WE BREW WITH YOU.™

THE OFFICIAL NEWSLETTER
OF ALL THINGS LALLEMAND BREWING

INCREASING BREWING EFFICIENCY

EDITION #17

BE PASSIONATE BE LALLEMAND

In 2019, we started centralizing our supply chain operations. In June 2024, we moved to a larger warehouse facility in Leopoldsdorf, Austria, consolidating multiple storage locations under one roof. This allows us to reduce transportation, use recovered heat for office heating, generate renewable energy, and offer on-site charging for electric cars. This move signifies the conclusion of this project.

While we will keep working hard to improve the efficiency and sustainability of our operations, this move was the last major step concluding this project.

In front, from left to right:
Levente Imreh (driver / baking), **Julia Schwammenschneider** (Logistics & Customer Care Manager), **Susanne Sladek** (office / baking), J**aqueline Binder** (office / baking), **Brent**, **Claudiu Axente** (Warehouse Manager), **Georgine Fischer** (Logistics & Customer Care Coordinator)

On the back, from left to right:
Martin Kraus (fleet manager / baking), **Sylvie**, **Karl Ecker** (driver / baking), **Abod Bolos** (warehouse worker), **Robert Stefanc** (Logistics & Customer Care Coordinator)

#bepassionatebelallemand

EDITION #17 *Special thanks to Eric Abbott, our ESG member, for his contributions to co-creating the content for this edition.*

EDITORIAL

Brewing efficiency is becoming a priority for most brewers around the world. Economics and environmental concerns are forcing breweries and raw material producers alike to find ways to prevent waste and save resources.

At Lallemand Brewing, we are mindful that producing and shipping microorganisms impacts the environment and society. Each year, we invest in projects to decrease our environmental footprint and enhance efficiency. We are gradually making our facilities more environmentally conscious by recovering wasted heat, reducing odors around our facilities, generating energy from waste streams, minimizing water usage, and transitioning to renewable energy sources where feasible.

Breweries and suppliers are increasingly getting questions about the quality of their products and if they are produced in a sustainable way. Lallemand has appointed a corporate environmental, social, and governance (ESG) reporting manager and formed a companywide ESG workgroup with representatives from all business units, including Lallemand Brewing. Through our management policies and products, Lallemand currently contributes to 11 of the 17 United Nations Sustainable Development Goals (SDGs).

Lallemand Brewing supports the promotion of diversity, equity, and inclusion (DEI) within the brewing industry. Many of our team members are involved and volunteering on DEI committees or organizations. Sylvie Van Zandycke, our Sales and Marketing Director, serves as the Director of Ethics for The Siebel Institute of Technology and is president of a local chapter of the Pink Boots Society, which supports women and non-binary individuals in the fermented/alcoholic beverage industry to advance their careers through education. We also support the Michael James Jackson Foundation, which funds technical education and career advancement for black, indigenous, and people of color in the brewing and distilling industries.

In our latest newsletter, we highlight our research and development efforts to optimize yeast strains for reduced energy consumption in cooling processes. Additionally, we discuss how enzymes and process aids can contribute to brewery sustainability by enhancing brewing efficiency, increasing yields, and improving product stability.

Eric Abbott
Technical Support Manager and
member of the Lallemand ESG workgroup

LEVERAGING ENZYMES AND PROCESS AIDS TO IMPROVE BREWING EFFICIENCY

There is no single silver bullet for a brewery to reduce their environmental impact. Rather, it is the optimization of each of the many steps in the brewing process that leads to a greater cumulative effect. Fortunately, optimization efforts usually lead to cost savings as well , giving everyone an added incentive to increase efficiency and reduce waste.

Enzymes and process aids are invaluable tools for optimizing the brewing process. For example, enzymes and process aids can reduce fermentation and maturation time, improve mash extract and lautering times, increase yields, and extend product shelf-life. While these tools are commonly used in larger breweries that are focused on efficiency, it is less common for enzymes and process aids to be used in smaller, craft breweries. This is changing as customers demand greater environmental responsibility, and brewers are under increasing pressure to cut costs and get an edge on the competition.

The Role of Enzymes and Process Aids in Brewery Efficiency and Environmental Impact

FERMENTATION AND MATURATION TIME — There are many ways that a brewer can improve the efficiency of the brewing process. Faster tank turnarounds can help you get more volume out of your brewery without purchasing new fermenters, which require energy and resources to manufacture and ship. Nutrients can help speed up fermentations and prevent off-flavors during fermentation, thereby reducing maturation time and lowering the energy required for cooling the beer. Using an acetolactate decarboxylase enzyme (ALDC) will break down diacetyl precursors and eliminate the need for a diacetyl rest. Maturation can also be shortened by using finings or proteases to speed up clarification and improve filtration.

MALT — Enzymes can help to improve mash efficiency, which allows for the total grain bill to be reduced. Glucosidic enzymes such as fungal α-amylase or glucoamylase will increase the extraction of fermentable sugars from the malt. Glucanase enzymes will improve lautering and extract. Protease enzymes can increase the FAN levels when using low FAN adjuncts. These enzymes all support the use of higher levels of adjuncts, and local or organic malts that tend to have lower or inconsistent levels of enzymes. The malting process is energy and water intensive, so replacing some malt with adjuncts requires fewer resources.

HOPS — Antifoams can be used in the kettle or fermenter to reduce losses due to boil-overs or fermenter blow-offs. Antifoams can also increase hop utilization since less α-acids are lost in the foam, so hop rates can be reduced. β-Glucosidase enzymes can promote biotransformation and improve total hop aroma without increasing hop rates.

YEAST — Zinc is especially important, and yeast-derived sources of zinc such as Servomyces™ are more bio-available to yeast during repitching.

PRODUCT YIELD — Process aids can increase the total product yield per brew. Using kettle finings and beer finings will increase the yield of wort and beer, respectively. The usable kettle and fermenter capacity can be increased by using antifoams to reduce the amount of headspace required.

SHELF LIFE — Increased product stability can reduce wastage of finished product and packaging. Shelf life can be improved by using antioxidants to prevent staling. Proline-specific proteases can reduce colloidal haze and increase product shelf life.

OTHER CONSUMABLES — Using finings can extend filter life and reduce the need to use excess water to backflush. Antifoam will reduce the amount of chemicals and water required to clean a tank.

The applications are seemingly endless for enzymes and process aids to increase efficiency, reduce environmental impact, and lower costs. These products are widely available and generally do not require additional equipment to use. We have included a quick-reference guide to summarize which products can be used to achieve different outcomes. For any additional information about enzymes or process aids, contact us at brewing@lallemand.com

Summary of Benefits of Enzymes, Process Aids & Nutrients

abvickers

	Shorter Maturation	Shorter Fermentation	Greater Extract	Facilitates Sustainable Ingredients (local, organic, adjuncts)	Great Product Stability / Longer Shelf Life	Reduced Wastage (product, packaging)	Increased Yield / Reduced Losses	Use Less Raw Material (malt, hops, yeast)	Use Less Consumables (chemicals, filter material,	Use Less Water
BALANCED NUTRIENTS • Yeastlife Extra™ • Yeastlife O™	✓	✓		✓						
ZINC NUTRIENT • Servomyces™								✓		
GLUCOSIDIC ENZYMES • Alphamylase™ • Glucoamylase™			✓	✓						
GLUCANASE™			✓	✓						
NEUTRAL PROTEASE • Protozyme™			✓	✓						
PROLINE-SPECIFIC PROTEASE • Clarizyme™	✓				✓	✓				
ANTIOXIDANT • Vicant™					✓	✓				
ACETOLACTATE DECARBOXYLASE • ALDC	✓									
FININGS • Compac CG™ • Protosol™ • Protofine™ • Isinglass	✓						✓		✓	✓
ANTIFOAM • Foamsol™							✓	✓	✓	✓
β-GLUCOSIDASE • Aromazyme™								✓		

ENERGY REDUCTION IN FERMENTATION AND MATURATION

What role does yeast play in energy use? Both suppliers and brewers are increasingly recognizing the importance of addressing sustainability concerns throughout the brewing process. From sourcing ingredients to packaging, every aspect of brewing plays a role in its environmental footprint. There is a growing need to find innovative solutions to minimize energy consumption and reduce waste. As yeast producers, we are exploring ways that our strains can be used to help breweries reduce their environmental impact. We identified LalBrew Voss™ and LalBrew NovaLager™ as having potential to reduce the energy required for cooling due to their ability to ferment at warmer temperatures. But how much energy could you save?

Putting it to the test

We conducted a series of pilot fermentations to measure how much energy could be saved by fermenting at warmer temperatures. LalBrew Voss™ fermented at 35°C was compared to LalBrew Nottingham™ fermented at 20°C, and LalBrew NovaLager™ fermented at 20°C was compared with LalBrew Diamond™ fermented at 12°C. Relative energy consumption was monitored by tracking the on/off time of compressors or glycol chillers during fermentation and cold crash (Fig 1)..

The experiments yielded valuable insights into the relationship between yeast strains and energy efficiency. While there was a reduction in energy use with the warmer fermentation strains, the actual energy savings were lower than initially anticipated. In fact, the energy consumption during the chilling phase of maturation emerged as a more significant factor than fermentation temperature. The total cooling time (glycol or compressor running) during these fermentations was only about 12 hours. Therefore, reducing your cold maturation time by as little as a day will lower your energy consumption more significantly than fermenting at warmer temperatures. Our experiments show that the energy savings from even a small reduction in cold maturation time will likely be greater than energy savings due to warmer fermentation. Be wary of exaggerated claims from any supplier.

Energy reduction through shorter maturation

While fermentation temperature may not be a significant factor, yeast still has a role to play in reducing energy use by reducing maturation times. Here are some practical tips for reducing energy consumption during maturation:

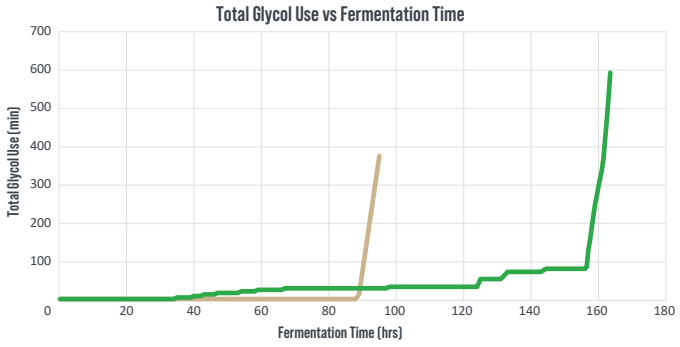

Fig. 1: Total fermenter glycol chilling time when using **LalBrew Voss™** and **LalBrew Nottingham™**

- **Choose non-H_2S strains such as LalBrew NovaLager™ or LalBrew Farmhouse™.**
- **Choose strains that do not require a diacetyl rest (LalBrew NovaLager™)**
- **Choose high-flocculation strains, or alternatively, brew hazy styles that don't require clarification.**
- **Brew short maturation styles such as wheat beers and IPA.**
- **Monitor VDK levels closely to ensure minimal maturation time without compromising beer quality.**
- **Use enzymes such as ALDC™ (diacetyl reduction) or proteases such as Clarizyme™ (reduces chill haze).**
- **Use finings (Vicfine™, Protofine™, or Protosol ™) for faster clarification.**

Improved efficiency throughout the brewing process

While energy savings during fermentation alone may not be as substantial as once thought, brewers can improve efficiency by addressing all aspects of the brewing process. Install heat recovery systems. Upgrade to more energy-efficient equipment. Use antifoam agents (Foamsol™) to optimize cleaning processes and minimize chemical usage. Adopt precision fermentation management techniques.

These are just a few initiatives that, collectively, contribute to enhancing overall efficiency within the brewing process. As an industry, embracing innovation and collaboration will be paramount in driving towards a more environmentally friendly future for brewing.

CONSIDERATION ON BREWING SUSTAINABILITY

By Keith Lemcke,
Marketing Director, Siebel Institute of Technology

At the 2023 Craft Brewers Conference, the Siebel Institute of Technology booth was situated across from a company selling self-adhesive labels designed for beer cans. They had some very impressive products in a variety of materials. As I looked at their display, a thought came to mind regarding sustainability. Do labels interfere with the recyclability of the aluminum can? While recycling capabilities will vary by region, it turns out that can labels do indeed have the potential to complicate recycling aluminum depending on the label materials.

Consider small changes in your business

Recyclability is just one component of sustainability. Brewing is a complex process with many steps that can be optimized to increase efficiency and reduce waste. For example:

- **Can I reduce my energy for cooling by reducing maturation time?**
- **Can I make use of renewable energy in my process?**
- **Can I extend yeast usage through repitching?**
- **Can I reduce my malt bill by increasing mash efficiency?**
- **Can I reduce hop amounts by increasing hop utilization and promoting biotransformation?**
- **Can I encourage the use of refillable glass growlers instead of single-use aluminum growlers?**
- **Can I use locally sourced ingredients?**
- **Can I reduce the use of water and cleaning chemicals?**
- **Can I increase shelf life to reduce wastage of expired products?**
- **For brewpubs, can the restaurant take any steps to reduce waste?**

There are hundreds of practices within the brewery and front-of-house that can be modified to make a real impact on your environmental footprint. It requires that you pay attention to what comes into your company and what goes out of it, including the products you make, the methods you use to distribute your products, effluent from your manufacturing process, and even the goods you use to promote your brand. Paying attention to the many small opportunities for optimization is a larger step towards reaching your sustainability goals.

Big breweries are leading the way

You can learn a lot from the world's leading breweries and these breweries are willing to share! Over the years, some of the largest and most successful U.S. craft breweries have given presentations as part of Siebel courses, including topics such as sustainable packaging and sourcing materials from ethical producers. Simply searching the term "brewery sustainability" online will result in how-to approaches from leading breweries as well as valuable information from the Brewers Association and other trusted brewing-related sources.

Environmental impact is part of a comprehensive brewing education

In our advanced-level programs such as the WBA Master Brewer program, critical topics regarding environmentally sustainable practices are covered throughout the course. For example, the management of brewery effluent is covered under wort production, fermentation operations, and in areas involving packaging. The processes and systems involved in CO_2 collection and reuse are extensively discussed during the Packaging and Process Technology module, which also looks at the environmental impact of various forms of packaging. Brewing conferences usually feature a sustainability track that deals with multiple issues at varying levels of complexity.

Making the effort to prioritize sustainability issues isn't an easy task, especially amid the stresses of rising costs, understaffing, and normal brewery operation. But it is important that each brewery makes the critical step to take action, no matter how big or small. Training in every phase of brewing operations can help brewers identify specific opportunities for maximum impact and minimal cost (and, in some cases, may even save you money). With everyone making small changes, we are building a brewing industry that is more environmentally friendly.

THE RIGHT YEAST FOR HOMEBREWING CLEAN LAGERS

There is always a perfect moment for a lager: a hot summer day, a game night, the end of a long working day, or a light lunch — to name just a few perfect moments! One of the cruelest paradoxes of homebrewing is that summer is the best time to drink a light lager. However, this beer style can't be brewed properly in the summer unless you have access to fermentation temperature control, which most homebrewers do not. Historically, lagers were brewed in the cooler months and then stored in caves for a long, cold maturation period called "lagering." Alas, most homebrewers also lack access to lagering caves. Thus, many homebrewers resign themselves to drinking commercial lagers during the summer until the cooler temperatures return.

What is Lager yeast?

A lager, by definition, needs to be brewed with lager yeast of the species *Saccharomyces pastorianus*. The *S. pastorianus* yeasts are hybrids of *S. cerevisiae* ale yeast with *S. eubayanus*, a cold-tolerant yeast species. The optimal fermentation temperature range for different types of lager yeasts is determined by genetics. Of the two traditional lager yeast lineages, Group I (Saaz) strains have more DNA from *S. eubayanus* and ferment at cooler temperatures (8-12°C), whereas Group II (Frohberg) strains have equal DNA from *S. eubayanus* and *S. cerevisiae* and ferment slightly warmer (10-15°C). Virtually all commercial lager strains today are Group II.

A few years ago, yeast scientists used non-GMO breeding methods to select a novel lineage of lager yeasts. These Group III strains have a broader temperature tolerance because they have more DNA from *S. cerevisiae*. The first commercial Group III lager yeast is LalBrew NovaLager™, which has a wider optimal temperature range of 10-20°C.

Why is brewing lager at home a challenge?

The delicate, clean, and balanced flavor profile of a lager is achieved by fermenting at lower temperatures with traditional Group I or II strains. This keeps ester levels lower and reduces the formation of off-flavors such as H_2S (rotten eggs). For traditional lager strains, warmer fermentation temperatures tend to promote higher H_2S levels. H_2S will generally be reabsorbed by the yeast during the maturation period after fermentation is complete.

Diacetyl is another common off-flavor in lagers. Yeast secretes diacetyl precursors into the beer during fermentation, and diacetyl is re-absorbed by normal yeast metabolism after fermentation is complete. Diacetyl reabsorption is slower at these low temperatures, so a diacetyl rest is normally performed by increasing the temperature slightly at the end of fermentation. Diacetyl is produced in greater amounts when valine levels are limited, and traditional lager yeasts tend to produce more diacetyl since they do not uptake valine efficiently.

Refreshing lagers brewed at home with LalBrew NovaLager™

The ability to ferment warmer with Type III strains is a huge benefit for homebrewers since no diacetyl rest is required. LalBrew NovaLager™ will not produce H_2S since it lacks a gene for sulfur metabolism. Furthermore, LalBrew NovaLager™ has a greater amount of *S. cerevisiae* DNA, meaning it efficiently uptakes valine from the wort and produces lower levels of diacetyl compared to traditional lager strains. Clean and neutral flavors are consistently reported when fermenting LalBrew NovaLager™ throughout the temperature range of 10-20°C. A few brewers have even pushed the limits above 25°C with great results (some intentionally, others due to glycol failure).

With LalBrew NovaLager™, it is possible to brew crisp and clean lagers in the heat of the summer without the need for refrigerated fermentation control. No need to purchase refrigeration equipment, no need to do a diacetyl rest, and little to no maturation required to reduce off-flavors. You can focus more on relaxing with your lager in the sun with a simpler process, less equipment required, and less energy required for extended cold maturation. Refreshing!

DID YOU KNOW...

...the brewing process can use up to 10 liters or more of water to produce a single liter of beer? By implementing a water conservation plan, some breweries have successfully lowered this ratio to 3:1.

3:1

Reusing Clean In Place solutions, condensing water from kettle stacks, using grey water for cooling or pre-rinsing tanks, and testing rinse water runoff to avoid over rinsing tanks are a few ways a brewery can reduce water use.

Source: The New Brewer. Sustainability Issue. January/ February 2020. Available at: brewersassociation.org/the-new-brewer/jan-feb-2020/

BREW SMARTER, NOT HARDER

CHRIS LEWINGTON FROM BREW RESOURCEFUL ON ENVIRONMENTAL IMPACT AND COST SAVINGS

How can I reduce my environmental impact? How can I cut costs while maintaining quality? These questions are in the minds of many brewers. But where should you start? The journey toward greater brewing efficiency can be seen as overwhelming. At Lallemand Brewing, our philosophy is We Brew With You, so these questions are top of mind for us as well. In this article, Eric Abbott, Technical Support Manager for Lallemand Brewing, sits down with Chris Lewington, Founder of Brew Resourceful, to chat about brewing efficiency and how brewers can save money and reduce the environmental impact of the brewery. The full interview is available on our website through the link below.

What does brewing efficiency mean to you?

Brewing efficiency is defined by how many resources are consumed to produce your beer. I focus on five main factors: ❶ Brewhouse efficiency, ❷ Water, ❸ Electricity, ❹ Gas, and ❺ CO_2. It is best to think of these factors in terms of intensity, in other words, how much is consumed per volume of packaged beer produced.

What is the first thing a brewer should do when they decide to focus on reducing their costs?

Most brewers want to have less of an impact on the environment. Focusing on efficiency has both a financial and environmental impact. You will spend less on raw materials, utilities, and energy and also lessen your impact on the environment. One of the best ways of becoming more sustainable as a planet is for businesses and individuals to consume less. That's exactly what efficiency means.

It seems like a simple concept, but the reality is that many breweries are not focused enough on optimizing their brewing processes. Why is that?

I understand why breweries, especially craft breweries, don't always focus on efficiency. As a craft brewer, your unique selling point is the quality of your product, so this becomes your sole focus. As a result, many brewers get stuck with inefficient processes, such as sub-optimal CIP routines, boiling for longer than 60 minutes, or mashing brewhouse efficiencies below 90%.

I prefer to frame the question differently. Instead of asking "Why aren't you brewing efficiently?" I turn it around and ask: "Would you like to spend less money on raw materials and utilities every month?" Brewers might not have a good answer to the first question, but the answer to the second question is always, "Well, yeah, of course I would!".

What is the first thing a brewer should do when they decide to focus on brewing efficiency?

The first step is just data collection. Look at your meter readings and your utility bills. Enter those values into a spreadsheet along with the packaged volume for that period. This allows you to calculate the intensity of each utility/resource — how much is consumed to produce a volume of packaged beer. Once you have established your internal baseline, you can track progress over time. For brewhouse efficiency, you are probably already collecting the necessary gravity and volume data on your daily brew sheets.

Free OpenAI tools such as Chat GPT can help you analyze your data more quickly and provide insights on what factors are causing X, Y, or Z.

It may seem simple, but from my experience, I would say that at least 80% of craft breweries are not measuring these basic sustainability metrics.

I have built free spreadsheets, calculators, and tools to get you started measuring all of the key metrics. Check them out for free here.

READ THE FULL INTERVIEW ON OUR WEBSITE

Chris Lewington has been working for over a decade in the brewing departments of some of the industry's most exciting and respected breweries. Managing breweries ranging from 2,000hl p/a to 250,000hl p/a his range of experience and knowledge in craft brewing is unique. His business, Brew Resourceful, utilizes that experience and knowledge to make the brewing industry more resourceful, increasing breweries profitability and reducing carbon emissions with process-based solutions.