

ADVANCED PROCESSING TECHNOLOGIES FOR COCONUT MILK, COCONUT CREAM, COCONUT MILK POWDER AND VCO

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Introduction

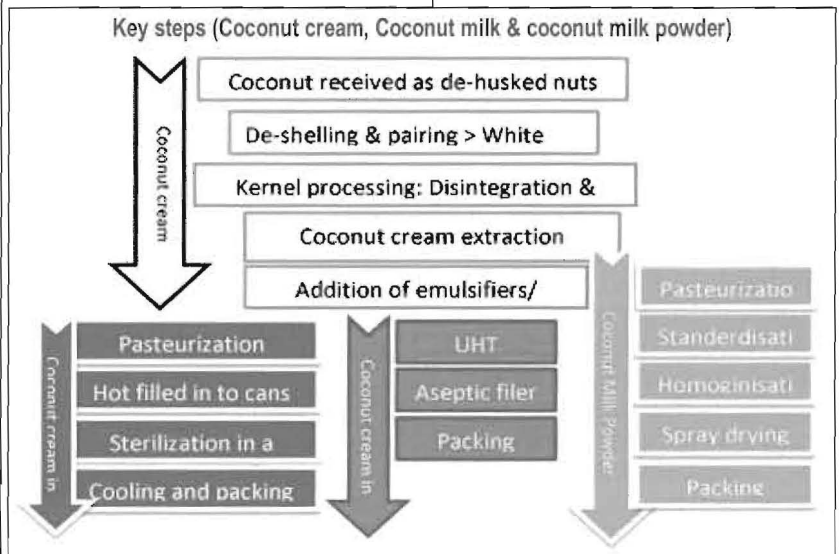
Coconut is most commonly used ingredient in local cuisines. Historical evidence of coconut plant and use of coconut in local cuisines goes back to 6th century. Industrial uses of coconut sap and kernel product as copra were the traditional industries based on coconut. Under colonial rule plantation were developed and Sri Lanka became a significant supplier of processed plantation products such as Tea, copra, desiccated coconut and coconut oil. During British colonial and post-colonial period Europe was more interested in desiccated coconut hence small and medium scale processing plants were put-up on the island. In 20th century coconut milk base industry developed as there was demand for coconut milk in European countries. In Sri Lanka Coconut milk powder was first manufactured by Nestlé in 1989.

Lankan products this area needs to strengthen further.

Manufacturing Technologies

In this report we have considered manufacturing processes of Coconut milk, Coconut cream

operation hence basic hygiene levels are maintained. After pairing white kernel is exposed hence require good level of housekeeping and hygienic standards to be maintained. There should be clear hygienic zones to be maintained. In local industries



and Coconut milk powder. Manufacturing steps of all three

good conveying systems to move white kernels to better hygienically controlled area are maintained. Most importantly white kernel has to follow FIFO and must avoid storage of white kernels in normal environment. In local mills such hygienic zones are maintained as per the code of practices established by Coconut development authority, Sri Lanka.

Export volumes of Coconut Products, (all volumes in MT)

Product category	2011	2012	2013	2014 Jan -Mar	Prorated 2014
Coconut oil	1931	2499	3821	1449	5796
Desiccated Coconut	45761	40224	28202	12175	48700
Copra	2185	653	71	49	196
Coconut milk	6351	9036	12570	3286	13144
Coconut cream	1745	2000	1591	517	2068
Coconut Milk powder	4446	4641	4702	1628	6512

Above data shows that Coconut milk based products get more attraction from our investors. Though exact number of export organizations and volumes are difficult to trace but browsing through internet, can find significant number of suppliers who are willing to supply coconut base products as per customer needs. However to safeguard quality image of Sri

products mentioned above are common up to the process of milk extraction. In Sri Lanka most the steps up to milk extraction are manual and general purpose machineries, which used for desiccated industry, are used.

Hygienic zoning

De-shelling and pairing areas more operational and a manual

Coconut cream manufacturing

Millers receive de-husked nuts to produce coconut milk. On receipt they do quality inspections to remove bad quality nuts (Cracked, Germinated, damaged) and follow de-shelling and pairings to get white kernels. White kernels are crushed to remove coconut water and washed in hot water (approximately at 80C) to remove residual coconut water

and dirt. Cleaned white kernels move to disintegrator to make white coconut meat and move through stream chamber to extraction press. Heated coconut meat enters to extraction press which operates with continuous press to extract milk. Total solid of final milk maintain by extraction process. In case need, add extraction machines in series to get a better extraction (For coconut milk can go for several extraction steps). Extracted milk has to pass through a vibrating sieve to remove residues.

Extracted coconut cream contains high level of fat ~30% depending on total solid of Extracted milk and specification of final product. Coconut cream which use for spray drying need high level of total solid ~ 40% to optimize energy at spray drying. However, due to high fat content in coconut cream it may easily stepping to creaming, Flocculation and coalescence of fat globules which leads to separation (Fig 1). It is essential to add approved stabilizers and emulsifiers to get stable texture. For better performance it is good to dissolve specified stabilizers/emulsifiers in hot water and subsequently add to milk and mix with an emulsifier. Better performance can expect from hominization.

Summary and essentials of key steps (Coconut cream manufacturing)		
Coconut pre-processing	Removal of shells and parings to get white kernel	Coconut milk extraction plants receive de-husked nuts to their mills. In local market de-shelling and pairings (Removing brown peel) are manual operation which consume lot of labour
Coconut kernel processing	White kernel to crushed wet coconut meat	White kernel need to crush into big pieces to remove coconut water and disintegrate to small chips before move to press
Coconut cream processing	Wet coconut meat to coconut cream	Disintegrated chips are moving through steaming chamber to heat-up which helps to have good yield in extraction. Milk extraction commonly use screw press extraction units. By adding series of units it can increase extraction yield. Who needs coconut milk may add water to residues to have better extraction.
Addition of permitted stabilizers / Emulsifiers	Stabilization	Extracted milk may separate due to high level of fat content. This step helps to stabilize the liquid. Depend on what stabilizers are adding need to follow appropriate mixing system
Pasurisation (Incase of transferring and storage of coconut milk)	Use indirect heat exchangers to do pasteurization	This step helps to mitigate microbial contaminations and natural enzyme deactivation
Storage and keeping quality	Store most preferably 8- 10 C in chill water circulated storage tank	Temperature and controlled agitation is required to prevent Creaming, flocculation

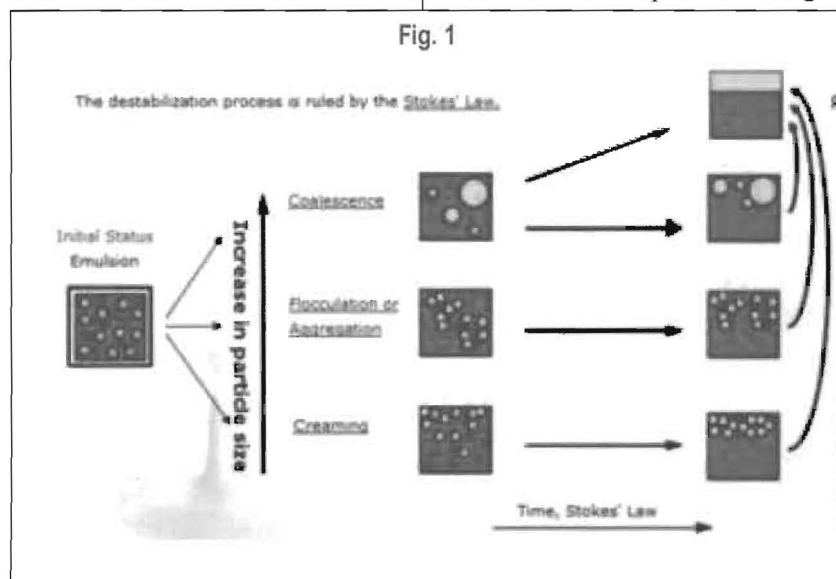
Coconut milk

Process of Coconut milk differs to cream from standardization. Coconut milk has less total solid and fat hence it may need to add more water. Water addition starts from extraction process to get

more extraction yield. It is an advantage to have series of extraction units (2-3 units) which use previous units wet press residue with additional water.

Coconut milk powder

Processing of coconut milk powder is comparatively expensive process which requires advances technology such as spray dryers. As per our knowledge only spray dryers were used to produce coconut milk powder. However there may be a possibility use roller dryers or oven dryers with different recipes which not known to us to date. Spray drying of cow's milk has contributed significantly to advancement of spray dryers today. However, use of cow's milk spray dryers for coconut milk powder led to several concerns which need to address.



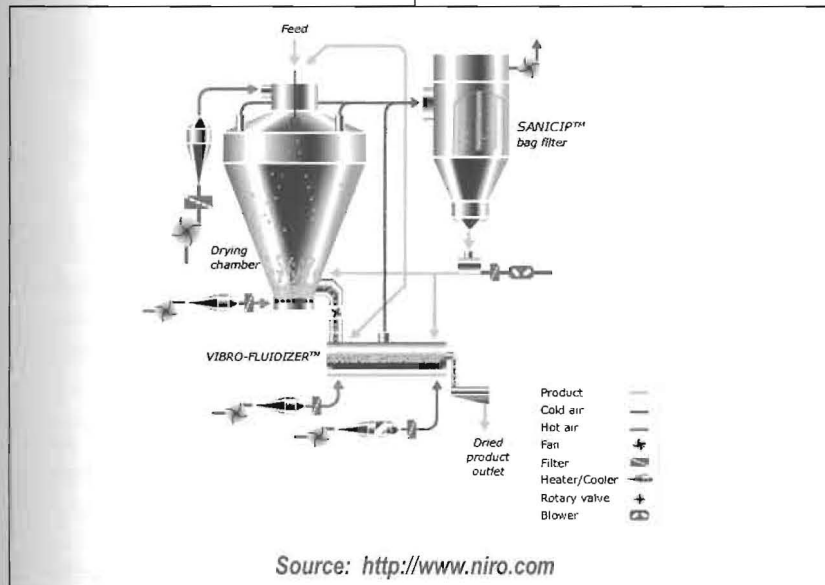
Coconut milk powder having significantly high fat content hence fouling in spray dryers is comparatively high. Today, technology advancement, research and development are mostly done by dryer manufactures. They may able to give technical solutions if you correctly submit your needs and issue. As product owners and producers we must aware to present and discuss our needs correctly at design stage of the spray dryer. By visiting such web sites you can find different type of spray dryers as per the need of final product (Conventional spray dryers, Versatile spray dryer, multi stage dryers..... Visit <http://www.niro.com/niro>).

air. This part contributes significantly to operation cost.

Spry drying chamber 95% of the drying happens inside the chamber. Hot air touched on atomized liquid at the top of the dryer and generates powder particles. Real formation of powder particles and its properties happen inside the rowler. It is important to have correct design of nozzle's and tower shape and appropriate vibrators to remove powder deposits on the walls of dryer to get optimized production. Preventive automated safety system must be operational at all the time.

Fluidized beds are appropriately use to convey powder particles, smooth drying and cooling using dehumidified air. Vibration, sieve formation and air flow need to design correctly to have optimal use of fluidized beds.

Above described key areas are the basic conditions which some one look into at the design stage. However we would like to re-emphasis that good understanding of the product properties which expect at final product and communication to your spray dryer manufacture is the key which entrepreneur must looked into. Spray drying manufactures may able to transform your need technically if it correctly mentioned.



Source: <http://www.niro.com>

Spray dryers have key components

1. Hot air generation
2. Spray drying chamber
3. Separators
4. Fluidized beds

Hot air generation

Spry drying happens at the tower when hot air mixed with the liquid. Hot air should be good enough to carry all required moisture from the liquid. At designing stage need to look into air quality, seasonal variation of humidity of inlet air and cost efficient system to generate hot

Separators

Hot air which used to dry the powder at the drying chamber will release to outside through separators. Air which comes out from chamber and fluidized beds carry small particles of powder. In separator, separate powder partials applying cyclone effect. Due to fineness of powder particles separators tends to get blocked, hence appropriately designed vibrators are vital for good operation.

Fluidized beds

Good practices

Though technology plays a good role of product manufacturing, it is essential to complement it with good practices to get a quality product.

Good procurement & Material handling practices

1. Local industry, keeps nuts approximately 21 days at the farm or collectors storage for seasoning. This helps in de-husking at the field, de-shelling and paring at the mill. However storage of nuts in plantation in open heaps prevents proper drying of nut and moist conditions may leads germination and adverse effects. Appropriately ventilated heaps of coconuts and correctly following of seasoning time period is the good practice which helps in this industry.
2. De- husked nuts must be covered and keep away from direct sunlight and rain. Nuts tend to get cracked due to heat and then spoiled. De-husked nuts must process within short period of time 2-3 days would give god results.

3. Nut varieties, geographical regions and good plantation practices lead to variation of extraction yields of the nuts. Having procurement intelligence may help to get good yields at extraction.

Good manufacturing, Quality control and assurance practices


Though Coconut milk powder is common for culinary application (Which secondary cooking is applicable) cannot prevent its use as cold beverages. It is vital to have sound microbiological and food safety standards which follows closely the milk powder. Get a high quality product from unhygienic field operational roots (de-husking, collection of nut, de-shelling...) is a challenge but achievable. Need good practices such as appropriate segregation of work areas (Zooning principles), implementing proper food safety management system throughout the process, well defined quality control and quality assurance practices are essential to achieve such quality. Though there is adequate system it has to be followed in every step from farm to consumer.

Nestlé manufactures coconut milk powder


Coconut milk powder is a unique to Nestlé Sri Lanka because it was developed locally with the strong guidance from Nestlé

Processing Technology - Coconut Milk

Key areas of Processing



Ingredients Mixing
As per the ingredients need to define mixing and hydration time.
For better performance - heat milk or water to 60 C
Turbo mixtures or liquidizers are commonly used



research and development units. Currently our product “Maggi Coconut milk powder” is exporting to worldwide approximately to 60 countries. Product was first developed in 1986 using Spray drying facility at Kurunegala factory. With continuous growth, dedicated spray dryer was introduced in 1993. It is a Niro multi stage spray drying plant. Our presence in the world has increased year by year and currently we produce more than 6500 MT per year.

We procure annually ~ 60 Mio nuts for our operation. The millers supply us coconut cream to our specifications. With this operation Nestlé contributes significant amount of money to rural farmers by procuring their plantation output.

Nestlé maintain high quality standard’s in our processing plants which is similar to milk powder. Our products are certified with ISO standards (Food safety and quality management system), Kosher and Halal. Quality management system has been implemented throughout our value chain and good procurement practices and manufacturing practices are continuously followed by every individual.

We are the pioneering processing unit for coconut milk powder in Sri Lanka and generate significant amount of foreign revenue (Approximately 2 billion LKR) to country by exporting local product.

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