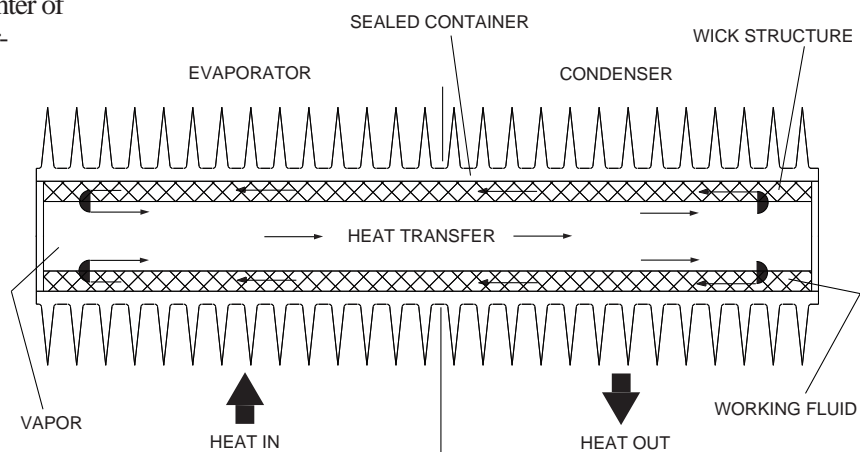
HOW IT WORKS

An individual heat pipe is made up of three basic components: a sealed tube (pipe), a capillary wick structure, and a working fluid. Colmac starts with a 1" inside diameter aluminum tube with an integral capillary wick formed into the inside wall. The tubes have integral fins (with .015" average mean thickness and 11 fins per inch) that are extruded from the tube wall to insure maximum heat transfer.

Internally the heat pipes are partially filled with a suitable working fluid (Colmac standard is R134a) and hermetically sealed. Because the heat pipe is sealed under a vacuum, the refrigerant is in equilibrium with its own vapor. The capillary wick distributes the refrigerant over the inside of the pipe.

An external partition, usually located in the center of the heat pipe coil, separates two typically counter-flow air streams. Warmer air flowing over one end of the heat pipe evaporates the refrigerant inside the tube. The vapor migrates through the tube to the cooler end where it is condensed, giving off its heat to the other air stream. The condensed liquid returns to the warmer end through the wick, completing the cycle.

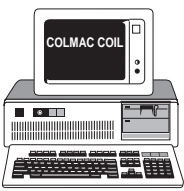
This heat pipe system is being driven entirely by the temperature difference between the two air streams. There are no moving parts, no maintenance, no external power required – just long life and problem free operation.



The Colmac heat pipe coil has taken this innovative technology and applied it to the task of saving energy for buildings and industry ... energy from conditioned air in buildings ... from wasted heat in HVAC systems or industrial processes ... in fact savings from almost any waste heat or cooling application that you can imagine. In short, wherever Colmac heat pipe coils have been applied, the basic plant or process heat balance equation has been improved and the cost of the equipment is amortized in a very brief time.

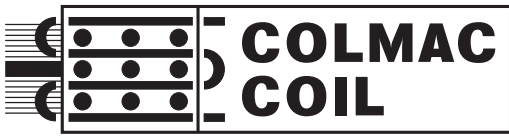


SIZING SOFTWARE



Colmac offers Heat Pipe Pro sizing software that allows you to size your own heat pipe coils for ratings, capacities and conditions desired.

“Heat Pipe Pro” is a Windows based heat pipe coil selection, sizing, and pricing software. It will pick an appropriate Colmac heat pipe coil model, given flow and temperature input, or will give the exact performance of the heat pipe for a selected model. The program performs precise psychrometric calculations and determines exactly how much control is required to prevent frost build up. It calculates indirect evaporative cooling and dehumidification applications as well. Heat pipe drawings, specifications, and pricing for the model selected are also included in the software.

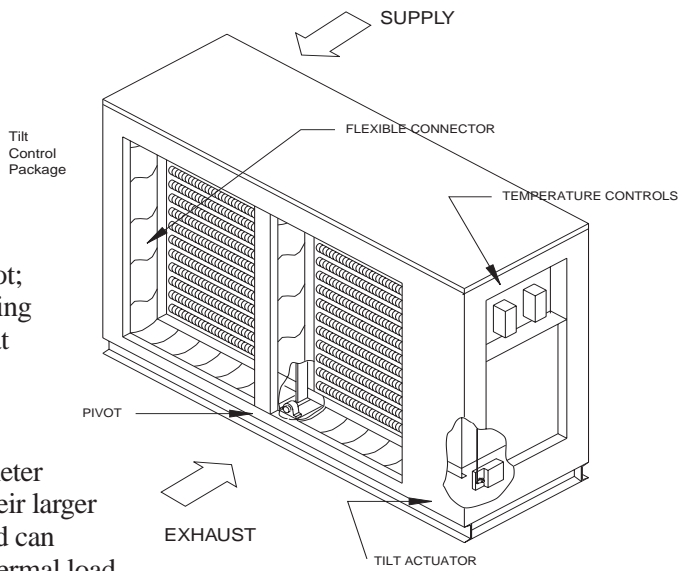


FROST & TEMPERATURE CONTROL

It is sometimes desirable to control the performance of a heat pipe coil in order to prevent frost build-up on the exhaust side of the heat pipe coil in the winter, or to prevent inadvertent heating of the supply air when cool make-up air is desired in the spring or fall. The Colmac heat pipe coils have two very effective methods of temperature control:

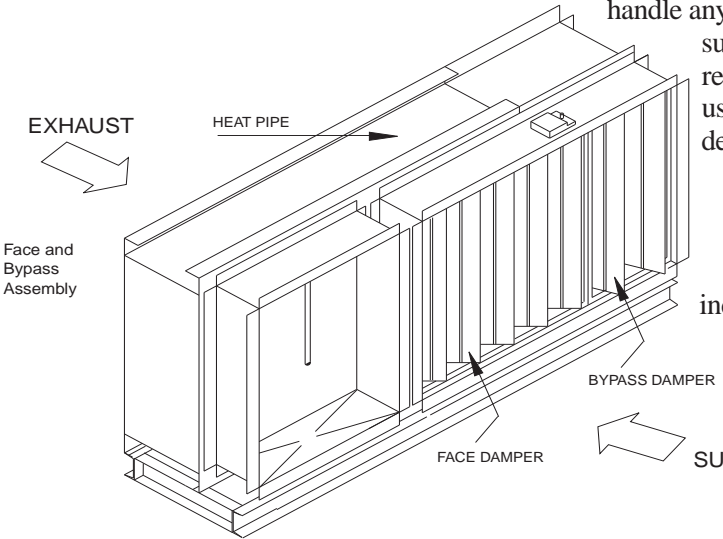
Tilt control

Because Colmac heat pipe coils depend on an internal evaporation/condensate cycle, their performance can be altered by using gravity to limit the effectiveness of the cycle. If the heat pipe is tilted such that the cool air end is lowered below the warm air end, the effectiveness of the heat pipe is diminished. The tilt can be adjusted to accomplish just the right amount of temperature control. The heat pipe coil is mounted on a central pivot; its tilt from the level is controlled by a mechanical actuator responding to the input from two proportional temperature controllers. The heat pipe coil is connected to ducts by short flexible duct connectors.



There is a common misconception that tilting a heat pipe coil increases its efficiency. It does not. Gravity can assist a small diameter heat pipe that “chokes” due to insufficient flow area. Because of their larger internal diameter, Colmac heat pipe coils have no such problem, and can handle any thermal load,

summer or winter, without resorting to tilt. For temperature and frost control, tilt is actually used to derate the performance of the heat pipe coil to achieve its desired effect.



Face and bypass dampers

Face and bypass dampers are used throughout the HVAC industry, and can be used effectively with Colmac heat pipe coils to control frost and temperature. In the winter when supply air temperatures are cold enough to create frost on the exhaust air side, face dampers begin to close and allow cold supply air to bypass the exchanger. Face dampers also close to prevent heating of supply air in spring and fall when an economizer cycle is desired.



ENHANCED DEHUMIDIFICATION

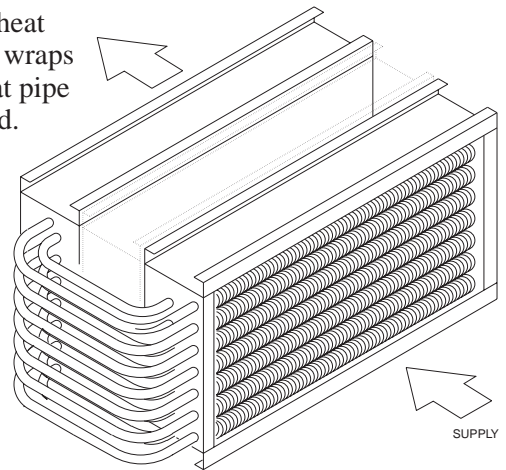
Colmac heat pipe coils can be used to solve HVAC problems in conjunction with dehumidification coils.

A dehumidification coil cools air below its dew point, extracting water in the process. The air leaving the coil has less absolute humidity, but it is saturated with water vapor and has no capacity to absorb more water. It is common practice to reheat this cold clammy air to avoid condensation in duct work and to make the air more comfortable.

This additional expenditure of energy can be avoided with the use of Colmac heat pipe coils. In its "in-line" or "wrap around" configuration, the heat pipe actually wraps around the DX or chilled water dehumidification coil, with one section of the heat pipe coil upstream and one section downstream. Typically, a two row heat pipe is used.

Hot, humid air coming into the air handler passes through the first heat pipe section. The heat pipe pre-cools this air prior to entering the dehumidification coil. This allows the coil to have a higher chilled water temperature for a given amount of cooling, or in the case of a DX coil, a lower compressor load. This cooling savings is in addition to the savings from the free reheat.

As the cool, dehumidified air emerges from the coil, it passes through the second section of the heat pipe, where it is reheated to a temperature with a more comfortable relative humidity.

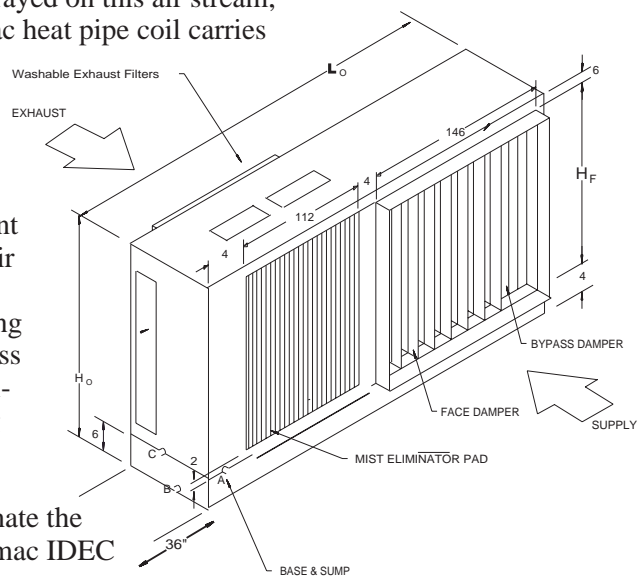


INDIRECT EVAPORATIVE COOLING

One of the most powerful applications of the Colmac heat pipe coil is indirect evaporative cooling (IDEC). IDEC is a way of capturing most of cooling energy lost when conditioned air is exhausted from a building and is a way of cooling building make-up air without adding humidity. In either case, building make-up air is cooled by using the psychrometric potential of air exhausted from the building or outside air. Water is sprayed on this air stream, lowering its temperature towards its wet bulb temperature. The Colmac heat pipe coil carries this coolness and transfers it to the supply air stream, without the addition of humidity. IDEC is distinguished from evaporative (or swamp) cooling, which merely exchanges a drop in temperature for a rise in humidity.

The Colmac indirect evaporative cooling systems are highly efficient and take full advantage of the temperature potential of the exhausted air stream. Unlike other systems that use a "media" to saturate the air upstream of the heat exchanger, the Colmac indirect evaporative cooling system keeps the air saturated through the exchanger as the dry coolness is being supplied to the make-up air. This means that in a typical application, several more degrees of cooling can be supplied to the building make-up air.

A Colmac IDEC system can reduce the size of, or sometimes eliminate the need for mechanical air conditioning equipment. In either case, a Colmac IDEC system significantly reduces electric power consumption.



Contact your Local Representative

COLMAC COIL MFG., INC.

370 North Lincoln • P.O. Box 571
Colville, WA 99114-0571 USA
Phone: (509) 684-2595 • Fax: (509) 684-8331
Website: www.colmaccoil.com
e-mail: mail@colmaccoil.com