

August 2009

[http:// www.carboyclub.com](http://www.carboyclub.com)

What's Brewing

August: LoneRider Brew It Forward Homebrew Competition (Sat, August 1)

August: Mead Day 2009 (Sat, August 1)

August: CARBOY Pint Night (Date: TBD, Loc: TBD)

August: Summertime Brews Festival – Greensboro (Sat, August 15)

August: Beer, Bourbon & BBQ – Cary (Sat, August 15)

Sept: CARBOY Pint Night (Date: TBD, Loc: TBD)

Sept: High Country Beer Fest – Boon (Sat, Sept 5)

Sept: Brewgrass Festival, Asheville (Sat, Sept 19)

Sept: CARBOY Oktoberfest (Sun, Sept 20)

Oct: CARBOY Pint Night (Date: TBD, Location: TBD)

Oct: World Beer Festival – Durham (Sat, Oct 3)

Oct: Charlotte Oktoberfest (Sat, Oct 10)

Oct: Hickory October Fest (Oct 9-11)

Oct: Lighthouse Festival – Wilmington (Sat, Oct 17)

Wort Aeration: Effects of Aeration Method, Chilling Method, and Wort Gravity on Oxygen Concentrations

By Mitch Woodward

Having been involved in brewing now for more than 2 years, and being a big-time science geek, I am constantly on the hunt for new and more effective brew-day procedures that will result in more consistent results. After a few questionable big-beer fermentations, one area that I decided I needed to understand more about, in terms of how it affects yeast health and attenuation (and of course the qualities of final product!), is effective wort aeration methods.

After a good bit of research, including a July-August 2009 article in **Brew Your Own** by **Jon Stika** entitled **Wort Aeration**, I found that I agree with Jon and **BYO Technical Editor Ashton Lewis** when he summarized some of the confusion and mixed-messages surrounding the subject, "There is no exact answer to your exact question on aeration, the experienced brewer will come up with their own special techniques and interpretations to the tremendous number of ideas floating around the brewing (and homebrewing) world."

One conclusion was clear however; most that have looked at this subject agree that wort has an oxygen content of about 8.5 ppm when saturated with air (79% nitrogen and 21% oxygen) and an oxygen content of about 43 ppm when saturated with pure oxygen. References by Palmer, and Lewis indicate 8-16 ppm O₂ is needed by yeast at pitching, with 8 ppm O₂ often cited.

Using this as a jumping off point, I decided that I did not have the time to test every method of wort aeration that I had heard discussed or read about, but simply test a few commonly used methods with the goal of determining which methods would give the best results in the least amount of time, and at the least cost for the homebrewer.

Test Procedure

All the following test results included 5 gallons of wort that was made from water and cane sugar, then boiled for 15 minutes, chilled to 68F (using either a submersion or counter-flow chiller), and measured for oxygen using a model SM600 digital dissolved oxygen meter by Milwaukee Instruments. (A meter I was familiar with from our stream water studies around the Raleigh, NC area and found to be very accurate and dependable.) The meter was calibrated prior to testing each batch using standard solutions from the meter manufacturer.

Results:

- 1) The saturation point of oxygen in pitching-temp wort (68F) was **8.5 ppm** when using air as the O₂ source. This agrees with Palmer and Lewis.
- 2) Boiled and chilled wort of either 1.048 or 1.090 SG tested immediately after chilling to 68F, **contained less than 2.0ppm O₂ without aeration** and must receive additional aeration to provide sufficient oxygen for yeast.
- 3) When an **Emersion Chiller** was used with some slight stirring to facilitate rapid cooling and whirlpooling, then poured through a funnel from the kettle into carboy, the wort contained - **4.1 ppm**.
- 4) Same as 3) above, but a **Counter-flow Chiller** was used to cool hot wort and allowed to fall about 1 foot into carboy fermenter through a funnel - **4.2ppm**.
- 5) Using the '**Mixstir**' was very effective in raising O₂ to saturation (8.5 ppm), requiring only about **30 seconds with a cordless 3/8 drill running on high speed**, regardless of wort SG. (Foaming was a problem, however, so you may want to consider running the Mixstir 15 seconds on, rest 15, then run another 15 seconds.)
- 6) **Shaking or rocking the carboy** (plugging the hole with a sterilized stopper, holding it firmly in place with one hand, then either picking up the carboy and shaking or laying it down on its side on a towel and rolling it vigorously in a back and forth motion) was found to also be very effective. Word of warning - picking up the carboy and shaking it for that long requires a strong back and a good grip!!! Quite a workout! **Saturation (8.5ppm) was achieved after 60 seconds of vigorous shaking with 1.040 SG wort and 90 - 120 seconds with 1.090 SG wort.**
- 7) Use of an **aquarium-type pump and 2u* stainless diffusion stone** was also effective, but needed more time. It took **7 minutes to reach saturation (8.5ppm) in 1.040 SG wort.** (* Note - We tried to use a 0.5u stone but the pump could not develop the necessary pressure to push air out of the stone.)
- 8) With **1.040 wort, pure O₂ and 0.5u stainless diffusion stone** attached to a hose with a small amount of stirring (regulator on O₂ tank set very low, so O₂ was just coming out and bubbles were very small with little buoyancy). **Wort reached saturation (8.5ppm) in just 1 minute.** After 2 minutes, 13.9ppm. After 3 minutes +19.9ppm. (+ Note: 19.9 ppm was the maximum detection limit of the meter.)
- 9) With **1.090 wort**, getting O₂ into the wort did take a little longer. With everything the same as in 8) above, **wort reached 5.0ppm in 1 minute. 7.8ppm in 90 seconds, and in 2 minutes, 10.0ppm. After 3 minutes - 12.8ppm, after 4 minutes 18.5ppm.**

"The easiest way to spot a wanker in a pub is to look around and find who's drinking a Corona with a slice of lemon in the neck." -Warwick Franks

Conclusions and Discussion:

The tried and true method of rocking and shaking is effective in getting wort up to O₂ saturation in a short amount of time (60 seconds for 1.040 SG wort, 90 - 120 seconds for 1.090 SG wort). Also, you can't beat the price!

The Mixstir also proved itself to be very effective when used with a 3/8" drill running on the highest speed for 30 seconds, regardless of whether wort was 1.040 or 1.080 SG. I have developed a 'alternating whirlpooling technique' that I like where I will run the Mixstir on high until the spinning wort makes a whirlpool that reaches the bottom of the carboy, then I will reverse the drill quickly and get the whirlpool to rotate in the opposite direction. This really creates some turbulence! I repeat this for about 30 seconds, pitch the yeast, then repeat the whirlpooling technique another 30 seconds. **I have never had a problem fermentation using this method and I know my wort is consistently close to saturation every time.** One potential problem you may have with this method is the large amount of foam produced. If foaming is an issue, using a foam reducer like Fermcap-s and / or waiting for the foam to dissipate, then mixing again can help. Cost is minimal if you already have a drill and if you're like me -- using power tools whenever you can -- it is very effective.

Using pure O2 and a 0.5u diffusion stone was also effective but exacting. 1.040 wort reached 8.5 ppm O2 in just 1 minute and 1.090 wort reached 7.8 ppm in 90 seconds and 10.0 ppm in 2 minutes. Beside the higher costs (you will need a diffusion stone, O2 tank, regulator, filter, lines), consistency with O2 delivery between batches can be a problem if you don't have a flow meter. I did have some trouble setting the regulator so that O2 flow was consistent between test batches and the bubble size remained consistently small. During test runs, I found that just a little difference in O2 flow rate made a big difference in wort oxygen concentration. I often had to re-adjust the regulator after closing the valve on the tank between batches. I also found that it was very easy to get the 1.040 SG wort beyond the maximum detection limit of the meter (+19.9ppm), especially if I adjusted the flow rate on the regulator beyond

where I just had very small bubbles coming from the stone. No doubt that this is the highest cost option but, if you already have this equipment for making yeast starters it can be a good option.

Use of an aquarium-type pump and 2.0u stainless diffusion stone was also effective, but needed more time. It took my pump at least 7 minutes to reach saturation (8.5ppm) in 1.040 SG wort. This is not necessarily a bad thing though, as you could be doing other things like cleaning up or having a beer! **An option I like, particularly with bigger beers, is to use the Mixstir or pure O2 to bring the wort up to saturation, pitch the yeast, then run the aquarium-type pump setup for 30-60 minutes while I'm cleaning up.** This way, I'm satisfied the yeast are getting all the oxygen they need without over doing it on the O2.

CARBOY Officers for 2009-2010

The July meeting was used to vote for the 2009-2010 officers. We appreciate the efforts of last year's officers and welcome Aaron, Walt and Jimmy on board for this year.

CARBOY Officers 2009-2010

President: Aaron Miller
 Education VP: Walt Haulenbeek
 Social VP: Jimmy Vervaecke
 Treasurer: Mike Dixon
 Communications Director: Kevin Thorngren

CARBOY Officers 2008-2009

President: Walt Sweeney
 Education VP: Brian Sico
 Social VP: Bill Dubas
 Treasurer: Mike Dixon
 Communications Director: Kevin Thorngren

LoneRider Brew It Forward Competition

By Kevin Thorngren

The first LoneRider Brew It Forward competition was a great success. LoneRider celebrated the event by inviting all of the entrants to the brewery for the competition. Not sure how the judges felt about being watched by the brewers as they judged their beers but overall it was a successful event. CARBOY was well represented in the event with winning five of the twelve first round medals. Next year we need all of the first round winners to be CARBOY members!!

First Round

1st Place

Shawn Dagnall	Yellow belly frog Farmhouse Ale
Andrew Simmering	Saloon Stout
Andrew Simmering	Snake Bite IPA
Brad Vincent	Double Monkey IPA

2nd place

Kevin Cosentino	Blood Red Rye Ale
Jason Alarcon	Hop Rod Rye Jr.
Jimmy VerVaecke	Betty's Dirty Sister
Jimmy VerVaecke	Breakfast on the Range

3rd place

Eric Himburg	Elizabeth Adams
Kevin Cosentino	Gunslinger Pils
Mike Weiss	concealed-n-packen IPA
Sam Victory	Scottish 60/-

Best of Show

1st place BOS

Kevin Cosentino	Gunslinger Pils
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2nd Place BOS

Shawn Dagnall	Yellow belly frog Farmhouse Ale
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3rd place BOS

Andrew Simmering	Saloon Stout
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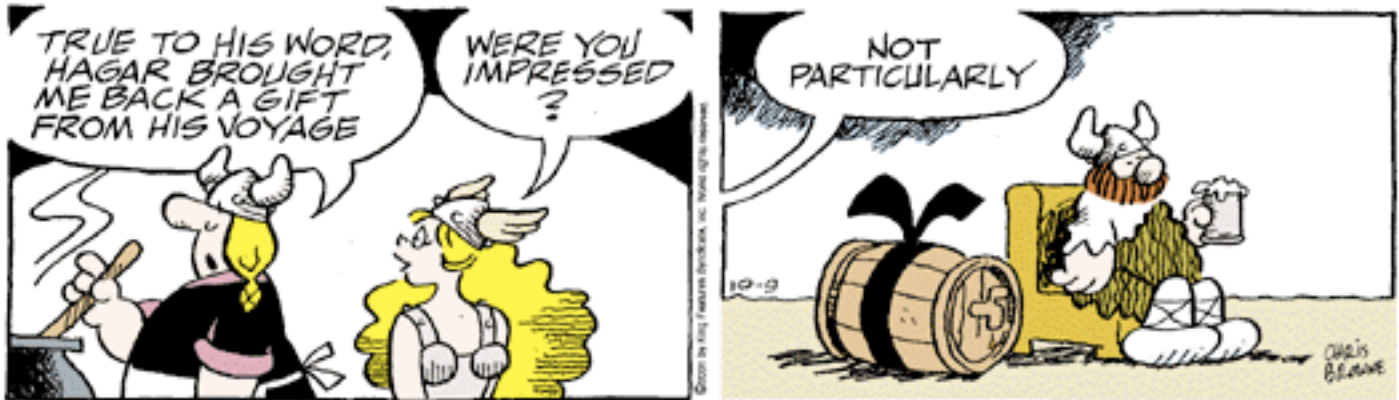


Editor's Note

By Kevin Thorngren

I want to thank Mitch Woodward for his article on Wort Aeration. This saves me the effort of searching the internet for something to put in the newsletter. I challenge everyone in the club to provide something for the newsletter this year. Even if the submission is as simple as a couple of pictures from a brew tour. I am just looking for something / anything that would be of interest to the readers. The more participation there is the more interesting the newsletter will be. The newsletter is not only for the club members but it is an advertisement for our club to attract new members.

I invite anyone interested in submitting anything from a feature or general interest articles to travelogues, recipes, etc. to do so. Please send to CarboyCommunications@CarboyClub.com.



Meeting Location

CARBOY's monthly meetings are currently held at the BB&Y Restaurant. BB&Y is located on the first floor of the Caswell Building at 3700 National Drive, in the Koger Center off Glenwood Avenue in West Raleigh. Owner Jonni Jones allows CARBOY to meet monthly at his restaurant when we don't have picnics or field trips scheduled. BB&Y is open for lunch each week-day. We encourage members to visit BB&Y for a relaxed informal meal. Please let Jonni know you're from CARBOY when you visit her restaurant.

The next meeting is August 26th

Executive Committee

President: Aaron Miller
(CarboyPresident@CarboyClub.com)

Education VP: Walt Haulenbeek
(CarboyEducation@CarboyClub.com)

Social VP: Jimmy Vervaecke
(CarboySocial@CarboyClub.com)

Finance Director: Mike Dixon
(CarboyTreasurer@CarboyClub.com)

Communications Director: Kevin Thorngren
(CarboyCommunications@CarboyClub.com)

Join CARBOY!

CARBOY is a family-oriented social club that enjoys the art of brewing and drinking their own beer. We meet monthly on the 4th Wednesday. To join, contact Mike Dixon. Our current annual dues are \$15.00 for regular members, and \$10.00 for associate members. Please send a check and membership application to:

CARBOY
c/o Mike Dixon
9611 Stable Point Circle
Wake Forest, NC 27587