

Beverage (Carbonated Drinks) - Sugar Dissolving

Sugar Dissolving

De-aeration

Blending

Pasteurisation

Carbonation

Filling & Packaging

Utilities

Sugar Dissolving is the first unit in this seven step overview of beverage (carbonated drinks)

Sugar Dissolving Process Description

The base ingredient for most carbonated beverages is a sugar syrup, prepared by combining crystalline cane or beet sugar and water.

In certain markets, notably in North America, high fructose corn syrup (HFCS) may be used as an alternative base ingredient and the sugar dissolving process will not be required. HFCS is any of a group of corn syrups which have undergone enzymatic processing in order to increase their fructose content and are then mixed with pure corn syrup (100% glucose) to reach their final form.

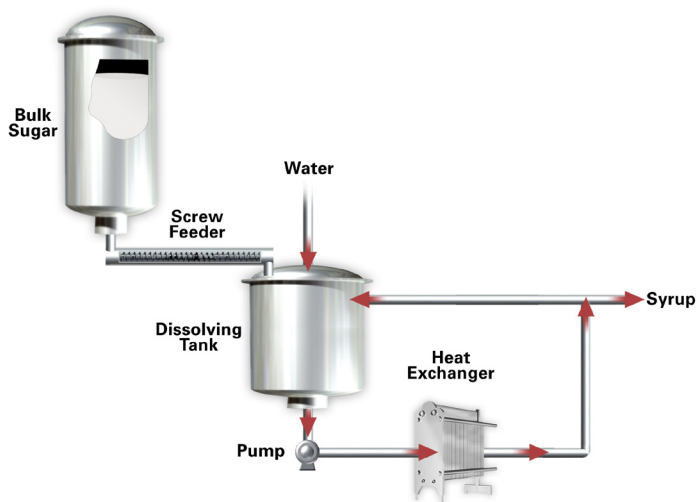
Crystalline sugar is stored either in bulk silos or various bulk bag formats. Syrup is prepared to a specific concentration, measured in degrees Brix (°Brix). This is a measurement of the mass ratio of dissolved sucrose to water and is monitored by an in-line mass flow meter that measures the specific gravity of the solution. For example, a 25°Brix solution is 25% (weight/weight), comprising 25g of sucrose per 100g of liquid. Beverage syrups are typically in the range of 60-70°Brix.

Dry sugar is metered into a sugar dissolving tank via a screw feeder, equipped with a frequency converter for capacity regulation. Sugar dissolving is achieved using a high velocity recirculation of either water or low °Brix syrup from a recovery tank, together with sugar in the dissolving tank. Built-in filters in the system trap any non-dissolved sugar crystals and return them to the dissolving tank.

Sugar dissolving involves either a hot dissolving process at a temperature of 80-85°C or a cold dissolving process at a temperature of 35-45°C, depending on desired final °Brix value. In either case, heating of the re-circulating solution is by plate heat exchanger using saturated steam. High accuracy mass flow meters are used to control the final strength of the syrup, taking into account appropriate temperature compensation factors. The final syrup °Brix value is continuously monitored and adjusted as necessary, to an accuracy of up to 0.1°Brix.

The final syrup may be cooled to around 20°C using a plate heat exchanger before feeding directly to the blending process or a syrup buffer vessel.

Select Critical Control Points of Sugar Dissolving



Sugar Level in Silos

Monitor granular sugar inventory to ensure adequate feedstock for production.

Water Flow – Sugar Dissolving

Accurate measurement of water flow to ensure consistent product formulation and sugar concentration.

Steam Measurement – Sugar Dissolving

Accurate steam measurement helps to identify poor performance of the heat exchanger, predict possible malfunction and optimize energy usage.

Steam Flow – Sugar Dissolving

Plate heat exchangers use saturated steam to heat the re-circulating sugar solution. Steam flow control maintains consistent plate heat exchanger temperature, optimizes end product quality and avoids unnecessary energy usage.

Syrup Temperature

Optimum control of syrup temperature ensures complete dissolution of sugar, and aligns with the required °Brix concentration.

Syrup °Brix Measurement

Ensure accurate °Brix sugar concentration in the end product by continuous measurement of the mix. This is essential to ensure consistent flavour and shelf-life.

Sugar Dissolving Tank Level







Liquid level is monitored to confirm the vessel contents volume and to provide fill and empty alarm points.

Services Temperatures

Services temperatures must be measured at various positions, for both process control and temperature alarm functions.

Improving Beverage Efficiency

Recommended Product Solution

<p>Sugar Level in Silos</p> <p>Control Point Challenge: Monitoring the volume of sugar in silos to ensure adequate feedstock for production.</p> <p>Solution: The non-contacting radar level gauge provides a reliable continuous level measurement of sugar in the silo by using microwave signals, requires no calibration and has no moving parts.</p>	<p>Rosemount 5600 Radar</p>  <ul style="list-style-type: none"> • Parabolic antenna • ±10mm accuracy • 4-20 mA + HART • No moving parts • Remote indicator • Configuration wizard • Linearization algorithms for filling 	
<p>Water Flow – Sugar Dissolving</p> <p>Control Point Challenge: Accurate measurement of water flow rate to ensure consistent product formulation.</p> <p>Solution: Magnetic flow meters offer a cost effective and low maintenance method to accurately measure volume of the water added to the dissolving tank.</p>	<p>Rosemount Magmeter</p>  <ul style="list-style-type: none"> • Accuracy to 0.25% • Cost effective water measurement • Simple configuration and start-up • Full diameter with low pressure drop and no added shear or turbulence • Low/no maintenance – no moving parts 	
<p>Steam Measurement – Sugar Dissolving</p> <p>Control Point Challenge: Accurate steam measurement helps to identify poor performance of the heat exchanger, predict possible malfunction and optimize energy usage.</p> <p>Solution: Steam can be accurately and repeatably measured using Vortex or Differential Pressure (DP) flow meters. For best performance, use temperature and/or pressure compensated Vortex or DP flow meters. Both technologies offer the lowest permanent pressure loss, maximizing energy efficiency.</p>	<p>Dp Flow Rosemount 3095 Mass Probar</p>  <ul style="list-style-type: none"> • 1% mass flow rate accuracy • Five year stability • Real-time fully compensated mass flow • HART output • P/DP/T measurement in a single unit 	<p>Rosemount Vortex 8800MV</p>  <ul style="list-style-type: none"> • Volumetric flow accuracy up to 1.35% of rate • P and T compensated mass accuracy to 1.6% of rate. • T compensated mass accuracy of 2-3% of rate • Low installed cost • Rangeability to 30:1
<p>Steam Flow – Sugar Dissolving</p> <p>Control Point Challenge: Steam flow control maintains consistent plate heat exchanger temperature, optimizes end product quality and avoids unnecessary energy usage.</p> <p>Solution: Accurate steam flow control is achieved by highly reliable general purpose control valves.</p>	<p>24000SVF Control Valve</p>  <ul style="list-style-type: none"> • Sizes: 1/2 - 2" • Ratings: ANSI Class 150 or 300 • Body Materials: Steel and 316L stainless • Flow Coefficients: Maximum Cv from 0.001 to 62 • Rangeability: 100 to 1 	<p>GX Control Valve</p>  <ul style="list-style-type: none"> • Sizes: FN15 to DN150 • Ratings: PN 10/16/25/40 • WCC, LCC, 316L, CW2M • Flow Coefficients: Maximum Cv from 0.04 - 389

Improving Beverage Efficiency

Recommended Product Solution

Syrup Temperature	Rosemount 644 Temperature
<p>Control Point Challenge: Temperature measurement and control of syrup to ensure complete dissolution of sugar.</p> <p>Solution: Reliable and accurate temperature measurement is achieved by replacing direct-wired sensors to the control system by sensor-mounted temperature transmitters using 4-20mA with HART protocol. RTD Pt-100 offers the highest accuracy and linearity and the use of transmitters provides a clean signal to the temperature controller.</p>	 <ul style="list-style-type: none"> • Universal RTD/Thermocouple • 4-20mA + HART • 0.03°C accuracy • 2 year stability • Direct mount sensor
Syrup °Brix Measurement	Micro Motion CMF
<p>Control Point Challenge: Accurate measurement of the °Brix sugar concentration during syrup preparation and final product mixing. This is essential to ensure consistent flavour and shelf-life.</p> <p>Solution: Micro Motion meters accurately measure the in-line °Brix concentration.</p>	 <ul style="list-style-type: none"> • Mass flow accuracy of 0.05% • In-line density accuracy to +/- 0.04 °Brix • Clean-in-place
Sugar Dissolving Tank Level	Rosemount 3051S
<p>Control Point Challenge: Accurate measurement of the contents of the vessel throughout the production process.</p> <p>Solution: Hygienic pressure transmitters provide accurate vessel hydrostatic head measurement using 4-20mA with HART protocol direct to the control system. Provides level alarm function as well as contents monitoring.</p>	 <ul style="list-style-type: none"> • dP with remote seals • +/- 0.065% accuracy • 4-20mA + HART • Tuned capillary system • 5 years stability
Services Temperatures	Rosemount 644 Temperature
<p>Control Point Challenge: Temperature measurement of service streams at various points to confirm and record the correct temperature profile and act as alarm points.</p> <p>Solution: Pipeline mounted RTD Pt-100 068 series with direct mounted transmitter offers good accuracy and fast response time.</p>	 <ul style="list-style-type: none"> • Universal RTD/Thermocouple • 4-20mA + HART • 0.03°C accuracy • 2 year stability • Direct mount sensor