

Delighting Our Customers sums up our service philosophy that starts from product conception & development, right through to product delivery to our customers.

Our business is anchored upon a strategic alignment to key raw materials, manufacturing excellence using the world-class technology, meeting stringent accreditation in food safety and sustainability.

We create and produce high quality, competitive products with proven performance in a wide variety of application fields.

Our service philosophy also extends into Research & Development, where we have the flexibility to design customised solutions to meet our customers' formulation challenges.

Let us delight you and support your sustainable business growth.



Health & Free Sales Certification (Ministry of Health Malaysia)



GMO-Free Certification (MPOB)



BRC Global Standards Food Safety (LRQA)



Halal (JAKIM Malaysia)



Kosher Pareve (Circle SK)



Segregation & Mass Balance RSPO SCCS Certification (SIRIM QAS Int'l)



MS 1480 : 2007 HACCP (SGS UK)



ISO 14001



OHSAS 18001



Winner of Frost & Sullivan's 2016 Best Practices Award Entrepreneurial Company of the Year

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A GENTLE TOUCH

PRODUCING HIGH QUALITY RECOMBINED MILK
A Technical Guide

A Summary With Focus On Important Processing Implications

SUMMARY

To produce a high quality recombined milk product, processes must be well considered and raw materials must be carefully selected.

Quality variations of milk powders often cause high levels of fouling (short production runs) and stability issues.

Such quality issues will only increase if the milk is not treated gently. Mixing

temperatures, pH adjustment and aging time will influence the end quality.

The addition of Texturising Systems can reduce the risk of fouling and stability related problems. However, raw materials and processes must firstly be in balance and well considered. No Texturising System is able to turn bad milk (powder) into good milk!

Ekömul KREM 300 series for UHT Recombined Milks

UHT RECOMBINED MILK FORMULATION

COMPOSITION	DOSAGE (%)
ANHYDROUS MILK FAT	3.00
SKIMMED MILK POWDER (MH)	9.60
EKÖMUL KREM 301 SE / KREM 303 SE	0.20
WATER	61.40
TOTAL	100.00
TOTAL FAT	3.30
TOTAL PROTEIN	3.20
TOTAL MSNF	9.20
TOTAL SOLIDS	12.40

Benefits of Ekömul KREM 301 SE and KREM 303 SE in UHT Recombined Plain Milk:

- Creamier Taste
- Thicker Mouthfeel
- Delay Creaming Off
- Reduced Sedimentation

UHT RECOMBINED CHOCOLATE MILK FORMULATION

COMPOSITION	Dosage (%)
ANHYDROUS MILK FAT	2.00
SKIMMED MILK POWDER (MH)	7.70
SUGAR	6.00
COCOA POWDER	0.85
EKÖMUL KREM 302 SE / KREM 304 SEC	0.25 / 0.30
WATER	83.20
TOTAL	100.00
TOTAL FAT	2.40
TOTAL PROTEIN	2.70
TOTAL MSNF	7.30
TOTAL SOLIDS	16.50

Benefits of Ekömul KREM 302 SE and KREM 304 SEC in UHT Recombined Chocolate Milk:

- Good Flavour Release
- Creamy and Thicker Mouthfeel
- Delay Creaming Off
- Better Cocoa Suspension
- Reduced Cocoa Sedimentation

INTRODUCTION

Recombined UHT treated milk beverages are widely produced and consumed in Asia, Africa, Latin America and countries in the Middle-East. Due to a lack of sufficient milk volumes as a result of increasing consumption or poor milk quality, most UHT milk production are based on imported milk powders.

Often these powders are bought on the world spot market, potentially leaving the final producer with raw material variations from time to time. Apart from plain milk, these powders are processed into a huge variety of different milk beverages. Chocolate milk, flavoured milks, mineral fortified, protein fortified, concentrated milks and low cost milks based on cheap

milk solids are all growing segments in the Dairy Market.

The required shelf life varies from region to region from 3 to 12 months. Raw material variations combined with a long shelf life under high storage temperatures often cause quality related issues. Fat separation, sedimentation, viscosity increase and whey separation are all well known to the UHT milk industry.

This paper will focus on the important processes and formulation parameters recommended to achieve high quality recombined UHT milk based on water, skimmed milk powder and anhydrous milk fat.

DEFINITION : WHAT IS MILK?

- Oil-in-water emulsion with the fat globules dispersed in the continuous serum phase
- Colloid suspension of casein micelles, globular proteins and lipoprotein particles
- Solution of lactose, soluble proteins, minerals, vitamins.

Composition, average raw-milk

COMPOSITION	%
FAT	3.90%
PROTIEN	3.30%
LACTOSE	4.60%
MINERALS	0.65% (calcium phosphate 0.12%)
OTHERS	0.20% (acid, enzymes, vitamins)
WATER	87.35%

Composition, skimmed milk powder

COMPOSITION	%
FAT	0.60 – 1.25%
PROTIEN	34.00 – 37.00%
LACTOSE	49.50 – 52.00%
ASH	8.20 – 8.60%
MOISTURE	3.00 – 4.00%

Composition, commercial whole milk

COMPOSITION	%
FAT	3.50%
PROTIEN	3.10%
LACTOSE	4.60%
ASH	0.80%

RAW MATERIALS

Skimmed Milk Powder (SMP)

Low to medium type SMP is recommended for UHT milk production. In order to avoid quality defects, mineral content and pH levels are both of critical importance. If these are outside the acceptable range, there is an increased risk of fouling during production.

Fouling is typically monitored by delta T or pressure build up in the production line. When delta T becomes too high, production must stop and CIP is required. Stability and quality wise, SMP with a less than ideal pH or abnormal mineral content will increase the risk of fat separation, sedimentation, gelation or whey separation. Seasonal variations, geographic variations, breed variations and feed variations all have its influence on the stability and quality of UHT treated milk.

It is of utmost importance that these variations are well monitored from lot to lot. Most defects are not seen instantly but only after months, when it's too late!

Fat

Anhydrous milk fat (AMF) is often used. Unsalted butter can also be used.

Phosphates / Citrates

Used for pH adjustment and sequestering free calcium.

The natural pH of milk is 6.70. In some cases, milk powders can have slightly lower pH and adjustments will be required.

At a lower pH, the heat stability of the milk proteins will be negatively affected, leading to serious quality issues.

Calcium in milk is found as calcium phosphate. Normal high quality milk, suitable for UHT milk production, has a calcium content of around 0.12% (120 mg). Two-thirds of the total calcium content is bound within casein micelles. The last third of calcium content is found as free form. Depending on the lactation stage or period of the year, a higher content of free calcium will sometimes occur. Such milk (and its powders) are not recommended for UHT milk. Due to high levels of free calcium present, a drastic increase in fouling will also take place.

Di-Sodium Phosphate (DSP), Tri-Poly Phosphate and Sodium Hexametaphosphate are the most commonly used.

Hexametaphosphate will not affect pH but is more effective as a sequestering agent than di-sodium and tri-poly phosphate.

DSP and Sodium-Citrate are mainly used for pH adjustment.

Stabiliser / Emulsifier And Texturising Systems - A Critical Functional Ingredient In A UHT Milk Formulation

- Improved mouthfeel / texture,
- Improved stability against creaming - off and sedimentation
- Increased production runs (less fouling)

Combination of hydrocolloids and emulsifiers widely used to achieve improved product shelf life and organoleptics.

PROCESS

Recombination

Higher temperatures make it easier to disperse ingredients and to hydrate milk powders quickly. On the other hand, high recombination temperatures will have a negative impact on fouling and shelf life stability of the final product.

At 50°C the whey proteins slowly start to change its structure. If enough heat is applied it will completely denature. Whey proteins are fully denatured when exposed to temperatures of 90°C for a few minutes.

As the whey proteins changes its form from native to denatured, its particle size will increase. Fouling, sedimentation and whey separation will most likely occur.

Accordingly we recommend mixing temperature and hydration between 45 – 50°C.

pH Adjustment

pH must be measured after mixing and, if required, adjusted to 6.70 – 6.80 before further processing.

Hydration

Ideal hydration should occur for 15 – 20 minutes at 45 – 50°C. Longer periods might cause a pH drop as lactic acid bacteria will convert lactose into acid. Higher temperatures will, as mentioned, cause heat stability issues.

Pasteurisation and homogenisation

Pasturisation at 72°C / 15 sec and homogenization pressures around 160 – 200 bars is normally applied.

Aging

Aging is required before UHT treatment.

The newly created “matrix” of protein, fat and minerals must find its balance, before reaching the high temperatures of a UHT treatment.

Short aging times can lead to bigger particles, therefore having a negative impact on fouling and then overall long term product stability.

Taste might also be negatively affected. Ideally, aging overnight (say 12 hours) at 5°C, is recommended. As time is money, most UHT milk producers tend to use shorter time.

UHT and Homogenisation

The following steps are typical of a UHT process :

- Preheat to 65 - 70°C
- Homogenisation 180 bar
Downstream ideal, but not typical in all regions
- Hydration cell at 90°C / 15 sec
- UHT 142°C / 2 – 4 sec
- Cool to 20°C
- Fill

Having a hydration cell after homogenisation and before the product reaches its peak temperature in the UHT section often contributes to a lower level of fouling. Keeping the milk at around 90°C for up to 30 seconds prevents milk proteins from heat shocks when reaching the UHT section.

While recommended, not all UHT lines have such a pre-holding cell incorporated into the production line.