

Water Cooling Tower

TONY C. MIN

The Hilton Water Cooling Tower

The HILTON Water Cooling Tower provides students with an interesting example of conservation of mass by the evaporative cooling of water in air and conservation of energy through the exchange of heat between water and air. The equipment may be used when introducing students to the properties of vapour/gas mixtures and to principles of psychrometry.

Instruments are provided which permit the calculation of an energy balance by the application of conventional energy equations.

The tower is of the ~~forced~~ ^{wind} draught counter flow type with air from a centrifugal fan entering the base of the tower and passing through anodised aluminium film packing before discharging to the atmosphere at the top. Air flow is controlled by a shutter mounted on the fan intake.

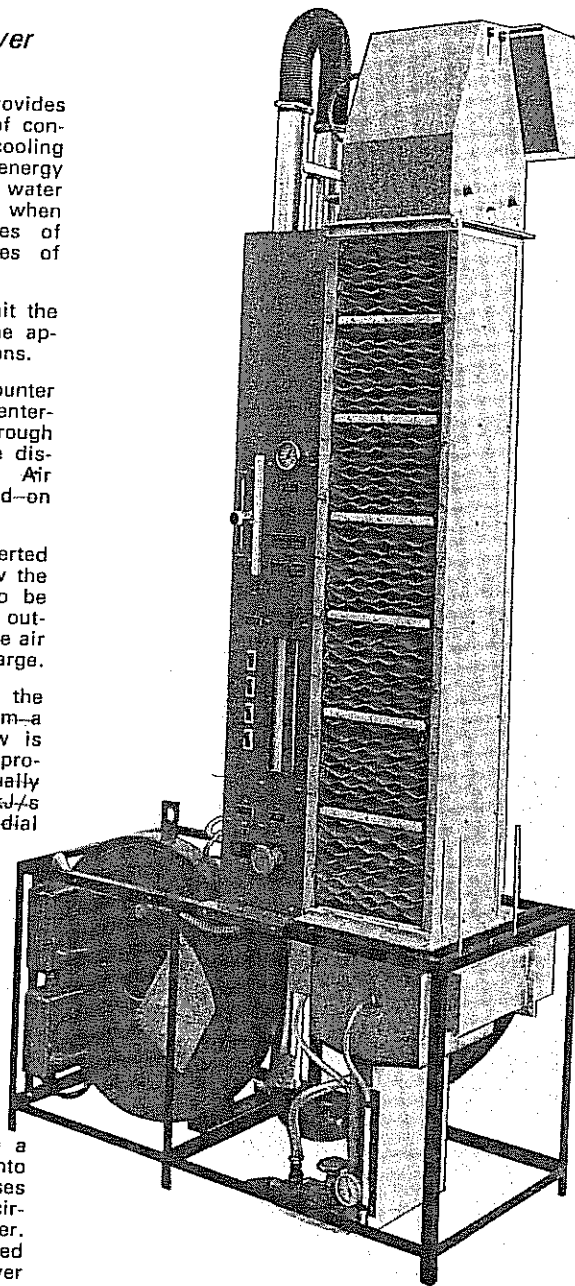
Wet and dry bulb thermometers are inserted at the air inlet and outlet points to allow the changes in the properties of the air to be determined. Adequate aspiration of the outlet wet bulb is ensured by accelerating the air through a converging section before discharge.

Water is evenly distributed across the tower by a spray bar, fed by gravity from a constant level header tank. Water flow is controlled by a valve and a flowmeter is provided. Heat is added by four individually switched immersion elements of 2.5 kJ/s each and temperature is obtained from a dial type thermometer.

After falling through the film packing the water is collected in a calibrated tank and the water loss is measured. Outlet temperature is given by a second dial type thermometer.

The tower is of uniform cross section 300mm. square and has an observation panel on one side. Packing elements are easily removed and students may add additional instruments for project or research purposes.

The complete equipment operates from a 3-phase electrical power supply divided into two 3-phase circuits. Each circuit passes through a switched fused isolator. One circuit supplies 3-phase power to the air blower. The other circuit is split into 3 balanced single phases supplying single phase power to the water heaters.



SPECIFICATION

Air Supply System

~~4 HP Single stage centrifugal air blower~~
440/3/50 Hz or 220/3/60 Hz delivering
440 m³/h maximum at 500 mms.w.g.

Air flow control shutter on blower inlet.

Fused switch isolator and Direct on line starter.

2 pairs of matched wet and dry bulb mercury-in-glass thermometers.

Range 0-50°C or 30-120°F.

Air flow orifice plate and differential manometer with direct reading scale calibrated 0-440 m³/h or 0-250 ft³/min.

Water System

On/off water inlet valve.

~~Stainless steel constant level header tank~~
supplied by mains water or other source.

Water system drain valve.

Water flow control valve.

Calibrated water mass flowmeter range 0-290 kg/h or 0-10.5 lb/min.

~~Stainless steel water heating tank with 4 x 2.5~~
kJ/s 240 volt immersion elements

or
6 x 1.5 kJ/s 110 volt immersion elements.

Dial type water delivery thermometer.

Range 10 to 120°C or 50 to 250°F

Dial type water outlet thermometer

Range -30 to 60°C or -20 to 140°F.

Stainless steel calibrated water collecting tank integral with Cooling Tower.

Fused switch isolator.

The equipment can be supplied to operate from either 440/3/50HZ or 220/3/6:

P. A. HILTON LTD. ENGINEERS
Horsebridge Mill, King's Somborne, Stockbridge, Hants., England
Telephone: King's Somborne 382

P. A. HILTON LTD. ENGINEERS

IDEAL DESIGN CONDITIONS

Ambient air condition :	Dry bulb temperature 20°C (68°F) Wet bulb temperature 16°C (60°F) Relative humidity 66.5%
Air inlet condition :	Dry bulb temperature 30°C (85°F) Wet bulb temperature 18.8°C (65°F) Relative humidity 33%
Air outlet condition :	Dry bulb temperature 33°C (90°F) Wet bulb temperature 32.6°C (89°F) Relative humidity 97%
Air mass flow :	436 kg/h. (16 lb/min)
Water mass flow :	287 kg/h. (10.5 lb/min)
Water supply temperature :	9.5°C (49°F)
Water delivery temperature :	41.8°C (109°F)
Water outlet temperature :	19.1°C (66°F)
Evaporation rate :	10kg/h (0.36 lb/min)

- ① This unit was converted to induced draft.
- ② Temp/Flow control of inlet water provided by globe valve & water tempering valve.
- ③ Air flow is adjusted by multi speed motor on blower.

The complete equipment is mounted within a frame 155 cms. (61") long; 58 cms. (23") wide and has an overall height of 236 cms. (93"). All instruments can be supplied in S.I. or (English) units.

