MANUAL BLEED

STAINLESS STEEL EVAPORATIVE CONDENSER ECOSS

Bleed (Water deconcentration)

Periodic or continuous bleed is necessary to avoid excessive concentration of salts that increase water hardness, or for draining oils and other impurities that may float over the recirculating water.

The heat exchange process in a condenser or evaporative cooler has the water evaporation process in its nature and principle, this phenomenon occurs only in pure water and therefore tends to concentrate the impurities, especially the salts.

The exact value of the evaporation rate at the design point can be found in the product technical sheet. For more information, refer to our technical department.

ECOSS G3	GFHE 0824-8.1I/012F.E
Capacity:	1.889,8 kW
Volumetric Flow Rate:	351,1 m3/h
Refrigerant:	PG 40%
Inlet Temperature:	35,0 °C
Outlet Temperature:	30,0 °C
Wet Bulb Temperature:	21,0 °C
Altitude:	3 m
Pressure Drop:	1,491 bar
Refrigerant Charge:	1.429,7 kg
Total Air Flow:	300819 m3/h
Total Water Recirculation Flow:	268,9 m3/h
Water Evaporation Rate:	2,550 m3/h
Basin Volume:	1,674 m3

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The excessive increase in water hardness may accelerate the scale formation process on the heat exchange coil, and consequently, the loss of yield over time, and in extreme cases, when this high concentration of salts has a chlorinated base (high concentration of chlorides), the occurrence of pitting corrosion in the stainless steel coil may occur.

This way, the total make-up water flow is given by the evaporation rate, adding the water drag rate due to air saturation plus the bleed rate for water deconcentration.

Make-up Flow = Evaporation Rate + Drag Rate + Bleed Rate

Control of Parameters

Since the natural process of heat exchange tends to concentrate salts, the bleed rate has the opposite function of deconcentrating, that is, it limits and controls the concentration of salts within the maximum analytical parameters required for safe operation of the equipment. The table below indicates the maximum analytical parameters for a safe operation.

Analytical Parameter	Recommended limit
pH	6,5 a 9,0
Total Alkalinity (ppm $CaCO_3$)	750
Calcium Hardness (ppm $CaCO_3$)	500
Chlorides (ppm as Cl^-)	250
Soluble Silica (ppm as SiO_2)	150
Sulphates (ppm as SO_4)	250
Dissolved Solids	1500
Conductivity (µS/cm)	3000

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The evaporation rates are related to the operation data, they suffer the influence of the total air flow, total recirculation flow, humid bulb temperature, installation capacity and height, as well as the concentration of salts and analytical parameters of water can make them vary.

The water evaporation rate at the design point can be found in the product technical sheet. For more information, refer to our technical department.

Concentration Cycles

The definition of the bleed rate is based on the concept of Cycles of Concentration (COC), therefore, a determined cycle of concentration indicates how many times the recirculation water can increase its concentration without allowing the equipment to operate out of the maximum analytical parameters recommended.

For example, for a cycle of concentration equals to 5, it means that the concentration of make-up water may concentrate 5 times during the operation and it will still be within the maximum analytical parameters recommended for a safe operation.

The number of cycles of concentration is determined by the characteristics of the make-up water, as well as the antiscalant, anticorrosive chemical additives, and biocides used in the chemical treatment when applied.

A practical example to determine the number of cycles of concentration is shown below:

Equipment = GFHE 0824-8.1I/012F.E

Capacity = 1.890 kW

Evaporation rate = 2,550 m^3/h

Analysis of make-up water:

Analytical Parameter	Make-up water
pH (25ºC)	6,57
Total Alkalinity (ppm $CaCO_3$)	19,60
Calcium Hardness (ppm $CaCO_3$)	20,00
Chlorides (ppm Cl^-)	16,99
Soluble Silica (ppm SiO_2)	48,77
Sulphates (ppm SO_4)	NA
Dissolved Solids	262,0
Conductivity (µS/cm)	104,30

This way, there is the following analysis:

Parameter	Recommended limit	Make-up water	COC
pH (25ºC)	6,5 a 9,0	6,57	Accepatable
Total Alkalinity (ppm $CaCO_3$)	750	19,60	38,3
Calcium Hardness (ppm $CaCO_3$)	500	20,00	25,0
Chlorides (ppm Cl^-)	250	16,99	5,9
Soluble Silica (ppm SiO_2)	150	48,77	3,1
Dissolved Solids	1500	262	5,7
Conductivity (µS/cm)	3000	104,30	28,8

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The analysis shows that the critical parameters in make-up water are the concentration of silica, dissolved solids and chlorides. They show us that the values of the cycles of concentration (COC) are respectively 5,9 5,7 and 3,1. Since the values presented vary, this analysis must be constantly made in order to ensure that the equipment is operating in safe conditions, and also to prevent the unnecessary bleed of water.

For the definition of the bleed rate, it is possible to take the value with lower COC (3,1) or the average of critical values (4,9).

Taking the more critical value for COC, 3,1, the bleed rate is calculated according to below:

Bleed Rate = Evaporation Rate / COC

Therefore, for the example concerned:

Bleed Rate = 2,550 m^3/h / 3,1 = 0,822 m^3/h

Finally, the total make-up water rate:

Make-up flow = 2,550 m^3/h + 0,822 m^3 /h = 3,372 m^3/h

Important!

For more information, refer to our technical department.

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