Automated
inductive
Deconcentration

PRODUCT SUPPORT

DAi

I Deconcentration blow down

I – 1 The requirement

In evaporative cooling equipment the cooling is accomplished by evaporating a small portion of the recirculating water as it flows through the unit. When this water evaporates, the impurities originally present in the water remain. Unless a small amount of water is drained from the system, known as blow-down, the concentration of dissolved solids will increase rapidly and lead to scale formation or corrosion or both, and to bacteria growth. Also, since water is being lost from the system through evaporation and blow-down, this water needs to be replenished.

I – 2 Solutions

Deconcentration : The only available solution to prevent the above mentioned problems is water blow down. The tower water thus concentrated will be regularly drained and replaced with less concentrated make-up water. This operation is essential; it can be done in several ways.

I-2-1 Manual deconcentration.

a - Basic.
A leak is set so there is a blow down.

b - Improved.
A leak is located above the water level, on the piping to the sprayers for example; it is set and thus there is blow down only when the circuit is working.

I-2-2 Standard automated deconcentration

a - By flow meter.
A make-up water meter relayed by an electronic terminal box makes it possible to drain the exact quantity equivalent to the evaporation. This system has the advantage of being robust and reliable but it should be properly implemented and it does not take account of water quantity fluctuations.

b - By conductivity measurements
Water conductivity is directly proportional to its salt content. By measuring the conductivity (or conversely resistivity) the salt content of the tower water is checked; it is enough to use a drain valve to adapt this value to the predetermined value. Two types of sensors are used to read the data.

b – 1 – Metallic electrode sensors – **RESISTIVITY**
Current is passed through two metal sensors to measure resistivity of the water. This system is reliable but required regular monitoring and cleaning of the electrodes, since passing current between two electrodes polarises those electrodes and accelerates the deposits.

b – 2 – **INDUCTION** sensors
The newest one is measured by INDUCTION current caused by a magnetic field, so this reading is taken indirectly. Located in the liquid to be measured, the sensor is made of composite material as no current crosses it. This technology allows a reliable measurement of water characteristics. Very reduced maintenance and very long last accuracy.

I – 3 Water consumption calculations

Consumption = Evaporation + deconcentration
Summer evaporation = 1,4* litre per kW/h taken
Half season and winter evaporation = 1* litre per kW taken

$$\text{Deconcentration} = \frac{1}{(\text{Concentration rate} - 1)} \times \text{Evaporation}$$

* mean value allowing it to be slightly varied according tom water temperatures

Concentration rates usually used

A – with no treatment = 1,5 to 2,5
B – with chemical treatment = 2 to 3
C – with intense chemical treatment = 3 to 5*
Concrete or stainless steel tank strongly recommended

Example – 1000 kW tower in summer

Case A : concentration rate = 2
or deconcentration = evaporation
so consumption = 1,4 + 1,4=2,8 m^3/h

Case B : concentration rate = 2,5
or deconcentration = 0,66 x evaporation
so consumption = 1,4+0,92=2,32 m^3/h

Case C : concentration rate = 4
or deconcentration = 0,33 x evaporation
so consumption = 1,4 + 0,46=1,86 m^3/h

I – 4 Comparison of deconcentration systems

Example :

Air conditioning plant 10 hours per day, 60 days in summer at maximum power and 120 days at half power 1000 kW tower

a - Standard system with improved manual deconcentration (1-2-1-b)

Concentration rate = 2

Deconcentration shall be calculated for summer at maximum power, namely purging equal to summer evaporation or 1,4 m^3/hr

or summer hourly consumption of 2,8 m^3/hr (see above calculation)

or hourly consumption excluding summer of 0.5 m^3/h (500 kW) + 1.4 (blow down setting) = 1.9 m^3/hr
namely yearly consumption of :

10h x 60d x 2,8m^3/h = 1680 m^3 of water
10h x 120d x 1.9m^3/h = 2 280 m^3 of water

namely yearly consumption of 4960 m^3 of water

b – Automated deconcentration system based on conductivity measurements

Concentration rate = 2,5 (equivalent to 2 as checked)
Deconcentration is calculated for each season at the precise power or deconcentration equals, in summer, 1,4 m^3/h x 0,66 (concentration = 2,5) or

0,93 m^3/h, and for the other seasons 1 m^3/h x 0,5 (power) x 0,66 or 0,33 m^3/h.

or 2,33 m^3/h summer hourly consumption (see above calculation)

or 0,83 m^3/h hourly consumption excluding summer namely yearly consumption of

10h x 60d x 2,33m^3/h = 1398 m^3 of water
10h x 120j x 0,83m^3/h = 996 m^3 of water
namely yearly consumption of 2394 m^3 of water

So it is a saving of over 1500 m^3 of water per year (2166 precisely).
How much does your make-up water cost, how much does your discharge water cost?
Make your own calculations!!
Note: our sales department is at your disposal to make a quick assessment of the savings which you could make by fitting automated deconcentration to your plant..

II <u>Automated *i*nduction Deconcentration</u>

II – 1 Choice of system

Consistent with JACIR - AIR TRAITEMENT equipment designed to minimize maintenance, we offer the most successful technology as regards conductivity reading “measuring a current induced by a magnetic field”. Thanks to this state-of-the-art technology the proposed PVDF sensor is tolerant and fully reliable when faced with clogging (so long as the water flows freely!!!). A yearly check is usually enough.
We offer a motor driven ball drain, clogging resistant.
A 4-20mA output is available for conductivity transfer, with central control for example.

II – 2 Equipment description

DAi/s = Automatic induction Deconcentration
(power up to 1 500 kW)

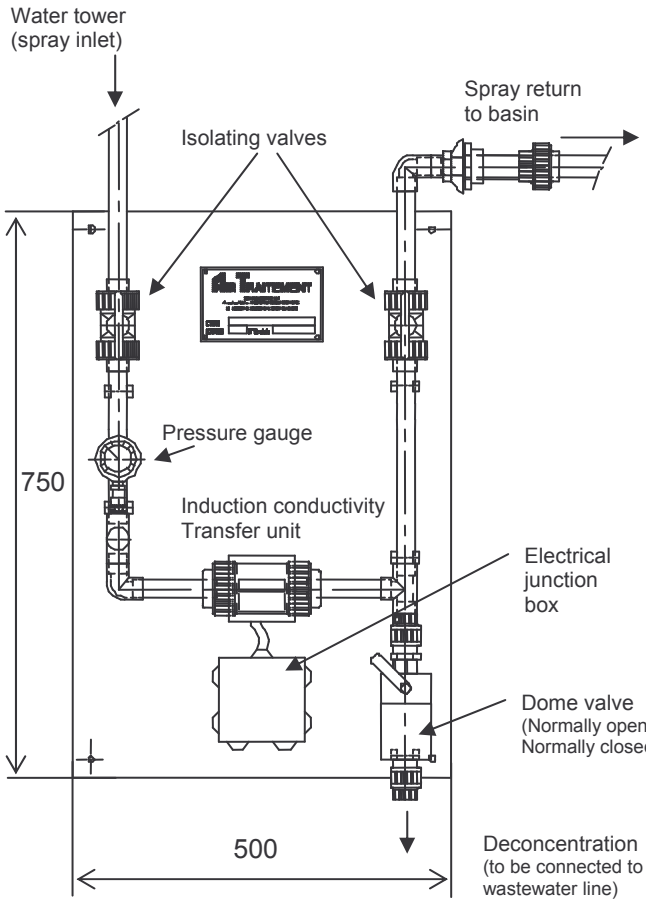
- Conductivity meter with induction PFDF sensor
- Motor driven spherical dome valve
- Electrical junction box
- Control pressure gauge
- Isolating valves
- Set of elements mounted on very thick plate (for easy fixing in the plant room), 25 ext. ∅ PVC water connections and electrical connections.

DAi/Gs = High Power Automatic *i*nduction Deconcentration (1500 kW to 4000 kW power). The same as Dai/s except for 40 ext. ∅ PVC water connections.

Dai/f = It is a Dai/s located in the exchanger room in one of our towers, with water connections made.

Dai/Gf = It is a Dai/Gs mounted in a high power closed tower (> 1500 kW).

<u>Parts connection diagram :</u>



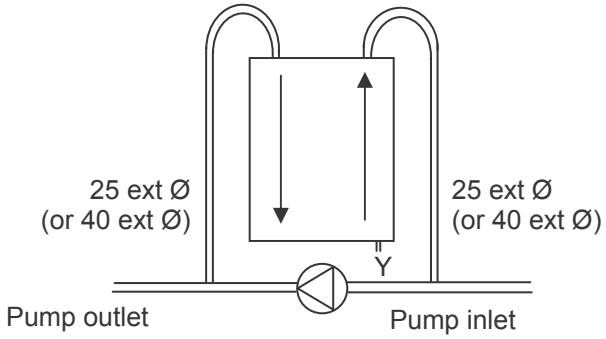
Depth = 250 mm

II – 3 Installation

II-3-1 For separate boards (DAi/s or DAi/Gs)

They shall be vertically fixed in a room at between 5 and 60° C protected from direct sunlight.

<u>Water connection</u> :



<u>Electrical connections :</u>

Directly into sealed 220/230V 50 Hz junction box.
Consumption = 10 VA.

Typical specification :
DAi/s or DAi/Gs

Dai/(G)s automated deconcentration must be provided with an induction conductivity sensor. Delivered on a very stainless steel bearing plate, it shall consist of a liquid crystal display, an electronic connection terminal in a sealed box with two terminals for remote conductivity transfer, double coil sensor with built-in temperature compensator, PVC pipes fitted with 2 stop valves, control pressure gauge and motor controlled bleed-off ball valve for direct flow.

The unit shall be fully wired, tested and calibrated in the factory (standard settings appropriate to the site if required).

Dai/(G)f automated deconcentration comprising DAi/(G)s deconcentration, this being fully installed in the exchanger room in one of our closed circuit towers.

Water connection to the pump discharge for inlet, purge connection taken to the outside and connection to the tower for measuring discharge.

Main advantages of *DAi* Automated Deconcentration.

1/ depreciation generally less than 1 year

2/ easy use

3/ protects your circuit against excessive scaling up, which can then be deposited in very great quantities seriously clogging your circuits in water treatment products which can in this case become extremely aggressive and destroy typical paint or zinc coatings.

4/ specially designed for cooling towers

5/ operating reliability

6/ clogging tolerant induction sensor.

7/ Clogging tolerant ball valve fitted with motor.

8/ wired, tested and set in our factory.

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Distributed by…

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