Fermentis by Lesaffre

E2U EASY TO USE

TECHNICAL GUIDELINES SafBrew™ LA-02

Oct26
TG-LA-02 – V2

SafBrew™ LA-02 is suitable for both <0.5% ABV and 0.0% ABV beer production.
This technical document is organized into two sections:

1 Guidelines for **<0.5% ABV Beer** (classic fermentation process) – Page 1

2 Guidelines for **0.0% ABV Beer** (specific aeration process) – Page 4

1 - GUIDELINES FOR <0.5% ABV BEERS (FERMENTATION)

SafBrew™ LA-02 (*Torulaspora delbrueckii*) is a non-*Saccharomyces* yeast that has been specifically selected to produce low and non-alcoholic beers (<0.5% ABV). This yeast only assimilates primarily simple sugars (glucose and fructose) and slowly assimilates saccharose. However, it does not assimilate maltose, maltotriose, or dextrins.

This strain exhibits neutral to mild fermentation characteristics with no phenolic (spicy) notes. Sensory profiles may differ depending on the wort and fermentation conditions.

BEER STYLE

Low and non-alcoholic beers.
This strain is POF- and does not produce phenolic characters in the beer.

GRAVITY

The ethanol produced by **SafBrew™ LA-02** is directly correlated with the original gravity (OG) of the wort, and more specifically, the quantity of monosaccharides (DP1).

When tested, original gravities of 8°P, 10°P, 12°P, and 14°P finished with an ADF (apparent degree of fermentation) of approximately 10% (+/- 2% ADF) utilizing a standard mash regime of 30 mins at 65°C (149°F) and 20 mins at 74°C (165.2°F).

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Table 1: ADF of NA beer attenuated with SafBrew™ LA-02

Original extract	Expected alcohol content (low)	Expected alcohol content (high)
4 °P	0.15%	0.23%
6 °P	0.24%	0.36%
8 °P	0.32%	0.49%
10 °P	0.41%	0.62%
12 °P	0.50%	0.76%
14 °P	0.60%	0.90%

The final exact value will depend on your raw materials and mashing regime. These factors directly impact the quantity of simple sugars available to the maltose-negative yeast. Additionally, the oxygenation given to the fermentation will impact the final alcohol content as this strain is Crabtree-intermediate, meaning a certain amount of oxygen can induce cellular respiration without the production of alcohol.

FERMENTATION TEMPERATURE

The recommended temperature for **SafBrew™ LA-02** is between 18°C and 20°C (64.4 – 68°F).
For a quick fermentation, we recommend the higher end of this range.

As soon as your target ADF is reached (while not exceeding 4 days of fermentation), the beer should be cold crashed and transferred to maturation.
Keep the beer cold until pasteurization, as any contamination would have an elevated risk of fermenting the residual sugars. Diacetyl rest should be avoided at high temperatures.

PITCH RATE

During batch fermentation procedures, use 50 g/hl in primary fermentation (0.06 oz/gal).

Direct pitching: Pitch the dry yeast directly into the fermentation vessel over the surface of the wort at or above the fermentation temperature. Progressively sprinkle the yeast over the wort, ensuring the yeast covers the entire surface available to avoid clumping. Ideally, add the yeast during the first part of filling the vessel; in this case, hydration can be done at a wort temperature higher than the recommended fermentation temperature, provided that the vessel is then filled with wort at a lower temperature to bring the entire wort temperature down to the fermentation temperature.

Rehydration: Sprinkle the yeast into a minimum of 10 times its weight of sterile water or boiled and hopped wort at 15°C to 30°C (59°F to 86°F). Leave to rest 15 to 30 minutes, then gently stir and pitch the resulting cream into the fermentation vessel.

Aeration: It is not necessary to aerate the wort before pitching the yeast.

Dry hopping is not recommended at fermentation temperature or at temperatures higher than 4-5°C (39.2-41°F) to avoid the hop creep effect. Hop creep can lead to a higher concentration of glucose that will ferment in the presence of yeast. It is strongly recommended that any dry hopping process be conducted exclusively post-fermentation, when the beer has cooled to a temperature of less than 4°C (39.2°F).

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POINTS OF ATTENTION

- **ADF:** The expected ADF is between 5 and 10%. It is strongly recommended to cold crash as soon as your ADF is in this range. Any cross-contaminant could otherwise take over and ferment the remaining sugars.
- **Beer packaging:** Due to residual sugars left in the beer, pasteurization of the packaged beer is mandatory to avoid living microorganisms remaining in the product. At pH 4.2, we recommend a minimum of 50 PU (ideally 80 to 120 PU). At a lower pH level and/or high IBU, the PU level can be adjusted. Flash pasteurization is not adequate for stabilizing the beer, due to the possible presence of living microorganisms in later process steps.
- **pH:** Due to the low attenuation of **SafBrew™ LA-02**, the acidification or pH drop will be less than typical fermentations (between pH 4.5 and 5). It is recommended to adjust the pH before and/or after fermentation to achieve flavor and microbial stability.
- **SafBrew™ LA-02 is not suitable for cropping and repitching**. Any *S. cerevisiae* or *S. pastorianus* (cross-contaminant from the brewery) that could enter the slurry would have a growing advantage over the *Torulaspora delbrueckii* as the latter cannot ferment maltose.
- **SafBrew™ LA-02 should not be used for propagation** as any contaminant (even *S. cerevisiae* or *S. pastorianus*) would have access to the maltose/maltotriose and dominate the propagation medium.

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2 - GUIDELINES FOR 0.0% ABV BEERS (SPECIFIC AERATION PROCESS)

SafBrew™ LA-02 is a Crabtree-intermediate yeast, suitable for producing 0.0% ABV beer under specific oxygenation protocols and process parameters. A Crabtree-intermediate yeast is a yeast that does not have a true Crabtree phenotype. With sufficient oxygenation of the wort in the brewery, the strain only uses respiration. If conditions vary, the strain may use fermentation and respiration in parallel.

This strain is POF- and does not produce phenolic characters in the beer.

PROCESS & PARAMETERS

Extract
To achieve a 0.0% ABV beer using **SafBrew™ LA-02**, the recommended extract should be approximately 6 °P. For fermenters that are filled with more than one brew, a high gravity wort can be used if sterile process water is added to dilute it back to 6 °P.

Aeration and aeration loop
To ensure aeration and consequently the production of a 0.0% beer, an aeration loop must be installed.

An example aeration loop consists of:

- Piping for the collection of wort from the base of the tank
- A pump with variable flow
  - Flow initiation set to 1.5x tank volume per hour (e.g. 150 hL/hour for a fermenter of 100 hL)
- An aeration system (e.g. Vivelys VISIO® 0.0%), including an oxygen sensor and a candle to inject oxygen
  - Many other fully integrated micro-oxygenation systems can be used
- Recirculation of the wort through the racking arm.

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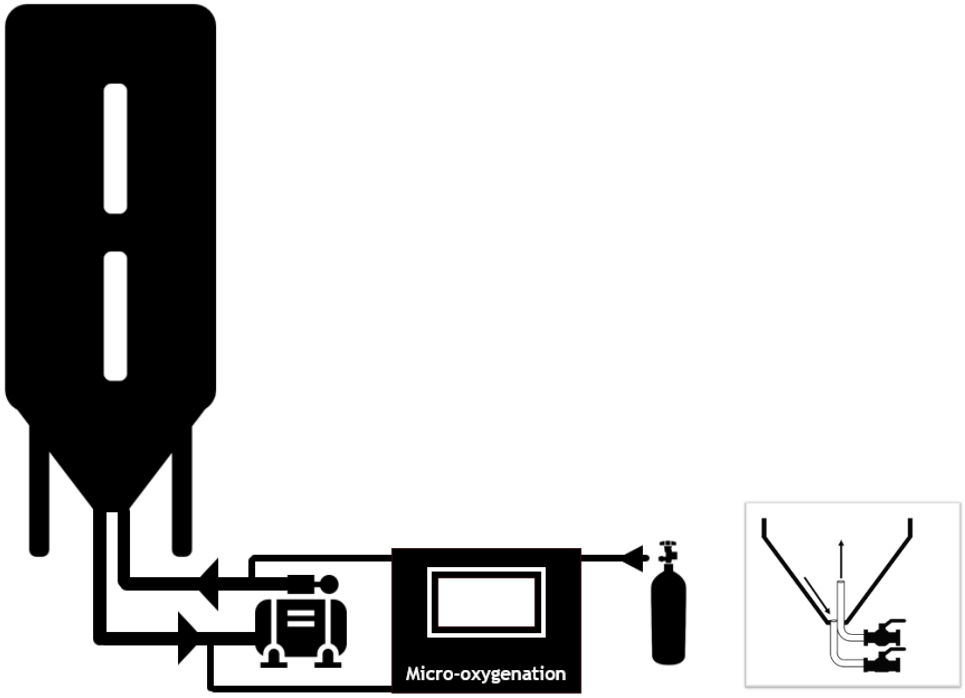


Figure 1 – Aeration loop example

Aeration/Oxygenation:

- Introduction of oxygen: initial aeration rate of 10-15 ppm
  - There are two ways to initiate the process
    - Via existing inline aeration from the brewhouse
    - Via aeration loop (Figure 1)

  NOTE: Pitch yeast only in pre-aerated wort

- Phase 1: Yeast oxygen consumption (Figure 2):
  - During this phase SafBrew™ LA-02 will consume oxygen
  - Phase 1 is complete when the dissolved oxygen level drops below 2 ppm

- Phase 2: Oxygen regulation (Figure 2):
  - During this phase, maintain oxygen level at 2 ppm using aeration system
  - Phase 2 is complete when the beer sensory assessment is neutral. When satisfied with your beer's sensory profile, process to crash cooling
    - see sensory assessment for neutrality point below

- Phase 3: Crash cooling process (Figure 3)
  - When the beer is ready, set the fermenter cooling system to 2-4°C
  - During this step, gradually decrease aeration

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- Phase 4: Termination of the aeration process
  - When the temperature decreases to below 6°C, there is minimal yeast activity and aeration can be stopped
  - Once the beer is at final cold temperature, strip out the residual oxygen via CO_2 purge resulting in under 50 ppb of oxygen.

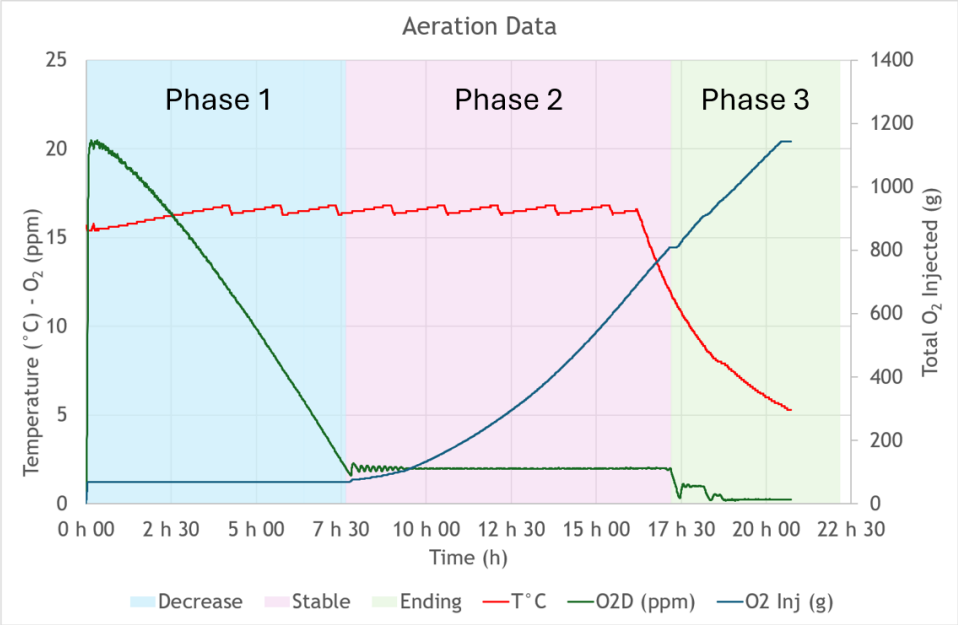


Figure 2: Example of dissolved oxygen and temperature during production.

Decrease, Stable and Ending refer to different phases of dissolved oxygen.
- T°C is product temperature.
- O2D (ppm) is dissolved oxygen in product.
- O2 Inj (g) is cumulative oxygen added in aeration loop.

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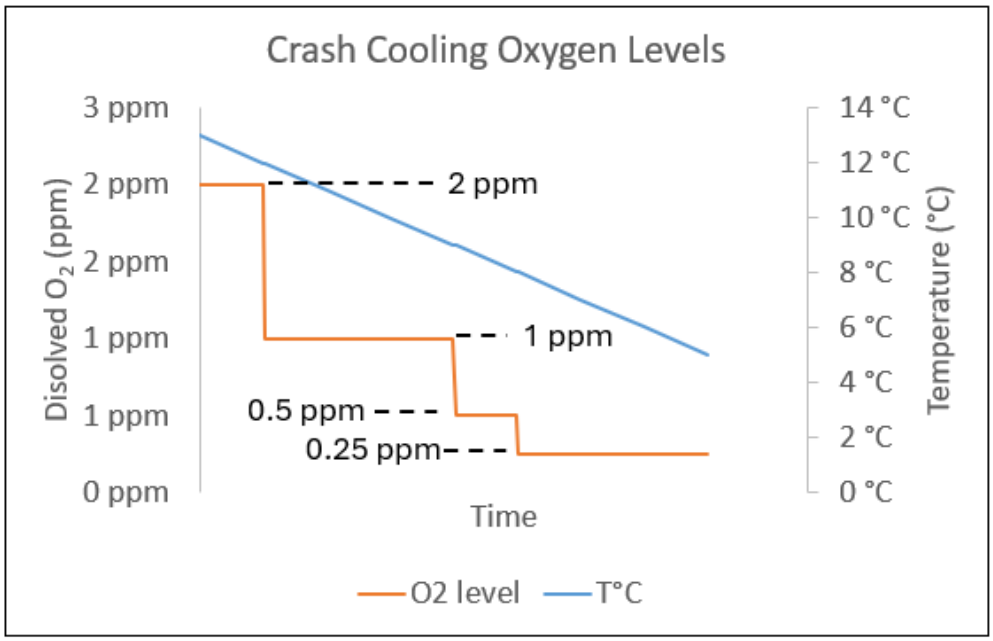


Figure 3: Example of aeration step down during cooling process

Sensory assessment for neutrality point:
At the end of phase 2, the decision to begin crash cooling the beer is made by sensory tasting for neutrality. Gradually post inoculation, the worty flavor will decrease, leaving the beer neutral. This neutrality point will remain for a few hours (2-8h) depending on the process parameters, especially temperature. When the process continues past the neutrality point, typically some fruity/red apple esters may develop. It is recommended to initiate the crash cooling when the neutral point has been reached.

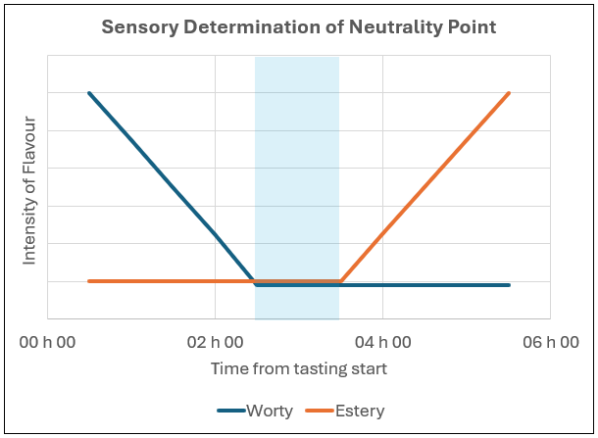


Figure 4: Neutrality point over time.
This graph shows the neutral sensory balancing between worty and estery flavors present during 0.0% ABV beer production with **SafBrew™ LA-02**.

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PROCESS INFORMATION

Pitching rate:
10 g/hl (0.013 oz/gal).
A low initial pitch rate is recommended as the aeration process enables the production of biomass and a fast reduction of worty flavors without over-production of esters.

Process temperature: 16-19°C (60.8 - 66.2°F)

Process parameters and crash cooling time:
Temperature and pH can be used to fine tune the process speed. A faster process will tend to reduce the neutral window period.

- Starting recommendations based on brewery cooling capacity:
  - Breweries that have a high cooling capacity (~3°C/h)
    - Faster parameters to 19°C and pH 4.0
  - Breweries that have a lower cooling capacity (~1 °C/h)
    - Slower parameters of 16°C and pH 4.4.
- Temperature:
  - A low temperature, 16 °C, will slow the process down
  - A high temperature, 19 °C, will speed the process up
- pH:
  - A high pH, 4.4 will slow the process down
  - A low pH, 4.0 will speed the process up

Process time and pitching:
Typical crash cooling initiation varies between 16 – 22 hours post yeast pitch if following the parameters outlined above. Below is an example of a practical schedule for breweries working in one shift:

- **SafBrew™ LA-02** is pitched around 5 to 6pm.
- The expected time to taste is around 15 hours after pitching, so around 8 to 9am the following morning.
- Brewers may crash cool whenever sensory assessment is satisfactory and typically started 30 minutes to 2 hours following the first beer tasting.

Oxygen or air:
Sterile compressed air or pure oxygen may be used. Oxygen typically does not produce foam, while compressed air requires consideration of the foam volume inside of the tank. It is recommended to keep a reserve supply of oxygen to avoid running out of O_2 during the process, if using pure oxygen tanks. The use of sterile compressed air offers a continuous feed/supply of oxygen and needs to take into account extra head space for foam formation.

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Post processing:
It is recommended to process the beer post crash cooling within 3-4 days. Even at 2-4 °C, there are viable yeast cells and any metabolic activity may change the beer flavour, including undesirable attributes. The pH can be adjusted to balance the sweetness or acidity of the beer. It is recommended to perform lab bench pH adjustments to your product to obtain the best balance in your beer. Previous Fermentis experiments with NOLO beers found a pH range between 3.9 - 4.1 allows for reduced sweetness perception. We recommend bench top trials with pH ranging from 4.4 to 3.8.

Removing yeast before packaging reduces the microbial load and will allow for a more efficient pasteurization of the beer. If possible, filter and/or separate the beer before packaging via available means such as centrifugation.

INSTRUCTIONS FOR USE

Direct pitching: Pitch the dry yeast directly into the fermentation vessel over the surface of the wort at the process temperature. Progressively sprinkle the yeast over the wort, ensuring the yeast covers the entire surface available to avoid clumping.

Rehydration: Sprinkle the yeast into a minimum of 10 times its weight of sterile water or boiled and hopped wort at 15°C to 30°C (59°F to 86°F). Leave to rest 15 to 30 minutes, then gently stir and pitch the resulting cream into the fermentation vessel.

POINTS OF ATTENTION

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- **ALDC:** to avoid any production of diacetyl, and because this process does not allow for a diacetyl step, we recommend the use of ALDC. It can be added directly to the wort when pitching the yeast.
- **SafBrew™ LA-02 is not suitable for cropping or repitching**. Any *S. cerevisiae* or *S. pastorianus* (cross-contaminant from the brewery) that could enter the slurry would have a growing advantage over the *Torulaspora delbrueckii* as the latter cannot ferment maltose.
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