RECP Best Practice Catalogue

Enhanced product precooling Developed within the framework of MED TEST II July 2018







SECTOR:	Food & Beverage
SUBSECTOR:	Processing and preserving of fruit and vegetables
PRODUCTS	Semi-cooked Frozen vegetables
CATEGORY	Technology upgrade/Eco-innovation
APPLICABILITY	Process

COMPANY NAME	
COMPANY SIZE	Large

TEST Training kit

Description of the problem (Base scenario):	The production process includes a blancher, which acts as a cooking step for the product. In the blancher, the product is soaked in hot water (around 90 degrees) for the desired cooking time. Following the cooking step, the product, which is at 90 degrees is precooled to around 20 degrees before it enters the freezing tunnel.
	Product precooling is conducted through merely heat transfer between the product and cold water supplied through a closed cycle water sprayers. Water flow rate of 6m3/hr. Water temperature leaving the pre cooling step is around 30 degrees, and is cooled back to 7 degrees through a refrigeration cycle (ammonia chiller).
Description of the solution	Installing atomizing nozzles to spray water droplets with small diameters will enhance the cooling effect at the pre-cooler, as a portion of water will evaporate, leading to more heat release from the product (specific energy of evaporation is 2200 kJ/kg). Adding an air fan can support the cooling. This measure will require atomizing air source (25 Nm ³ /hr of air at 2 bar pressure would serve for the given water flow)

Economic Benefits	 180 kw cooling load will be equivalent to around 45 kw electric energy (assuming a COP of ammonia system is 4). This is equivalent to around 270,000 kWh/year of electric energy savings ~ 10,400 Euro /year. Increased water consumption to compensate for the evaporated water = 5 kg/min *60 min/hr * 20 hrs/day * 300 days/year = 1,800 m³/year ~ 513 Euro/year Additional electricity needed to run the air blower, and compressed air source shall be added as extra costs in the full feasibility.
Environmental Benefits	Reduction of electricity by around 270,000 kWh/year (9% of baseline) leading to 130 ton of CO_2 emissions being avoided.
Health and safety impact	None

Capital investments & financial indicators	Investment is around 2,000 Euro. Payback is estimated as 0.19 years.
Suppliers	Nozzle suppliers, and Spraying systems suppliers
Other aspects	Full feasibility for the measure is needed, and preferable to be supported by case study from similar industry.
Implementation	This measure is retained for study, pending full feasibility study.

Replicability sectors	Semi-cooked frozen vegetables
Aspects to investigate for replicability	Cooling load in the precooling step (temperature profile, throughput, Cp) Water flow and temperature profile
Useful resources	

TEST Training kit