

# DRY COOLING ADVANTAGES

- No need for water availability on site
- Environmental regulations for water saving
- Respect environmental regulations, limiting the temperature increase in rivers, lakes and oceans
- Flexibility in the selection of the power plant site (grid proximity, land cost, fuel source proximity)
- Life expectancy exceeding power plant life
- Reduced operation and maintenance cost
- Shorter lead-time for power plants permits and consequently for start-up

## DIRECT DRY COOLING SYSTEMS (ACC)

### Air Cooled Condenser (ACC)

Directly condenses the steam turbine exhaust flow and returns condensate to the boiler without water loss. The steam is directly condensed inside air-cooled finned tubes without using an intermediate surface condenser.

ACCs are used in utility, industrial and renewables markets for large and small size plants. SPX Dry Cooling designs, manufactures and constructs traditional A-Frame ACC as well as our innovative Hexacool® ModuleAir™, and Natural Draft Condenser using high efficiency SRC® finned tubes.

### A-Frame ACC Features

Traditional A-Frame, with near than 1000 installations in the world, is the state-of-the-art ACC, suitable for small to large power plant in a large variety of site condition (low ambient temperature, high wind, high seism, low noise). SPX Dry Cooling, A-Frame ACC, with free-expansion tube bundles supported by an A-Frame structure, can be mounted on concrete or steel structure.

### Hexacool®

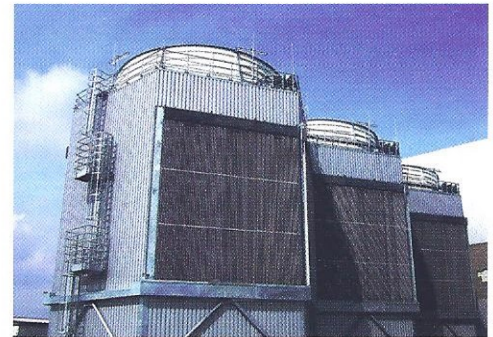
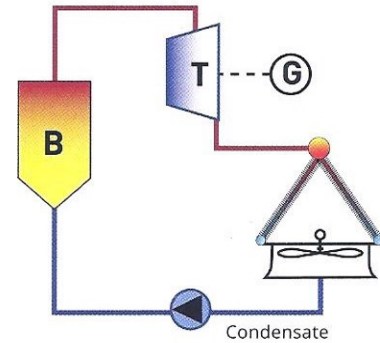
Hexacool is a standardized, modular ACC system for small power plants, from few megawatts to several hundred megawatts. Hexacool induced draft ACC is easy to construct, has a reduced height, and low wind sensitivity.

### ModuleAir® ACC

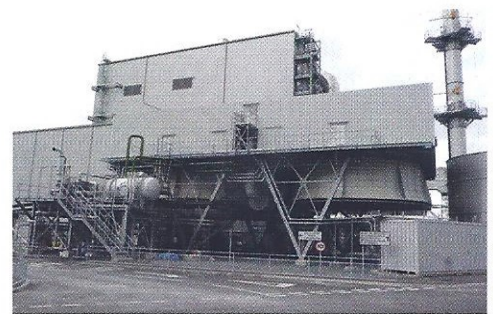
ModuleAir is a modular SRC air cooled condenser design, featuring factory assembled structural components, duct, and modular heat exchanger bundles. With construction savings of up to 25% versus the conventional A-Frame ACC design, construction time can be reduced by several months for large power plants. ModuleAir can also achieve lower steam turbine back pressure and increase power production at low ambient air temperatures.

### Natural Draft Condenser

Natural Draft Condenser is an air cooled condenser where fans are replaced by natural draft tower reducing drastically the electrical power consumption of the ACC and rotating parts needed.



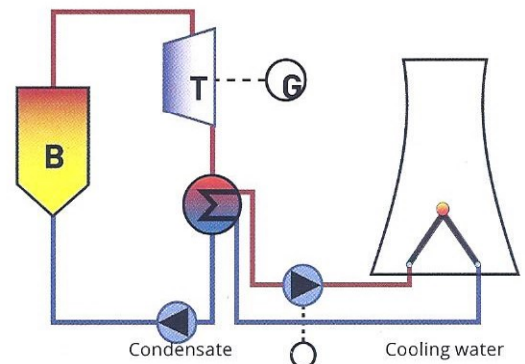
Hexacool



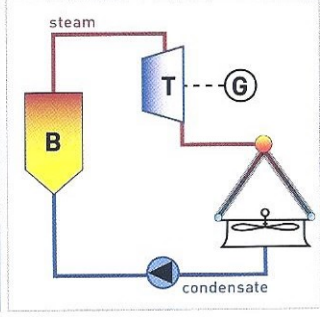
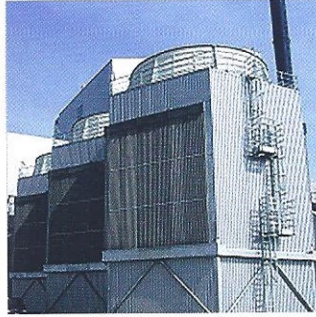
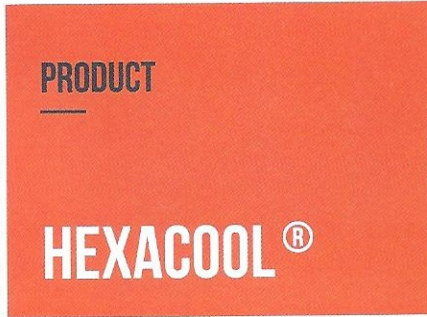
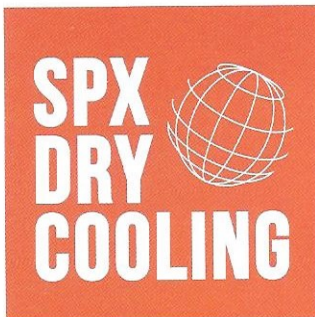
ModuleAir ACC

## INDIRECT DRY COOLING TOWER (IDCT)

Indirect dry condensing system coupling a dry cooling tower with a steam surface or jet condenser and suited for any large capacity condensing units. Thanks to tall concrete shell, Hot air recirculation is avoided, the auxiliary is power reduced, and only a few rotating part are need. This translates into low maintenance and high availability.







ACC Plant cycle

## DIRECT DRY COOLING SYSTEM

Hexacool® is a standardized, modular Air Cooled Condenser (ACC), easy to erect and robust in performance well suited for small power plants from a few megawatts to 50 megawatts. ACC directly condenses the steam turbine exhaust flow and returns condensate to the boiler without water loss.

Typical Hexacool applications are waste to energy plants, biomass power plants, geothermal power plants, small size electrical power plants and industrial/process plants, where Hexacool® is more cost effective solution than traditional A-Frame ACC.

## HEXACOOOL® FEATURES



Single-Row Condenser tubes (SRC®)

The heat exchanger's finned tubes, the core technology of the Air Cooled Condenser, is the Single-Row Condenser (SRC®) tube – an elongated aluminum clad carbon steel flat tube with brazed aluminum fins.

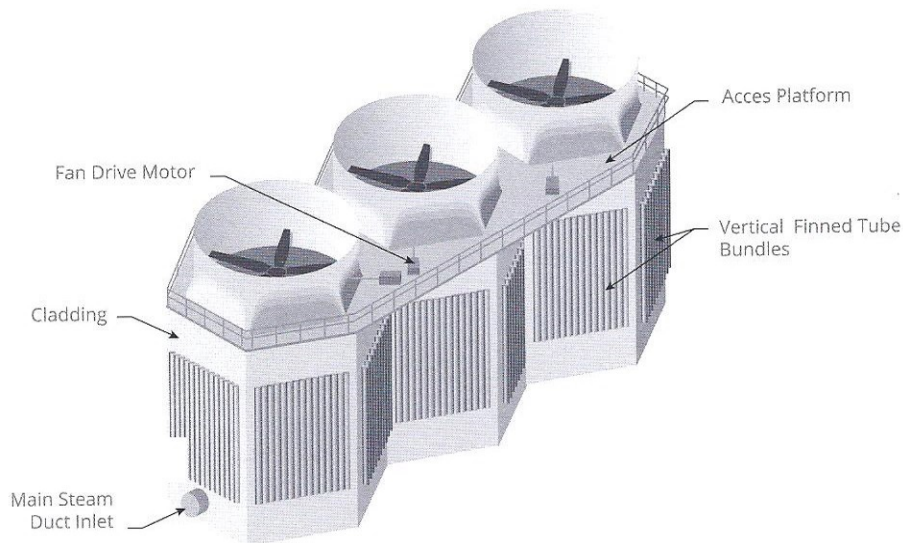
The excellent corrosion and freeze resistant SRC® finned tubes are manufactured in SPX Dry Cooling fully owned state of the art factories.

Finned tubes are arranged vertically on the sides of the Hexacool®, where both primary and secondary finned tubes zones are provided to ensure good non condensable gas extraction to the air evacuation unit.

Airflow is delivered by induced draft axial fans, driven by electric motors and gearboxes, installed above the heat exchangers. Hexacool® is available with fan size from 32ft to 40ft.

The typical scope for an ACC installation includes the heat exchangers, the fan motor groups, the supporting structure, the steam ducting from the steam turbine interface, auxiliaries such as the condensate and drain pumps, condensate tank, the air evacuation units and related piping works, electrical and instrumentation – (see below).

SPX Dry Cooling has extensive experience in designing, manufacturing, delivering and constructing ACC's all over the world.



Hexacool® ACC Overview

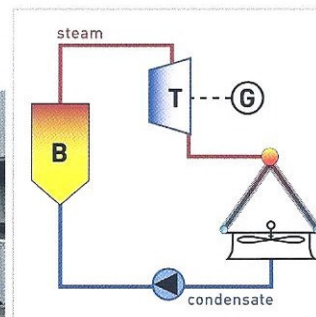


**SPX  
DRY  
COOLING**



**PRODUCT**

**MODULEAIR®**



ACC Plant cycle

## DIRECT DRY COOLING SYSTEM

ModuleAir® is an innovative modular Air Cooled Condenser (ACC) directly condensing the steam turbine exhaust flow. The condensate returns to the boiler without water loss as in traditional ACC. With factory pre-assembled structural components and modular heat exchanger integrated with steam and condensate manifolds, construction cost are reduced versus conventional A-frame ACC designs. Construction time can be reduced by several months for large power plants. ModuleAir® can also achieve lower steam turbine back pressure and increases power production at low ambient air temperatures.

## MODULEAIR® FEATURES



Single-Row Condenser tubes (SRC®)

Advanced design ModuleAir® ACC modules are made up of standard finned tubes of approximately 2 meters in length arranged in delta on top of a supporting structure. A large portion of the steel structure is made of factory pre-assembled steel trusses for an easy erection on site.

Airflow is delivered by forced draft axial fans, driven by electric motors and gearboxes, installed below the heat exchangers.

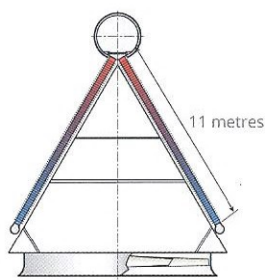
The factory pre-assembled ModuleAir® fin tube bundles with Single-Row Condensers (SRC®) tubes, include steam and condensate manifolds, eliminate site welding ensuring ultimate quality. Both primary and secondary finned tube zones are provided to ensure good non condensable gas extraction to the air evacuation unit.

The heat exchanger's finned tube, the core technology of the Air Cooled Condenser, is the Single-Row Condenser (SRC®) tube an elongated aluminum clad carbon steel flat tube with brazed aluminum fins.

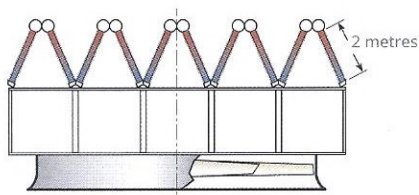
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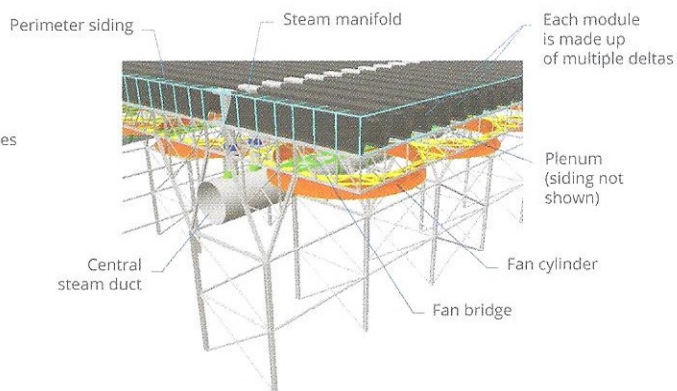


Classical A-Frame ACC Module Design



ModuleAir® Module Design

Comparison between classical A-Frame and ModuleAir® Module Design



ModuleAir® ACC Overview

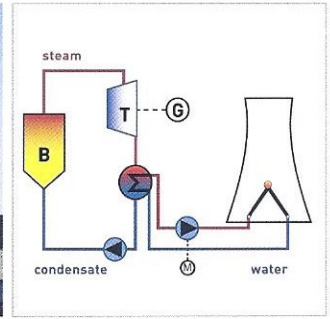
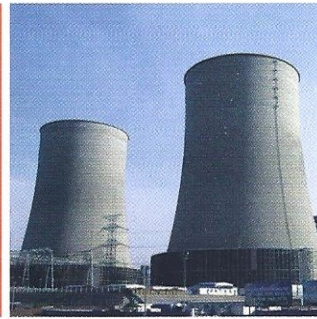


# SPX DRY COOLING



PRODUCT

## INDIRECT DRY COOLING TOWER



IDCT Plant cycle

## INDIRECT DRY COOLING SYSTEM

Indirect dry condensing system coupling a dry cooling tower with a steam condenser is available for any large capacity condensing units. Steam flowing from the turbine is condensed by cold cooling water in either a surface condenser or in a jet condenser. The heated water is then pumped to the heat exchangers arranged vertically around the concrete tower. Airflow across the heat exchangers is created by the natural draft cooling tower.

Indirect Dry Cooling Tower (IDCT) systems have been used for over 50 years for various applications in the power industry. SPX Dry Cooling has supplied the largest indirect system presently in operation in the world.

## INDIRECT DRY COOLING FEATURES



MCT: Multi Channel tubes



RAFT: Round aluminum finned tubes

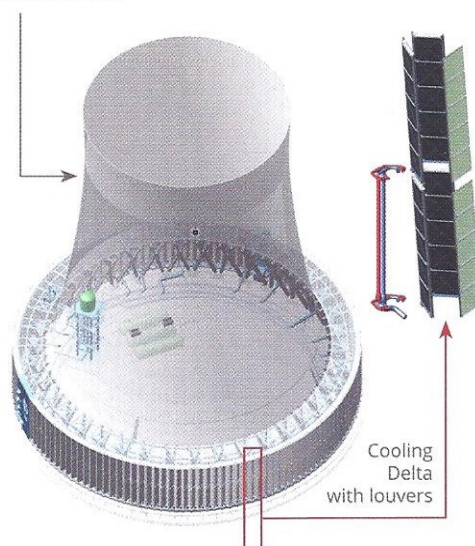
The finned tubes bundles are arranged vertically in delta cooling elements around the perimeter of the tower – (see below). The delta cooling elements incorporate louvers on the front and finned tube heat exchangers on the back sides, to control airflow and preventing freezing during cold conditions.

The finned tube is the key component. The indirect dry cooling tower is equipped with either MCT – a multi-channel aluminum clad carbon steel flat tube with brazed aluminum fins providing outstanding reliability and performance or RAFT – round aluminum tubes with aluminum fins.

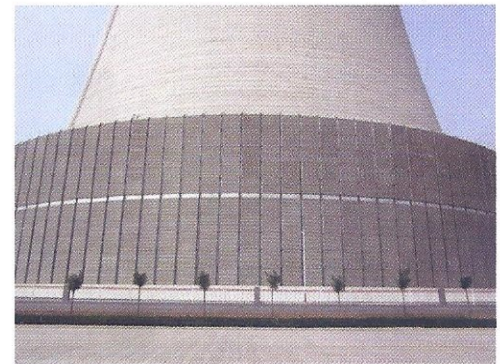
There is enough space inside the tower to install a FGD unit. Due to the natural draft created by the large concrete shell, only a short chimney is necessary to lift the flue gas.

The typical scope for an IDCT installation includes the heat exchangers, the louvers, the supporting structure, the water piping and tanks, auxiliaries such as the circulation pumps, cleaning system and instrumentation.

Natural Draft Tower



IDCT Overview



Cooling Delta with louvers