Searle Adiabatic System

Searle

Adiabatic Cooling System

Introduction

The Searle Adiabatic cooling system is designed to enhance the thermal performance of air-cooled condensers and dry air coolers by reducing the effective incoming air temperature. Temperature reduction is achieved by spraying water into Temperature reduction is achieved by spraying water into the incoming air via a series of sparge pipes and nozzles located adjacent to the heat exchange coils. located adjacent to the heat exchange coils. The adiabatic process relies on evaporating spray water in the incoming air stream.

The energy used to evaporate the spray water results in a reduction in air temperature and an increase in humidity. The total enthalpy of the air remains the same. On a typical unit fitted with 12 pole motors operating in an ambient of 32oC db and 40% RH a depression of 80% can be achieved, resulting in an effective incoming air temperature of 24oC Maximum depression on units fitted with 6 pole Delta motors is 60%. For alternative conditions please refer to enclosed tables.

System Description

Searle Adiabatic cooling systems are made up of two principal assemblies. The adiabatic control box, which can be factory fitted to air-cooled condensers and dry air coolers. The sparge and nozzle assembly is factory fitted to Vee bank units and supplied loose (for shipment) on flat bed units. These items are also available as a retro fit kit for site upgrades. Three versions of the adiabatic control box are available:

Option 1
Without a pressurisation pump where the supply water pressure, at design flow rate, is not less than 5 bar.

Option 2
A low flow rate pressurisation pump where the supply water pressure, at design flow rate, is not less than 2 bar.

Option 3
A high flow rate pressurisation pump where the supply water pressure, at design flow rate, is not less than 2 bar

All adiabatic control boxes are fitted with water strainer, mains inlet solenoid valve, vent solenoid valve, pressure regulator and gauge, pressure switch, ultraviolet lamp, scale inhibitor and a 230-volt control panel. The electronic controls are mounted in a polycarbonate box and contain a mains isolator, adiabatic sequence controller and transformer. Water is sprayed into the air stream via a sparge systemWater is sprayed into the air stream via a sparge system made

of 22mm Copper pipe fitted with atomising nozzles and connected together with push fittings. A drain solenoid is fitted to the lowest part of the system.

Applications

Adiabatic systems can be applied to air cooled condensers and dry air coolers when there is a reasonable difference between the dry bulb and wet bulb temperatures. The following benefits and features may be achieved when fitting adiabatic systems:

- achieved when fitting adiabatic systems: when there is sufficient difference between the dry bulb and wet bulb is temperatures.
- Reduction in physical size of plant.
- Increasing in capacity on existing dry systems.
- Standby - used as emergency capacity on critical applications or upgrades.

- Sequence of Operation
- A sequence of operation has been developed:
- To ensure no free standing water is left in the system when inactive.
- Water in the supply pipe is used to flush the system before spraying starts.
- Ultraviolet lamp is operating at full power.

When water is passed through the ultraviolet lamp, doses of UV radiation, lethal to pathogens, are emitted in order to eliminate any health risks, including Legionella. Searle adiabatic cooling systems conform to the design requirements of ACOP L8 "control of Legionella bacteria in water systems".

The adiabatic system is normally started from an external volt free signal provided by a capacity control system, BMS or emergency override. The ultraviolet lamp is switched on and the vent and drain solenoids are closed.

After a set time delay the main solenoid is opened to flush the system before the pump is started.

The pressure in the system and operation of the ultraviolet lamp are monitored. If the ultraviolet lamp fails or the pressure falls below 1 bar the system will be closed down. The mains solenoid and pump will cycle on and off as the load varies. The ultraviolet lamp and vent/drain solenoids are cycled off at the end of the day's operation ensuring the lamp operates at full power and the amount of water be recycled back to the spray nozzles.

Quality Assurance

Searle is a certified company to BSEN ISO 9001 which is the highest Quality Assurance qualification currently available, covering Performance Testing, Manufacturing Systems and Inspection Procedures.

MAXIMUM FLOW RATES

	1 FAN	2 FAN	3 FAN	4 FAN	5 FAN
MODEL	l/m	l/m	l/m	l/m	l/m
Vee bank	n/a	6.5	9.8	13.1	16.3
Flat bed	1.1	2.2	3.3	4.4	5.4

	2x2 FAN	2x3 FAN	2x4 FAN	2x5 FAN	2x6 FAN
MODEL	l/m	l/m	l/m	l/m	l/m
Vee bank	6.5	9.8	13.1	16.3	19.6
Flat bed	4.4	6.5	8.7	10.9	13.1

Note: The flow rate is based on 6 and 8 pole requirements.
For 12 and 16 pole fans, the flow can be reduced to 85% of these values.

MAXIMUM DRY BULB DEPRESSION

	% DRY BULB DEPRESSION				
MODEL	16 POLE S/D	12 POLE S/D	8 POLE S/D	6 POLE S	6 POLE D
Vee Bank	80%	80%	80%	80%	60%
Flat bed	80%	80%	80%	80%	60%

S = Motor running in Star
D = Motor running in Delta

Technical Data

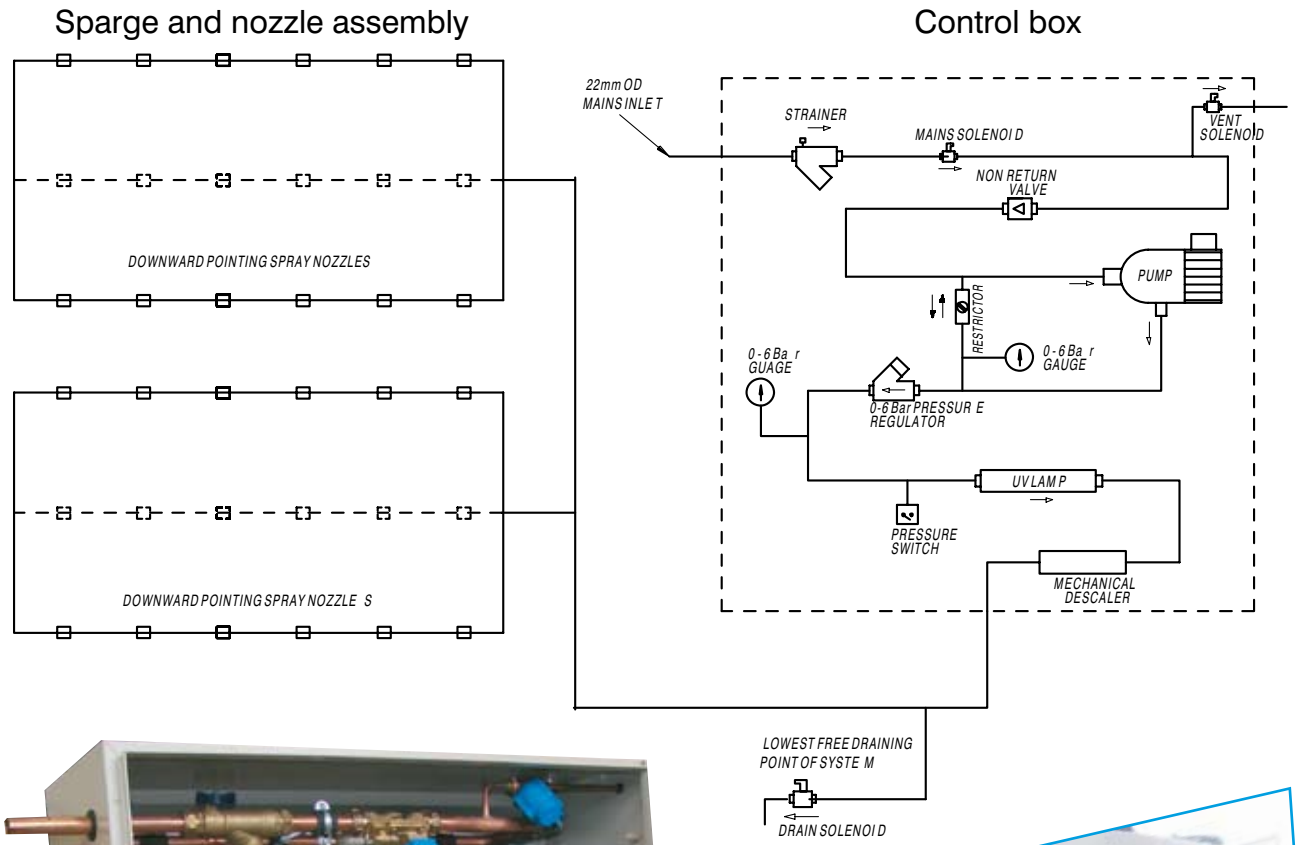
EFFECTIVE AIR ON CONDITION TABLE FOR 80% DRY BULB DEPRESSION

Ambient Dry Bulb	Ambient (Air on) Relative Humidity									
	30		40		50		60		70	
	Air on wet bulb	Effective Ambient	Air on wet bulb	Effective Ambient	Air on wet bulb	Effective Ambient	Air on wet bulb	Effective Ambient	Air on wet bulb	Effective Ambient
25	14.4	16.6	16.2	18.2	17.9	19.5	19.5	20.7	21.0	22.1
26	15.1	17.5	17.0	19.0	18.7	20.4	20.3	21.8	21.9	23.3
27	15.8	18.2	17.7	19.7	19.5	21.0	21.1	22.6	22.8	24.2
28	16.5	19.0	18.5	20.5	20.3	22.2	22.1	23.5	23.7	25.1
29	17.2	19.8	19.3	21.5	21.2	23.0	22.9	24.5	24.6	26.0
30	17.9	20.6	20.0	22.2	22.0	23.7	23.8	25.7	25.5	26.9
31	18.7	21.3	20.8	23.0	22.8	24.7	24.7	26.2	26.4	27.8
32	19.4	22.2	21.6	24.0	23.6	25.6	25.5	27.0	27.3	28.8
33	20.0	23.0	22.4	25.0	24.5	26.5	26.4	28.0	28.2	29.8
34	20.8	23.7	23.1	25.6	25.3	27.2	27.3	29.0	29.1	30.7
35	21.5	24.5	23.9	26.5	26.1	28.5	28.2	29.8	30.1	31.7

EFFECTIVE AIR ON CONDITION TABLE FOR 60% DRY BULB DEPRESSION

Ambient Dry Bulb	Ambient (Air on) Relative Humidity									
	30		40		50		60		70	
	Air on wet bulb	Effective Ambient	Air on wet bulb	Effective Ambient	Air on wet bulb	Effective Ambient	Air on wet bulb	Effective Ambient	Air on wet bulb	Effective Ambient
25	14.4	18.6	16.2	19.7	17.9	20.7	19.5	21.7	21.0	22.6
26	15.1	19.5	17.0	20.6	18.7	21.6	20.3	22.6	21.9	23.5
27	15.8	20.3	17.7	21.0	19.5	22.5	21.1	23.5	22.8	24.5
28	16.5	21.1	18.5	22.3	20.3	23.4	22.1	24.5	23.7	25.4
29	17.2	21.9	19.3	23.2	21.2	24.3	22.9	25.3	24.6	26.4
30	17.9	22.7	20.0	24.0	22.0	25.2	23.8	26.3	25.5	27.3
31	18.7	23.6	20.8	24.9	22.8	26.1	24.7	27.2	26.4	28.2
32	19.4	24.4	21.6	25.8	23.6	27.0	25.5	28.1	27.3	29.2
33	20.0	25.2	22.4	26.6	24.5	27.9	26.4	29.0	28.2	30.1
34	20.8	26.1	23.1	27.5	25.3	28.8	27.3	30.0	29.1	31.1
35	21.5	26.9	23.9	28.3	26.1	29.7	28.2	30.9	30.1	32.1

CONTROL BOX AND PIPE SCHEMATIC



Pump	Voltage	Power	FLA (A)
Low flow pump	230 / 1/ 50	0.66Kw	2.92A
High flow pump	230 / 1/ 50	0.85Kw	3.72A

GEA Searle Ltd