9 Syrup Making — The Heart of the Process

THE SYRUP PROPORTIONING SYSTEM

Syrup-to-water proportioning is mainly used in the carbonated soft drinks industry.

This chapter deals with the subject of the syrup-making stage in soft drink manufacture. It, therefore, ostensibly deals only with those final beverage-filling operations in which prepre-pared concentrated syrup of the product is blended, at the filling machine, with treated water in a prescribed water-to-syrup ratio.

This blending operation is effected by a piece of equipment called a syrup proportioner (or blender). It may vary in design, from a simple pump with a manually adjustable piston stroke to very sophisticated units consisting of computerized flow rate regulators. Whatever the design, the principle is the same. The flow is set to deliver the prescribed amount of syrup to that of the treated water. The resulting water and syrup blend is then thoroughly mixed in-line on a continuous basis, is carbonated, and is delivered to the filler bowl for packaging into bottles or cans. This system, in which concentrated syrup is first produced and thereafter mixed with treated water at the filling point, has always been, and still is, the main one used in the carbonated soft drinks industry.

I visited many carbonated soft drink operations, big and small, all over the world. Most, if not all, produce their products in this manner. On the other hand, with the exception of the larger international soft drink corporations, I have not come across many smaller still beverage manufac-turers that use the syrup proportioning system for their final beverage products. Such manufacturers prepare their final beverages in tank batches of bulk final beverage in ready-to-drink (RTD) form, which is then delivered to the filling machines for final product packaging. I will return to this subject of syrup versus bulk RTD a little later in this chapter.

It would seem that this chapter is only applicable to carbonated soft drink manufacture. This is not altogether true, because when preparing RTD noncarbonated beverages, a syrup-making stage of sorts is still involved. Concentrated syrup is first made up in a tank and then diluted with treated water in the same tank to final batch volume at a specified final beverage Brix. The reader is requested to bear in mind that though the focus of this chapter is on carbonated soft drinks, much of the subject matter is applicable to bulk preparation of RTD still beverages as well.

WHY IS SYRUP PROPORTIONING USED?

Syrup proportioning may well have its roots in early soft drink history.

This question can be answered in two ways, depending on how one looks at the question. If the question is really asking why this system is, in particular, used for carbonated soft drinks, I have a theory that may serve as an explanation for this.

Mass production of soft drinks in bottles copied the way the beverages were prepared at the drugstore soda fountain.

Historically, carbonated soft drinks developed in the late 19th century in the American drugstores, where people could find refreshing drinks made from diversely flavored syrups dispensed and mixed into glasses of carbonated water (see the "Introduction" of this handbook). These drinks were known as the "soda fountain" beverages that became a rage in the U.S. Some drugstore owners saw the business opportunities involved and began supplying the customers

with the drinks manually filled into bottles so that they could be taken away for drinking at home. Proving to be a great success, some entrepreneurs recognized the business potential in mass producing the bottled beverages in factories. Thus, the first bottling plants came into being.

My theory is that when the machinery and processes were designed for these first bottling plants, the designers copied the ways the beverages were prepared in drugstores. A small amount of concentrated syrup was dispensed into a bottle, carbonated water was added, the bottle was capped, and the liquid was mixed by shaking or inverting the filled bottle a few times. Not only was copying the manual drugstore process the logical and reasonable thing to do, but also processes and equipment to prepare and fill carbonated RTD final beverage into bottles did not exist at the time, even if someone had thought about going that way in mass producing the drinks.

Syrup making became the standard process for carbonated beverage production. Even as gradually more sophisticated machinery and processes developed, the syrup-making stage remained an integral but separate part of the production sequence on which basis these new processes and equipment were designed. This principle has lasted to this present day, and most of the modern, highly sophisticated carbonated beverage filling equipment is still designed on the syrup propor- tioning principle.

This was one way to answer the original question of why syrup making and proportioning it with water at the filler is found in carbonated soft drink operations only. Obviously, if there were no advantages in this system historically, it would have been abandoned for the RTD beverage filling system. Before dealing with these advantages, I ask for the reader's indulgence for my going into a little more history of the carbonated soft drinks industry development related to syrup-making aspects.

SYRUP-MAKING TECHNIQUE

In order to standardize the terminology used in this chapter and to address some primary premises on which this chapter is based, the following items need to be clarified:

- The syrups discussed in this chapter, unless specifically indicated otherwise, refer to those prepared with the natural sweetener sucrose alone (cane sugar or beet sugar). This is not to say that syrup making with other natural sweeteners, such as high-fructose corn syrup (HFCS) or invert sugar, is vastly different. The differences in operational aspects are virtually the same, but I wish to avoid falling into scientific inaccuracy traps by not distinguishing between some of the subtle technical differences between sucrose and these other natural sweeteners that may exist when they are used in syrup making.
  - Sucrose will be referred to as "sugar" for the simple reason that this is how the operators on the floor of the bottling or canning plant commonly call it. There is no need to always use the chemical notation for this sweetener.
- Syrup making in this chapter refers to the operation that takes place on-site in a carbonated beverage manufacturing facility. It does not refer to the operation in an outsourced syrup manufacturing facility from which the syrup is delivered in bulk to the beverage factory by tanker. Though in principle these should be similar operations, this chapter focuses on the in-house syrup making of a regular carbonated beverage bottling plant.
- The site in the bottling plant in which all syrup making is carried out will be referred to as the "syrup room" (even though in some larger carbonated soft drink operations this can be more of a "hall" than a "room").

General Process Outline

Simple syrup preparation.

Figure 9.1, a simplistic schematic representation of the syrup-making process, outlines the standard syrup-room equipment and process flow of the system. A measured amount of treated water is pumped into the tank (1), and the agitator is started. The prescribed amount of sugar is added to the treated water and allowed to mix in the water for some time, until it is completely dispersed and dissolved in the water. The resultant sugar solution is commonly called "simple syrup" and will be referred to as such in this handbook.

The simple syrup is then pumped through a polishing filter (2) to a second tank (3). Filtering the simple syrup through the polishing filter is a standard requirement aimed at removing any foreign matter, such as black carbonized specks that are commonly found in even the best grades of sugar. The pore size required of the polishing filter depends on the general quality of sugar used and is usually in the 5 to 20 µm range.

Adding the beverage base ingredients.

To the transferred filtered simple syrup in a second tank, the other beverage formulation ingredients are added in a prescribed manner and sequential order. The total complement of formulation ingredients, excluding the sugar (and the carbon dioxide gas later added at the filling machine), form what will be called the "beverage base" for that particular formulation.

Topping up to final volume with treated water.

The beverage base ingredients are mixed well into the simple syrup by the tank agitator until they are completely dissolved or dispersed in the syrup. The agitator is then stopped, and more treated water is added to bring the total liquid quantity in the tank up to the final volume prescribed for the syrup batch. This volume determination can be performed by using a calibrated dipstick or sight glass. (Load cells can also be used if such a luxury can be justified and afforded.)

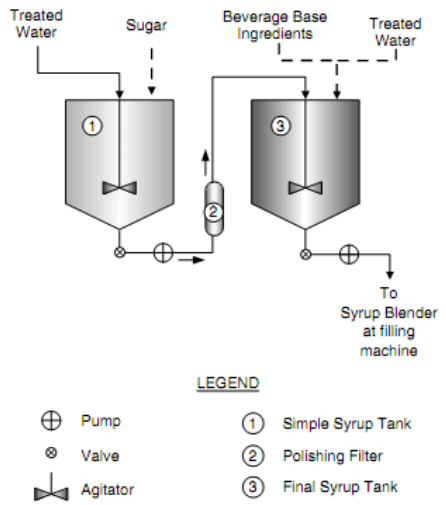

FIGURE 9.1 The standard syrup-making process.

Deaeration and final quality control testing are conducted before releasing for filling.

After topping up with the treated water to the final batch size volume, the agitator is restarted, and the syrup is mixed for approximately 10 to 15 min. The agitator is stopped, and the syrup is allowed to deaerate for 1 to 2 h. At this stage, the syrup can be referred to as final syrup, as it now contains all the

required components and is at the prescribed volume for the batch. It is ready for use in filling at the bottling line, provided, of course, that it passed all the required quality control (QC) tests.

This operation of final syrup preparation was referred to in the title of the chapter as the “heart” of the overall carbonated soft drink manufacturing process. I called it so, because it is in this final syrup preparation stage where all of the beverage’s key components are measured out, added, and mixed into the syrup in the correct manner. It is the stage in which the prescribed quality parameters for the final beverage are built into the product and checked for conformity. Well-prepared final syrup will offer the filling line no problems in filling final beverage as far as can be related to syrup quality. Good final syrup will make a good final product. The final syrup can be likened to a cake mix. A cake will flop, regardless of correct oven conditions, if the cake mix was not prepared correctly.