RECP Best Practice Catalogue

Evaporator upgrade
Developed within the framework of
MED TEST II
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UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

switchmed

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Best Practice - Evaporator upgrade

SECTOR:	**Food & Beverage**
SUBSECTOR:	Manufacture of other food products
PRODUCTS	Different types of vacuum and refined table salt.
CATEGORY	Technology upgrade/Eco-innovation
APPLICABILITY	Process

COMPANY NAME	---
COMPANY SIZE	Large

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Description of the problem (Base scenario):	The refining process of the salt requires the dilution of raw salt in water, followed by the addition of soda ash solution to remove the impurities. The solution is then directed to the evaporator under vacuum conditions to remove its water content and yield Vacuum salt. The evaporator acts as a heat exchanger in which live steam indirectly heats the solution which is under vacuum to evaporate the water content. The current evaporator is single effect evaporator, in which the water content removed from the solution in the form of vapor condensates and is sent to drain. Condensate from the steam is directed back to the boiler feed tank.
Description of the solution	The improvement measure represents installation of multi-effect evaporator, in which the all of the vapours from the first effect are condensing and in their turn evaporating vapours in the second effect. Achieving a second (or more) effect, can be through Thermal Vapor Recompression (TVR), in which the solution in the second effect must have lower pressure, or Mechanical Vapor Recompression (MVR), in which the condensate from the first effect is compressed to increase its pressure. The company opted to go for the MVR option.

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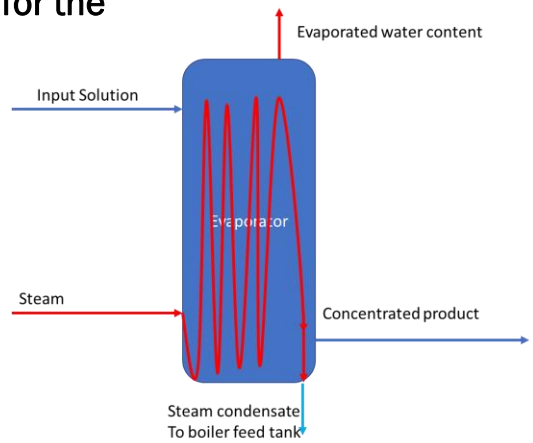
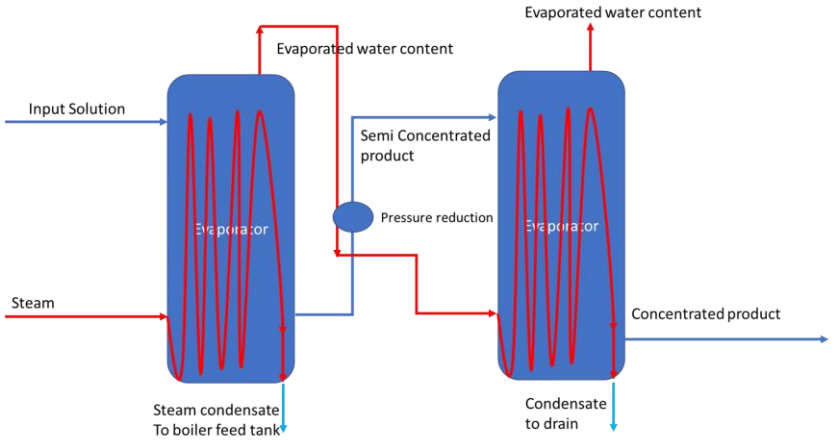
Schematic for the solution



Single Effect Evaporator



Thermal Vapor Recompression

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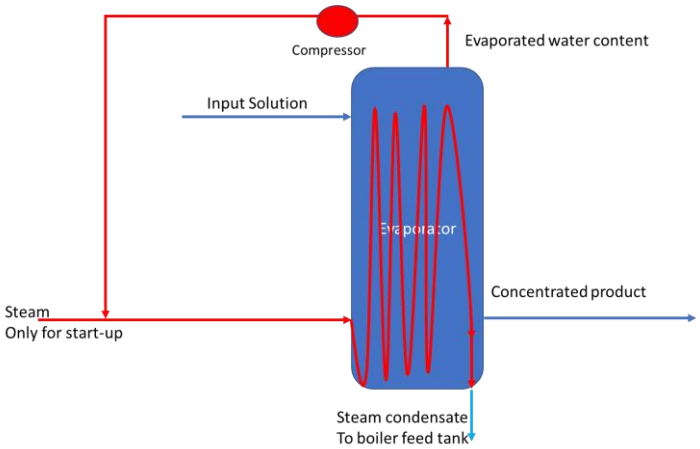
Schematic for the solution



Mechanical Vapor Recompression

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Economic Benefits	Baseline consumption is 250 m^3/ton (2,812 kWh/ton) of natural gas, and 100 kWh/ton of electricity. Thus the total energy was 2,912 kWh/ton, equivalent to 46.75 Euro/ton. The estimated consumption after the upgrade will be 2.9 m^3/ton (32.6 kWh/ton) of natural gas, and 300 kWh/ton of electricity. Yielding to a total energy of 332.6 kWh/ton, equivalent to 12 Euro/ton. With annual production of 43,200 ton/year, total amount of energy saved=2,580 kWh/ton (111,450 Mwh/year). Annual savings are 35 Euro/ton (1,512,000 Euro/year).
Environmental Benefits	Reduction in energy consumption by 2912-332.6 = 2580 kWh/ton savings With an annual production of 43,200 ton/year = 111,450,600 kWh/year. CO_2 reduction associated with the energy savings is equivalent to 20,099 ton/year
Health and safety impact	Not applicable

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Capital investments & financial indicators	Cost of upgrade is around 7,500,000 Euro. Payback is around 5 years
Suppliers	Imported
Other aspects	The implementation of this upgrade shall yield to double the productivity, which will increase the economic benefit and eventually decrease the payback period.
Implementation	The company is still studying the financials of the project, and seeking to secure the investment cost. The company was pipelined to the EBRD financial mechanism.

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Replicability sectors	The same concept can be replicated in • Dairy industry (powder milk production) • Fruit Pulp and tomato paste, concentrates. • Yeast industry. • Fertilizers industry. • Instant coffee, • or any other industry involving evaporation process
Aspects to investigate for replicability	Specific energy consumption Number of existing evaporator effects Technology suitability for the product (check with main equipment suppliers)
Useful resources	EU BREF document for Food, Drink and Milk Industries, August 2006, Table 4.20 Comparison of efficiencies of multi-effect evaporators in the dairy industry http://eippcb.jrc.ec.europa.eu/reference/BREF/fdm_bref_0806.pdf