Dosing and Mixing Principles

Key Operating Conditions

1. Sugar particle size
2. Liquor fat content
3. Milk powder fat content and type

Key Operating Results

1. Target mixing fat
2. Chocolate temperature

Dosing

The dosing system delivers the raw ingredients to the mixer in a precise way. Each recipe will have a **target mixing fat** that will vary from recipe to recipe. The milk powder fat content and type will affect the amount of mixing fat needed. The goal is to have a chocolate mixture in the mixer with the correct mixing fat, which will allow for correct roll refining processes.

Accurate dosing is critical! Incorrect dosing will cause poor chocolate plasticity coming off the 2-roll refiner, and incorrect fineness coming off the 5-Roll refiner.

Mixing

The purpose of the mixer is to:

- Uniformly combine the raw ingredients.
- Coat the dry raw ingredients with fat.
- Adjust the chocolate temperature to 40C (104F).

The required amount of chocolate mixing fat is set to provide enough liquid fat to properly coat all the dry raw ingredient particles. Natural variation in sugar particle size & liquor fat content may require changes in the amount of fat added to the mixer to ensure all dry ingredients are coated.

The chocolate temperature must be 38-40 °C (100-104 °F). For cocoa butter-based chocolates, if the temperature is lower than 38C (100F) the fat could solidify and no longer function as a proper coating for the dry ingredients. This will cause problems as the chocolate is roll refined.

Equipment

Operators are the first line of defense in maintaining equipment! Observations made while operating equipment during a normal shift can help determine operational issues before they become major problems or cause catastrophic failures.

Pumps

In chocolate and compound production, moving products is essential. Moving products through a plant can be compared to the digestive and circulatory systems of our body. To achieve the end goal, we have to move solids, liquids, and gases.

Moving low moisture solids is accomplished by conveyors, blowers, rotary airlocks, and other equipment. **Moving slurries and liquids** is accomplished by using various pumps and piping.

Sometimes gravity can be used to move fluids, but most of the time pumps are needed to move liquid through the refining line. The majority of the pumps used in chocolate manufacturing are positive displacement (PD) pumps, but centrifugal pumps are also used.

Dynamic pumps, such as centrifugal pumps, move products mechanically using a propeller or impeller. **Positive displacement pumps** can also be driven mechanically, or they can move products using air or water pressure.

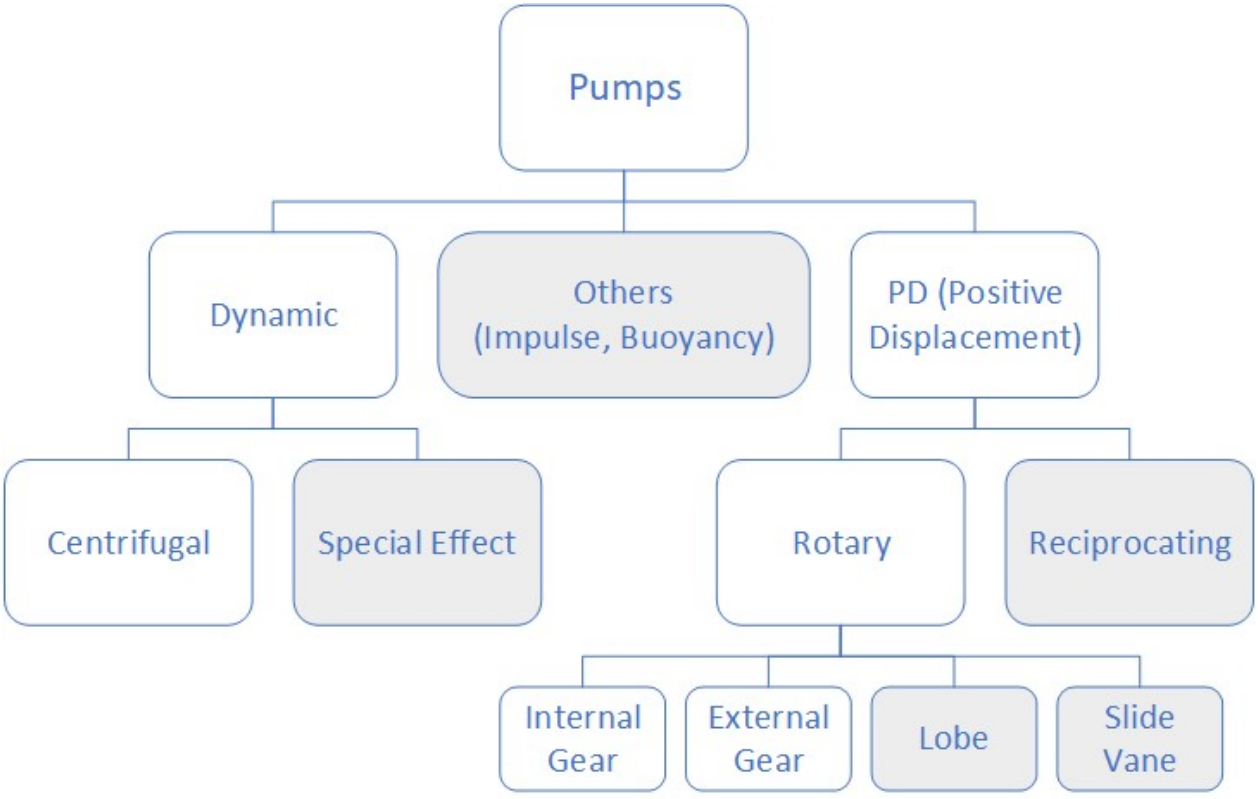

Figure 26. Diagram of pump categories and subcategories. Pumps that are grayed out are not discussed in this document.

Tempering and Moulding Process Flow

1. After chocolate has completed the refining process, it is stored in moulding storage tanks.
2. From the moulding storage tank, it is pumped into an intermediate holding tank called a pre-temper tank.
3. Next, the chocolate is pumped from the pre-temper tank through a tempering unit to start the tempering (crystallization) process.
4. The tempered chocolate is then sent to the depositor, where it is moulded into the correct product shape (e.g., drops, chunks or bars) onto a steel belt or into a mould.
5. Next it is cooled in the cooling tunnel for a set amount of time, before being sent to final packaging.
6. Any chocolate that is not sent to the depositor is redirected to a decrystallizer to melt the crystals down. It then flows back to the Pre-Temper Tank for reuse.

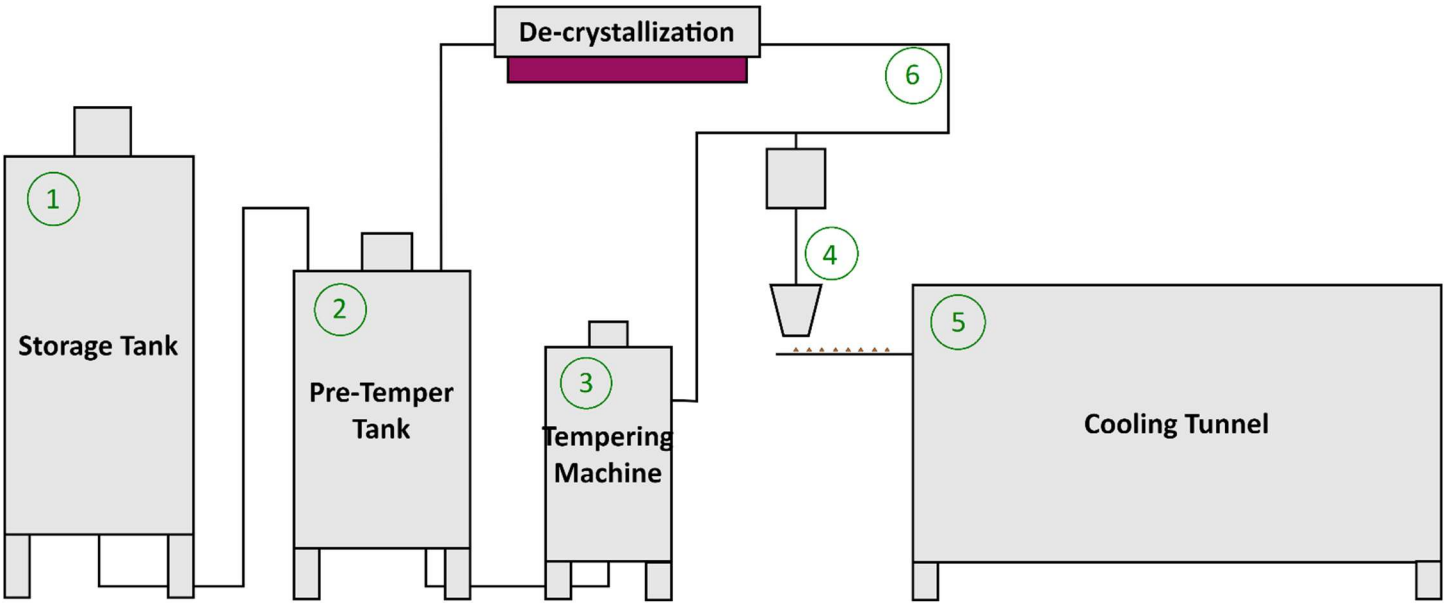

Figure 1. The chocolate tempering and moulding process flow.

Moulding Lines

A moulding line is a grouping of all the parts of the tempering and moulding process: storage tank, pre-temper tank, tempering machine, depositor, decrystallizer, and cooling tunnel. Each facility has several moulding lines, and each line typically specializes in certain types of moulding. You will learn to operate each of these lines.

Feed Pump Speed

The feed pump sends the tempered chocolate from the tempering unit to the depositor. The pump speed should be fast enough to make sure that the hopper of the depositor stays full, with a minimum amount of chocolate being sent to the decrystallization unit.

2.4 Products

Chocolate and other compound products can be moulded into drops, chunks, wafers or bars. Drops, chunks and wafers are deposited onto a steel belt, while blocks are deposited into a mould to create a variety of shapes, sizes and designs.

2.4.1 Drops, Chunks and Wafers

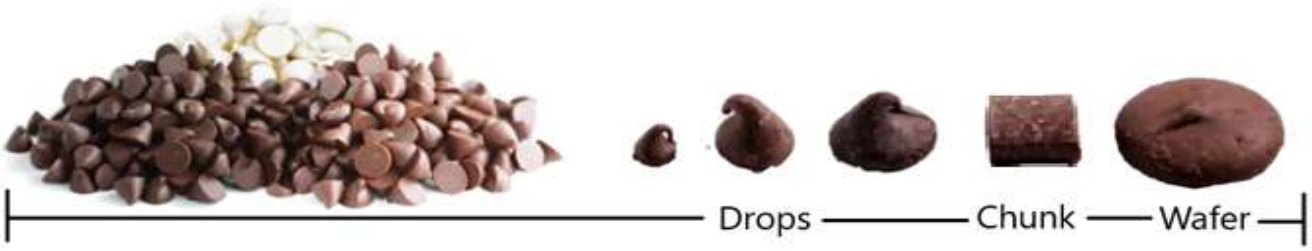

Figure 2-2. Chocolate chips, chunks, and wafers of varying colors, shapes, and sizes. (Aasted, p. 13)

By changing plates on drop depositors or adjusting parameters such as suck-back, piston length, and lift table height, operators can modify:

- Size of drop
- Length of tail
- Curl of tail
- Height of drop
- Diameter of drop

Drops, chunks, and wafers are measured in “chips per pound.” In the image below, the 1M, 2M, 3M etc. refer to the count per pound for that particular chip size; 1M = 1000 count = 1,000 chips per pound.

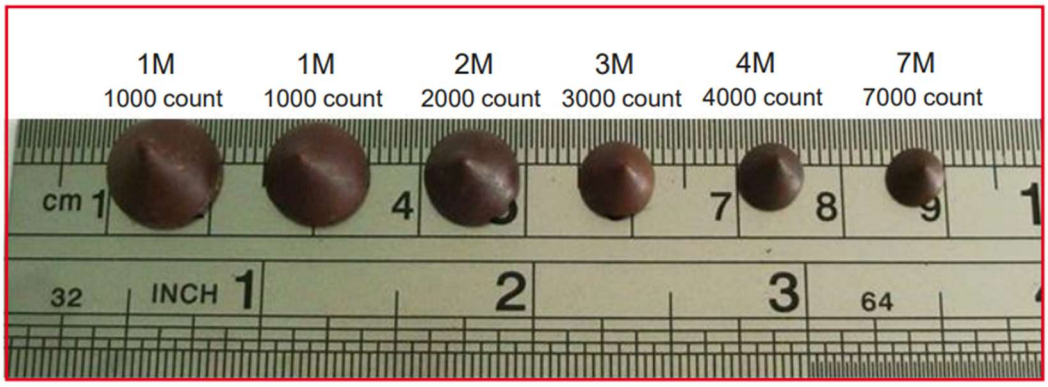

Figure 2-3. Various sizes of drops on a ruler with their corresponding “chips per pound” drop count labeled above. (Aasted, p. 14)

2.4.2 Blocks

Chocolate, compound products and liquor bars are typically moulded in polycarbonate moulds because polycarbonate moulds have heat transfer characteristics similar to chocolate.