

Thermo-compression evaporation

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THERMO-COMPRESSION as applied to evaporators, particularly in the dairy industry, is an arrangement wherein a portion of the vapors discharged from an evaporator effect, is captured and compressed to a higher pressure and temperature for reuse on the hot side of the heating surface.

This is accomplished by the use of a thermo-compressor, using the energy of the boiler steam supplied to the evaporator, to entrain and compress the low-pressure spent steam, for re-use in the same body or effect. A thermo-compressor is similar to and operates on the same principle as the steam jet ejector; pressure levels are dictated by the design of the particular evaporator.

This principle is not new, having been discussed extensively in the technical literature of the last century. Application proved to be more difficult than theory, however, and until recently thermo-compression evaporators had not been generally successful.

Part of the difficulty lay in the primitive equipment used, which left much to be desired. Over the years, both evaporators and ejectors have been improved with advancing theory and increasing experience, so that the equipment came to be truly engineered and its performance predictable. It then became possible and practical for engineers of the two fields to get together and discuss the problems and potential of both evaporator and thermo-compressor, so that they could be tailored into a practical working unit.

In the design of evaporators, it is advantageous to have a broad temperature spread across the heating

surface, in order to get maximum heat transfer with the least investment in surface. It also has been found that heat transfer decreases substantially as the solids in the product being evaporated increase. Hence it is desirable to conduct the evaporation in more than one body, to gain

better heat transfer when the product is lean and to separate this operation from the portions of the evaporator operating with increased solids.

In the design of thermo-compressors, the maximum amount of steam will be compressed when the increase in pressure and temperature is

Typical dairy installation of thermo-compression, double-effect evaporator. At right may be seen the large Elliott thermo-compressor in vertical position. At upper left is the Elliott two-stage ejector serving the condenser. Installations such as this are serving milk evaporators all over the country.

