Treatment Plant for Milk Whey

1. Premise

The technique of ionic exchange can be used both directly on a milk whey, and on a whey which has already had its proteins removed.

For the demineralisation of the whey in the first case, it is necessary to use an ionic exchange system, with the whey passing through two resin beds in series (cationic and anionic), which will hold back the ions present, and a whey is obtained which is made up of protein and lactose.

In the second case, to remove the protein, it is necessary to use an ultrafiltration system, placed before the ionic exchange plant, which will allow the recovery of the protein content. The whey without protein is then sent to the ionic exchange which will allow the recovery of the lactose present. The use of ultrafiltration is advised in order to guarantee a longer resin life, in particular for the anionic one, which often has problems of protein precipitation as the pH moves from acid to alkaline.

Even if the whey has had the protein removed first, the final product after the ionic exchange is the same if the concentrate of the ultrafiltration is mixed with the recovery of the final lactose coming from the ionic exchange.

If we talk about treating a milk whey directly, after the ionic exchange system we will have a whey made up of proteins and lactose plus sugars. It is possible to separate the various components of this liquid using different filtering processes.

- The proteins can be recovered using a process of ultrafiltration. All the protein content of the whey will be contained in the concentrate of the ultrafiltration. The permeate of the ultrafiltration will be made up of lactose, sugar and water.
- A process of nanofiltration then allows the separation of the lactose from the sugars, and a concentrate is obtained with a high lactose content. The content of sugars in the permeate resulting from the noanofiltration can be separated from the water solution by a process of osmosis inverse.

The section of nanofiltration can be considered optional, as the lactose will be recovered (mixed with the sugars) by placing a reverse osmosis plant directly on the permeate of the ultrafiltration.

- The lactose solution obtained can be further concentrated and brought to a dry state using a vacuum evaporator from the C&G "DRY" ES Series.

2. ***Resins used for the demineralisation***

The plant constructed by C&G Depurazione Industriale uses a strong acid cationic resin and a weak basic anionic resin. Both the resins are for alimentary use (food grade).

The former is a polystyrene resin, with sulphonic group $-SO_3H$, the latter has an acrylic structure and is made up of tertiary amines.

Each salt is transformed on the cations into its corresponding acid, and the resin frees hydrogen ions

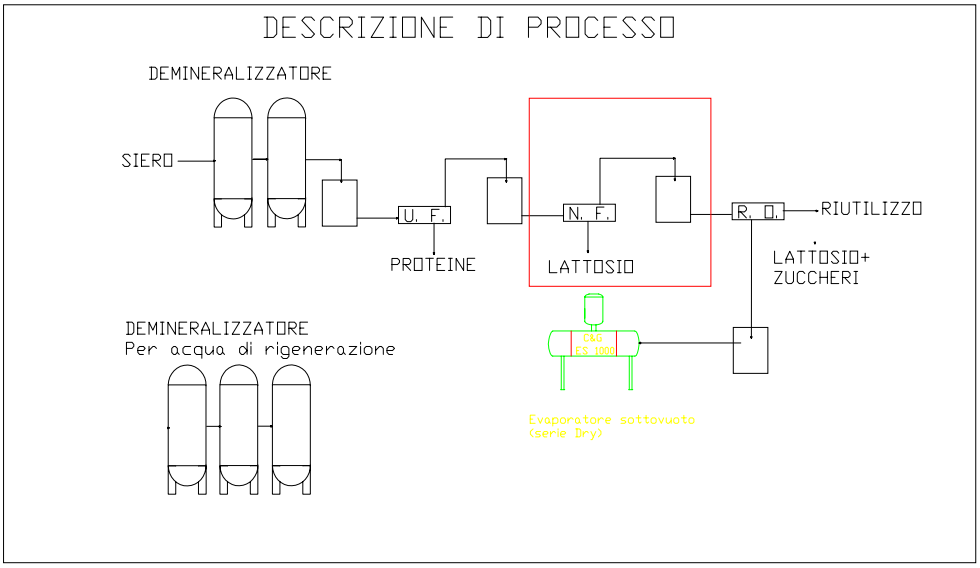
$$RSO_3 + HCl \leftrightarrow RSO_3Na + HCl$$

De-acidification occurs on the anions, the acids are fixed and the resin frees hydroxyl ions.

$$RNH_3OH + HCl \leftrightarrow RNH_3Cl + H_2O$$

We are referring to a dilution, that is to a substitution of the mineral salts with water.

The ionic exchange plant will have to be regenerated when the cyclical life of the resins has exhausted its possibility of exchange. The regeneration has to be carried out using demineralised water, and as such, there has to be a demineralization plant (or a reverse osmosis plant) for the storage of water with low saline content to be used during the regeneration..


DESCRIZIONE DI PROCESSO
DEMINERALIZZATORE
SIERO
U. F.
PROTEINE
N. F.
LATTOSIO
R. O.
RIUTILIZZO
LATTOSIO+
ZUCCHERI
DEMINERALIZZATORE
Per acqua di rigenerazione
C&G
FS 1000
Evaporatore sottovuoto
(serie Dry)

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