

# Lecithin

## The Natural Emulsifier for Instant Powders

### Introduction

Soya bean lecithins are multifunctional food ingredients that can be used in a wide variety of food applications. One of the main application areas are instant powders.

Reconstitution of powder can often cause some trouble as not all powders react in the same way. Lecithin is the single one emulsifier that can overcome these troubles. It is just a matter of selecting the right lecithin and process.

Solae's broad line of refined specialty lecithins will effectively wet and disperse both hydrophilic and lipophilic powders. They can be applied to the powder surface or used during agglomeration. Refined specialty lecithins will disperse powders quickly and completely by reducing surface and interfacial tension between powders and liquids.



Figure 1 Whole milk powder test with different types of lecithin

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Figure 1 shows three whole milk powders as they are added to water. The beaker on the right contains a whole milk powder without lecithin, the centre beaker contains the same whole milk powder instantised with a standard grade lecithin and the beaker to the left contains whole milk powder instantised with an enzyme hydrolysed lecithin. Figure 1 clearly illustrate that selecting the right lecithin improves the wettability and dispersibility of the whole milk powder.

## **Benefits of using Lecithin**

- Promote controlled hydration of hydrophilic powders or rapid wetting of lipophilic powders.
- Promote rapid wetting in hot and cold liquids.
- Retain instantising properties for extended periods.
- Functional at low levels.
- Bland flavour and odour.
- Retain the flow-ability of powder.
- Easy to apply.

Powders are normally dissolved in water or other kinds of fluids. As water has a high surface tension the wettability and dispersibility of fine powder is reduced. To improve the instant properties of the product a special technical or mechanical treatment is required. This is done by agglomeration, spray drying or by surface application.

Generally three "functionalities" are required for instant powders:

1. Wetting: Penetration of fluid/liquid into a porous system.
2. Sinking: Sinking of the particles thorough the surface of the liquid.
3. Dispersibility: The ability of the powder solids to completely disperse in the solvent as individual particles with minimal stirring.

## **What is Lecithin?**

Lecithin is a complex mixture of surface-active agents called phospholipids. Phospholipid molecules contain a lipophilic portion with an affinity for fats and oils and a hydrophilic portion with an affinity for water. This contributes to the surface-active properties necessary for promoting quick and complete wetting in aqueous systems.

## **Choice of lecithin**

The type of lecithin to be used for improving the wettability and dispersibility of a powder depends of the powder to be instantised.

Hydrophilic or water soluble polar powders such as gums and starches or protein powders like Caseinate, tend to wet too fast. When added to water they form large lumps that are wet on the outside and dry on the inside. These lumps are commonly called fish eyes.

For these types of powders *lipophilic* lecithins are commonly used to slow down the wettability of the powder just enough so that it disperse evenly into to the solution without forming lumps.

On the other hand, hydrophobic or lipophilic non-polar powders typically require *hydrophilic*, high polarity lecithins to promote wetting of the fatty surface.

A hydrophilic lecithin applied to the surface of a whole milk powder (26% fat) overcomes the repulsion between the surface fat and the water and allows the milk powder to wet and dissolve very quickly.

### **Types of lecithin used for instant powders:**

- Native lecithin (Low to medium polarity).
  - Standard grade
  - Refined, sprayable
  - Deoiled
- Modified lecithin (High polarity)
  - Hydrolysed
- Fractionated lecithin (High polarity)
  - PC-Enriched

### **Method of Application**

Lecithin can be applied to the surface of a powder in three main ways. An even coating of the lecithin on the powder or agglomerate surface is essential to achieve effective wetting.

### **Surface application**

Lecithin may be applied in undiluted form during the last step of powder production. Powders consisting of relatively small particles have a greater surface area than larger particles, thus requiring a higher level of lecithination. Fine powders may need up to 2.0% coverage while coarse powders may use only 0.5% to achieve good wetting. An even coating of each powder particle is essential to provide maximum powder wetting and dispersion. Lecithin is usually sprayed into a ribbon blender or V-blender and thoroughly mixed so each particle is coated with lecithin.

### **Agglomeration**

This is often used to improve the instantising properties of powders. During agglomeration, air is used in a fluid bed mixer to circulate the powder. An aqueous lecithin solution is sprayed onto the powder to produce a larger particle. After the powder is agglomerated and dries, lecithin may also be spray applied to the surface of the agglomerated particle. Usage levels for lecithin in the agglomerating solution typically run 10% to 15% with the solution being applied at a 5% to 10% level on the powder. Higher usage levels of the aqueous lecithin solution (often over 20%) are recommended for powders like caseinates which are difficult to instantise.

## What is agglomeration?

The process cements the fine particles into agglomerates that contain capillary channels, and these allow liquid to be drawn in, thereby producing a wetting action. Agglomerates also affect the bulk density so that material has a greater volume for a given weight.

It is important, when using an agglomeration process, to ensure that the final product will retain its instant properties after the normal process of packing and transportation. If the particle strengths are weak, some fine powder may be formed during movements, and this can destroy some of the quick wetting properties.

To get an effective agglomeration the particle must collide, adhere and resist mechanical breakdown during handling.

### For effective agglomeration particles must:

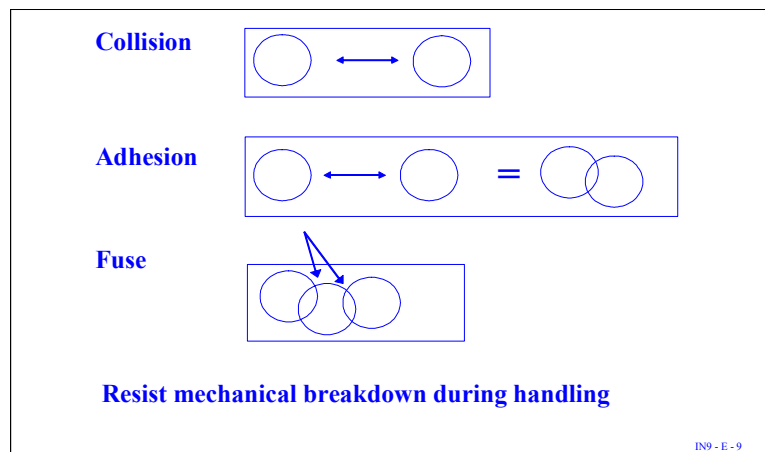


Figure 2 shows the agglomeration process

## Co-spraying

The last relatively common way to instantise a powder is to co-spray dry it with lecithin. A hydrophilic, water dispersible lecithin is added to the solution to be dried, and after the powder is dried it should be instantised, if the lecithin is on the surface. This method is not the most effective process and often require higher amount of lecithin.

## Factors affecting the shelf life

- The quality of the packing appears to be the main factor affecting the shelf life.
- Instantised milk powder should be stored in air tight containers.
- Exposure to humidity has a negative effect.
- Free fat on the surface.
- Shape and particle size of the powders are determining of the shelf life.

## Dust Control

Lecithin is widely used for dust control. Manufacturers of bakery mixes or dusty ingredients can spray a small amount of lecithin (less than 1 %) on to the surface of a dusty powder to greatly decrease the dustiness of that powder without harming its functionality. In many cases the flow characteristics and dispersibility of the powder are actually improved. Low viscosity, low flavour lecithin, like STERNPHIL MB 45, can be sprayed to control dusting.



## Conclusion

Lecithin is a functional instantising agent for food and non food powders. The key to a successful instantising of a powder is to evenly coat each particle of the powder with a fine layer of the appropriate lecithin.

Lecithin is a popular label friendly ingredient in all industries and especially the dairy industry is fond of using it.