



Artificial Carbonation

There are many different methods of artificial carbonation, from the simple 'shaking keg' method, to in-line pin-point carbonators with high speed pumps. They all share in common, however, a few simple principles that, when understood will allow you to achieve perfect levels of carbonation every time. The following handout is designed to help you understand what carbonation is, how it is measured, and how to aim for a desired level of carbonation in your beer.

What is Carbonation?

Carbonation is the process of injecting or dissolving carbon dioxide gas in a liquid to create an effervescence of pleasant taste and texture. In order to force-carbonate a liquid, two conditions have to be met: The liquid must be cold enough to accept the gas, and the liquid must be in a sealed pressure vessel to allow the gas to forced in under pressure.

Why cold?

It has to do with the fact that carbon dioxide is soluble in a solution in an inverse relationship to the temperature of the solution. You can visualise this by thinking about two cans of soda pop. If you keep one can on ice, when you open it, it will foam very little, and the soda will be strongly fizzy on your tongue. If you keep the other in the back window of your car on a summer day, it will foam explosively when you open it, and after that will seem flat and bland. That is because the carbon dioxide gas in the warm soda has escaped from solution. As a general rule of thumb in carbonation procedures, cold=good.

As for pressure vessels, most of these will commonly be soda kegs, or beer kegs. There are some other sealed pressure vessels on the market, but they are proprietary designs of the manufacturer, and none are as easy to use as the soda/beer models. Be sure that all of your pressure vessels have proper safety fittings, and are clean and sanitised before use.

How is Carbonation Measured?

Carbonation is measured in Volumes of CO₂. One volume of CO₂ is equal to one litre of carbon dioxide dissolved in one litre of liquid, two volumes is equal to two litres of gas in one litre of liquid, etc. Remembering this definition isn't important, but this is the only way measurements of 'fizziness' are defined.

Examples of Carbonation Levels

Most North American commercial beers are carbonated to 2.5-2.9 volumes. British cask ales are between 1.5 and 1.8 volumes (this 100% difference in carbonation is the reason why a lot of North Americans think the British drink their beer 'flat'), while some German Weizen beers have 3.0-3.5 volumes. While it is a matter of individual taste, most people will appreciate a beer that has about 2.4-2.6 volumes of CO₂.

The Carbonation Chart

As was stated above, the colder the liquid is, the easier carbon dioxide will dissolve into it. The following chart shows the maximum volume of CO₂ that a beer will hold at a given temperature. To

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use this, look up the volume of CO2 that you wish to dissolve in the beer, cross reference it to the temperature your beer is at, and this will tell you the gas pressure needed.

Deg. F	Deg. C	PSI												
		1	2	3	4	5	6	7	8	9	10	11	12	13
30	-1.11	1.82	1.9	2.03	2.14	2.23	2.36	2.48	2.6	2.7	2.82	2.93	3.02	-
31	-0.56	1.78	1.9	2	2.1	2.2	2.31	2.42	2.54	2.65	2.76	2.86	2.96	-
32	0.00	1.75	1.9	1.95	2.05	2.16	2.27	2.38	2.48	2.59	2.7	2.8	2.9	3.01
>33	0.56	-	1.8	1.91	2.01	2.12	2.23	2.33	2.43	2.53	2.63	2.74	2.84	2.96
34	1.11	-	1.8	1.86	1.97	2.07	2.18	2.28	2.38	2.48	2.58	2.68	2.79	2.89
35	1.67	-	-	1.83	1.93	2.03	2.14	2.24	2.34	2.48	2.52	2.62	2.73	2.83
36	2.22	-	-	1.79	1.88	1.99	2.09	2.2	2.29	2.39	2.47	2.57	2.67	2.77
37	2.78	-	-	-	1.84	1.94	2.04	2.15	2.24	2.34	2.42	2.52	2.62	2.72
38	3.33	-	-	-	1.8	1.9	2	2.1	2.2	2.29	2.38	2.47	2.57	2.67
39	3.89	-	-	-	-	1.86	1.96	2.05	2.15	2.25	2.34	2.43	2.52	2.61
40	4.44	-	-	-	-	1.82	1.92	2.01	2.2	2.3	2.39	2.47	2.56	2.65

Things to Keep In Mind...

This carbonation chart assumes 100% efficiency of CO2 uptake. If you have a very large head space in your keg (i.e.; 23 litres of beer in a 50 litre keg) you will probably need to vigorously carbonate your keg at a higher pressure, and then reduce the gas pressure to allow it to condition. In addition, the act of bottling your beer will allow a little CO2 to escape, so slightly more carbonation will be needed to compensate.

Most commercial quality (Brew-On-Premise) carbonating systems don't allow for 100% efficiency of uptake: they rely on 'overkill', putting a high CO2 pressure on the keg and using the carbonation recirculating pump for a short period of time to force it into solution. People using these systems should consult the manufacturers instructions for carbonation times and pressures. The chart provides the correct data for carbonating your beer, but there's no substitute for knowing your equipment's characteristics.

No matter what kind of system you use, your beer will display better carbonation characteristics if you allow it to condition. Conditioning is the process of allowing the bubbles to become finer and finer in solution. If you carbonate and attempt to dispense immediately, the bubbles will be large and unstable. Allowing the beer to rest overnight at carbonating temperature will yield finer bubbles and longer lasting carbonation.

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