Restaurant Facility Management Association

Facilitator — June / July 2011

Don't Lose Your Fizz!

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the old phrase, "Out of sight, out of mind," applies to many things, including—surprisingly—restaurant fountain systems.

Usually the units are so reliable that we tend to ignore them, which is unfortunate since fountain drinks are one of the highestgrossing profit items in a restaurant. It is truly quite amazing the number of flavors that can be concocted from syrup, water and carbon dioxide. While this mix percentage may be miniscule in a fine-dining establishment, the gross profit contribution in a quick-service operation is an important driver of profitability.

In order to understand the process, let's take a look under the hood.

The Basics of Carbination

Soda water, carbonated water or bubbling water—whatever you wish to call it—was discovered by inhabitants of areas with naturally carbonated springs, such as the Perrier Spring in France. It was Joseph Priestly in 1767 who invented a process to carbonate water in a way that has made our current soft drink industry possible.

That mysterious tank on the wall above the syrup rack or under the fountain is the engine that drives the process. Typically, there is a motor, a Procon pump and the ubiquitous tank. I think we have all, at some point in time, listened for the carbonator to come on when chasing down a fl at-drink complaint. But, in actuality, the carbonator itself is largely silent and modern units have no moving parts.

The sound that we hear is the motor that pumps water into the tank. In a simple carbonator set up, we have a potable water source hooked up to the pump on the motor. We need that motor and pump because normal water pressure is between 40 and 80 psi. Within the tank we have a spray head, a dip tube and a water-level sensor. We also have a carbon dioxide line connected to the tank. The pressure of carbon dioxide in the tank is on the order of 100 psi, so we need a motor and pump that will raise the water pressure high enough to induce a flow into the carbonator tank.

The motor and pump also serve to improve the flow rate of water for high-volume fountain heads to enable the use of small-diameter tubing, rather than copper, to move the carbonated water to the fountain. CO_2 and copper react to form copper sulfate, which is poisonous.

Within the tank, the level sensor turns the motor on and off to keep the tank half full of water. The area of the tank above the liquid is filled with high-pressure carbon dioxide. The outlet for the water line has a spray head attached to it in order to break the water stream into small droplets that enter the tank. Breaking the water into droplets gives the water more surface area as it descends to the liquid level and allows the water to absorb carbon dioxide almost instantly. The high pressure within the tank and the saturated carbon dioxide in the air space keep the carbon dioxide from leaving solution in the water.

The outlet for carbonated water is usually on the top of the tank. A dip tube extends from the connector down to very near the bottom of the tank so that the outlet flows only carbonated water and not carbon dioxide or a mixture of the two.

What happens when a guest depresses the dispense lever? Since the whole system is under pressure, opening the valve causes carbonated water to flow from the carbonator tank. Once the level of the liquid in the tank falls to a predetermined level, the level sensor sends power to the motor, which turns the pump and forces water into the tank by overcoming the carbon dioxide pressure within the tank. The motor runs until dispensing stops and the liquid level once again rises to the set point.

Syrupy Sweet

Pure carbonated water tastes pretty nasty. We need the other side of the equation before we have a proper fountain drink: the syrup system.

My first non-consumer exposure to fountain systems came via a stint as a manager for Burger King Corp. At that time, in the early 1970s, we used 1-gallon cartons of syrup and 5-gallon stainless-steel canisters to feed the dispensers, along with 50-pound bottles of high-pressure CO_2.

The process to add syrup was this: Disconnect the CO_2 line, bleed the pressure from the tank, remove the lid of the tank, pour in syrup, replace the lid and replace the CO_2 line. At that time, Burger King had sesame seed buns. The sesame seeds got everywhere, including inside the tanks, which played havoc with the syrup orifices in the dispenser heads.

The "good old days" were not so good, at least in regard to fountain systems. Long live bag-and-box systems.

A Better Way

While some large venues, such as sports arenas, can have some truly gargantuan fountain systems, the modern restaurant typically uses the bag-and-box system. In this system, the different flavors come inside a plastic-lined cardboard box. These disposable containers commonly use CO_2-powered pumps to move the syrup through the lines and out to the dispenser, though some use a small wall-mounted air compressor to power these pumps. It saves CO_2 but adds another failure point to the system. An empty bagand- box will cause the syrup pump to cycle, which is a good way to run up your CO_2 costs.

At the dispenser, we have some very important parts of the system, some of which are often overlooked. When the syrup and water enter the dispenser, they pass through a cold plate. This is a vital part of the system that many do not know exists. Unlike a solid such as sugar, which easily dissolves in warmer water, CO_2 and other gases stay in solution and dissolve better in colder water.

The two most common systems for keeping the cold plate cold are to place it at the bottom of the ice bin or in a water bath that is cooled by a separate compressor and cooling system. From the cold plate, the syrup and water fl ow to the dispensing heads.

The syrup travels in dedicated lines to each head. The carbonated water commonly flows in a single line to a distribution manifold where it splits off to the individual heads.

When the solenoids in the head open the water and syrup valves, the water and syrup flow through the diffuser, into the nozzle and into the customer's cup. While most of the system is sealed and does not need frequent cleaning or maintenance, the diffusers and nozzles require daily cleaning and sanitation. You wouldn't want to see an algae "beard" on the diffuser as I have observed at an unnamed convenience store chain.

Getting it Right

Chasing an "off" flavor can be a truly maddening adventure. One thing to keep in mind is the psychology of off tastes. Once someone says, "Here, taste this. Does it taste right to you?" the die has been cast. The second person (and the third, fourth and so on) detects the off taste too.

Blind taste tests of fountain drinks from an independent source are the only true way to determine if an off taste exists.

If you do indeed have an off taste, these are the areas to check.

Single flavor with an off taste?

The syrup, syrup line and the offending head are the only sources. Change the syrup box and purge the system by depressing the lever and letting the soft drink flow for a minute or two. If there has been a recent change in the lineup of the flavors on the dispenser, the installer may have used an existing line with the new flavor. Some flavors, especially root beer, can permeate the line and impart an off taste to the current flavor. It is always best to install new syrup lines with any new flavor.

Fluctuations in brix can cause the drink to drift from the proper taste profile. Brix is the measure of dissolved solids in a solution and is measured in degrees. In the soft drink industry, the term has evolved to mean the proportion of syrup to water. The old standard was five parts water to one part syrup for sugared syrups, but this varies by product. Always use the manufacturers' stated proportion.

We can measure the real brix with a refractometer; however, the industry commonly uses a separator and a brix cup to check and set the proportions. The separator is placed on the dispenser head in place of the diffuser. It separates the flow of carbonated water and syrup so that each flows into the two compartments of the brix cup. The graduations on the brix cup let us check for the proper proportion.

Multiple flavors with an off taste?
Look to the water and ice. Both the water entering the carbonator and the water feeding the ice machine should be filtered. If not, add filters or change the existing filters. Examine the ice machine for foreign materials, cleanliness and sanitation. Don't forget to check the ice bin. You would be surprised what can grow on the bottom of an ice bin.

Don't forget to check the CO2 source as it is common to all the drinks. Make certain that the CO2 source is food-grade CO2 and not industrial CO2.

Flat drinks can also sometimes be misreported as an off taste. If the drinks lack proper carbonation, check the CO2 supply. Is there excessive foaming when the drink hits the ice in the cup? If so, check the cold plate. Is there ice in the bin? Have the warm water and syrup caused an ice bridge to form in the ice bin that prevents ice contact with the cold plate? Is the cooling system for the water bath off or inoperative?

As I mentioned earlier, a cold liquid helps CO2 to stay in solution. Even if the water is properly carbonated, when warm product hits the cold ice in the cup, much of the CO2 is shocked out of the solution.

Next, check the carbonator for flooding. Flooding occurs when the carbonator fills with water, restricting the air space above the water level. This can happen if the pressure of the CO2 falls, allowing the water to flow into the carbonator without the aid of the pump. The fix is simple: Restore CO2 pressure, cut off the water to the carbonator and open a dispensing valve until the carbonator pump kicks on again. Then restore the water supply.

Carbonators commonly have RPZ valves on the supply water line to prevent carbonated water from back flowing into the copper lines. Older systems might still rely on a double-check valve mounted on the carbonator to prevent backflow. Failure of double-check valves is rare but possible.

Many years ago, I was puzzled by a faucet in a restroom that would emit a short hiss upon opening the valve and before the water began to flow. I finally tracked it to a failed double-check on the carbonator that was allowing carbonated water into the potable water line. When the faucet had not been used in a while, CO2 gas would leave the solution and form a pocket in the valve.

Line By Line
While usually trouble-free, there are certain issues that can occur with the syrup and carbonated water lines that run from the bag-and-box area to the dispenser. By and large, the industry uses plastic lines as they have the lowest initial cost for materials and installation. Stainless- steel lines are the type against which all other options are measured, but the cost can be prohibitive. That said, I don't remember ever having an issue with properly installed stainless-steel lines. Plastic, on the other hand, can lead to several issues.

I've had to replace plastic lines due to vermin chewing into them. Sometimes the inner lining can leak and you can observe "blisters" of syrup within the outer cover, which indicates that a major syrup leak is very near. Lastly, the syrup lines are often run through an overhead or under-slab chase. The under-slab chases are especially problematic as leaks can go undetected for some time. The chase can also become flooded and contaminate the lines over time. You really haven't lived until you have to vacuum the muck out of a chase that has been flooded by slowly leaking lines. The odor is—to put it delicately—memorable.

This basic understanding of soft drink dispensing systems will enable you to discuss your system intelligently with your soft drink rep or to restore your system with a shorter downtime when there is a problem. An additional benefit is your newfound ability to impress the operations folks with your all-encompassing knowledge of all things regarding restaurant facilities. And you may even find that you now know the answers to some of the questions on the CRFP exam.

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