Cornelius Service Training Series

Basic Post-mix Beverage Unit

Creating A Quality Drink:

- Chp. 1 Water
- Chp. 2 Syrup
- Chp. 3 CO_2

Dispensing A Quality Drink:

- Chp. 4 Temperature
- Chp. 5 Carbonation
- Chp. 6 Water To Syrup Ratio

Maintaining A Quality Drink

- Chp. 7 Ice
- Chp. 8 Containers
- Chp. 9 Maintenance

Cornelius Service Training Series
Basic Beverage Unit

The information and instructions in this manual are subject to change without notice. This information is not intended to cover all details or variations of the equipment and circumstances that you may encounter.

This manual assumes that any person(s) working on equipment has been trained and are skilled in working with electrical, plumbing, pneumatic, and mechanical equipment. Appropriate safety precautions must be taken and all local safety and construction requirements met.

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Basic Beverage Unit
Creating A Quality Drink, Lesson 1

WATER QUALITY

Introduction

As a service technician of beverage dispensing equipment, understanding how water affects the quality of a beverage will make your job easier and more rewarding. After completing this lesson on Water Quality, you will have a better appreciation for a major ingredient in beverages.

Preview Questions

Check your current knowledge by taking a few minutes to answer the following questions:

1. Approximately what percentage of a beverage is water? _____

2. What is the major complaint concerning chlorinated water systems? _____

   _____

3. Name one problem caused by poor water quality. _____

   _____

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Lesson

Study the following material about Water Quality and answer the questions in the Review section. These questions summarize the most important points in this lesson.

Water Quality

The majority of beverages contain about 83% water. Poor quality water can spoil your beverage and cost you valuable customers.

Post–mix beverages use local water that is carbonated and then mixed with top quality flavorings to produce the finished drink. However, top quality flavorings cannot hide poor water quality!

☞ Remember: *Poor drink quality results in dissatisfied customers.*

approx. 83% water

Water Quality & Dispensing Valves

Water quality issues have an affect on dispensing valves. Chloramine, a combination of chlorine and ammonia is responsible for some degradation of rubber components. Chloramine is used in many U. S. water supplies. Its affects can be minimized by installing and maintaining a water filtration system.

Water Safety

Just think: 99% of all treated city water is used for utilitarian purposes like flushing toilets and watering lawns. Only 1% of city water is consumed.

Municipal water departments treat water with chloramine to make it potable (safe for drinking). Most water departments however do not filter or deodorize the water to any significant degree because of the cost. Therefore, the water may be safe to drink but it may be less than desirable for making beverages.

Softened Water

Total hardness is a measure of dissolved minerals (mainly calcium and magnesium) in the water. Hardness is measured in grains per gallon. A grain is 0.002285 ounce (0.065 gram).

Water softeners are very common. Depending on the building plumbing, soft water may be the only water available for use with the beverage system.

Water Filters

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Soft water has a pH that is usually too low (less than 7.0) to be suitable for carbonation. Therefore it is necessary to avoid soft water.

Chlorination Basics

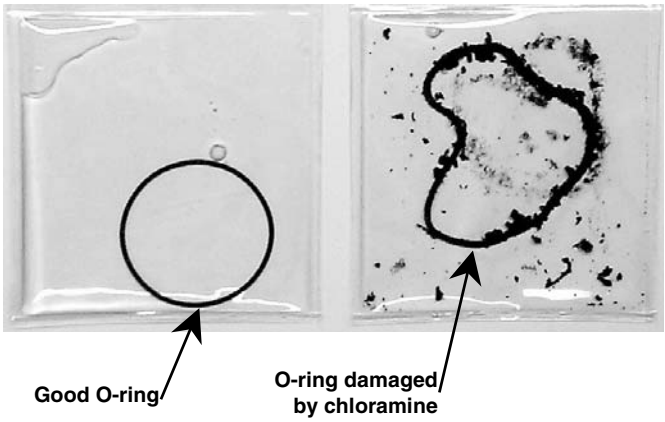
Chloramine is a commonly used disinfectant because it is effective and inexpensive.

- A common source of chloramine is sodium hypochlorite. Liquid bleach (laundry bleach: Clorox, Purex, etc.) contains a 5.25% active chloramine.
- Chloramine in water solution is measured in parts per million (ppm).
- Although chloramine will “oxidize” (kill) the organisms in the water, it will not remove them.
- Chloramine can leave a distinctive odor to the water that it purifies.

Chloramine and Equipment

Equipment components exposed to high concentration chloramine for long periods may be damaged.

- Stainless Steel cooling coils can be etched by chloramine resulting in off tastes.
- Plastic fittings, tubing and other components that are exposed to chloramine can become brittle and eventually crack causing leaks.
- The life of rubber parts such as O–rings can be shortened from prolonged exposure to chloramine.



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Chloramine and Beverages

There are three major ways that beverages are affected by chemicals used to make the water safe:

- Chloramine gives off an unpleasant taste and odor. This is a common objection to using chloramine in water supplies. Since beverages are 83% water, the taste of the drink changes significantly depending on the quality of the water.
- High levels of chloramine react with beverage ingredients diminishing flavors.
- High levels of chloramine can flatten carbonation requiring more CO_2 to compensate.

Economics of Water Quality

Poor water quality can cause many problems. Some of the problems are:

- Increased service calls because of component failure resulting in leaks, off taste, etc.
- Beverages that don't taste good resulting in lost sales.
- Lost sales equals lost customers resulting in lost market share.

☞ Lost revenue (lost customers) and increased costs through additional service calls.

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Review

1. What percentage of every beverage is water?_____
2. What do most municipal water treatment plants use to make water safe? _____
   _____
3. What percentage of all municipal water is used for drinking? _____
4. What unit of measurement is used to measure water hardness?_____
5. Why is chloramine a common disinfectant?_____
   _____
6. Since chloramine does not remove the impurities in water, what does it do? _____
   _____
7. What is a common objection to chloramine? _____
8. Name several components in a beverage system that can be damaged by high concentrations of chloramine._____
9. What effect does chloramine have on carbonation?_____
10. Name three problems resulting from poor water quality._____
    _____

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Basic Beverage Unit
Creating A Quality Drink, Lesson 2

SYRUP

Introduction

It is important to understand syrup and its importance to the quality of a beverage. After completing this lesson on Syrup, you will have a better appreciation for this major ingredient in beverages.

Preview Questions

Check your current knowledge by taking a few minutes to answer the following questions:

1. What affects the thickness (viscosity) of syrup? _____
2. Name one type of syrup container. _____
3. What are the ingredients of a beverage? _____

_____

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SYRUP

Lesson

Study the following material about Syrup and answer the questions in the Review section. These questions summarize the most important points in this lesson.

Ingredients

Every post-mix drink consists of carbonated or plain water and syrup. Although syrup is less than 1/5 of the total drink volume, it is an important ingredient because it contains the flavoring and the sweetener.

Diet or Sugar Syrup

Diet: Syrup without sugar is referred to as diet syrup. It is sweetened with an artificial sweetener.

Sugar: Syrup sweetened with sugar and/or high fructose corn syrup.

Syrup Viscosity

Viscosity refers to thickness or resistance to flow. For example: Molasses is highly viscous and pours (flows) slowly.

Sugar syrup is viscous (thick) because of the sugar content. The degree of viscosity varies by flavor and by brand. Diet syrup has a much lower viscosity because of the lack of sugar.

When syrup is cooled it becomes more viscous and more resistant to flow. Preservatives used in fruit flavored syrups increase viscosity and can cause deposits to form on the inside of the stainless steel cooling coils.

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Syrup Containers – Tanks

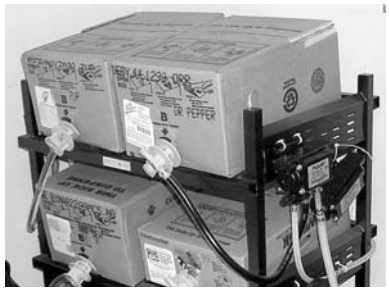
Syrup Tanks

Syrup can be supplied in stainless steel tanks. The tanks typically hold five gallons of syrup, although this may vary. Stainless steel syrup tanks are reusable. They are filled by the syrup supplier and delivered to the account. When the tank is empty, it is returned to the syrup supplier to be washed, sanitized and refilled.

Syrup tanks are pressurized to deliver the syrup to the cooling unit and the post-mix valves. Because of its viscosity, sugar syrup must be pressurized at a higher pressure than diet syrup. Diet syrup must be pressurized at a lower pressure.

It is important to keep the pressure on the tank as low as possible so the syrup does not absorb CO_2 and carbonate. This is especially true for diet syrup, which carbonates easily.

Syrup Containers – Bag-In-Box


Bag-In-Boxes on racks

The bag-in-box (BIB) is a one-way container. When this container is empty, it is discarded.

The syrup is contained in a bag that has a fitting for a disconnect. The bag is housed in a triple wall corrugated cardboard box. Hence the name bag-in-box.

The BIB is available in 5-gallon and 2.5-gallon sizes.

The syrup is pumped out of the bag by a gas operated pump. As the syrup is pumped from the bag it collapses. Because the CO_2 never comes in contact with the syrup, it does not become carbonated. This is especially beneficial with diet syrup since it can carbonate easily.

SYRUP

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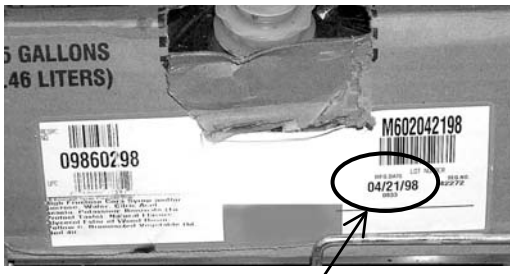
SYRUP

Syrup Date Codes

All tank and BIB syrup containers are date coded.



Date Code

The containers usually have the “use before” date stamped on them. In the case of tanks the date is usually on a tag attached to the tank.

Because syrup has a specific shelf life, it is important that the oldest syrup be used first. Any syrup that is beyond the acceptable life for the product should be returned to the supplier. Diet syrup with artificial sweetener is most susceptible to spoilage.

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Review

1. What are the components of a quality beverage? _____
   _____
2. Viscosity is _____
3. Sugar syrup is sweetened with _____
4. Diet syrup is sweetened with _____
5. Why are syrup containers date coded? _____
6. What are the two types of syrup container? _____ and _____
7. _____ is used to propel syrup from a stainless steel tank.
8. A BIB pump is operated by? _____
9. What affects viscosity? _____

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Basic Beverage Unit
Creating A Quality Drink, Lesson 3

CARBON DIOXIDE (CO_2)

Introduction

When you have completed this lesson on carbon dioxide you will have a good understanding of the importance of this ingredient in every beverage.

High pressure cylinders

Bulk cylinders

Preview Questions

Check your current knowledge by taking a few minutes to answer the following questions:

1. What are the most common sizes of high pressure CO_2 cylinders? _____

   _____

2. High pressure CO_2 cylinders must be inspected every _____ years.

3. What agency regulates CO_2 cylinders? _____

4. CO_2 is used to _____ water and _____ syrup.

5. High pressure CO_2 cylinders are always filled by _____.

6. Low pressure CO_2 cylinders are often called _____.

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Lesson

Study the following material about CO_2 and answer the questions in the Review section. These questions summarize the most important points in this lesson.

Carbon Dioxide (CO_2) is a heavier than air, colorless, odorless gas that is not combustible.

In the beverage world CO_2 is used primarily to carbonate water, but it is also used to propel syrup through the system tubing. It sometimes is used to operate pneumatic components like pumps.

CO_2 Storage

CO_2 can be stored in high pressure cylinders that typically contain 10, 20, or 50 pounds of CO_2. These cylinders are made of aluminum or steel and have a valve at the outlet. The valve has a rupture disk that protects against over–pressure conditions. CO_2 cylinders can be returned for refilling.

High pressure cylinders

Bulk cylinders

CO_2 can also be stored in low pressure cylinders that are made of stainless steel and are thermally insulated. These containers typically hold 200 or 400 pounds of CO_2. The low pressure bulk cylinders are permanently installed and are refilled on site.

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CO_2 Problems

Cutaway of cylinder with carbonic acid etching

Moisture that gets into a CO_2 cylinder creates problems. The most serious of these problems is the formation of carbonic acid. When moisture enters the cylinder and comes in contact with CO_2, carbonic acid is formed and damage can occur to the cylinder walls. Carbonic acid is present in carbonated water but in that case the concentration is very weak.

Avoid any situation that allows moisture or oil to get into the cylinder. Other lessons cover proper cylinder handling techniques. Besides cylinder damage these contaminants also cause off taste problems that can be difficult to diagnose.

Cylinder Control

CO_2 cylinders are controlled by the Federal Department of Transportation (DOT). Any person filling cylinders must be familiar with the laws applying to CO_2 cylinders. Any person testing cylinders must be certified by the DOT.

Cylinders should be inspected every five years.

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High Pressure Cylinders

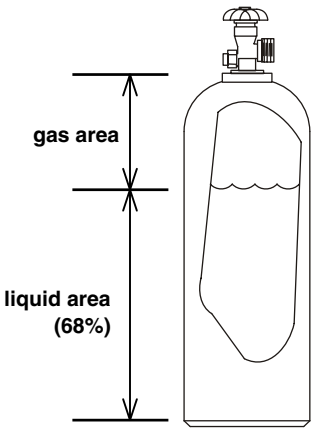
Common high pressure cylinders are 20- and 50-pound cylinders.

A 20-pound CO_2 cylinder is designed to hold 20 pounds of liquid CO_2, a 50 pound CO_2 cylinder is designed to hold 50 pounds of liquid CO_2.

Important Information to remember:

- When any CO_2 cylinder is filled to its "fill weight", it is 68% full.
- The space above the liquid is needed for generation (boiling) of the CO_2 gas.

Overfilling a cylinder can be very dangerous.



High Pressure CO_2 Cylinder
(properly filled)

Normal pressure inside a high pressure cylinder is ambient temperature dependent (about 800psi at 72° F).

Temperature Of CO_2 In Cylinder	CO_2 Gage Pressure
40º F	553 psig
50º F	638 psig
60º F	733 psig
70º F	838 psig
80º F	960 psig
90º F	1190 psig
100º F	1450 psig
110º F	1710 psig
120º F	1980 psig
130º F	2250 psig

Low Pressure Bulk Cylinders

Low pressure cylinders are permanently installed and are refilled on site. This is convenient because the filling can be done without disturbing the operation and it can be done without entering the establishment.

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Low pressure cylinders typically hold 200 or 400 pounds of liquid CO_2.

Low Pressure Cylinder Specifications		
	200 Lb. cylinder	400 Lb. cylinder
Max. allowable working pressure	300 psig	
Normal operating pressure	110-200 psig	110-200 psig
Max. allowable evaporation rate	1.5 lbs./day	4.0 lbs./day
Vacuum jacket material	type 304 stainless steel	
Inner jacket material	type 304 stainless steel	
Insulation type	multi-layer foil & paper/high vacuum	

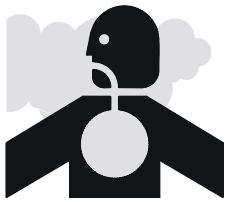
CO_2 Safety

High pressure CO_2 cylinders must be handled with care. The internal pressure is very high, up to a maximum 1800 psi.

When the cylinder is not in use always keep the cylinder valve closed to prevent any moisture from entering the cylinder. Any moisture in a CO_2 cylinder can cause carbonic acid to form and corrode the cylinder walls. Corrosion can reduce the wall thickness and the cylinder can rupture.

WARNING: Always secure the cylinder so it cannot be knocked over. If a cylinder is knocked over, the valve can break and the cylinder will become an unguided missile. Serious and possibly fatal injuries can occur.

DANGER: CO_2 displaces oxygen. Strict attention must be observed in the prevention of CO_2 gas leaks in the entire CO_2 and beverage system. If a CO_2 gas leak is suspected, particularly in a small area, immediately ventilate the contaminated area before attempting to repair the leak. Personnel exposed to a high concentration of CO_2 gas will experience tremors that are followed rapidly by loss of consciousness and suffocation.



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Review

1. What is CO_2? _____
2. What is CO_2 used for? _____
3. What are the two types of CO_2 containers? _____ and _____
4. What is a serious contaminant to CO_2? _____
5. What damage can this contaminant cause? _____
6. CO_2 cylinders must always be kept _____ so they cannot be knocked over.
7. CO_2 cylinder valves must always be kept _____ when the cylinder is not in use.

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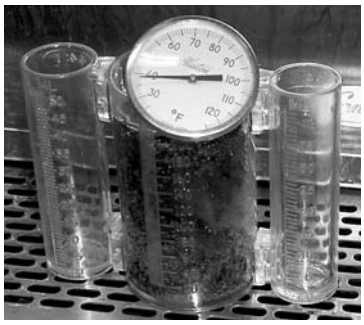
Basic Beverage Unit
Dispensing A Quality Drink, Lesson 4

TEMPERATURE

Introduction



Temperature control is critical to a quality beverage. When you have completed this lesson on temperature, you will understand how and why concern for temperature is important in your job.

Preview Questions

Check your current knowledge by taking a few minutes to answer the following questions:

1. Is it necessary to cool the syrup when dispensing a post-mix beverage? _____

   _____

2. What temperature range is ideal for a beverage when it is dispensed? _____

3. Name one common method of cooling a post-mix beverage. _____

   _____

4. What is the relationship between carbonation and temperature? _____

   _____

   _____

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Lesson

Study the following material about temperature and answer the questions in the Review section. These questions summarize the most important points in this lesson.

Ideal Temperature

Although all aspects of a beverage dispensing system are important producing a quality beverage, none is more important than temperature control.

Temperature control is important to a quality beverage because:

- A warm drink will not retain carbonation.
- A warm drink will melt excessive ice and dilute the drink.

☞ The finished drink temperature must be between 33°F and 40°F.

The table below shows how the temperature of water and syrup, when combined, can effect the temperature of the finished drink.

Finished Drink Temperatures				
Syrup Temp.	Water Temperature			
	33°F	34°F	35°F	36°F
65°F	38.04°F	39.10°F	40.00°F	40.85°F
70°F	39.20°F	40.00°F	40.83°F	41.67°F
75°F	40.00°F	40.83°F	41.67°F	42.50°F
80°F	40.83°F	41.67°F	42.50°F	43.33°F
85°F	41.67°F	42.50°F	43.33°F	44.17°F
90°F	42.50°F	43.33°F	44.17°F	45.00°F
Note: temperatures based on 5:1 Ratio				

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Carbonation Loss vs. Temperature

Carbonated water is kept under pressure until it is dispensed. As long as it is under pressure the carbonation remains in the water. After the water is dispensed as part of the beverage the only pressure on the water is normal atmospheric pressure.

Keeping the liquid as close to 32°F retains the carbonation. The warmer the drink temperature is, the greater the carbonation loss.

The following chart shows the relationship between drink temperature at dispensing time and the carbonation lost.

Acceptable carbonation loss before the taste (quality) of the drink is affected is 8% .

Drink Temperature		Carbonation Retained	Carbonation Lost
2°C	36°F	100%	0%
3.3°C	38°F	96%	4%
4.4°C	40°F	92%	8%
5.6°C	42°F	88%	12%
6.7°C	44°F	84%	16%
7.8°C	46°F	81%	19%
8.9°C	48°F	78%	22%
10°C	50°F	75%	25%
11.1°C	52°F	72%	28%
12.2°C	54°F	69%	31%

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Cooling the Product

There are many ways to cool the carbonated water and/or water and syrup. Electrically refrigerated units and ice cooled equipment are available in many sizes for almost any dispensing requirement. However the dispenser must be able to cool the volume of product that will be dispensed through it.

☞ The dispenser must also be able to handle the desired flow rates.

Check the dispenser specifications before installation and verify that it meets the requirements.

To ensure that the drink can be dispensed cold, the valves are mounted directly on the dispenser cabinet to minimize “warm-up” space. Any tubing carrying cold product outside of the unit must be insulated to prevent warm up.

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Review

1. Temperature control is important to a quality beverage because _____ and _____ .
2. What is the ideal dispensing temperature range for a carbonated beverage? _____
3. Why is it necessary to cool both the syrup and the carbonated water? _____
   _____
4. What is the greatest carbonation loss allowable before the quality of the drink is affected?_____

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NOTES

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Basic Beverage Unit
Dispensing A Quality Drink, Lesson 5

CARBONATION

Introduction

Carbonation is a major part of most beverages. When you have completed this lesson on carbonation you will understand how it is created and how it is controlled.

Preview Questions

Check your current knowledge by taking a few minutes to answer the following questions:

1. What is carbonation?_____

   _____

2. What unit of measurement is used to measure carbonation? _____

3. How is carbonation created? _____

   _____

   _____

4. A specific carbonation level is the result of _____ and _____.

5. To determine the carbonation level of a beverage, you must know the _____ of the product and the _____ of the CO_2.

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Lesson

Study the following material about carbonation and answer the questions in the Review section. These questions will summarize the most important points in this lesson.

What is carbonation?

Carbonation is carbon dioxide (CO_2) in solution with a liquid. Normally the liquid is water and the result is carbonated water but other liquids can also be carbonated.

Carbonated Water = Carbon Dioxide (CO_2) + Water (H_2O)

Volumes

The term "volumes" has a special meaning when used with carbonation. It is a unit of measurement that refers to the concentration of CO_2 in a liquid.

Understanding Volumes

Imagine for a minute that you have two containers of the same size. One filled with water and the other with CO_2. If you combine them so that the CO_2 is in solution with the water, then you have one volume of CO_2 in solution — or a carbonation level of one volume.

1 container CO_2
+ 1 container water
= 1 volume CO_2

Again imagine that you have two containers of CO_2, and you combine these with one container of water. Then you have two volumes of CO_2 in solution — or two volumes of carbonation.

2 containers CO_2
+ 1 container water
= 2 volume CO_2

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Once more imagine that a container is filled with one volume of CO_2 in solution with one volume of water in a sealed tank. There is one volume of carbonation and the pressure within the tank is zero.

Now imagine the two volume solution in a sealed tank. The pressure reading is 14.7 psig (which is atmospheric pressure). Each time a volume of CO_2 is added to the water, the pressure increases by 14.7 psig.

Or stated differently: Every time the pressure is increased by 14.7 psi, one more volume of gas goes into solution.

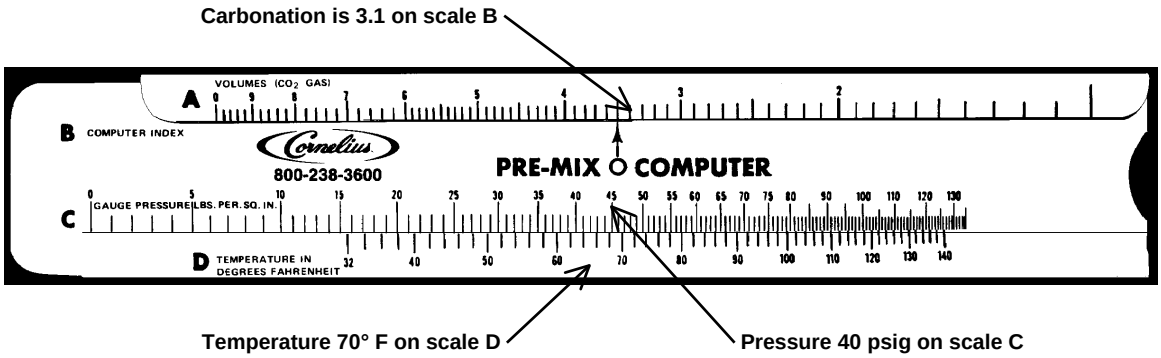
Measuring Volumes of Carbonation

To measure the volumes of carbonation in a tank of carbonated water, follow these steps:

1. Apply a pressure gauge/disconnect to the gas fitting of the tank and read the pressure in the tank.
2. Use a sample tube to draw off a small sample of product into a cup and measure the temperature of the product with a thermometer.

A Pre-Mix slide rule shows the relationship between pressure and temperature. Align the pressure on scale C and the temperature on scale D. When they are aligned, the Index Arrow (scale B) will point to the volumes of carbonation on the A scale.

For example:



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Creating the Desired Carbonation

You can also use the Pre-mix slide rule to determine what pressure creates a specific carbonation level.

Determine the temperature of the liquid in the tank, 60 °F (this example). In certain situations you would use the ambient temperature at the tank.

Using the slide rule, set the arrow at 3.5 volumes (the desired carbonation level in this example).

Read the pressure on the C scale that is aligned with 60 °F – in this example, 38 psi.

Carbonator

Set this pressure (38 psi) on the CO_2 regulator and wait for naturally occurring absorption.

Temperature to Pressure Relationship

By glancing at the slide rule, you can see that lower temperature liquids require less pressure to achieve the same carbonation level. Lower temperature liquids absorb CO_2 faster than warm liquids.

For example:

> A 45°F liquid requires 26 psi to obtain 3.6 volumes of carbonation. If the pressure is increased to 36 psi, the liquid will absorb an additional 0.8 volumes in 16 hours through naturally occurring absorption.
>
> A 70°F liquid requires 49 psi to obtain 3.6 volumes of carbonation. If the pressure is increased to 59 psi, the liquid will absorb an additional 0.53 volumes in 60 hours in naturally occurring absorption.

Since cold liquids absorb CO_2 faster than warm liquids:

- To delay the absorption of CO_2 use warm liquids.
- To speed up the absorption of CO_2 use colder liquids.

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How is Carbonation Created?

In a previous example a container of 60°F liquid was pressurized with 38 psig of CO_2 pressure. If we wait long enough the CO_2 will be naturally absorbed into the liquid and it will be carbonated. The time necessary for natural absorption is not practical. Shaking the tank speeds the process but is quite inconvenient.

Instead we rely on a carbonator that is designed to mechanically cause absorption of the CO_2 into the liquid.

Water is pumped under high pressure into a CO_2 atmosphere. The agitation and pressure cause the CO_2 to be absorbed rapidly.

Greater detail of the workings of a carbonator are covered in a lesson on Carbonators.

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Review

1. What is carbonation?_____
   _____
2. Volumes is a unit of? _____
3. Atmospheric pressure is _____psi.
4. To determine the volumes of carbonation in a tank of carbonated water, you need to know the _____ and _____.
5. Cool liquid will absorb carbonation _____ than warm liquid.
6. When calculating volumes of carbonation based on temperature and pressure, you should use a?_____
7. To slow down the rate of absorption of carbonation, the product should be kept as _____ as possible.

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Basic Beverage Unit
Dispensing A Quality Drink, Lesson 6

WATER TO SYRUP RATIO

Introduction

Water and syrup are dispensed through a post-mix valve at a specific ratio that is critical to the quality of the finished drink. When you have completed this Lesson you will understand how to control this important ratio.

Preview Questions

Check your current knowledge by taking a few minutes to answer the following questions:

1. Are all beverages adjusted for the same ratio? _____
2. What is a common water to syrup ratio for cola drinks? _____:_____
3. What is a ratio cup?_____

   _____

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Lesson

Study the following material about water to syrup ratio and answer the questions in the Review section. These questions summarize the most important points in this lesson.

Introduction to Ratio

When a post–mix drink is poured, the syrup and water are mixed in the nozzle of the valve. The flow rates of these two ingredients are adjusted so that the ratio of syrup to water is correct for the syrup (or concentrate) being poured.

For example:

- If the water flow rate is 2.5 oz/sec and
- the syrup flow rate is .5 oz/sec
- then the ratio is 5:1.

This means the finished drink is composed of 5 parts water and 1 part syrup. This is a common ratio but certainly not the only ratio.

Complete details of how to adjust the water and syrup flow rates to obtain the correct ratio can be found in the Lesson on Valves

☞ IMPORTANT:

- Always set the water flow rate first
- Always adjust the syrup flow rate to obtain the desired ratio.

Different Ratios

There are many different ratios. The most common are: 4.5:1, 5:1, and 5.5:1.

However when considering some of the tea and lemonade flavors there are many more and they might be 13:1 or 10:1, etc. Whenever you are working with an unfamiliar brand or flavor always check the syrup (concentrate) package to learn the proper ratio.

Accurate ratio affects the quality of the finished post-mix beverage. The manufacturer of the syrup tests to ensure a quality product therefore follow their standards.

“Syrup” and “concentrate” are basically the same thing but frequently the “flavoring/sweetening” ingredient for tea, lemonade, etc will be called concentrate rather than syrup.

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Measuring with a Ratio Cup

Ratio Cups and Separator Tube

The ratio cup consists of two or three compartments. In a traditional three compartment ratio cup, the center compartment is for water and the two side compartments are for syrup. The syrup cups are marked with the ratio they represent.

The capacity ratio of the center (water) compartment to the side (syrup) compartments is equal to the syrup to water ratio - 5:1, 4.5:1, etc.

Traditional two compartment ratio cup in use

The ratio cup requires the use of a separator tube to separate the water and syrup when they pour from the valve. The separator tube attaches to the syrup nozzle in the valve and diverts the syrup to the side so it can pour into the appropriate ratio side compartment, while the water pours into the center compartment. Fill the cup to approximately 3/4 full and always use approximately the same quantity to ensure consistency. The ratio is correct when the syrup and water are level.

A new two compartment ratio cup can measure many different ratios. Fill this style cup until the water is level with the 10-ounce indicator. Read the ratio on the syrup compartment scale. Although this cup has the advantage of indicating a variety of ratios, it is difficult to fill exactly to the 10-ounce indicator. Several attempts may be necessary.

When using any style of ratio cup, always take these precautions to ensure accuracy:

- After installing the separator tube, open the valve to fill the syrup tube.
- Clean the cup thoroughly between tests so there is no carry–over from one test to the next.

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Review

1. A ratio of 5 parts of water to 1 part of syrup is expressed as _____
2. What does a separator tube do? _____
3. Why should you open the valve after installing the separator tube? _____
   _____
4. What is the difference between syrup and concentrate? _____
   _____
5. To obtain the desired ratio, first set the flow rate of water / syrup. (circle correct answer) _

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Basic Beverage Unit
Maintaining A Quality Drink,
Lesson 7

ICE

Introduction

Ice can be crucial to dispensing and serving a quality beverage. After completing this lesson you will have a better appreciation for what role the different types of ice can play in a quality beverage.

Preview Questions

Check your current knowledge by taking a few minutes to answer the following questions:

1. Which of the following does not refer to a style of ice: cube, flake, chunklet,? _____

2. What temperature should ice be when it is used to cool beverages? _____ °F

ICE

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Lesson

Study the following material about ice and answer the questions in the Review section. These questions summarize the most important points in this lesson.

Ice Type and Temperature

Ice comes in numerous forms: cubed, crushed, flaked and chunklet. It also can range in temperature from 32°F to 0°F or colder. It is the different forms and temperatures that are of concern for beverage cooling and serving applications.

When ice is used to cool the drink before it is served, consider the following issues:

- The best ice is cubes at 32°F with a moist surface. Ice at 32°F is generally ice taken from an insulated ice maker bin.
- Ice that comes from a freezer is probably at 0°F or even colder. If this ice is used to cool product it will freeze the product and possibly damage the equipment.
- Ice cubes are a better cooling medium than flaked ice or chunklet ice. Flaked and chunklet ice have a high water content and therefore have reduced cooling capacity.

Maintaining Product Temperature With Ice

Pouring a drink into a container with ice helps to maintain the temperature of the drink, — but it can also cause problems. Here's what to look for and what to avoid:

☞ The best ice is cubes at 32°F with a moist surface. Ice at 32°F is generally ice taken from an insulated ice maker bin.

- Flaked ice maintains the temperature of the drink very well however it is not as desirable as cubed ice because its many edges can cause loss of carbonation. Also the water in flaked ice can cause dilution problems.
- Crushed or chunklet ice are not ideal but they are okay. Both of these have problems similar to flaked ice. Always look for solid (hard) ice rather than soft ice.
- Ice that is below 32°F should not be used. Ice at sub freezing temperatures has frost on the surface that reduces the carbonation in the drink. It will maintain temperature but the loss of carbonation is excessive.

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Review

1. What type of ice is best for both cooling a drink and keeping a drink cool after dispensing? _____

2. Why should you not use 0°F ice? _____

   _____

3. Describe two of the negative aspects of non-cube ice. _____

   _____

   _____

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NOTES

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Basic Beverage Unit
Maintaining A Quality Drink,
Lesson 8

CONTAINERS

Introduction

To serve the beverage it must be poured into a container. The size and material of the container can make a difference to the quality of the beverage. After completing the lesson you will understand the role that containers play in quality beverages.

Preview Questions

Check your current knowledge by taking a few minutes to answer the following questions:

1. What do you think would be the perfect container? _____

   _____

2. The _____ of the container can affect how fast the drink warms.

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Lesson

Study the following material about containers and answer the questions in the Review section. These questions summarize the most important points in this lesson.

☞ The perfect drink is a pre–mix product, refrigerated to 34°F, poured over 32°F ice cubes into a clean glass that is cooled to 34°F.

Container Features

A container is only one parameter in the Perfect Drink description above, but it is important. Containers for serving beverages are used because they are convenient, have good insulating qualities, are inexpensive, or because they advertise something.

When choosing a container look for:

- a suitable container material for cold drinks. Some paper cups can absorb moisture and become flimsy.
- a container that doesn't damage the quality of the drink. The container must have a clean surface.
- the correct size. Too small and the customer is not satisfied or inconvenienced by getting refills. Too big and the drink will deteriorate as the ice melts. Cup size and valve flow rate must be properly matched. A high flow rate (4.5 oz/sec) and a small cup (8 oz) are not a good match.

Types of Containers

- Glass is an excellent container for beverages. The glass must be properly washed and stored. Glasses should always be washed in a mild detergent, thoroughly rinsed and allowed to dry inverted on a drain board. Rinsing agents should not be used because they coat the glass causing loss of carbonation. When stored, glasses should not be hung from a rack with the inside container surface exposed to contaminates such as airborne dust, dirt, and smoke.
- Plastic containers are good beverage containers. If they are containers designed for reuse, they should be cleaned and stored like glass containers.
- Waxed paper containers are good also. These are one time use containers. They usually come wrapped and sealed in tubes of 50 or 100.

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- Foam cups such as Styrofoam are not suitable for carbonated beverages. Foam cups have a release agent on their surface that causes a rapid loss of carbonation. They may be used for non–carbonated drinks however.
- Ceramic or porcelain containers are not commonly used for beverages; but if they are suitable for food service, they are acceptable for beverages. They should be cleaned and stored like glass containers.

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Review

1. What type of container should not be used for carbonated beverages?_____

   _____

2. What containers are the best for carbonated beverages?_____

   _____

3. How should reusable containers be stored?_____

   _____

4. How does container size affect a quality drink? _____

   _____

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Basic Beverage Unit
Maintaining A Quality Drink,
Lesson 9

MAINTENANCE

Introduction

Appropriate and regular equipment maintenance is critical to both sanitation and reliability. After completing this lesson you will understand the extent of some of your maintenance responsibilities.

- ✓ Temperature ..... under 40°F
- ✓ Ice ..... WET
- ✓ Container ..... CLEAN
- ✓ Carbonation ..... 3.5 to3.7 volumes

Preview Questions

Check your current knowledge by taking a few minutes to answer the following questions:

1. How often should syrup tubing be sanitized? _____
2. Should ice bins be cleaned with detergent solution or plain water? _____
   Why? _____

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Lesson

Study the following material about equipment maintenance and answer the questions in the Review section. These questions summarize the most important points in this lesson.

This section on Equipment Maintenance covers all aspects of maintenance:

- Daily Cleaning
- Monthly Checks and Adjustments
- Quarterly Maintenance
- Annual Maintenance

Each maintenance event listed in the chart is explained on the following pages.

Schedule of Maintenance				
Event	Countertop Water Bath	Ice Cooled	Ice/Drink	Remote Cooling Water Bath
Clean Outside	Daily	Daily	Daily	----
Clean Valve	Daily	Daily	Daily	----
Clean Drip Tray	Daily	Daily	Daily	----
Clean Condenser	Monthly	Monthly	Monthly	Monthly
Check Water Bath	Monthly	----	----	Monthly
Check Ratio	Monthly	Monthly	Monthly	----
Clean Ice Bin	----	Quarterly	Quarterly	----
Change Filters	Quarterly	Quarterly	Quarterly	Quarterly
Clean Pump Screen	Quarterly	Quarterly	Quarterly	Quarterly
Sanitize Tubing	6 months	6 months	6 months	6 months

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Clean Outside

All outside surfaces must be cleaned daily using warm water, a mild detergent and a soft cotton cloth.

Rinse with clean cool water and dry with a clean dry cloth.

Notice: The term *warm* when used to describe the temperature of water is referring to water at approximately 130°F/ 55°C

Clean Valve

- Clean the outside of the valve with a soft cloth and warm soapy water.
- Rinse the valve surface with clean water and dry with a soft cloth.
- Remove the valve nozzle and the syrup diffuser.
- Wash the nozzle and diffuser in water. Soak in carbonated water overnight if possible. Use a soft brush as needed to remove any accumulated syrup deposits.

Clean the Drip Tray

Drip trays may or may not be removable from the dispenser depending on the model. For models where the drip tray can be removed:

- Remove the drip tray and the cup rest and take them to a large sink for cleaning. Flush thoroughly with warm water, then wash with soapy water to remove all residue. Rinse with clean tap water.
- Pour one gallon of warm (130°F/ 55°C) water down the drain tubing. Do NOT use hot water as this may collapse the tubing and cause a drain restriction.

For models where the drip tray cannot be removed:

- Wash the drain basin with warm soapy water and then rinse with clean, clear warm water.

Clean the Condenser

The condenser on electrically cooled equipment collects dust and other airborne contaminants. The condenser must be cleaned periodically since dust restricts the movement of air through the condenser reducing the cooling effect.

- Remove the hood covering the condenser and clean it and the condenser.
- The dust can be cleaned using a vacuum and/or a soft bristle brush. A vacuum creates the least mess but often a brush is needed to loosen the persistent dust.

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Check Water Bath

Water bath units utilize water to transfer heat away from the product in the stainless steel cooling coils. It is important that the water bath is full and that the cooling coils are completely submerged in the water bath.

If necessary fill the water bath with cold tap water up to the overflow.

Check Ratio

☞ The syrup to water ratio is not likely to change unless some variable within the system has changed. Before checking the ratio, always check the following:

- Empty or very low syrup tanks or B.I.B.s have slightly different operating characteristics, which can give false ratio readings.
- Check that all operating pressures are at the proper setting.

The most common and the best method of measuring ratio is a ratio cup. The ratio cup consists of two or three compartments. In a traditional three compartment ratio cup, the center compartment is for water and the two side compartments are for differing ratios of syrup. The syrup cups are marked with the ratio they represent.

Insert the syrup diversion tube for the valve being checked. This will separate the syrup flow from the water flow. Operate the valve momentarily to fill the syrup bypass tube. Now place the ratio cup below the valve so the water will flow into the water compartment and the syrup will flow into the syrup compartment.

Operate the valve until the ratio cup is at least 3/4 full. The levels of the water and syrup should be level.

A new two compartment ratio cup can measure many different ratios. Fill this style cup until the water is level with the 10-ounce indicator. Read the ratio on the syrup compartment scale. Although this cup has the advantage of indicating a variety of ratios, it is difficult to fill exactly to the 10-ounce indicator. Several attempts may be necessary.

Always follow the same procedure when checking the ratio so variables are not introduced by the procedure. Refer to the Valve Lesson for details on checking ratio and adjusting the syrup flow rate to obtain the proper ratio.

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Clean the Ice Bin

The ice bin must be cleaned regularly because it holds a food product — ice used in the drink cup.

Follow these instructions:

- Empty all ice from the bin and rinse with warm water until completely empty.
- Prepare a mild detergent solution with warm water and scrub the ice bin with a soft nylon bristle brush. Do Not use a metal bristle brush. Rinse with clean water.
- Prepare a sanitizing solution and fill a spray bottle. Spray the surfaces of the bin until they are completely dampened with the sanitizing solution.
- Allow to air dry.

Change the Filters

Determine the best interval for filter changes by keeping a record of the changes. Write the date of installation on the body of the filter.

Follow the filter manufacturer's instructions for the installation of the new filter.

Clean the Pump Screen

Turn the water off, loosen the pump screen with a wrench, and remove the screen from the pump body.

Flush the screen under running water to remove any accumulation of dirt. When the screen is thoroughly cleaned, replace it into the pump body.

Tighten the screen with a wrench to prevent leaks.

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Sanitize Tubing

Syrup tubing accumulates deposits over time and the tubing must be cleaned and sanitized. See the sanitizing manufacturer's recommendations and consult the equipment maintenance manual for specifics.

A general sanitizing procedure follows:

1. Remove disconnects from syrup tanks and rinse.
2. Connect a tank of sanitizing solution to a syrup system and open dispensing valve to purge all syrup. Close valve
3. Repeat step 2 to purge syrup and install sanitizing solution in each syrup system.
4. Keep sanitizing solution in system no less than ten and no more than 15 minutes.
5. Connect syrup tanks to each syrup systems.
6. Open dispensing valve to purge ALL the sanitizing solution from a syrup system. Close Valve.
7. Repeat step 6, purging the sanitizing solution from each syrup system.

Warning: Completely flush sanitizing solution from the syrup systems. Residual sanitizing solution left in the systems could create a health hazard.

Sanitizing

The syrup systems should be sanitized every 3 months by a qualified service person using the following procedure (or the sanitizer manufacturer's procedure if it meets NSF and FDA requirements). Use Chlor–Tergent from Oakite Products. Inc. (or equivalent sanitizer).

Sanitizing Syrup Tank System:

1. Remove quick disconnects from syrup tanks, then rinse all quick disconnects in potable water.
2. Using a clean empty syrup tank, prepare a full tank of sanitizing solution by mixing 21° to 38° C (70° to 100° F) potable water and 10 cc / 3.79 L (.34 oz./gal) of sanitizer. This mixture will provide 100 PPM of chlorine. Shake the sanitizing solution tank to thoroughly mix the sanitizing solution.
3. Connect tank containing sanitizing solution into one of the syrup circuits.
4. Place waste container under applicable dispensing valve. Dispense from the valve to permit sanitizing solution to purge all syrup out of the syrup circuits. Continue to dispense from the dispensing valve until only sanitizing solution is dispensed from the syrup circuits, then close the valve.
5. Repeat steps 3 and 4 to purge syrup from remaining syrup circuits.

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6. Allow sanitizing solution to remain in the syrup circuits for not less than 10- or more than 15-minutes contact time,
7. Remove tank containing sanitizing solution from the syrup circuits.
8. Connect tank containing potable water into one of the syrup circuits.

   CAUTION — Flush the system thoroughly — residual sanitizing solution left in the system could create a health hazard.
9. Place waste container under applicable dispensing valve. Dispense from the valve to permit potable water to purge sanitizing solution from the syrup circuits and the dispensing valve. Continue to dispense from the valve until only potable water is dispensed from the syrup circuits, then close the valve.
10. Repeat steps 8 and 9 preceding to purge sanitizing solution out of the remaining syrup circuits with potable water.

    CAUTION — To avoid possible personal injury or property damage, DO NOT remove the syrup tank cover until CO2 pressure has been released from the tank.
11. Disconnect tank containing potable water from the syrup circuits, then connect tanks containing syrup.
12. Dispense from all valves until only syrup is dispensed to permit syrup to purge all potable water from the system.
13. Dispose of sanitizing solution in a sanitary sewer, not in a storm drain, then thoroughly rinse inside and outside of the syrup tank that was used for sanitizing solution to remove all sanitizing solution residue.

Sanitizing Bag-In-Box Syrup System.

1. Disconnect all syrup outlet tubes connectors from the bag-in-box syrup containers, then wash all connectors in warm potable water.
2. Using a clean 20 L (5 gal) container to prepare 15 L (4 gal) of sanitizing solution by using 21° to 38° C (70° to 100° F) potable water and 40 cc / 15 L (1.36 oz. / 4 gal) of sanitizer. This will provide 100 PPM of chlorine. Thoroughly stir solution to mix the sanitizing solution
3. Install bag outlet fitting, cut from empty bag-in-box syrup containers, on ends of syrup outlet tube connectors.
4. Place all syrup outlet tubes, with bag outlet fittings on their ends, in container containing sanitizing solution.
5. Place waste container under applicable dispensing valve. Dispense from the valve to permit sanitizing solution to purge all syrup out of the syrup circuits. Continue to dispense from the dispensing valve until only sanitizing solution is dispensed from the syrup circuits, then close the valve.
6. Remove all syrup outlet tubes from the container with sanitizing solution. Then place all syrup outlet tubes in the container containing potable water.

   CAUTION — Flush the system thoroughly — residual sanitizing solution left in the system could create a health hazard.

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7. Place waste container under applicable dispensing valve. Dispense from the valve to permit potable water to purge sanitizing solution from the syrup circuits and the dispensing valve. Continue to dispense from the valve until only potable water is dispensed from the syrup circuits, then close the valve.
8. Remove all syrup outlet tubes from container containing potable water.
9. Remove all bag outlet fittings from the syrup outlet tubes connectors.
10. Connect all syrup outlet tubes connectors to bag-in-box syrup containers.
11. Dispense from all valves until only syrup is dispensed to permit syrup to purge all potable water from the circuits.
12. Dispose of sanitizing solution in a sanitary sewer, not in a storm drain, then thoroughly rinse inside and outside of the syrup tank that was used for sanitizing solution to remove all sanitizing solution residue.

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Review

1. What is the approximate temperature of warm water? _____ °F
2. Why does a water bath need to be checked? _____
3. What does a syrup diversion tube accomplish? _____

   _____
4. Why must the ice bin be cleaned? _____
5. What is an easy way to keep track of filter changes? _____
6. Why must care be taken to flush all sanitizing solution out of the syrup system? _____

   _____

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NOTES

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