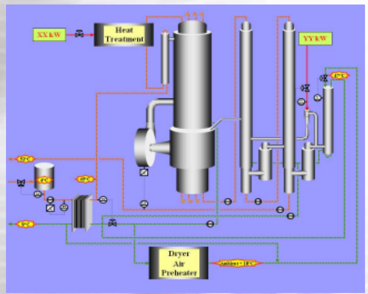
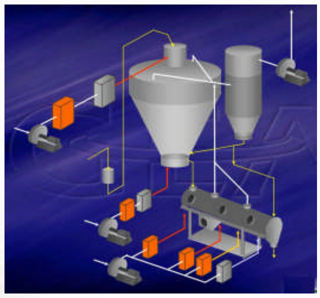
3 Step Heat Recuperation System

between a dairy falling film evaporator & a spray-dryer

New development in Dairy industry





Introduction

For a long time now, dairy evaporators and spray dryers have been the subject of an on-going improvement in the field of energy efficiency. Today, those two equipment can be individually considered as optimised.

Nevertheless, an evaporator has under certain circumstances an excess of heat and a spray-dryer is a heat consumer. The combination of the two processes is therefore another step ahead toward heat efficiency improvement when they are integrated in one global unique process.

Niro having both the expertise in evaporation and spray-drying technologies has developed this concept which is now available.

Principle

The heat-recuperation system is a sequence of 3 steps:

Step 1

The principle is to utilise the hot condensate generated by the evaporator to pre-heat the dryer drying air.

Not only that it can be seen as a way to get rid of an amount of heat which can sometimes be an issue in a downward process water treatment plant, it is a way to reduce the necessary heating-energy for the dryer i.e. steam, gas, fuel...

Depending on the different duties between the evaporator and the dryer but also on climatic conditions, a saving up to 30% of the total dryer thermal energy needs can be reached.

Step 2

The cooled condensate can then be utilised as cooling medium for the evaporator condenser. No cooling tower is therefore needed as the dryer pre-heaters replace the cooling-tower function.

By eliminating the need of a cooling tower, it eliminates the corresponding running costs such as maintenance costs but also and mainly the water treatment and the make-up water consumption. It is to be noted that such a saving can be significant as make-up water consumption represents at least ¼ of the total evaporator water needs.

It also reduces the hazards related to the well known bacteriological problems linked to the utilisation of open cooling towers.

Step 3

The heated condensate generated in the second step of the heat-recuperation process pre-heats the feed to the evaporator through a plate heat-exchanger.

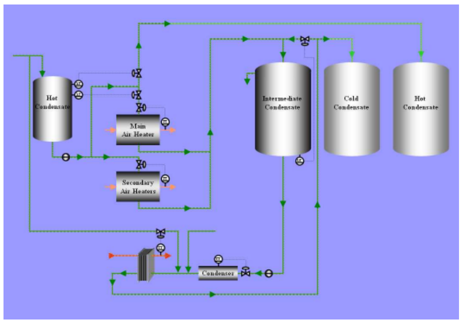
This last step generates cold condensate at the outlet of the heat-recuperation process.

Conclusions

Depending on the context, only one, two or three steps can be applied.

The integration set-up requires pipes, valves, a few instruments, tanks and appropriate pre-heaters to be installed in the dryer supply air duct network. The system can be part of a new powder facility project or installed afterward on an existing plant.

The pay-back time depends on each case but can be estimated in a first approach as 3 years approximately.



Study case

	Without heat-recuperation	With heat recuperation
Cooling tower make-up water	0.7 m³/h	0 m³/h
Steam consumption on the evaporator	1,250 kg/h	1,250 kg/h
Steam consumption on the spray-dryer	4,650 kg/h	3,640 kg/h
Condensate temperature	20 °C	11 °C

Combination of an MVR evaporator and a MSD™ spray dryer to process 30T/h of whole milk at 6°C.
The dryer air is heated with steam at 25 barg. Ambient temperature is 15°C

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