



“Permeate or Lactose” “Lactose or Permeate” Which way to go?????

We hear that question often.

We also hear people say they don't want to process lactose. HOWEVER, if a plant is making cheese, it IS processing lactose. It is not a question of IF; it is only a question of HOW.

Whey is about 70% lactose. Permeate is about 80% lactose. So, if a plant has whey, it has a lot of lactose. Most whey is fractionated to recover its valuable proteins. This has led to a decline in the production of dried sweet whey. Whey without the whey proteins (permeate) is difficult to dry. For many years it was crossed off as “impossible” to dry. Today we are approaching the introduction of the third generation of permeate driers. These driers can produce high quality dried permeate.

By contrast, lactose is very easy to dry and has been the major product produced from permeate. Traditional lactose processes recover about 70% of the actual lactose in permeate. As a result, the by-product of lactose manufacturing accounts for about 44% ($100\% - (70\% * 80\%)$) of the original permeate solids. This by-product is often referred to as delactosed permeate, Delac, DLP, or mother liquor (i.e., the liquor from which crystals are produced). Newer edible lactose processes can recover between 80 and 90% of the available lactose and, at the same time, produce a product that is of pharmaceutical quality. These processes significantly reduce the volume of “DLP”.

In the production of dried permeate, virtually all the permeate solids end up “in the bag”. There is no secondary product.

Both lactose and dried permeate have proven to be profitable products produced from permeate. Therefore, a logical question would be, “Which product is more profitable?”

Our company looks at permeate as an asset of the cheese/WPC plant. Our goal is to assist plants in achieving the greatest return on that asset. The first thing we try to impress upon the plant is the axiom, “No plant

will ever receive maximum value for its whey product unless the plant has the ability to put that product in a warehouse.” Any plant trying to sell a liquid product will go to potential buyers with “hat in hand”. They can’t risk offending the buyer; the buyer might shut them off. Not a great negotiating position. Furthermore, the distance a liquid product can be transported is limited; therefore, the number of potential buyers is limited. Dried products can be transported much farther; there is less volume, and they are more valuable. Amazingly, the number of potential buyers goes up as the square of the shipping distance.

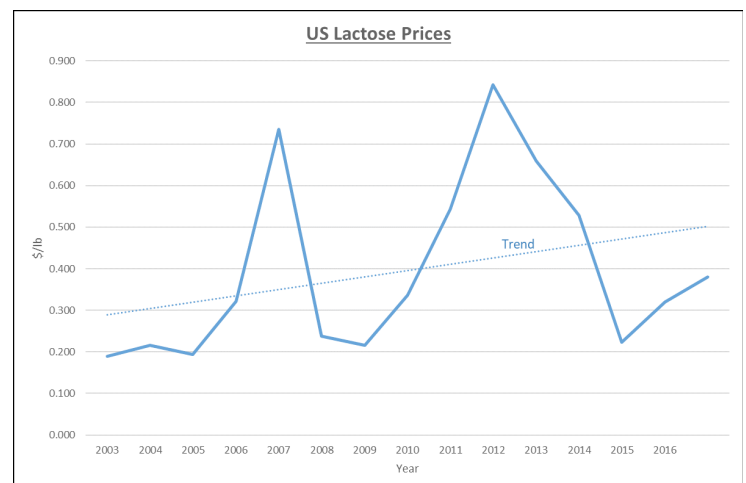
Once a plant has the ability to produce a product that can be put in a warehouse, the plant has the option of selling a liquid product. As a result, the plant might save drying costs and, at the same time, be able to offer a product to a customer at a more attractive price. This mutual benefit will not be realized if the plant doesn’t have the ability to put the product in a warehouse.

The decision to produce a dry (shelf-stable) product is the first step in maximizing a plant’s return on that asset called “permeate”. The second step is deciding which shelf-stable product to produce; dried permeate or lactose/DLP.

From a practical standpoint, permeate must be converted to dried permeate or lactose to be stable enough for long term storage.

From a process standpoint, it can be assumed the capital cost for conversion is similar for both options. From an operating cost standpoint, the total operating costs also can be assumed to be similar. After all, the largest operating cost for both processes is getting rid of water. Both processes require a large investment in a membrane/evaporator system and a significant amount of energy to remove the water. If $\text{PROFIT} = \text{INCOME} - \text{EXPENSE}$, and if EXPENSE is about the same for both products; then, the most profitable process will be the one that generates the greatest INCOME . $\text{INCOME} = \text{PRICE} \times \text{WEIGHT}$ where PRICE is \$/lb and WEIGHT is lb product/100 lb permeate solids. Given residual moisture, the theoretical yield of permeate is about 104 lb of product per 100 lb of permeate solids. The big unknown is the PRICE of permeate solids. For this example, let’s assume a long-term average price for permeate as \$0.28/lb. Therefore, $104 \times 0.28 = \$29.12$ per 100 lb of permeate solids.

Similarly, 100 lb of permeate solids would traditionally yield 56 lb of lactose. Like any other whey product, predicting future prices is difficult; however, the trend over the past 14 years could be a reasonable guess; i.e., \$0.50 per lb lactose. Therefore, lactose revenue from 100 lb of permeate solids could be about $56 \times 0.50 = \$28.00$ per 100 lb of permeate solids.



The secondary product from lactose production is a valuable feed product; however, the potential revenue is not significant and can be considered zero.

The above examples demonstrate that the long-term choice between dried permeate and a traditional lactose process is highly dependent on the assumed price for each product. Our company's recent introduction of the *Ultra-Pure Lactose*[™] process makes it possible to increase lactose yields and at the same time produce an edible lactose that meets pharmaceutical lactose standards. This process may push the economics towards lactose production for the foreseeable future.

“ADPI Dairy Ingredients Intelligence” are contributions by the authors and do not necessarily represent the opinions of ADPI.

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