



EVAPORATIVE CONDENSERS FEATURES & APPLICATIONS GUIDE



**INNOVATION AND SOLUTION
REVOLUTION**



EVAPCO, Incorporated is a leading manufacturer of cooling towers, closed circuit coolers, ice thermal storage coils and evaporative condensers in China since 1995 with wholly owned subsidiaries located in Shanghai and Beijing. In 2006, EVAPCO announced the opening of a new company, **EVAPCO (Shanghai) Refrigeration Equipment Company, Ltd.** and the completion of a new Asia/Pacific Headquarters and State-of-the Art Manufacturing Facility located in the Baoshan District of Shanghai.

EVAPCO (Shanghai) Refrigeration Equipment Company, Ltd. is a testimony to the company's commitment to providing the highest quality products and first class-service to clients throughout the China and Asia/Pacific markets. The manufacturing operation is ISO 9001 and ISO 14001 Certified. Evapco Shanghai is also authorized to manufacture and repair equipment in accordance with ASME Boiler and Pressure Vessel Code.

In addition, EVAPCO Asia/Pacific has a manufacturing facility located in Beijing, EVAPCO (Beijing) Refrigeration Equipment Company, Ltd. to provide quality products in the northern regions of China.

EVAPCO Asia/Pacific products are installed in cooling and refrigeration systems throughout China and Asia/Pacific region in the following markets:

- Commercial Air-Conditioning
- Industrial Refrigeration
- Industrial Process
- District Cooling-Thermal Storage
- Power

EXPERIENCE, INNOVATION, GUARANTEED PERFORMANCE

With dozens of U.S. Patents and foreign patent equivalents, EVAPCO's engineering expertise speaks for itself and provides an exceptional foundation for various product development projects. This foundation is the catalyst for providing customer driven features and benefits in an environmentally safe manner.

The state of the art Research & Development Center, located at EVAPCO's World Headquarters in Taneytown, Maryland USA, has over 5,600 square meters dedicated to thermal analysis and product development. Experienced R&D engineers perform product and application research year round in six environmental test chambers.

EVAPCO's The Research & Development Center features customized laboratories that are designed to conduct tests through a wide range of environmental conditions. The computerized data acquisition system



records the data and graphically displays continuous results, thereby providing the R&D engineers with valuable test information on a continuous basis.


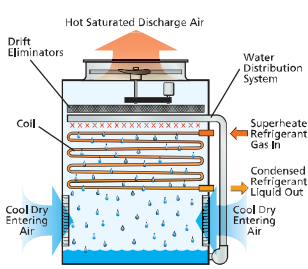

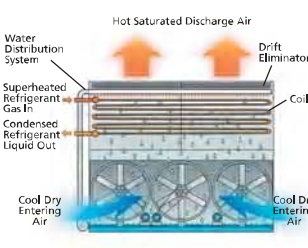

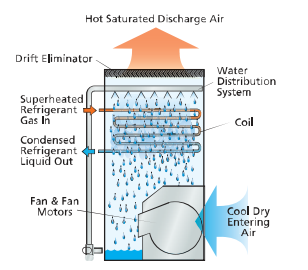

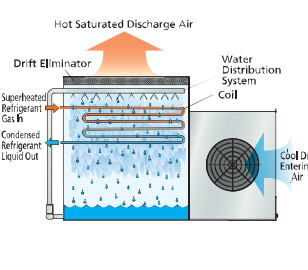

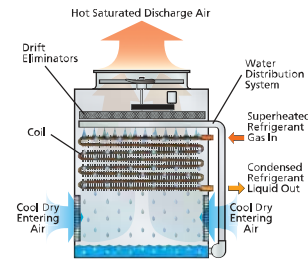
The R&D Center also has the industry's largest Low Temperature Environmental Test Chamber. This test chamber was converted from ammonia to CO₂ refrigerant in order to perform detailed thermal analysis on steel evaporators.

In addition to thermal research, the R&D Center also houses Evapco's Water Analytical Services group which performs advanced chemical and water analysis in support of the company water treatment business, an AMCA Fan Test Chamber for evaporator fan performance verification, and an ice thermal storage system with glycol chiller for developing charge and discharge performance rating. Product sound ratings are also measured on a dedicated Sound Test Pad located on the property.

All EVAPCO products are the result of extensive research and thermal testing. As a result, EVAPCO products deliver guaranteed performance in order to maximize system efficiency.

Features and Applications Guide

EVAPCO offers an extensive range of Evaporative Condensers for all types of applications. The below chart can help guide you to the selection of your next EVAPCO Unit!

Evaporative Condenser	Applications	Features	Principle of Operation
ATC-E 	<p>Low horsepower, induced draft, axial fan solution for all outdoor applications.</p> <p>Provide versatile options and easy for maintenance.</p>	<ul style="list-style-type: none"> 35-2637 nominal Ammonia Tons. Efficiently designed using counter-flow operation. Patented Thermal-Pak® II coil. Available with optional super Low Sound Fan and stainless steel construction. IBC compliant. 	
PMC-E 	<p>Low horsepower, forced draft unit suitable for outdoor applications.</p> <p>Perfect for centrifugal fan replacement projects and projects requiring low horsepower or directional sound.</p>	<ul style="list-style-type: none"> 124-1408 nominal Ammonia Tons. Individual fan drive systems are standard. Flexible volume control and stable operation. IBC compliant. 	
LSC-E 	<p>Low sound, centrifugal fan, forced draft unit suitable for both indoor and outdoor applications.</p> <p>Design especially for indoor and ducted layouts. This classic design is also ideal for exact replacement projects.</p>	<ul style="list-style-type: none"> 26-1142 nominal Ammonia Tons. Optional sound attenuation can reduce sound levels even further. IBC compliant. 	
LRC 	<p>Low profile, low sound, centrifugal fan, forced draft unit suitable for both indoor and outdoor applications.</p> <p>Minimal height design allows for replacement in height restricted areas.</p> <p>Provides versatile option for tight layouts.</p>	<ul style="list-style-type: none"> 18-269 nominal Ammonia Tons. 304 stainless steel cold water basin is standard. Compact design allows for units to be shipped and rigged in on piece. IBC compliant. 	
eco-ATC 	<p>Revolutionary reduced footprint, reduced horsepower, induced draft, axial fan solution for all outdoor applications.</p> <p>Perfect for tight layouts and project focused on energy efficiency.</p>	<ul style="list-style-type: none"> 125-2900 nominal Ammonia Tons. Extended surface Ellipti-fin™ enlarges the heat transfer area and improve capacity in dry/wet mode of operation. Fins are wound onto the surface of the tube. IBC compliant. 	

Design Features

EVAPCO offers an extensive list of features on every single product. Since 1976, EVAPCO has continued its strive towards innovation. Below are many of the design features EVAPCO offers on its Evaporative Condenser products.

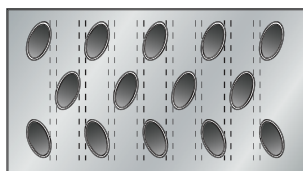
Patented Thermal-Pak® II Coil*

EVAPCO's Thermal-Pak® II coils are designed for maximum heat transfer efficiency. This unique coil design utilizes counterflow heat transfer. The rows of elliptical tubes are staggered and angled in the direction of airflow to enhance air turbulence, thereby increasing heat transfer while minimizing the airside pressure drop.

The design features of EVAPCO's Thermal-Pak® II coils ensure that the end user will receive the best evaporative heat transfer efficiency.

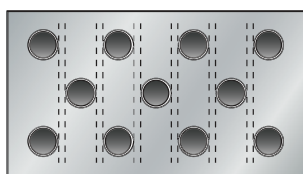
These characteristics and other engineering advancements of the Thermal-Pak® II have been proven in EVAPCO's world-class Research and Development laboratory, resulting in the following end user benefits:

- Lower Operating Refrigerant Charge
- Low Power Consumption
- Lower Operating Weight
- Small Plan Area
- Lower Scale Forming Potential Due To Full Coil Design



Thermal-Pak® II Coil by EVAPCO

*U.S. Patent No. 5,799,725



Round Tube Coil by Others

All coils are manufactured from high quality steel tubing following the most stringent quality control procedures. Each circuit is inspected to assure the material quality and then tested before being assembled into a coil.

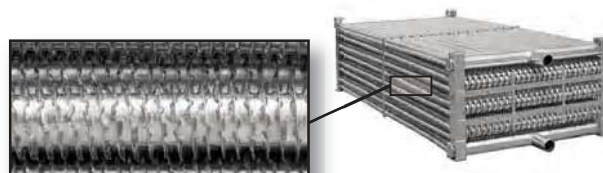
To protect the coil against corrosion, it is placed in a heavy-duty steel frame and the entire assembly is dipped in molten zinc (hot dip galvanized) at a temperature of approximately 427°C. After HDG (hot dipped galvanizing) the entire assembled coil is tested at 2.76MPa air pressure under water to make sure it is leak free.



Thermal-Pak® II Coil

Ellipti-fin™ Heat Transfer Coil (Patent Pending)

The **Ellipti-fin™** coil utilizes an elliptical shape tube with extended surface fins for maximum heat transfer efficiency. **The extended surface increases the heat transfer efficiency in the evaporative or wet mode as well as the dry mode of operation.**



Ellipti-fin™ Finned Elliptical Tube by EVAPCO

This patent pending coil design utilizes counterflow heat transfer. The rows of the finned elliptical tubes are positioned vertically in the direction of airflow to enhance turbulence, which increases heat transfer while minimizing airside pressure drop.

Ellipti-fin™ coils are manufactured from high quality carbon steel tubing following the most stringent quality control procedures and in accordance with the ASME B31.5 Refrigerant Piping Code.

Titan Coil (Optional)

NOW Evapco offers the optional **TITAN COIL**. Manufactured from type 304L Stainless Steel, the TITAN COIL is manufactured using EVAPCO's patented elliptical tube design upgraded to Xtra Tough construction featuring: Xtra Durability, Xtra Corrosion Resistance, and an Xtra long 5 YEAR coil warranty as standard.



ASME Coils (Optional)

Evaporative condensers can be furnished with condensing coils manufactured in accordance with the ASME Pressure Vessel Code Section VIII, Division I. Coils built with this option will bear a U-stamp indicating their compliance with the ASME code.

Patented Efficient Drift Eliminators**

An extremely efficient drift eliminator system is standard on all EVAPCO Evaporative Condensers. The system removes entrained water droplets from the air stream to limit the drift rate to less than 0.001% of the recirculating water rate.

With a low drift rate, EVAPCO equipment can be located in areas where minimum water carryover is critical, such as parking lots or near building walls.

The drift eliminators are constructed of an inert polyvinyl chloride (PVC) plastic material which effectively eliminates corrosion of these vital components. They are assembled in sections to facilitate easy removal for inspection of the water distribution system.



** (U.S. Patent # 6,315,804)

ZM® II Spray Nozzle Water Distribution System

Even and constant water distribution is paramount for reliable, scale-free evaporative condensing. EVAPCO's Zero Maintenance ZM® II Spray Nozzle remains clog-free under the toughest conditions to deliver approximately 4 lps to every square meter of coil plan area.

The heavy-duty ABS ZM® II Spray Nozzles have a 32mm diameter opening and a 32mm splash plate clearance. The fixed position ZM® II Spray Nozzles are mounted in corrosion-free PVC water distribution pipes that have threaded end caps. Together, these elements combine to provide unequalled coil coverage, enhanced droplet formation and make the industries best performing maintenance-free water distribution system.



ZM® II Nozzle

WST Air Inlet Louver

EVAPCO's water and sight tight (WST) louvers keep water in and sunlight out of induced draft products. The unique non-planar design is made from light-weight framed PVC sections which have no loose hardware, enabling easy unit access. The louver's air channels are optimized to block all line-of-sight paths into the basin, eliminating splash-out; even when the fans are off. Additionally, algae growth is minimized by blocking all sunlight.



Stainless Steel Strainers

The EVAPCO standard for many years, the stainless steel strainer is one component of the evaporative condenser subject to excessive wear and corrosion. With stainless steel construction, this component is designed to last the life of the evaporative condenser.



Exclusive Five (5) Year Motor & Drive Warranty

Evapco provides each unit with a 5 year motor and drive warranty which covers the fan(s), bearings, pulleys, shafts, belts, gear reducer(s), drive shaft(s), drive couplings, electric fan motor(s) and mechanical equipment supports on both belt and gear drive units.



International Building Code (IBC) Compliant Designs

In its continuing commitment to be the leader in evaporative cooling equipment design and services, EVAPCO has Independently Certified its units to withstand Seismic and Wind Loads in ALL Geo-graphic Locations and Installations in accordance with IBC 2006.



Easy Maintenance Basin Designs

EVAPCO designs products with future maintenance in mind. The Cold Water Basin is the most important area of the equipment to maintain. Dirt and Debris collect in the basin and must be cleaned out regularly. EVAPCO has designed their Cold Water Basins to allow for quick and easy access with the following features described below:

Easy Access

The cold water basin section on Induced Draft Units is easily accessible from ground level by simply loosening the (2) two Quick Release Fasteners on the inlet louver assemblies surrounding the evaporative condenser and lifting out the lightweight louver.

The basin can be accessed from all (4) four sides of the unit.

This open basin design enables the unit to be easily cleaned.



Louver Access Door

To aid in basin maintenance, many Induced Draft models can be equipped with an optional louver access door. This feature allows easy access to perform routine maintenance and inspection of the makeup assembly, strainer screen and basin without removing an entire inlet louver.

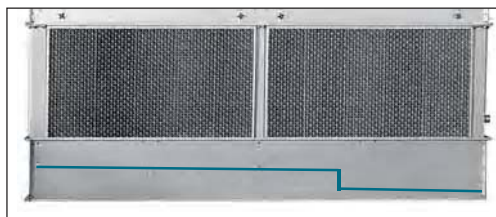
This feature is standard on models with 1.5m and taller louver sizes.



Clean Pan Design

EVAPCO units feature a completely sloped basin from the upper to lower pan section. This "Clean Pan" design allows the water to be completely drained from the basin. The spray water will drain from the upper section to the depressed lower pan section where the dirt and debris can be easily flushed out through the drain. This design helps prevent buildup of sedimentary deposits, biological films and minimizes standing water.

Note: on 1.2m wide units, the pan is sloped without the step.



Stainless Steel Options

All EVAPCO evaporative condensers are constructed of G235^Δ Hot-Dip galvanized steel as standard. A variety of stainless steel construction upgrade options are available in both 304 and 316 stainless steel, including stainless steel cold water basins and complete stainless steel units.

Easy Maintenance Drive System

The mechanical drive systems are easy to access and easy to maintain. Bearing lubrication and belt adjustment can be performed from outside the unit. All units with T.E.F.C. fan motors located outside of the unit are protected with a removable motor cover or fan screen.



T.E.A.O. motors located inside the fan casing are mounted on a swing-out motor mount on an adjustable base for easy removal.



Low Sound Solutions

Super Low Sound Fan (optional)

The Super Low Sound Fan offered by EVAPCO utilizes an extremely wide chord blade design available for sound sensitive applications where the lowest sound levels are desired. The fan is one-piece molded heavy duty FRP construction utilizing a forward swept blade design. The Super Low Sound fan is capable of reducing the unit sound pressure levels **9 dB(A) to 15 dB(A)**, compared to the standard EVAPCO fan.



Forced Draft Sound Attenuation (optional)

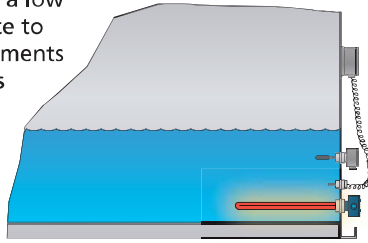
The centrifugal fan design of EVAPCO's forced draft evaporative condenser operates at lower sound levels which make these units preferable for installations where noise is a concern. For extremely noise sensitive applications, these centrifugal fan models may be supplied with various optional stages of intake and/or discharge attenuation packages, which greatly reduce sound levels even further.

^ΔNOTE: G235 designation means there is approximately 725g of zinc per square meter of surface area.

Optional Equipment

Electric Heaters

Electric immersion heaters are available factory installed in the basin of the condenser. They are sized to maintain a $+4^{\circ}\text{C}$ to $+5^{\circ}\text{C}$ pan water temperature with the fans off and an ambient air temperature of -18°C , -29°C or -40°C . They are furnished with a thermostat to cycle the heater on when required and a low water protection device to prevent the heater elements from energizing unless they are completely submerged. All components are in weather proof enclosures for outdoor use. The heater power contactors and electric wiring are not included as standard.



Self Supporting Service Platforms

Evaporative condensers are available with self-supporting service platforms that include access ladders which are designed for easy field installation. This option offers significant savings in comparison to field constructed, externally supported catwalks. The EVAPCO service platform option is located at each maintenance access door.



ATC-E Condenser with Optional Service Platform and Motor Davit

Electric Water Level Control

Evaporative condensers may be ordered with an electric water level control in lieu of the standard mechanical float and make-up assembly. This package provides accurate control of water levels and does not require field adjustment.



Multiple Circuit Coils

Evaporative Condensers may be supplied with multiple circuit coils to match various system requirements such as split systems, or if a glycol or water circuit is desired for compressor head cooling.

Capacity Control

Inverter Duty Motors

Inverter Duty motors are available for condenser applications which utilize variable frequency drive systems for capacity control.

Note: Variable Frequency Drive control may require other component modification such as motor shaft grounding brushes, AC load reactors, low pass filters and tuned trap filters to ensure proper motor performance and service life.

Two Speed Motors

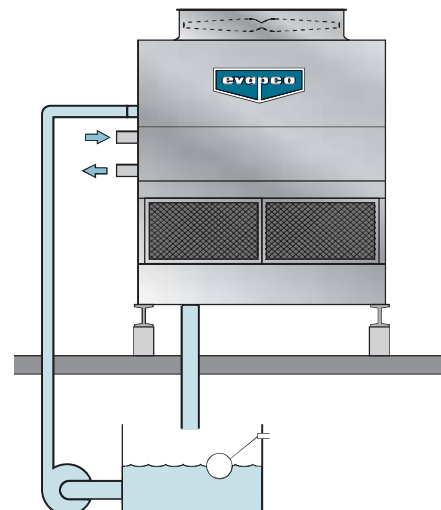
Two speed fan motors can provide an excellent means of capacity control. In periods of lightened loads or reduced wet bulb temperatures, the fans can operate at low speed, which will provide about 60% of full speed capacity, yet consume only about 15% of the power compared with high speed. In addition to the energy savings, the sound levels of the units will be greatly reduced at low speed.

Pony Motors

Pony motors are available for Forced Draft models as another capacity control method besides two speed motors, inverter duty motors and cycling fan motors. Pony motors are smaller fan motor for use in times of reduced loading. The pony motor is typically 1/4 of the kW of the primary motor and can significantly reduce energy consumption.

Remote Sump Configuration

For units operating in areas where temperatures may be very low, or where low temperatures may occur during periods when the unit is not operating, a sump located inside the building is the preferred means of ensuring that the basin water will not freeze. For these applications, the evaporative condenser will be supplied without the spray pump, float valve assembly, suction strainers and all associated piping, but with an oversize bottom outlet.





★ World Headquarters/
Research and
Development Center

■ EVAPCO Facilities

EVAPCO, Inc. — World Headquarters & Research/Development Center

EVAPCO, Inc. • P.O. Box 1300 • Westminster, MD 21158 USA
PHONE: 410-756-2600 • FAX: 410-756-6450 • E-MAIL: marketing@evapco.com

EVAPCO North America

EVAPCO, Inc. World Headquarters

P.O. Box 1300
Westminster, MD 21158 USA
Phone: 410-756-2600
Fax: 410-756-6450
E-mail:

EVAPCO East

5151 Allendale Lane
Taneytown, MD 21787 USA
Phone: 410-756-2600
Fax: 410-756-6450
E-mail: marketing@evapco.com

EVAPCO Midwest

1723 York Road
Greenup, IL 62428 USA
Phone: 217-923-3431
Fax: 217-923-3300
E-mail: contact@evapcomw.com

EVAPCO West

1900 West Almond Avenue
Madera, CA 93637 USA
Phone: 559-673-2207
Fax: 559-673-2378
E-mail: contact@evapcowest.com

EVAPCO Iowa

925 Quality Drive
Lake View, IA 51450 USA
Phone: 712-657-3223
Fax: 712-657-3226

EVAPCO Iowa

Sales & Engineering
1234 Brady Boulevard
Owatonna, MN 55060 USA
Phone: 507-446-8005
Fax: 507-446-8239
E-mail: evapcomn@evapcomn.com

Refrigeration Valves & Systems Corporation

A wholly owned subsidiary of EVAPCO, Inc.
1520 Crosswind Dr.
Bryan, TX 77808 USA
Phone: 979-778-0095
Fax: 979-778-0030
E-mail: rvs@rvscorp.com

McCormack Coil Company, Inc.

A wholly owned subsidiary of EVAPCO, Inc.
P.O. Box 1727
6333 S.W. Lakeview Boulevard
Lake Oswego, OR 97035 USA
Phone: 503-639-2137
Fax: 503-639-1800
E-mail: mail@mmccoil.com

EvapTech, Inc.

A wholly owned subsidiary of EVAPCO, Inc.
8331 Nieman Road
Lenexa, KS 66214 USA
Phone: 913-322-5165
Fax: 913-322-5166
E-mail: marketing@evaptech.com

Tower Components, Inc.

A wholly owned subsidiary of EVAPCO, Inc.
5960 US HWY 64E
Rameur, NC 27316
Phone: 336-824-2102
Fax: 336-824-2190
E-mail: mail@towercomponentsinc.com

EVAPCO Newton

701 East Jourdan Street
Newton, IL 62448 USA
Phone: 618-783-3433
Fax: 618-783-3499
E-mail: evapcomnw@evapcomnw.com

EVAPCO Europe

EVAPCO Europe, N.V.
European Headquarters
Industrieterrein Oost 4010
3700 Tongeren, Belgium
Phone: (32) 12-395029
Fax: (32) 12-238527
E-mail: evapco.europe@evapco.be

EVAPCO Europe, S.r.l.

Via Ciro Menotti 10
I-20017 Passirana di Rho
Milan, Italy
Phone: (39) 02-939-9041
Fax: (39) 02-935-00840
E-mail: evapcoeuropa@evapco.it

EVAPCO Europe, S.r.l.

Via Dosso 2
23020 Piateda Sondrio, Italy

EVAPCO Europe, GmbH

Bovert 22
D-40670 Meerbusch, Germany
Phone: (49) 2159-69560
Fax: (49) 2159-695611
E-mail: info@evapco.de

Flex coil a/s

A wholly owned subsidiary of EVAPCO, Inc.
Knøsgårdvej 115
DK-9440 Aabybro Denmark
Phone: (45) 9824 4999
Fax: (45) 9824 4990
E-mail: info@flexcoil.dk

EVAPCO S.A. (Pty.) Ltd.

A licensed manufacturer of EVAPCO, Inc.
18 Quality Road
Isando 1600
Republic of South Africa
Phone: (27) 11-392-6630
Fax: (27) 11-392-6615
E-mail: evapco@evapco.co.za

Evap Egypt Engineering Industries Co.

A licensed manufacturer of EVAPCO, Inc.
5 El Nasr Road
Nasr City, Cairo, Egypt
Phone: 2 02 24022866 / 2 02 24044997
Fax: 2 02 24044667 / 2 02 24044668
E-mail: Primacool@link.net / Shady@primacool.net

EVAPCO Asia/Pacific

EVAPCO Asia/Pacific Headquarters
1159 Luoning Rd., Baoshan Industrial Zone
Shanghai, P. R. China, Postal Code: 200949
Phone: (86) 21-6687-7786
Fax: (86) 21-6687-7008
E-mail: marketing@evapcochina.com

Evapco (Shanghai) Refrigeration Equipment Co., Ltd.

1159 Luoning Rd., Baoshan Industrial Zone
Shanghai, P.R. China, Postal Code: 200949
Phone: (86) 21-6687-7786
Fax: (86) 21-6687-7008
E-mail: marketing@evapcochina.com

Beijing EVAPCO Refrigeration Equipment Co., Ltd.

Yan Qi Industrial Development District
Huai Rou County
Beijing, P.R. China, Postal Code: 101407
Phone: (86) 10 6166-7238
Fax: (86) 10 6166-7395
E-mail: evapcobj@evapcochina.com

Evapco Australia (Pty.) Ltd.

34-42 Melbourne Road
P.O. Box 436
Riverstone, N.S.W. Australia 2765
Phone: (61) 2 9627-3322
Fax: (61) 2 9627-1715
E-mail: sales@evapco.com.au

EvapTech Asia Pacific Sdn. Bhd

A wholly owned subsidiary of EvapTech, Inc.
IOI Business Park, 2/F Unit 20
Persiaran Puchong Jaya Selatan
Bandar Puchong Jaya,
47170 Puchong, Selangor, Malaysia
Phone: (60-3) 8070 7255
Fax: (60-3) 8070 5731
E-mail: marketing-ap@evaptech.com

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<http://www.evapcoasia.com>



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