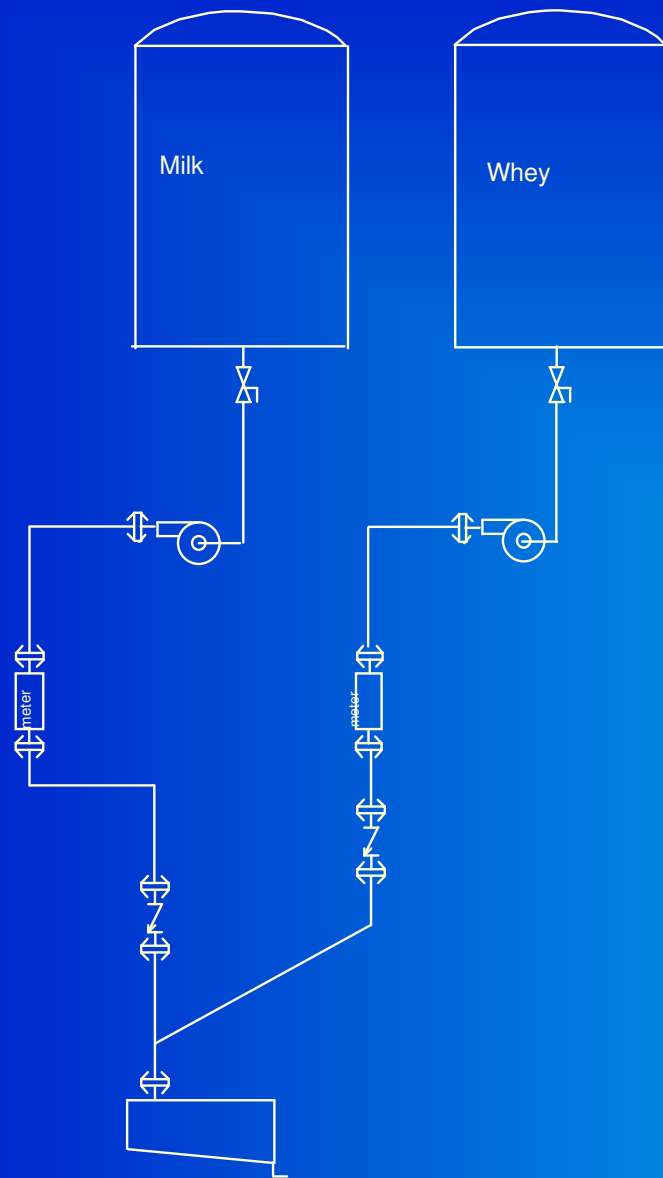


Continuous Protein Process System by Highland Equipment Limited



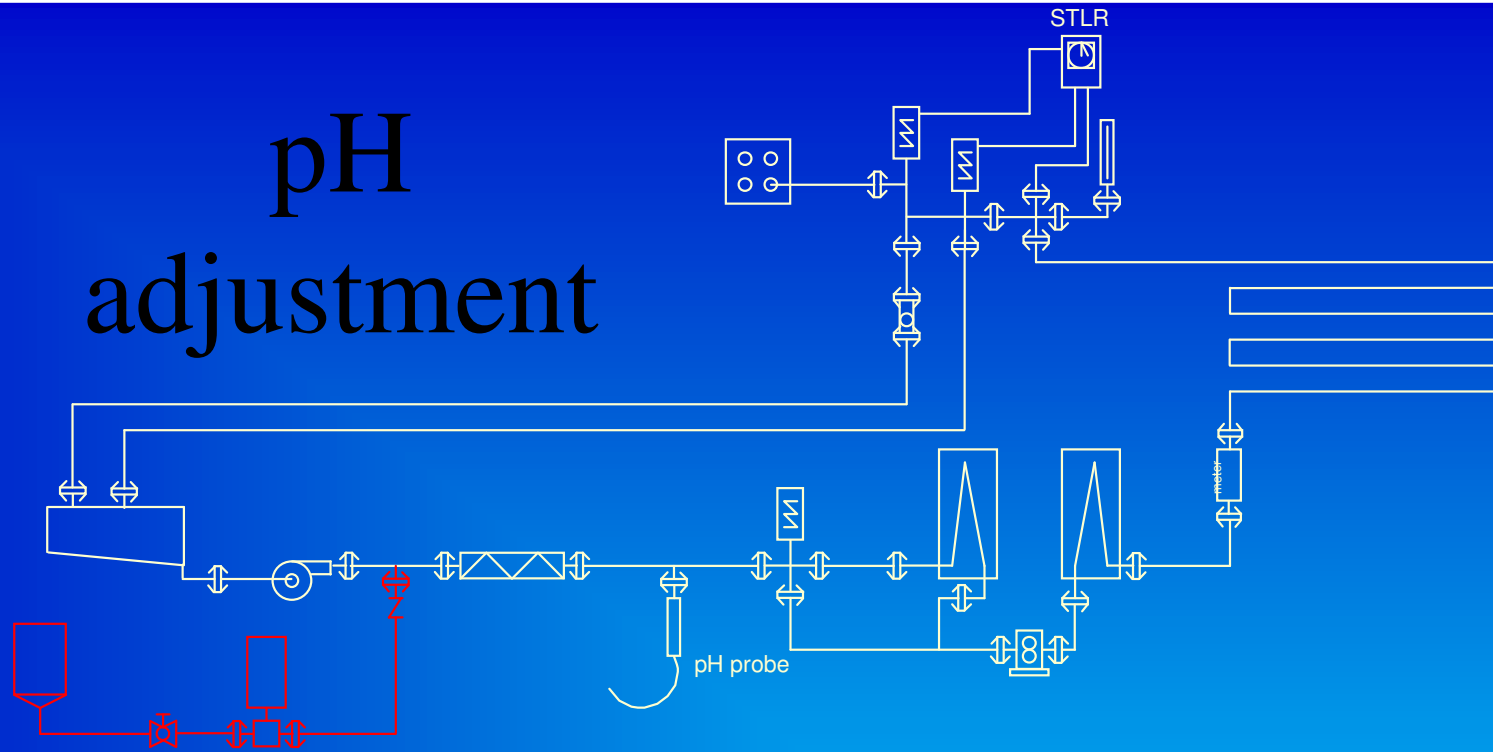
Blending



The Continuous Protein Process system is used for the manufacture of Ricotta cheese and similar types of cheese requiring heat and acidification. For Ricotta cheese production, the system performs with any ratio of whey and/ or milk ranging from 100% whey to 100% milk as well as WPC blended with whey or milk.

The ratio can be adjusted during processing. The raw materials are blended in -line.

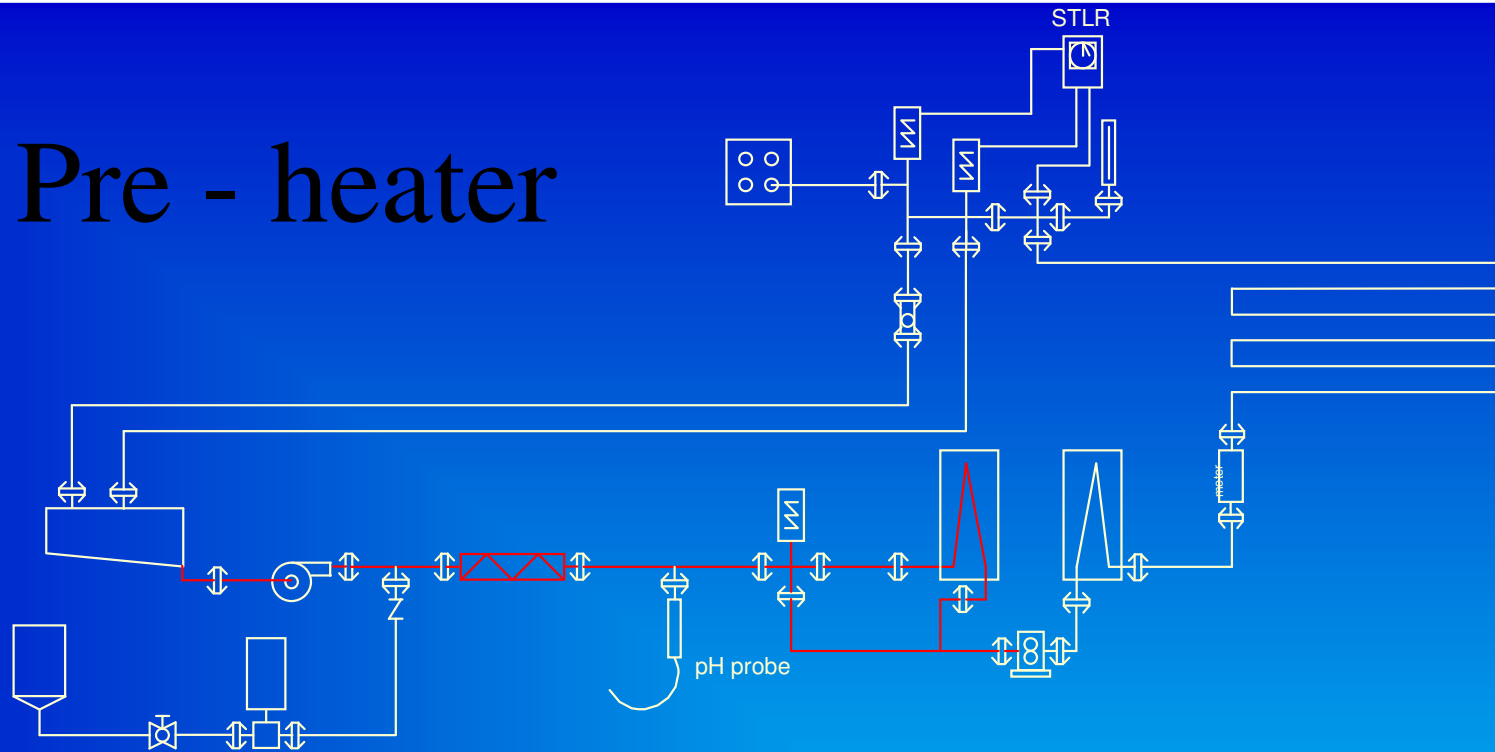
pH adjustment



The mixture is neutralized in-line with NaOH to a pH 6.5 to 7.1

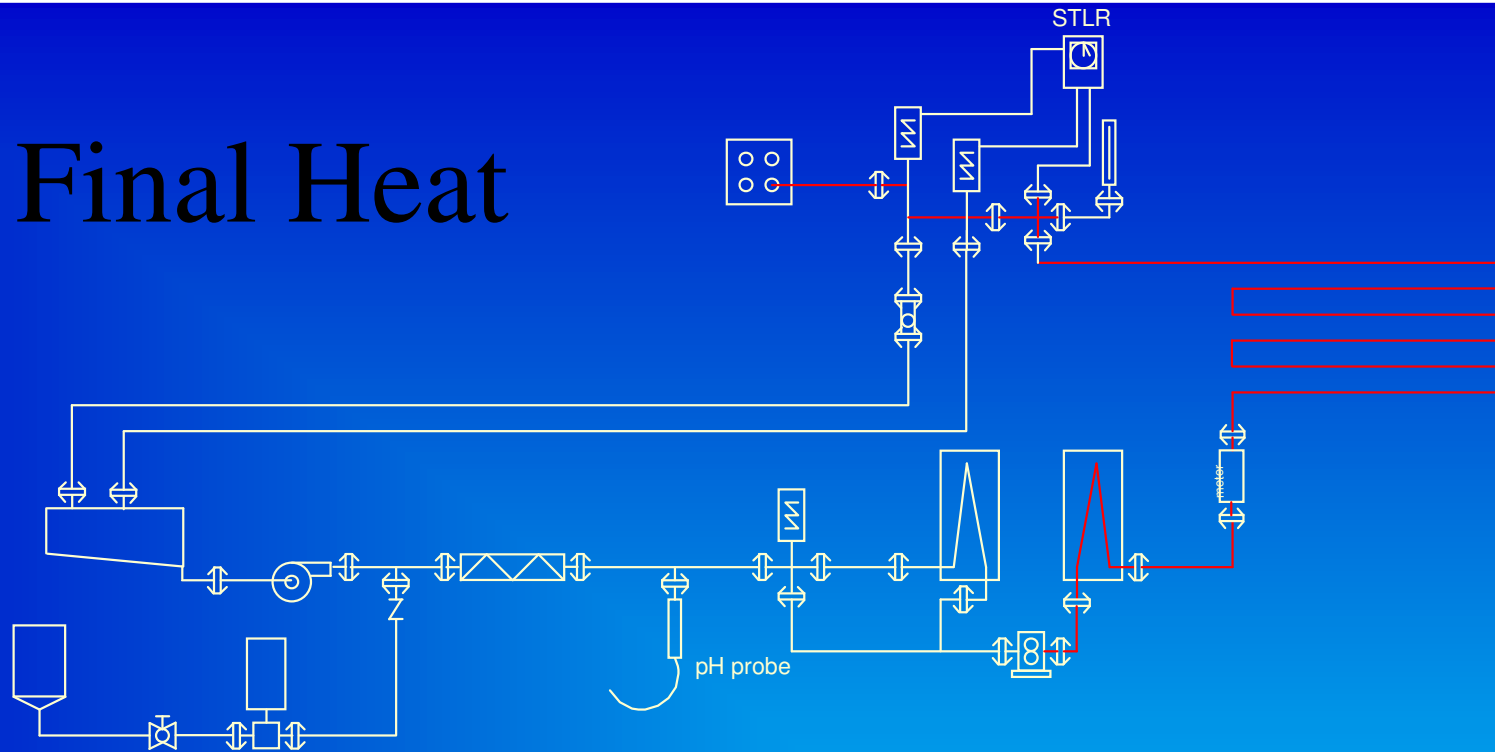
- Raw materials adjusted to a common pH.
- Enhanced protein denaturation.
- Reduce plate fouling.
- Extended running time.
- Consistent product quality.

Pre - heater



The raw product is heated up to 75°C (165 °F) in the pre- heating section

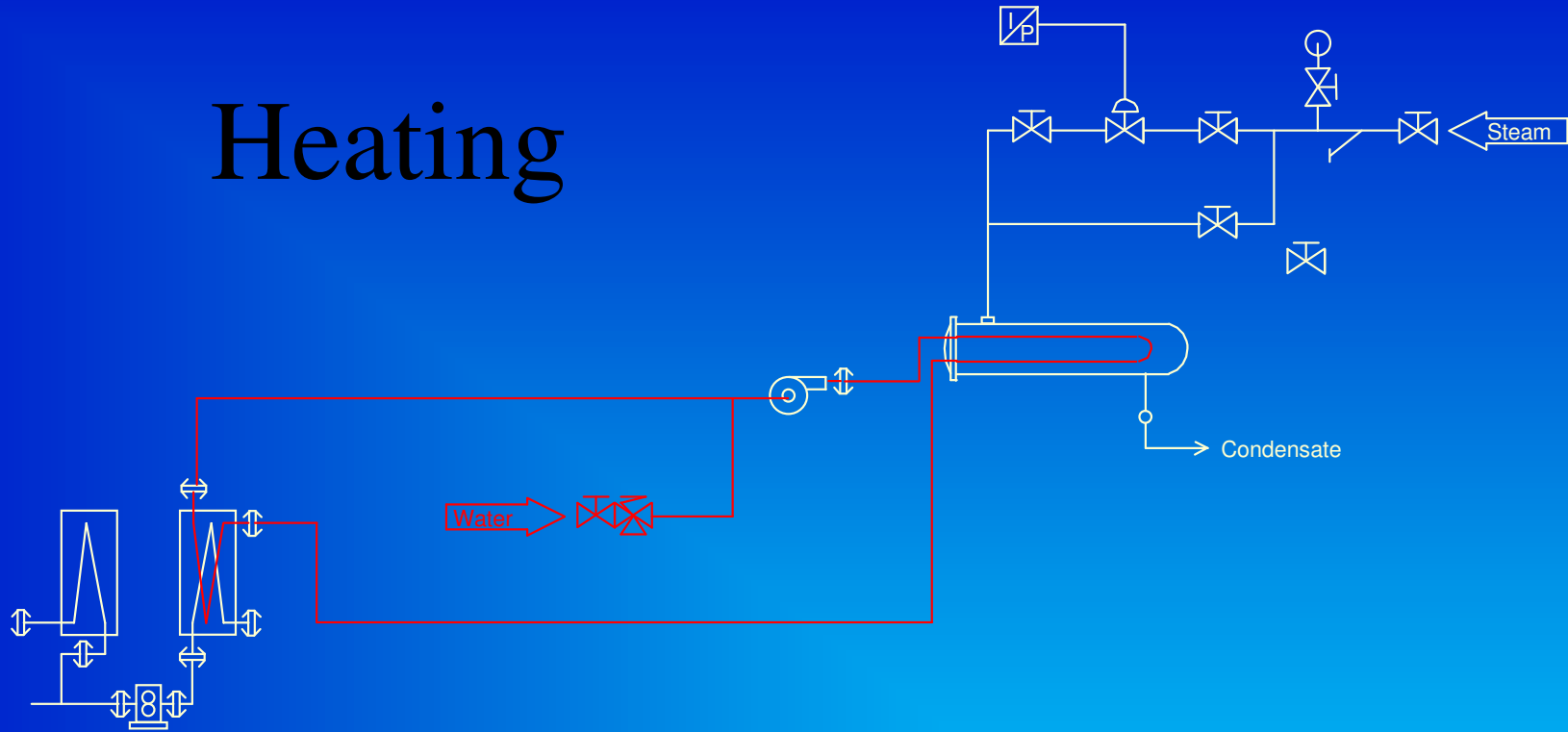
Final Heat



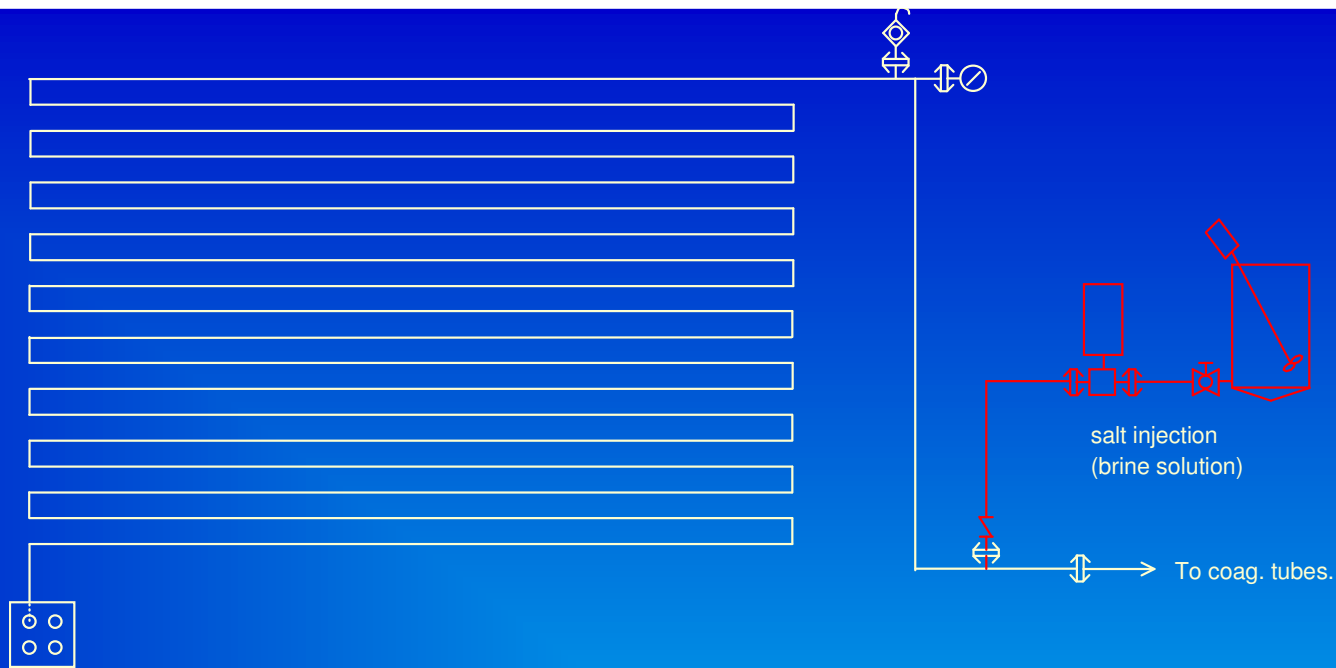
The raw product is heated up to 90°C
(190°F) in the final heating section

!!! Depending on the cheesemaker's preferences !!!

Heating



Hot water heating media is used in order to extend the running time

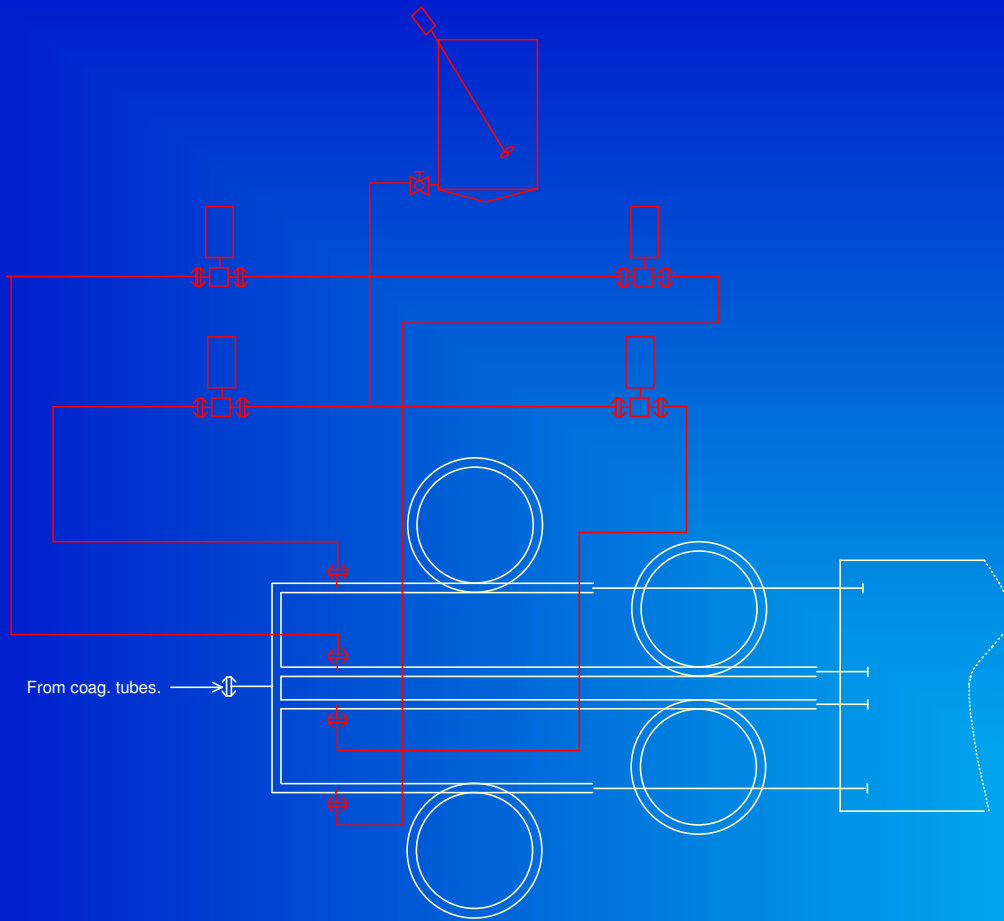


Denaturation Holding tube

- Holding time of 15 minutes.
- Insulated to reduce heat loss.
- Maintain high Reynolds numbers.
- Salt can be added.

Coagulation tubes and acid injection

A food grade acidulant is used to induce coagulation of the casein and denatured whey proteins in the hot whey/ milk blend



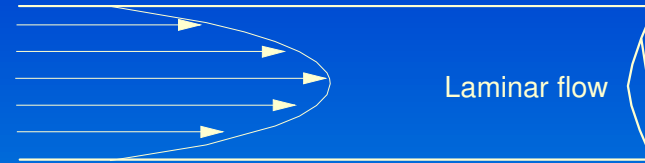
- The coagulated protein tends to compact and expel liquid as the curd travels through the tubes in a plug-flow fashion.

Laminar and turbulent flows



In the turbulent flow, the particles have an erratic motion and intermix intensively with each other.

In the turbulent flow, the layers intermix and the velocity of the liquid is roughly the same in the central part of the passage



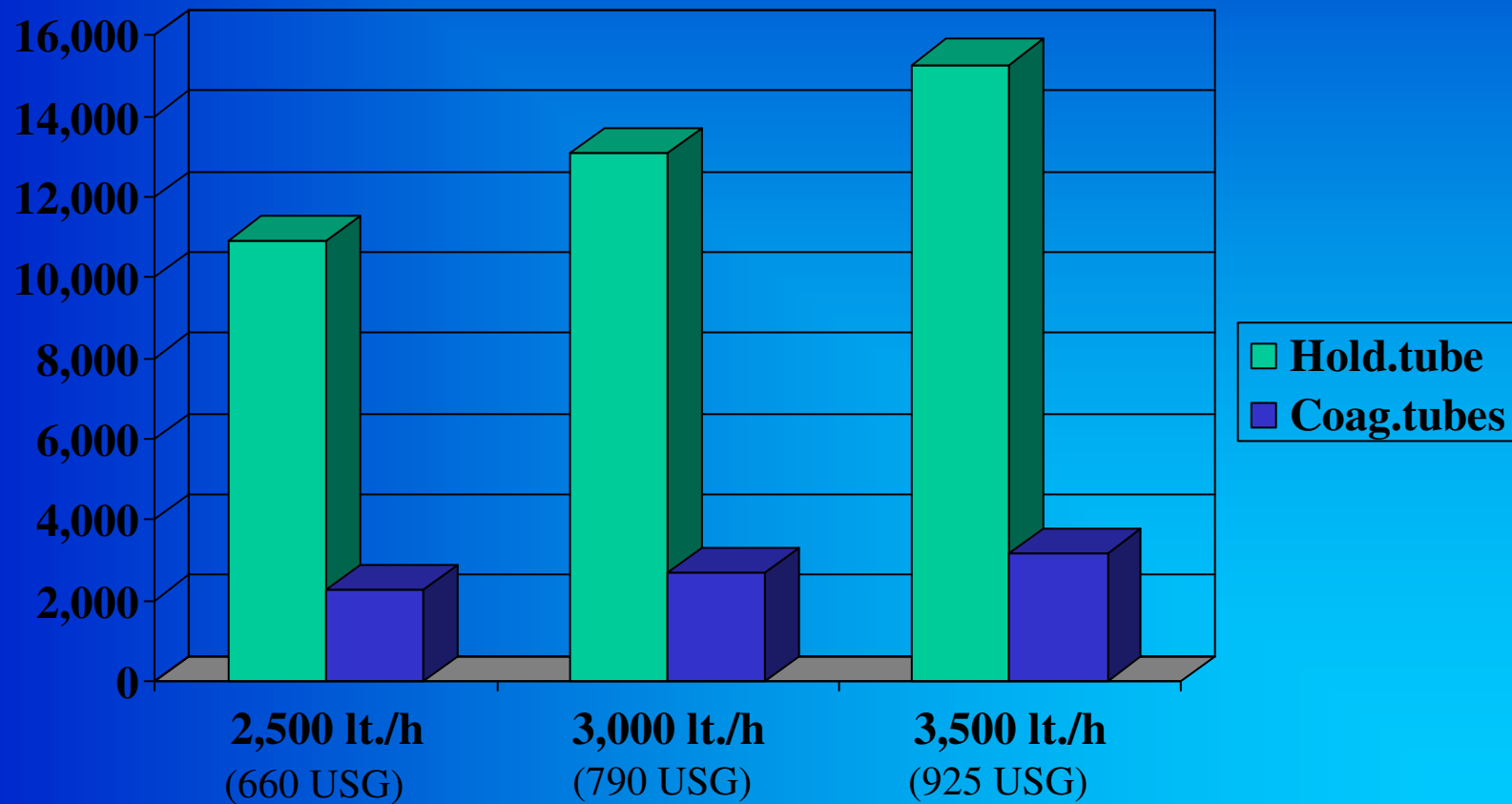
Laminar flow is a type of flow in which the particles maintain a continuous steady motion along parallel paths.

In laminar flow, the velocity is greatest at the centre of the passage

The pipe diameter, flow rate and viscosity will have a direct influence on the type of flow. Reynolds numbers (Re.) are used to determine if the flow is turbulent or laminar.

- Above 4000 Re: Turbulent flow.
- 2000 to 4000 Re: Transitional range.
- Below 2000 Re: Laminar flow.

Reynolds Numbers (Re)



Product



- The curd and deproteinated whey are separated on a conveyor belt.

Fat recovery

	Blend	Whey	Depletion
2,500 lt./h (660 US gallons)	0.925	0.043	95.4 %
3,000 lt./h (790 US gallons)	0.911	0.038	95.8 %
3,500 lt./h (925 US gallons)	0.940	0.055	94.1 %

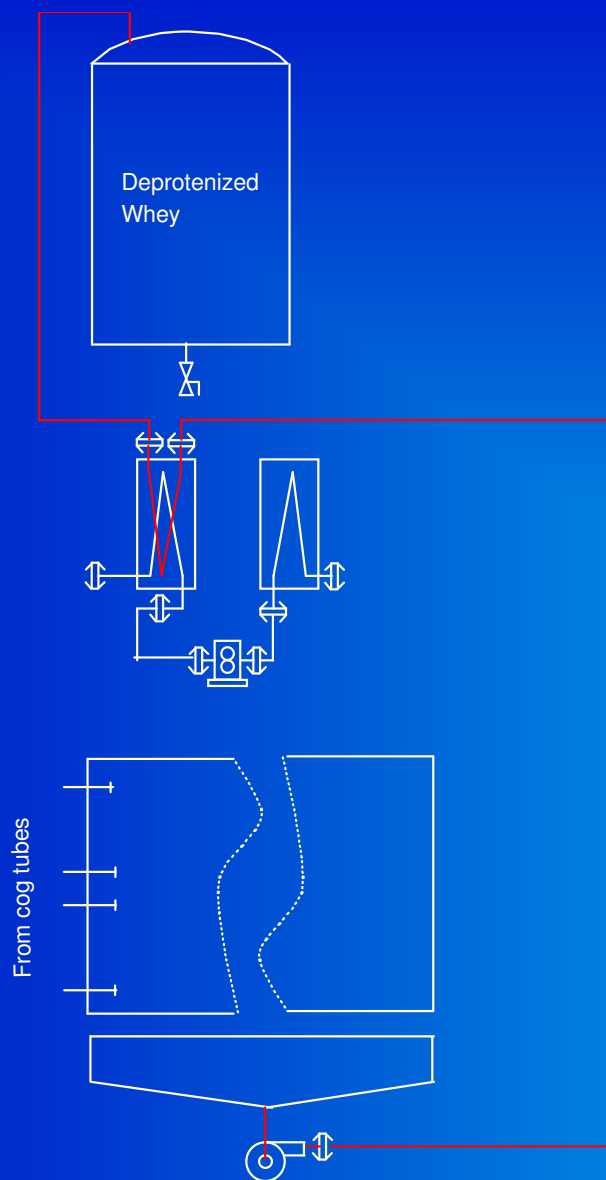
Depletion of milk fat from an 80 % whey and 20 % milk blend, (neutralized to pH 7.0) using the commercial CPP system. (Blend fortified with 5 % skim milk solid.)

Protein recovery

	Blend	Whey	Depletion
2,500 lt./h (660 US gallons)	1.175	0.051	95.7 %
3,000 lt./h (790 US gallons)	1.199	0.077	93.6 %
3,500 lt./h (925 US gallons)	1.235	0.059	95.2 %

Depletion of protein from an 80 % whey and 20 % milk blend, (neutralized to pH 7.0) using the commercial CPP system. (Blend fortified with 5 % skim milk solid.)

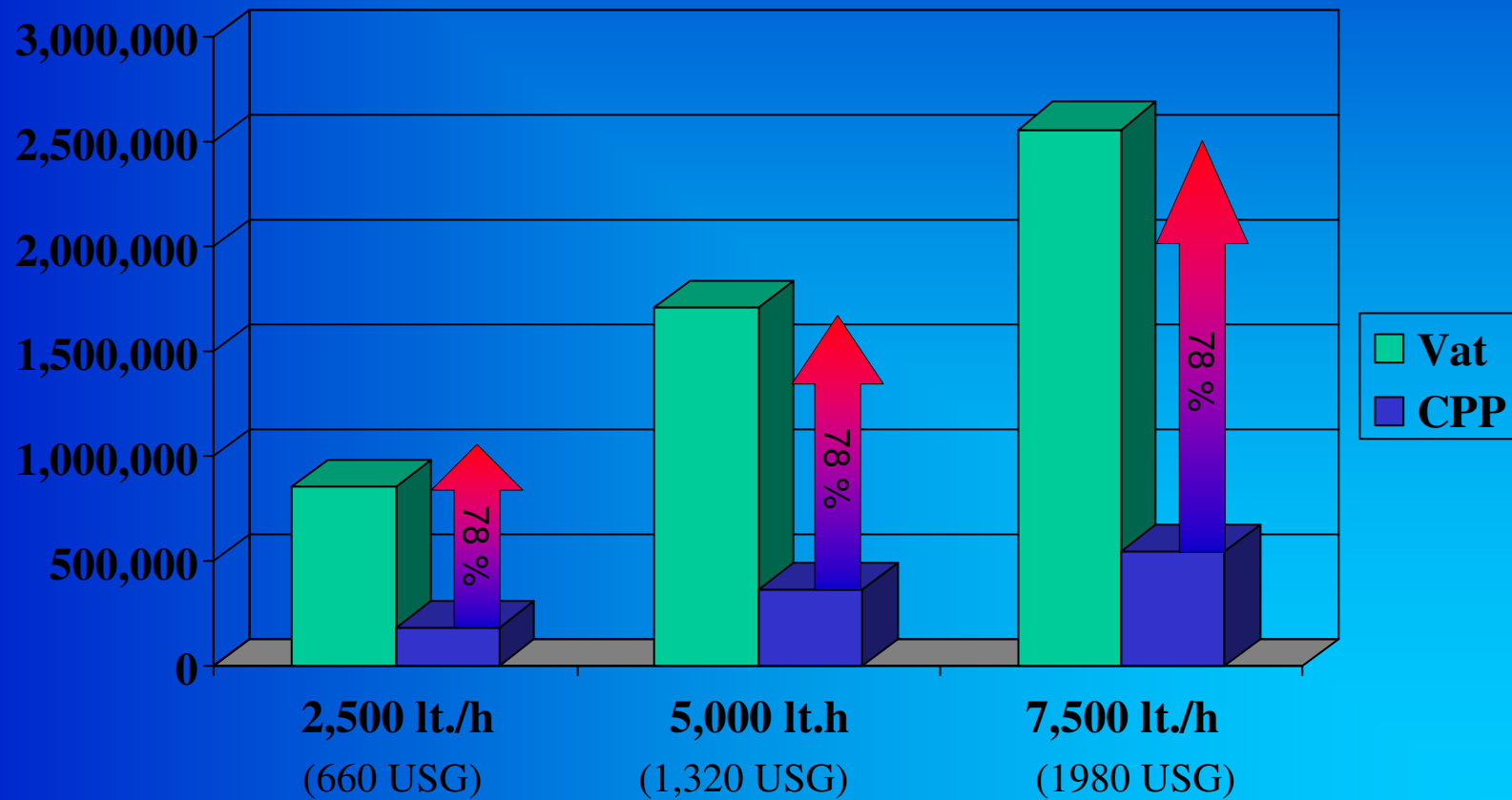
Heat recovery



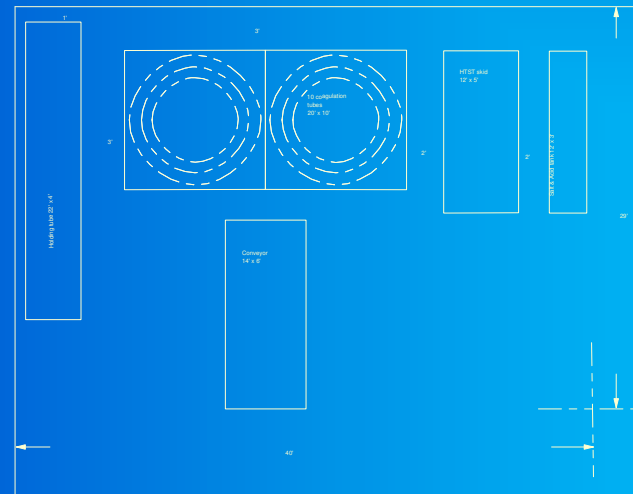
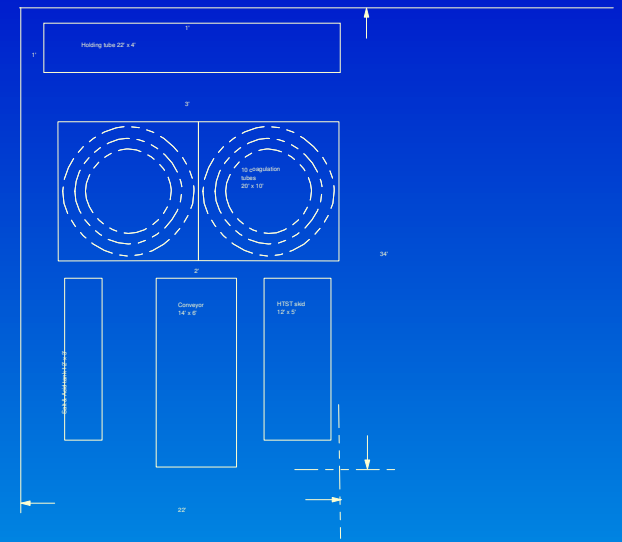
Energy savings of 70 % are achieved by recovering the heat from the spent whey.

Heat recovery

(BTUs needed)



Layout



Benefits

- 60% labor saving
- 70% energy saving on operating cost through the recovery of heat from the spent whey
- Extended shelf life
- Increased product yield due to the recapture of fines. Recovery of fat and protein averages 95%
- Return on investment of 1.5 to 2 years

CPP Features

- PLC controlled.
- HTST compliant.
- The system is fully CIP cleanable.
- USDA approval is pending.
- 3 models with capacity running ranges of 2,500- 10,000 liters per hour (660- 2,640 USG).

Highland Equipment Limited



Highland Equipment is a leader in the design, fabrication and installation of sanitary stainless steel equipment for the food, beverage, dairy, pharmaceutical and cosmetic industries. Established in the business for twenty-five years, Highland manufactures to ISO and demanding 3A standards, and is ASME (American Society of Mechanical Engineers) certified.