

DSM FOOD SPECIALTIES

BREWING ENZYMES FOR SUSTAINABLE BREWING AMBITIONS.



BRIGHT SCIENCE. BRIGHTER LIVING.™





50%
**OF CRAFT BEER
CONSUMERS SAY
A PRODUCT ADVERTISED AS BEING
SUSTAINABLE IS MORE ATTRACTIVE.**

Brewers today are united on at least one thing: the need to act and create a more sustainable brewing industry across the world.

It's clear that climate change could have devastating consequences for our planet, and the impact on the brewing industry is starting to become clear as well. Climate scientists expect extreme weather to impact barley quality and prices, and ultimately, impact prices and availability for consumers.

At DSM, we believe a commitment to sustainability is no longer a "nice-to-have". It's a global imperative and will fast become a requirement for doing business. We also believe consumers are beginning to understand this fact. A recent DSM survey of craft beer consumers found that 50% of consumers say a product, advertised as sustainable, is more attractive to buy.

DSM is a global purpose-led, performance-driven company, proud to work with the brewing industry to meet its sustainability targets. In this guide, we give you an introduction to our sustainability commitments centered on the themes of improve, enable, and advocate. We invite you to join the conversation with us and make a lasting impact for a better world today and tomorrow.



Joana Carneiro
Business Director Beverages,
DSM Food Specialties



**DSM IS PURPOSE-LED AND PERFORMANCE-DRIVEN.
WE WILL ONLY BE SUCCESSFUL IF WE
MAKE CHANGE HAPPEN IN THREE AREAS:**

IMPROVE.

Improve and adapt our own operational impact by further improving safety, decreasing our emissions, and stepping up our use of renewable energy.

ENABLE.

Enable our customers and partners to deliver sustainable and healthy solutions for the planet and society.

ADVOCATE.

Advocate for the future we believe in and fully accept our responsibilities as an active part of society.

IMPROVE: DSM OPERATIONAL TARGETS

SUSTAINABILITY IS OUR CORE VALUE.

**BETWEEN
2015 AND 2017,
DSM ACHIEVED:**

8%

GHG IMPROVEMENT

3%

ENERGY EFFICIENCY
IMPROVEMENT

21%

OF ENERGY FROM
RENEWABLE SOURCES

**BY 2030,
DSM AIMS TO
ACCOMPLISH:**

30%

GHG REDUCTION

75%

OF ENERGY FROM
RENEWABLE SOURCES

1%

IMPROVEMENT ON ENERGY
EFFICIENCY EACH YEAR

**RECOGNIZED
AS A LEADER IN
OUR INDUSTRY:**

DOW JONES
SUSTAINABILITY INDEX:

#1

IN INDUSTRY GROUP

SUSTAINALYTICS
RATING:

#1

IN INDUSTRY GROUP

ENTRANT, FORTUNE MAGAZINE
'CHANGE THE WORLD' LIST:

3 YEARS

ENABLE: PRODUCTS WITH AN IMPACT

TURNING UP THE HEAT ON ENERGY REDUCTION TARGETS.

BREWERS CLAREX®

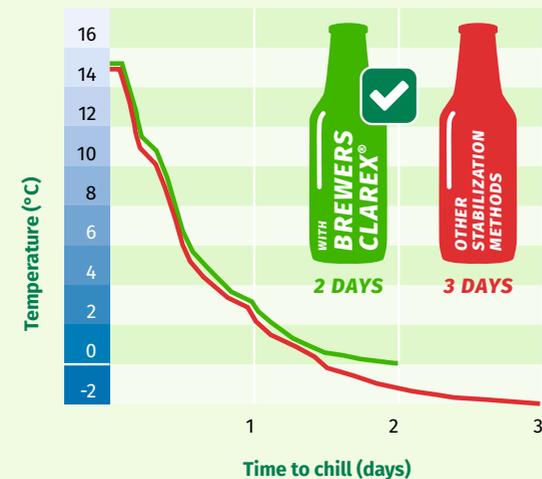
DSM's unique enzyme for beer stabilization reduces maturation time. Added to the fermentation stage of brewing, Brewers Clarex® allows brewers to skip the deep cooling and rinsing step in the beer stabilization and clarification process, which saves energy and water. With this simple change, brewers can cut their carbon footprint by 5-6%, reduce water use by 1%, and accumulate energy cost savings up to €70,000 per 1 million hectoliters of beer produced.

HOW BREWERS CLAREX® WORKS

Brewers Clarex® is a liquid fungal proline-specific endo-protease which prevents chill haze. Chill haze is formed when haze-sensitive proteins, rich in proline, attach to polyphenols in the grains and hops used. The protein-polyphenol complexes become visible as chill haze. In a traditional stabilization process, silica gel is needed to remove the proteins while PVPP powder removes the polyphenols. A deep cooling and rinsing step removes the protein-polyphenol complexes.

Brewers Clarex® simplifies this process by cutting the protein at the proline site. Polyphenols still attach to the protein fragments, but never become large enough to form colloidal beer haze. Brewers Clarex® is simply added to the start of the fermentation, and no special equipment is needed. Using Brewers Clarex®, brewers can save money with a less intense cooling step and reduce maturation time, leading to capacity improvements. A peer-reviewed study on stabilization of beer in room-temperature conditions showed that Brewers Clarex® hampers the formation of polyphenol-protein complexes, removing the need to perform beer filtration at 0°C to 2°C.¹

REDUCE MATURATION TIME



Results will depend on grain bill and process conditions.

¹ Cimini, A., and Moresi, M. 2018. Towards a Kieselguhr- and PVPP-Free Clarification and Stabilization Process of Rough Beer at Room-Temperature Conditions. Journal of Food Science. Vol. 83 (Nr. 1): USA.

ENABLE: PRODUCTS WITH AN IMPACT

TAPPING INTO SUCCESS FOR FARMERS AND BREWERS.

BREWERS COMPASS®

DSM's brewing enzymes like Brewers Compass® enable brewers to replace malt with locally available raw materials such as barley, wheat, maize, rice, sorghum, and cassava. The barley malting process accounts for around 10-15% of the eco-footprint of a beer. Switching from malt to barley brewing enables a 10% reduction in barley consumption and cuts water and energy use. When brewing with 100% barley using Brewers Compass®, the carbon footprint savings are typically over 60 kilograms of CO₂ per ton of barley used. And, even better—local sourcing stimulates economies in developing regions.

HOW BREWERS COMPASS® WORKS

Brewers Compass® is an optimized liquid enzyme blend that is added at the start of mashing for applications where 20% to 100% barley is used. It complements the enzymes present in barley (mainly β -amylase and exo-peptidase) and provides all other enzymes required for effective barley brewing in one liquid product. Its unique composition contains an optimized mix of α -amylases, endo-protease, beta-glucanases, and hemicellulases.

The unique composition of Brewers Compass® ensures a high yield and a wort that is rich in fermentable sugars and free amino nitrogen. The presence of beta-glucanases and (hemi-) cellulases in Brewers Compass® ensures the breakdown of beta-glucans, arabinoxylans and other hemicelluloses to ensure low wort viscosity and high wort as well as beer filterability.

Other brewing enzymes that can be used for the sourcing of local raw materials include MATS L Classic, MaxAdjunct L and Filtrase™ NL Fast, the use of which depends on the raw materials to be used and the required final product specifications.

BREWERS COMPASS® MIMICS THE DIASTATIC POWER OF MALT

Enzymatic activities		
Malt	Barley	Brewers Compass®
α -Amylase	←	α -Amylase
β -Amylase	β -Amylase	
Limit Dextrinase		
Peptidases	Peptidases	
Endo-proteases	←	Endo-proteases
β -Glucanase	←	β -Glucanase

ENABLE: GLOBAL ENZYME EXPERTISE & SUPPORT

SHARING OUR EXPERTISE.

DSM is a trusted, reliable partner for brewers across the industry with unique, high-quality products and in-depth technical expertise that enables brewers to reach their sustainability targets. Our global team of brew masters work side-by-side with our customers, supported by beer application centers in the Netherlands and China. Here are stories from two of our brewing team members dedicated to the success of their customers.



Pierre-Lambert Smal Brew Master

WORKING WITH AFRICAN BREWERS ON LOCAL SOURCING TARGETS

“I’ve been working with breweries in Africa for about five years, the changes we see today were already initiated a few decades ago. Adjunct brewing is not a new trend—it has been around since the ‘70s or ‘80s. But today, more change is taking place due to the available technical solutions. With enzymes, many brewers that were making good beer with 20-30% adjuncts are now moving up to 30-40% adjuncts on average. In my role, I work with the breweries to select the

right enzymes, advise on the dosage, and check that they perform according to specification in order to create efficiently produced, affordable, high-quality beer.

In Africa, brewing with raw barley or sorghum is not just about saving costs. Of course, brewers that reduce their reliance on imported malt in this region will save on transportation and the costs of the malt. But most importantly, they make a huge impact on the local economy and environment.

A major brewery that sources local materials can create thousands of new jobs in the region—an incredible way to invest in the economic development of the places where they operate while reducing the total carbon footprint of their beer production.”



Michelle Kurvers Key account manager

WORKING WITH BREWERS TO REDUCE ENERGY USAGE

“Brewers are continuously thinking in terms of efficiency, so it’s not a surprise really that they’re also taking the lead in sustainability. Brewers are keen to optimize their process and benefit from energy savings, and our Brewers Clarex® helps them to do that by reducing maturation time. Looking to hot areas, like in Asia where beer consumption has surged in recent years, saving a few degrees in maturation temperature can save a lot of time and energy.

I would say taste and quality are hallmarks of the brewing industry. Changes to the brewing process require time, resources, and trust and the goal is to keep the same taste and quality consumers expect. DSM helps along the way, providing expertise on our enzymes but also looking at the brewing process as a whole to ensure our customers’ goals are met. If all brewers come on board with an enzyme-based stabilization method, that could have a huge impact for our planet—and DSM is ready and willing to support this change.”

BUILDING THE MOVEMENT FOR A LOW-CARBON ECONOMY.

As climate change will continue to shape the way we do business now and in the coming decades, DSM is committed to supporting and leading advocacy initiatives that will enable the shift to a low-carbon economy. We believe this shift will require action by governments and companies from all industry sectors.

ENABLING POLICIES

DSM is in favor of consistent, long-term governmental policies that enable a low-carbon economy. We believe that government policies and initiatives should aim to:

<p>BOOST INNOVATION</p>	<p>INNOVATE SYSTEMS</p>	<p>INCREASE TRANSPARENCY</p>	<p>EDUCATE THE PUBLIC</p>
<p>Boost and incentivize low carbon innovations, improvement of energy efficiency and scaling of renewable energy.</p>	<p>Innovate fiscal systems and policies, including - but not limited to - carbon pricing and removal of fossil fuel subsidies.</p>	<p>Increase transparency and disclosure regarding financial investments and policies regarding the shift from fossil fuels to renewable energy.</p>	<p>Educate the public about the impact of climate change on the planet and society to increase awareness.</p>

SHARING OUR VOICE.

DSM demonstrates leadership by advocating a progressive agenda in discussions about climate and energy in industry associations and other industry initiatives. DSM, and especially our CEO Feike Sijbesma, is deeply engaged with the following partners on these topics:

The image displays a grid of logos for various partner organizations. The logos include: CDP (Driving Sustainable Economies), Caring for Climate (with UNFCCC, UNF, and CC logos), CP LC (Carbon Pricing Leadership Coalition), LCTPI (Led by wbcSD), PPCA (Powering Past Coal Alliance), The Prince of Wales's Corporate Leaders Group, TCFD (Task Force on Climate-Related Financial Disclosures), RE 100, WE MEAN BUSINESS, and the World Economic Forum.

FOR SUSTAINABLE BREWING AMBITIONS

**CONTACT US AT
INFO.FOOD@DSM.COM**

DSM Food Specialties - Enabling Better Food for Everyone

At DSM Food Specialties we are driven to enable better food for everyone. We provide ingredients and solutions that enable our customers to make healthier and more sustainable consumer food and beverage products. We are driven to partner with our customers to create food choices that people around the world can truly enjoy.

info.food@dsm.com | www.dsm.com/food



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