An apparatus and method for automatically gauging container and syrup requirements for beverage production includes: (a) dropping the level in a syrup recovery tank down to a pre-set level and maintaining it at that level; (b) loading remaining containers onto a conveyor belt system, which leads to a filler; (c) receiving input from a depalletizer confirming that the remaining containers have been loaded to the conveyor system; (d) stopping the flow of syrup from a syrup supply tank to a syrup recovery tank; and (e) pushing remaining syrup in at least one distribution line, which leads from the syrup supply tank, into the syrup recovery tank. This apparatus and method allow conservation of syrup and containers at the end of a production run.
APPARATUS AND METHOD FOR RECOVERING BEVERAGE SYRUP

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This is a continuation/divisional of U.S. patent application Ser. No. 09/405,569, filed Sep. 25, 1999.

BACKGROUND OF THE INVENTION

[0002] 1. Technical Field

[0003] This is an apparatus and method for monitoring syrup and container inventories during a beverage production run, and ending the production run with substantially no wasted syrup or containers, more particularly a syrup recovery system for insertion into a beverage production system.

[0004] 2. Background Information

[0005] To produce soft drinks and other beverages, many beverage companies have beverage production systems that spread across thousands of square feet of plant space. Simply put, in many existing systems for producing carbonated soft drinks, concentrated, pre-mixed beverage syrups are first channelled from syrup supply tanks through pipes to blend tanks where they are mixed with appropriate levels of drinking water. Carbon dioxide is bubbled through the diluted syrups and the soft drink then flows through lines to a filler system. At the filler, bottles or cans on an automated line are filled with exact amounts of the soft drink.

[0006] There are certain requirements during this soft drink production process. To maintain product quality, measurements throughout this production process must be exact. Secondly, product tanks and lines which hold product must be absolutely sanitary so the drinks do not become contaminated with dirt, bacteria or the like. Third, unused syrup or soft drink, some of which is diluted syrup washed out by periodic cleanings of the system, must be carefully disposed of to protect the environment. Though it sounds innocuous to a layman, high doses of sugar from waste soft drink can upset the ecological balance in, for example, a stream to which untreated industrial waste effluent empties. Syrup increases biochemical oxygen demand (BOD) in a discharge stream, which upsets the balance of animals and plants indigenous to the stream. Since many bottlers must pay by the gallon to treat their industrial waste, it is to their benefit to keep wasted soft drink syrup to a minimum.

[0007] If beverage production can be made more exact and controlled, a small amount of syrup can be conserved with each production run. The syrup recovery system of the present invention does allow the conservation of a certain amount of concentrated syrup during the production process. The recovered syrup is sanitary because it is captured at the outset within the production system. This recovered syrup can be made into soft drinks, which decreases product costs. It also reduces a beverage company’s wastewater treatment costs, and in turn helps in a small way to protect the environment. Although the amount of syrup recovered by the present syrup recovery system and method is ordinarily only a few gallons per bottling run, total savings over a one year period can be significant. The syrup recovery system of the present invention also enhances quality control by allowing a plant operator to more precisely control syrup measurements during the production process.

[0008] With this syrup recovery system, a plant operator can more precisely forecast the number of containers that will be needed for ending a production run. Also, a plant operator desiring to fill a known number of containers can automatically drain from a syrup supply tank only the exact amount of syrup needed for that particular run. This decreases or eliminates wasted containers and reduces labor costs. This syrup recovery system can be inserted into an existing beverage production system, or it can be incorporated into a new beverage production system being designed or constructed.

BRIEF SUMMARY OF THE INVENTION

[0009] The present invention is an apparatus and method for automatically gauging container and syrup requirements for beverage production. This syrup recovery method for gauging container and syrup inventories during beverage production, when syrup inventory is limited and container inventory is not limited, comprises the following steps: (a) transferring remaining syrup in a syrup supply tank into a syrup recovery tank in a beverage production system through at least one distribution line; (b) pushing the remaining syrup in the distribution line into the syrup recovery tank; (c) dropping the level in the syrup recovery tank down to a pre-set level; (d) loading and measuring the number of containers between a filler and a depalletizer on the conveyor belt system; and (e) allowing the containers to proceed into the filler.

[0010] When container inventory is limited and syrup inventory is not limited, the syrup recovery method herein comprises the steps of: (a) dropping the level in a syrup recovery tank down to a pre-set level and maintaining it at that level; (b) loading remaining containers onto a conveyor belt system, which leads to a filler; (c) receiving input from a depalletizer confirming that the remaining containers have been loaded to the conveyor system; (d) stopping the flow of syrup from a syrup supply tank to a syrup recovery tank; and (e) pushing remaining syrup in at least one distribution line, which leads from the syrup supply tank, into the syrup recovery tank.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

[0011] A more complete understanding of the invention and its advantages will be apparent from the following detailed description taken in conjunction with the accompanying drawings, wherein examples of the invention are shown, and wherein:

[0012] FIG. 1 shows a schematic diagram of a syrup recovery system according to the present invention; and

[0013] FIG. 2 shows a schematic diagram of a syrup recovery system according to the present invention within a beverage production system.

DETAILED DESCRIPTION OF THE INVENTION

[0014] In the following description, like reference characters designate like or corresponding parts throughout the several views. Also, in the following description, it is to be understood that such terms as “upper,” “lower,” “within,” and the like are words of convenience and are not to be construed
Referring to FIG. 1, the inlet port 19 is located on a lower portion, preferably along the bottom quarter, of the syrup recovery tank 11. The inlet port 19 leads into the syrup recovery tank 11. The syrup flows into the syrup recovery tank through the inlet port.

A level indicator 20 preferably extends down along the outside of the syrup recovery tank 11. It is preferably connected at one (top) end to the cleaning line 17 and at an opposite, bottom end to an outlet at the bottom of the syrup recovery tank. The level indicator 20 is a simple, back-up device for the operator to visually check the level of syrup in the tank from outside the tank.

On the outside of the tank is a control mechanism 21, ordinarily within a control panel. With the present system, the controls are centrally located in a convenient location. The control panel may alternatively be remotely to anywhere in the plant to allow easy access by the plant operator. The element that allows this accessibility is a microprocessor 22, which is in communication with the syrup recovery tank. The control mechanism 21 is connected with the microprocessor 22 for enabling a user to input information to the microprocessor, and to receive information (preferably by visual messages) from the microprocessor. Normally, a user inputs to the microprocessor using knobs, dials, buttons or a touch screen on the front of the control panel. Preferably, this system 10 includes a mechanical switch, or electrical component within the control mechanism for enabling the microprocessor. The control mechanism 21 preferably includes a screen for visually displaying information received from the microprocessor. The control mechanism, microprocessor, etc. are powered by electricity. This system 10 includes a source of electrical power 23 within, on, or connected to the control mechanism, preferably a cord with a plug for insertion into an electrically outlet. The control mechanism may also include extended memory devices, such as EEPROM, in communication with the microprocessor. The microprocessor controls, for example, the opening and closing of the divert valve. A personal computer, or other remote mechanism for allowing a user to program the microprocessor, or visually indicating to a user what is being programmed, may also be included herein.

Importantly, the microprocessor 22 is connected with, and receives information from, a level transmitter 24 within the syrup recovery tank 11, preferably by wiring. The level transmitter 24 is adapted for measuring syrup levels within the syrup recovery tank, and transmitting such information to the microprocessor. The level transmitter 24 preferably comprises a probe 25, which extends down into the recovery tank 11, and a movable float 26 at the bottom portion of the probe. In use, the float 26 floats on top of the syrup in the recovery tank, and the probe 25 sends back information concerning changing syrup levels electronically to the microprocessor 22. Preferably, a transmitter within the level transmitter mechanism measures voltage across the probe according to the height of the float along the probe, which varies with the level of syrup in the recovery tank. The transmitter converts voltage readings to the number of gallons of syrup in the recovery tank. Necessary information has been pre-programmed into the microprocessor, such as the amount of syrup needed for each container (e.g., bottles, cans), which varies with the different types of syrups (e.g., cola soft drink syrup requirements are different than lemon-
lime soft drink syrup requirements). The syrup recovery system 10 can thus respond automatically by, for example, closing the level control valve 14.

[0023] The syrup recovery tank is also connected to outlet distribution lines 27, which conduct the syrup away from the syrup recovery tank. Inlet distribution lines 12 run into the syrup recovery tank 11 and are called “inlet” here simply to distinguish them from lines running from the recovery tank 11, called here “outlet” distribution lines 27. Both distribution lines are most commonly systems of pipes. Syrup exits the syrup recovery system through an outlet port 28. The outlet port is located on a lower portion of the syrup recovery tank, preferably directly at the bottom center of the tank. The syrup is transportable from the syrup recovery tank through the outlet port 28 and through the outlet distribution lines 27. A tank drain valve 29 is preferably located at the outlet distribution line just after the outlet port 28 for draining the tank 11 during cleaning.

[0024] A conductivity sensor 30 on the outlet distribution line 27 preferably follows the tank drain valve 29. The conductivity sensor is adapted to input to the microprocessor when the syrup recovery tank 11 has emptied. The conductivity sensor 30 is preferably wired to aid and feeds data back to the microprocessor 22 to notify the microprocessor the point in time when the syrup recovery tank is empty.

[0025] As shown in FIG. 1, a pump 31, such as a centrifugal pump, a positive displacement pump, or a diaphragm pump, is connected to the outlet distribution lines 27 adjacent to the syrup recovery tank for pumping the syrup from the syrup recovery tank 11 through the outlet distribution lines 27. Preferably, a centrifugal pump pulls the thick syrup through the outlet distribution line from the syrup recovery tank 11. The pump 31 preferably includes a pump drain valve 32. After the pump 31, a shutoff valve 33 is preferably located along the outlet distribution line 27. This valve 33 is for closing off the line 27. A carbon dioxide blow valve 34 is preferably located at the outlet distribution line after the shutoff valve 33. This valve 34 is for emitting carbon dioxide from the line 27. Carbon dioxide is preferably used to push the last syrup in a production run along the line and thus clear the line. The syrup recovery tank 11 is not pressurized, and head pressure from carbon dioxide is not needed to push the viscous syrup out through the distribution lines. This syrup recovery system 10 can be incorporated into a soft drink production system initially, or it can be inserted into an existing soft drink production system for long term cost savings and improved efficiency.

[0026] This syrup recovery system 10 is preferably for use in beverage production systems with nonpressurized mix tanks, but it can be adapted for use in systems with pressurized tanks. Although it is preferred for incorporation into carbonated or noncarbonated soft drink production systems, this syrup recovery system could be used in beer-making systems or in any liquid material production system. The system is energy efficient.

[0027] In use, the syrup recovery system of the present invention is particularly helpful in two different situations: syrup cut-off, and container cut off. In the former case, a pre-programmed amount of beverage syrup, is loaded into the recovery system 10 and the canning/bottling process is initiated. When the last container is loaded onto a container conveyor, the level control valve 14 is closed. The amount of syrup and the number of containers on the conveyor are measured in this fashion. With the present recovery system, the number of containers and the syrup in the system will run out at the same time. In the latter case, the syrup is purged from the inlet distribution line 12 into the system 10. The syrup level then falls to the pre-programmed syrup level and shuts a container stop gate. The conveyor is then loaded to a container loading point. The amount of syrup and the containers have been measured using the present system 10. Containers and ingredient have not been wasted.

[0028] Referring to FIG. 2, the present syrup recovery system (apparatus) 10 is shown in place in a beverage production system. Syrup supply tanks 13 supply syrup, which is transported through distribution lines to the present system 10. A syrup supply valve 35 opens to allow the syrup to flow through the line 12, or closes to halt the flow of syrup through the line 12. A syrup supply pump 36 pumps the viscous syrup through the distribution lines 12. The syrup then enters the syrup recovery system through the inlet distribution lines 27 as described above. From the syrup recovery system, the syrup is preferably transported through a blender 37 and optionally a carbon dioxide cooler, where it is blended with water and carbon dioxide is bubbled through it to make the soft drink. Although the recovery system is preferred for use in carbonated soft drink production systems, it can as easily be used for producing any noncarbonated drinks in which a syrup must be blended with other ingredient(s), such as orange juice.

[0029] The drink is then preferably transported through distribution lines to a filler 38, where containers are filled with predetermined amounts of the drink. A filler stop gate 39 or similar automated mechanism is preferably used to halt the procession of containers 40 on a conveyor belt or the like into the filler 38. The microprocessor 22 is adapted to automatically open or close the stop gate on a filler. A depalletizer 41 or the like in the beverage production system automatically removes bottles from pallets. From the depalletizer, the containers 40 are fed to the conveyor belt.

[0030] The microprocessor 22 receives feedback from, and/or outputs to, many sources within the system 10. These are either wired to the microprocessor, connected to the microprocessor by air lines activated by electric solenoids within the control mechanism, or connected by other means. The microprocessor is connected to: the level control valve 14, the divert valve 16, the level transmitter 24, the tank drain valve 29, the conductivity sensor 30, and the pump drain valve 32. The microprocessor also inputs to a depalletizer alarm and input button 42, which is adjacent to the depalletizer 41, and a syrup cut-off alarm 43, which is adjacent to the syrup supply tanks 13. These are all essential or optional parts of the syrup recovery apparatus of the present invention.

[0031] There are two production situations in which the present syrup recovery system proves particularly useful. In the first, there is a limited, known amount of syrup and an unlimited number of containers available to be used for that production run. In that case, the syrup in the syrup supply tank 13 is depleted, then all of the syrup in the distribution lines 12 is pushed into the syrup recovery system 11. The syrup recovery tank level drops down to a pre-programmed set-point. The filler stop gate 39 closes automatically and the depalletizer alarm 42 will light. The containers 40 between
the filler stop gate 39 and the depalletizer 41 are then measured. The depalletizer operator then loads the conveyor belt with containers and then presses the depalletizer input button 42, which opens the filler stop gate. There will then be a measured amount of syrup and a measured number of containers to complete the run-out (end of production) process.

[0032] In the second situation, there is an unlimited amount of syrup and a limited number of containers available to be used for that production run. The operator pushes a button on the control panel, which inputs to the microprocessor 22. The amount of syrup in the syrup recovery tank 11 then falls to the pre-programmed cut-off point, which turns on the depalletizer alarm 42 light. The depalletizer operator then loads all the containers available onto the conveyor belt and then presses the depalletizer alarm and input button 42. The syrup supply valve 35 is then manually or automatically activated. There will then be a measured amount of syrup and a measured number of containers to complete the run-out process.

[0033] It can be seen that this system 10 networks with the depalletizer, the bottling area of the plant, and the syrup supply room. The syrup recovery system is like the brain which connects all three areas together. Previous to this invention, plant personnel were often reduced to scurrying around the plant to keep track of information from all three areas.

[0034] Also included herein is a method for substantially eliminating waste of syrup and containers during beverage production, comprising the steps of:

[0035] (a) transferring remaining syrup in a syrup supply tank 13 into a syrup recovery tank 11 in a beverage production system through distribution lines 12;

[0036] (b) pushing the remaining syrup in the distribution lines 12 into the syrup recovery tank 11;

[0037] (c) automatically dropping the level in the syrup recovery tank 11 down to a pre-programmed level or set-point;

[0038] (d) automatically closing a gate 39 on a filler 38 in the beverage production system;

[0039] (e) measuring the number of containers 40 between the gate filler 39 and a depalletizer 41, which feeds containers to the filler on a conveyor belt;

[0040] (f) loading the conveyor belt with containers; and

[0041] (g) opening the filler gate 39 and allowing the containers 40 to proceed into the filler 38. This method automatically gauges container and syrup inventories, when syrup inventory is limited and container inventory is not limited at the end of a production run. It preferably further comprising the steps of: (d2) lighting a depalletizer alarm to notify an operator, between steps (d) and (e); and (f2) pushing a depalletizer input button 42, between steps (f) and (g).

[0042] Also included herein is a method for substantially eliminating waste of syrup and containers during beverage production, comprising the steps of:

[0043] (a) automatically dropping the level in a syrup recovery tank 11 down to a pre-programmed level or set-point;

[0044] (b) automatically lighting a depalletizer alarm 42 to notify an operator;

[0045] (c) loading remaining containers 40 onto a conveyor belt, which leads to a filler 38;

[0046] (d) pushing a depalletizer input button 42 adapted to input to a microprocessor 22;

[0047] (e) closing a syrup supply valve 35 from a syrup supply tank 13; and

[0048] (f) pushing remaining syrup in distribution lines 12, which lead from the syrup supply tank 13, into the syrup recovery tank 11. This method automatically gauges container and syrup inventories, when container inventory is limited and syrup inventory is not limited.

[0049] From the foregoing it can be realized that the described device of the present invention may be easily and conveniently utilized and achieves many advantages for the beverage company. With this syrup recovery system, a plant operator can monitor how much syrup has been used and how much remains at any point during the production process. This syrup recovery system can also automatically provide a precise number for how many bottles, cans, etc. will be needed for a particular production run. The operator can automatically monitor syrup and container inventories during a beverage production run, and end the production run with substantially no wasted syrup or containers. This reduces syrup loss, wasted containers, and precious downtime due to miscalculations in the number of containers needed.

[0050] This system also decreases syrup wasted during switch-overs between different types of soft drinks, e.g., cola to lemon-lime soda, which require different ratios of syrup:water. It saves containers, product and man-hours at the end of production (during run-out). It addresses quality control problems and eliminates downtime due to tank changes. It decreases problems associated with air being mixed into the syrup during tank change-over. One of the quality control tests normally performed on sugared soft drinks during production is a Color test, which is also called a Brix test, which is performed to assure that the color of the soft drink, e.g., cola, stays the same. The present system can minimize fluctuating Brix results, or syrup pressure problems within production lines. The present system minimizes these problems by creating a void in the syrup line, allowing the air to purge from the syrup before it reaches the blender (proportioner). This means lower downtime due to Brix problems, and less product placed on hold or discarded due to questionable quality.

[0051] The syrup recovery system of the present invention is also advantageous in that waste disposal problems are turned into profits by converting what was formerly waste syrup into production run material. Syrup loss and Biochemical Oxygen Demand (BOD) waste treatment surcharges are in this way decreased.

[0052] While preferred embodiments of the invention have been described using specific terms, this description is for illustrative purposes only. It will be apparent to those of ordinary skill in the art that various modifications may be
made without departing from the spirit or scope of the invention, and that such modifications are intended to be within the scope of the present invention. It is intended that the doctrine of equivalents be relied upon to determine the fair scope of these claims in connection with any other person’s product which fall outside the literal wording of these claims, but which in reality do not materially depart from this invention.

[0053] Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can, by applying current knowledge, readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention.

BRIEF LIST OF REFERENCE NUMBERS USED IN THE DRAWINGS

[0054] (For information only)
[0055] 10 syrup recovery system
[0056] 11 syrup recovery tank
[0057] 12 inlet distribution lines
[0058] 13 syrup supply tank
[0059] 14 level control valve
[0060] 15 sightglass
[0061] 16 divert valve
[0062] 17 cleaning line
[0063] 18 spray nozzle
[0064] 19 inlet port
[0065] 20 level indicator
[0066] 21 control mechanism
[0067] 22 microprocessor
[0068] 23 electrical power source
[0069] 24 level transmitter
[0070] 25 transmitter probe
[0071] 26 movable float
[0072] 27 outlet distribution lines
[0073] 28 outlet port
[0074] 29 tank drain valve
[0075] 30 conductivity sensor
[0076] 31 centrifugal pump
[0077] 32 pump drain valve
[0078] 33 shut-off valve
[0079] 34 carbon dioxide blow valve
[0080] 35 syrup supply valve
[0081] 36 syrup supply pump
[0082] 37 blender
[0083] 38 filler
[0084] 39 filler stop gate
[0085] 40 containers
[0086] 41 depalletizer
[0087] 42 depalletizer alarm and input button
[0088] 43 syrup cut-off alarm

What is claimed is:

13. A method for gauging beverage container and syrup inventories during beverage production, when syrup inventory is limited and container inventory is not limited, comprising the steps of:
(a) transferring remaining syrup in a syrup supply tank into a syrup recovery tank in a beverage production system through at least one distribution line;
(b) pushing the remaining syrup in the distribution line into the syrup recovery tank;
(c) dropping the level in the syrup recovery tank down to a pre-set level;
(d) loading and measuring the number of containers between a filler and a depalletizer on the conveyor belt system; and
(e) allowing the containers to proceed into the filler.

14. A method according to claim 13, wherein step (d) further comprises activating a depalletizer alarm to notify an operator.

15. A method according to claim 13, further comprising the step of (d 2) receiving input from a depalletizer input button to open a gate on the filler, between steps (d) and (e).

16. A method for gauging container and syrup inventories during beverage production, when container inventory is limited and syrup inventory is not limited, comprising the steps of:
(a) dropping the level in a syrup recovery tank down to a pre-set level and maintaining it at that level;
(b) loading remaining containers onto a conveyor belt system, which leads to a filler;
(c) receiving input from a depalletizer confirming that the remaining containers have been loaded to the conveyor system;
(d) stopping the flow of syrup from a syrup supply tank to a syrup recovery tank; and
(e) pushing remaining syrup in at least one distribution line, which leads from the syrup supply tank, into the syrup recovery tank.

17. A method according to claim 13, wherein one or more steps are conducted automatically under the control of a microprocessor connected to the beverage production system.

18. A method according to claim 17, wherein step (d) further comprises automatically closing a gate on the filler by operation of the microprocessor.

19. A method according to claim 16, wherein one or more steps are conducted automatically under the control of a microprocessor connected to the beverage production system.

20. A method according to claim 19, wherein the syrup dropping to the pre-set level in step (a) automatically causes the microprocessor to activate a depalletizer alarm.
21. A method according to claim 19, wherein step (c) is carried out by a depalletizer input button inputting to the microprocessor.

22. A method according to claim 21, wherein step (d) occurs when the microprocessor receives the input from the depalletizer input button and operates to close a syrup supply valve on the syrup supply tank, the valve closure stopping the flow of syrup to the syrup recovery tank.

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