INTERCONNECTIONS OF THE REFRIGERANT - PARALLEL-ARRANGEMENT COILS

ECOSS STAINLESS STEEL EVAPORATIVE CONDENSER

The stainless-steel evaporative condenser ECOSS is the equipment with the lowest power consumption per kW of heat rejected, a feature that is the result of tests carried out in the thermodynamic and technology laboratories of Güntner.

Discharge line of the compressor (condenser inlet)

Good practice usually recommends a pressure drop that corresponds to 1.5°C in the loss of condensation temperature every 100 m, according to ASHRAE Handbook of Fundamentals.

CAUTION: Always consider the pressure drops in the discharge line for the sizing of the condenser and compressor.

Liquid line

Although most condensing systems have the same operating principle, due to the different constructive forms, the internal pressure drops of the coils can vary from one circuit to another. This variation in pressure drop, if the installation does not follow Güntner recommendations, can lead to the “drowning” of part of the coil and consequently, reduced energy efficiency of the cooling system.

Figure 01 below illustrates the parallel operation of two coils with different pressure drops in their circuit:

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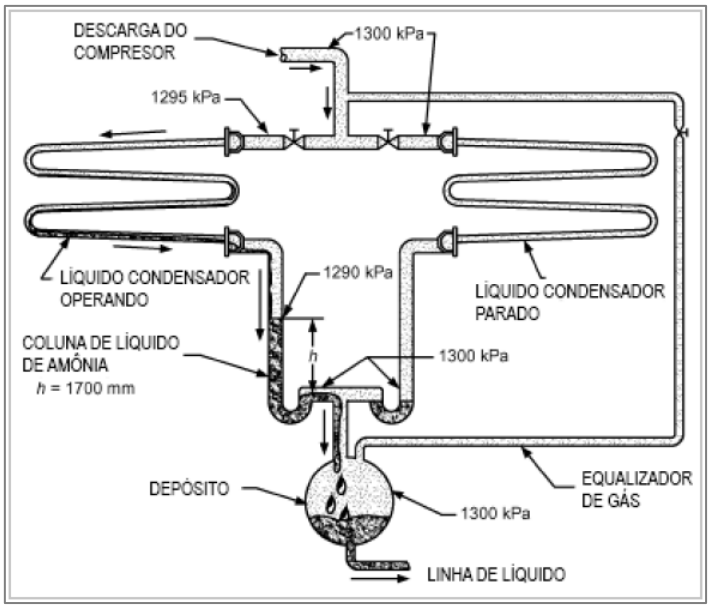

Figure 1 - two evaporative condensers with siphoning for liquid storage - ASHRAE Handbook, 2018.

It can be observed in the image above that the left coil has a lower pressure drop than the right coil, what leads to the accumulation of liquid in the coil with lower pressure drop until the pressure balance.

At the system illustrated in image 02, the coils feature individual siphons so that this accumulation of liquid occurs outside the heat exchange area of the condenser (outside the coil), avoiding the reduction of condenser capacity due to the damming of liquid fluid inside the coil.

The recommended minimum height for the siphon varies depending on the refrigerant used. For NH3, a minimum of 1.5 m of vertical column is recommended. For operations with halocarbons, the minimum is 3 m.

CAUTION: when including shut-off valves at the inlet or outlet of the coils, a higher height “h” will be required due to the addition of pressure loss.

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Condensers or Coils installed in parallel arrangement

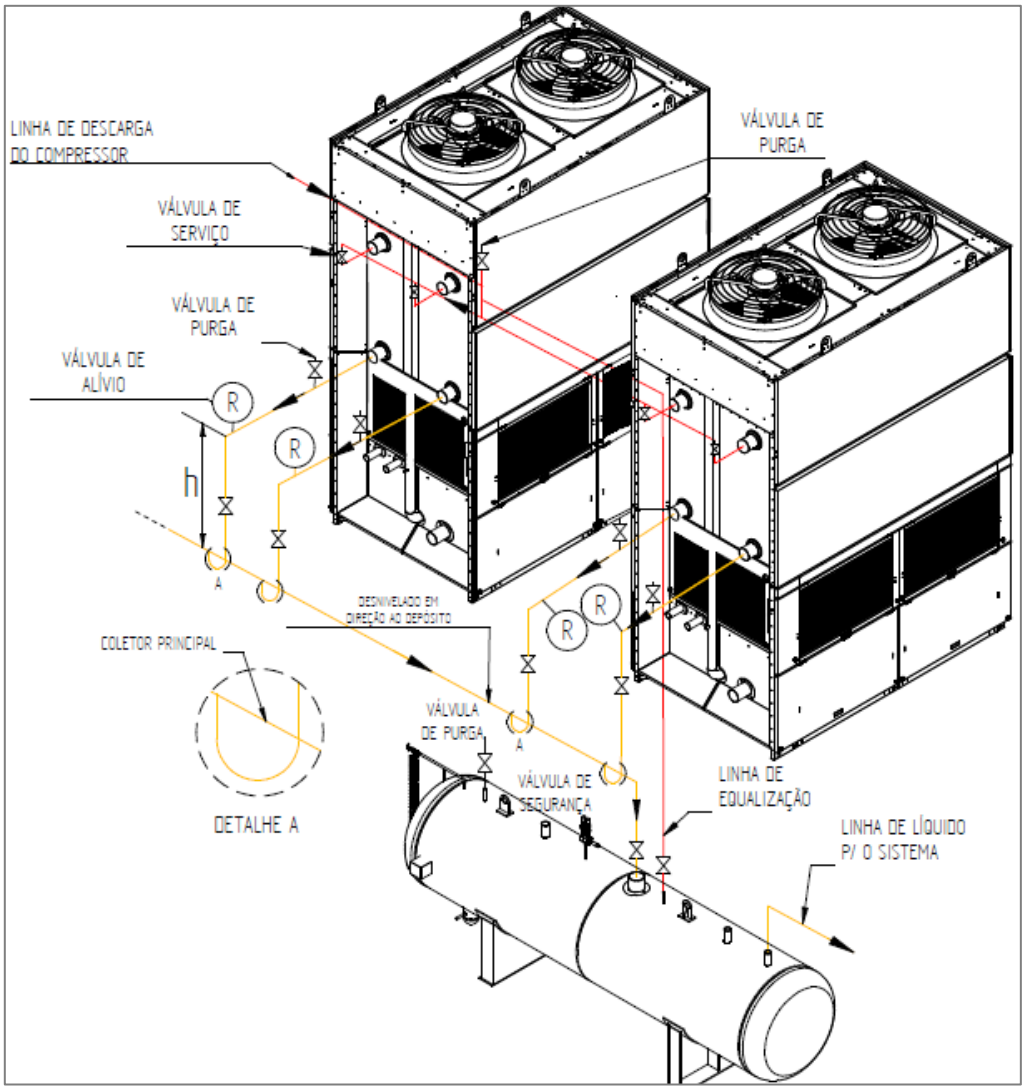

Figure 2 - Installation of condensers in parallel arrangement

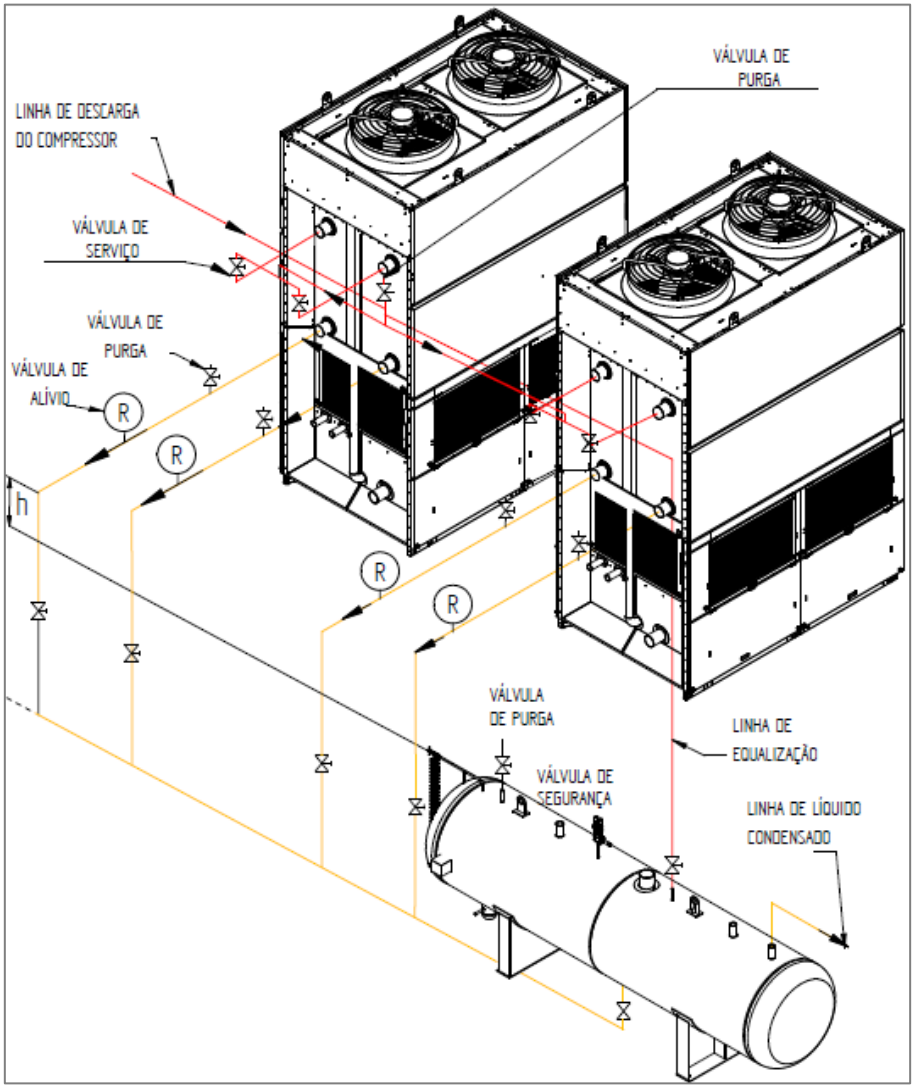

Figure 3 - Installation of parallel-arrangement evaporative condensers with the condensed liquid line through the bottom of the liquid tank

Güntner recommends the use of a siphon in the vertical portion of the liquid outlet lines of the condensers, along with a small siphon at the interconnection with the liquid line of the system, as shown in Figure 2.

The liquid inlet line can also be connected to the liquid tank from the bottom as shown in Figure 3.

The liquid flow line shall have an inclination of 20 mm/m towards the liquid tank and shall be sized so that the flow speed does not exceed 0,5 m/s.

The installation of the discharge pipes of the compressors and liquid in condensers or coils in parallel arrangement can be carried out according to Figure 2 configuration.

Figure 02 below illustrates the installation of the liquid lines of the condensers through the top of the liquid tank and the presence of siphon:

Height "h" should be designed according to the recommendation already described.

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Figure 3 illustrates the connection of the liquid line through the bottom of the liquid tank. In this type of configuration, the minimum height “h” of the vertical portion of the siphon is calculated from the maximum liquid level in the tank. The pipes must be sized as a siphoned liquid line.

There is also a third configuration option, where all liquid outlet pipes are connected to a collector pipe, so only an inverted siphon is installed before the collector connection to the top of the pressure vessel (liquid tank). The siphon should be positioned in such a way as to prevent vacuum formation in the collector, as shown in Figure 4 below.

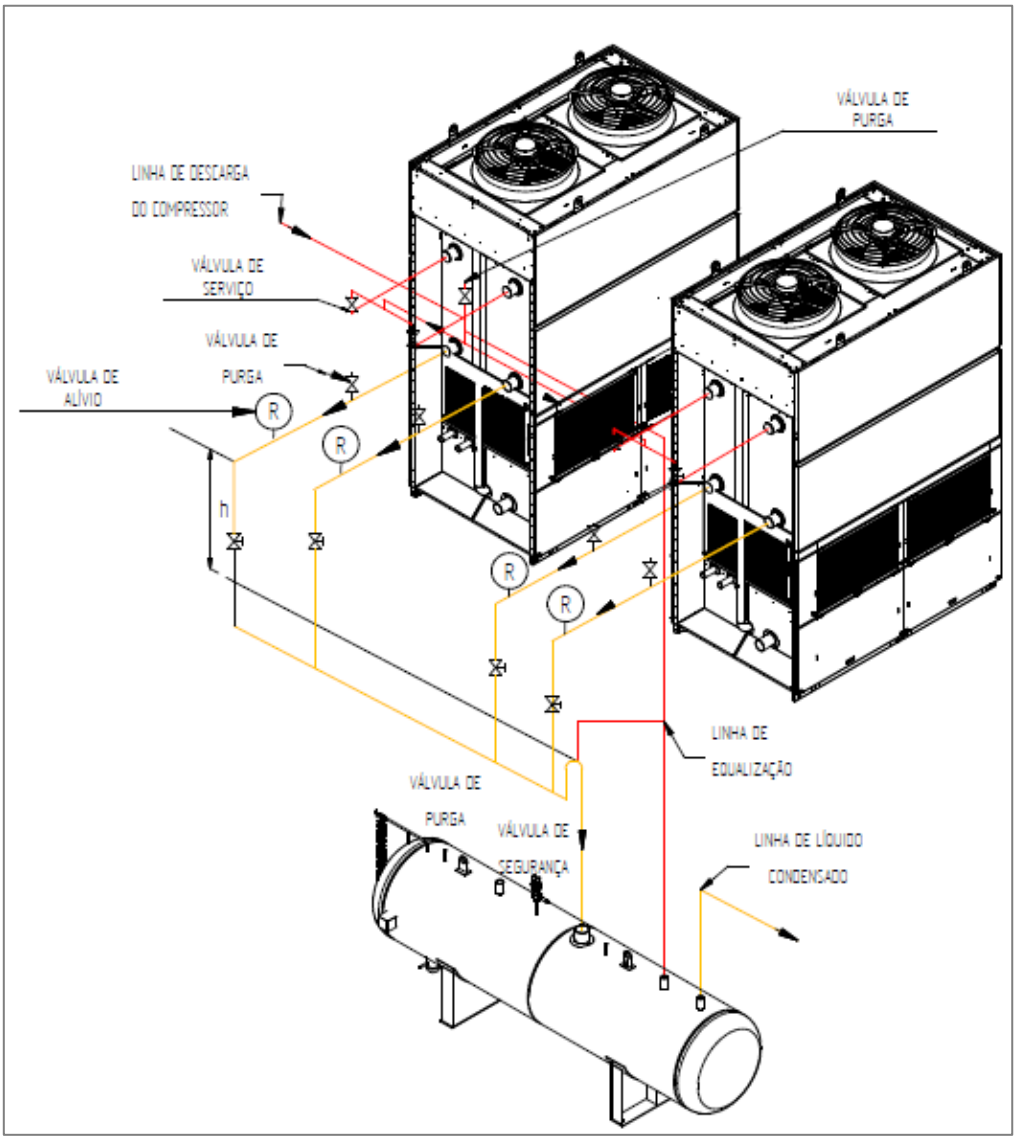

Figure 4 - Installation of evaporative condensers in parallel arrangement

For installations of multiple condensers as illustrated in figures 2, 3 and 4, the equalization line always connects the liquid tank to the point of the discharge line positioned at the condenser inlets as symmetrically as possible. Never equalize at the outlet of the condensers, in multi-unit installations as this destroys the effect of the liquid column of the siphon.

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Equalization line:

The sizing of equalization lines takes into account Table 1 below, which provides the recommendations for proper selection of the sizes of the equalization lines that have been used satisfactorily for most typical ammonia cooling systems.

Table 1 - Recommendation for equalization lines – Reference ASHRAE Handbook, 2018.

ECOSS G3	
Equalization Line Recommendations	
Maximum system capacity kW	Nominal diameter
225,0	3/4” (DN 20)
375,0	1” (DN 25)
700,0	1.1/4” (DN 32)
975,0	1.1/2” (DN 40)
1950,0	2” (DN 50)
2800,0	2.1/2” (DN 65)
4300,0	3” (DN 80)
7750,0	4” (DN 100)

Important!

For more information, refer to our technical department.

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