

Littleford Reactor Advances the Chocolate Industry

Littleford Day, Inc. is proud to introduce a new efficient Reactor concept for the Chocolate Industry, the DVT Polyphase® Reactor. From our current tests, pertinent literature and conversations with people in the chocolate industry, we present this technical concept for alkalizing cocoa.

The Littleford Day, Inc. DVT Polyphase Reactor's following capabilities enable both alkalization and drying of cocoa to be efficiently completed in one vessel.

- Unique Fluidized Bed Mixing Action
- High Speed Choppers
 - Disperse Liquid Additives
 - Increase surface area for Reaction or Drying
- Pressures to 250 PSIG
- Vacuum to 30" Hg

Therefore, we have divided our discussion into these two topics:

1. Cocoa Alkalization Process
2. Cocoa Vacuum Drying Process

COCOA ALKALIZATION PROCESSING

Cocoa powder is generally treated with alkali to improve color and develop the flavor. The practice originated in Holland, and is known as the "Dutch" process. At first, this innovation was met with fierce opposition, but the attitude has now changed, and it is estimated that 90% of the cocoa marketed at the present time is alkalized. Alkalized cocoa is known commercially as "soluble cocoa", because the particles remain in suspension for a longer time after preparation of the beverage than is the case when un-alkalized cocoa is used. The alkalization only slightly increases the solubility which ranges between 19-25% dependent on the conditions of production. It is claimed that alkalization is justified by the increased digestibility of the proteins and a reduction in astringency arising from a partial condensation of the tannins. The latter reaction is responsible for the enrichment of the color. The extent to which these changes take place will depend on the degree of alkalization. Untreated cocoa powder has a pH of around 5.6, while that of the alkalized powder is nearer 7.1.

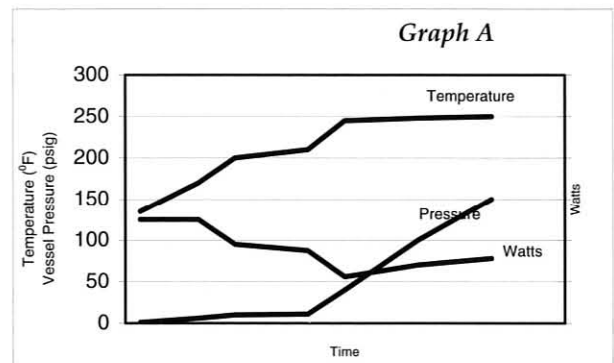
In alkalization various alkali salts may be added at a chosen stage either to the press cake or to the cocoa powder. The alkaline chemicals used are ammonia, potassium, sodium and ammonium carbonate, ammonium and sodium bicarbonate and sodium hydroxide.

The following is a description utilizing the Littleford DVT Polyphase® Reactor for alkalization:

1. Processing Red Cocoa
 - A. Charge cocoa (powder or kibble cake) to a cool Reactor. Start heat flow on the jacket and start plows and choppers.
 - B. Add water to create a slurry.
 - C. Start the addition of the Alkalina solution. (such as Potassium Carbonate)
 - D. Use steam injection to bring the product temperature to approximately 250°F.

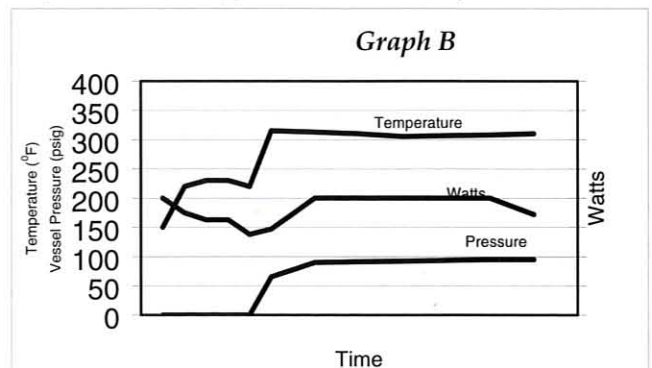
The exact temperature and length of cycle time are determined by testing.

Graph A shows a typical Red Cocoa cycle.



2. Processing Dark (Black) Cocoa
 - A. Charge cocoa (powder or kibble cake) to a cool Reactor and start heat flow on jacket. Start plows and chopper.
 - B. Add water to create a slurry.
 - C. Start the addition of Alkali solution. (such as sodium hydroxide)
 - D. Using steam injection, bring the product temperature to approximately 310°F. The exact temperature and length of cycle time are determined by testing.

Graph B shows a typical black cocoa cycle.



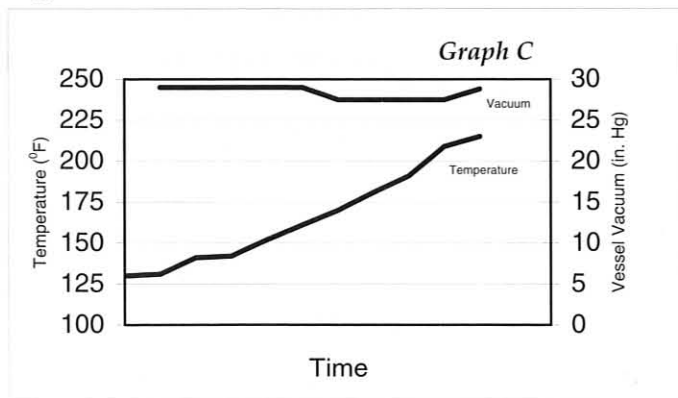
COCOA DRYING PROCESS

In the processes of alkalization water is added to the cocoa. To achieve maximum aroma and intensity of color the finished product moisture must not be greater than ~5%. Therefore, a subsequent drying process is necessary. For this application, vacuum drying and cooling is most efficient.

In using the DVT Polyphase® Reactor for drying cocoa from ~20% moisture or higher to ~5% moisture:

- A. Charge the wet cocoa (if the drying is done directly after alkalization the wet cocoa is already in the unit) to a cool reactor. Start heat flow on jacket, begin drawing vacuum, start plows and start choppers.
- B. Continue drying under a ~28" Hg vacuum.
- C. Cool product then discharge.

Graph C shows a typical drying cycle in a DVT Polyphase® Reactor.



The Littleford DVT Polyphase® Reactor can be enhanced with an optional Littleford Pulse Back Filter to effectively handle the vapor stream created during drying. The Littleford Pulse Back Filter is used to filter the vapor stream from the Dryer in order to prevent product carry-over into the condenser. The filter housing is heated slightly higher than the dew point of the vapor, thus preventing condensation. Filter bags of proper porosity are mounted over stainless steel cages and can easily be removed through the removable top section of the filter housing. A pneumatic pulse jet system (using air, N₂ or another suitable gas) provides continuous automatic bag cleaning through a venturi at the top of the bag. Since this pneumatic shockwave clears only one row of bags at a time, there is no interruption of vapor flow through the filter. This provides a continuously operating dust control system during drying.

Littleford Day
Where Processing Ideas Become Reality

Littleford Day, Inc.

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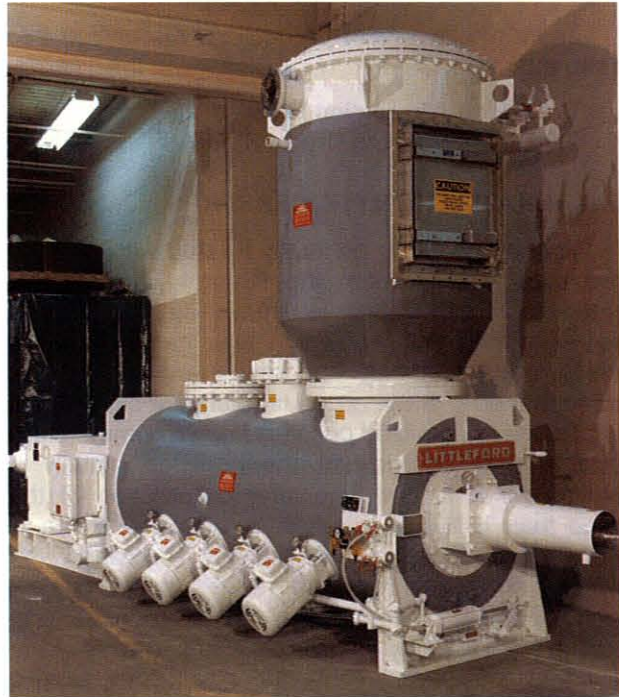
We have found that the advanced Littleford process will result in:

1. Controlled alkalized drying through effective / optimum heat transfer.
2. Improved alkalization
3. Increased efficiencies of alkalization.
4. Efficient single unit processing of the entire process.

The Littleford Reactor enables the processor to produce an excellent, dried product with the desired pH and color.

The Littleford DVT Polyphase® Reactor is designed and constructed according to "GMP" and to meet or exceed FDA, 3A, USDA, compliance as specified by the customer.

This proven Littleford technology has been applied to numerous complex and difficult applications in the Food, Pharmaceutical, Nutraceutical and Biotechnical Industries. Littleford DVT Polyphase® Reactors are offered in a variety of sizes to meet most production requirements. Littleford can interface its system controls with existing equipment or supply fully automated process control systems.



For a free brochure or a detailed discussion, contact us at:

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