

LIFE Beverage Layman's Report

*This project receives the contribution
of the LIFE financial instrument of the
European Commission.*

*LIFE Project Number <LIFE15
CCM/BE/000090>*



In 2016, AB-InBev has been granted
approximately € 800 000 for the
LIFE BEVERAGE PROJECT
that is part of our ambitious
dream to create a cleaner world.

These LIFE programs contribute to the
achievement of the objectives of the Europe
2020 strategy and embed sustainability and
social responsibility throughout our entire
value chain.

Introduction



Anheuser-Busch InBev (AB InBev) is a publicly traded company based in Leuven, Belgium. The company's portfolio comprises **over 500 beer brands including global ones** such as Budweiser®, Corona® and Stella Artois®; multi-country brands like Beck's®, Castle®, Castle Lite®, Hoegaarden® and Leffe®; and local champions such as Bud Light®, Jupiler® and Skol®. AB InBev brewing heritage dates back **more than 600 years**, and it leverages the collective strengths of approximately **200,000 employees** based in **more than 50 countries worldwide**.

Brewing quality beer starts with the best ingredients. This requires a healthy, natural environment, as well as thriving communities. We are building a company to last, bringing people together for a Better World, now and for the next 100+ years. That's why sustainability isn't just part of our business, it is our business.

The sustainable development goals (SDGs) of AB InBev stand in line with these of the UNDP and EU. Out of the 17 SDGs for 2030 we have committed to work on various SDGs, climate change being one of them.

We have committed to a 25% reduction in our CO₂ Emissions by 2025. It is an ambitious task that will require innovation and step changes to the way we brew beer.



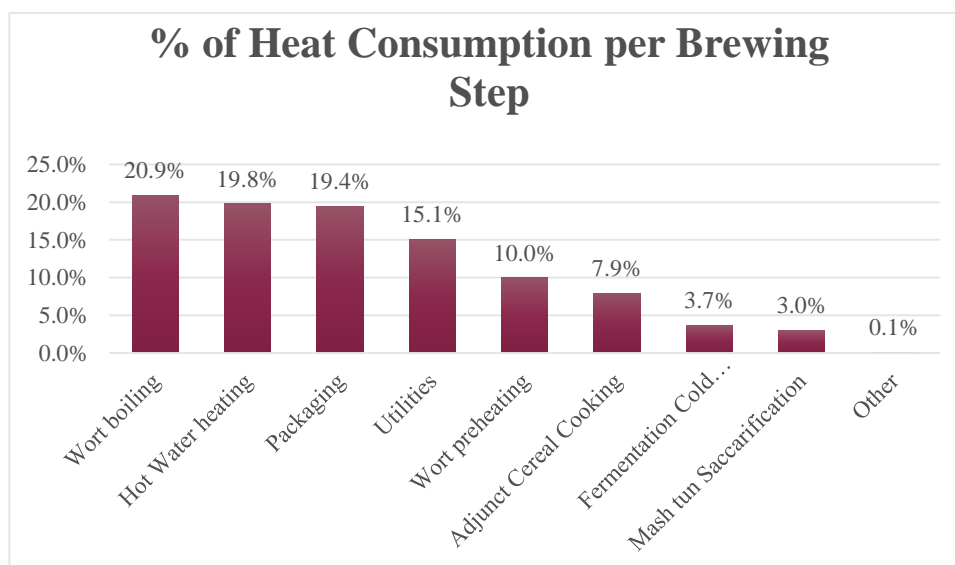
Brewing process and Climate Change



Brewing requires four essential ingredients: Water, Malt, Hop and Yeast.

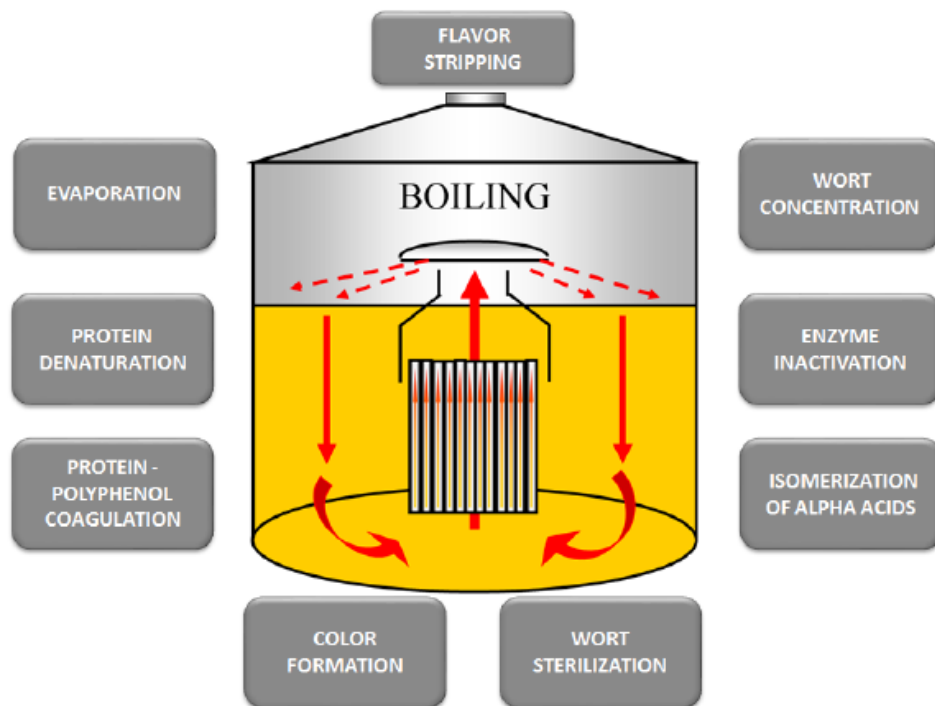
- 1) The malt is milled to the desired size.*
- 2) Milled grain is mixed with water. during mashing process enabling production of enzymes and their activation, therefore converting the unfermentable starch into fermentable sugars.*
- 3) During lautering, the solid fraction (spent grains) are eliminated from the liquid fraction, which is called “wort” (sugar rich brew)*
- 4) The wort will be brought into the boiling kettle.*
- 5) The boiled wort will be transferred to a fermentation vessel with the yeast. Alcohol and CO₂, will be metabolised by the yeast consuming the fermentable sugars*
- 6) During conditioning of the beer, the desired beer profile is attained.*
- 7) Residual haze is removed during filtration and prepared for release to the packaging lines*

Beer brewing is a major contributor to our climate footprint as it requires considerable amounts of electricity and fossil fuels to drive the process inside the operations. By tackling the most energy intensive unit of the process, AB Inbev will have the biggest environmental impact.



The **boiling step** is **the most energy consuming step in the brewing process**, which consumes up to **20 % of the total heat** required and generating high levels of greenhouse gases. Fuel and water consumption could be drastically reduced in this process step if it could be minimized or avoided altogether **by a disruptive innovation**.

Why do we Boil Wort?



The boiling step has several functions as shown in the pictures here above. However, only 1 requires evaporation: Flavor Stripping.

Evaporation will strip out off-flavours such as DMS (dimethyl sulphide) from the wort. This goes to the heart of beer making, because without Flavor Stripping step, the finished beer would not be accepted by consumers.

Evaporation, the transformation of liquid water to gas water (steam), consumes most of the energy used during boiling. Finding a way to reduce the evaporation rate while maintaining quality would substantially decrease the energy consumption.

An alternative technology development to evaporation was proposed by ABI to LIFE that would enable equal removal of off flavours while eliminating the high energy demand from the evaporation step.

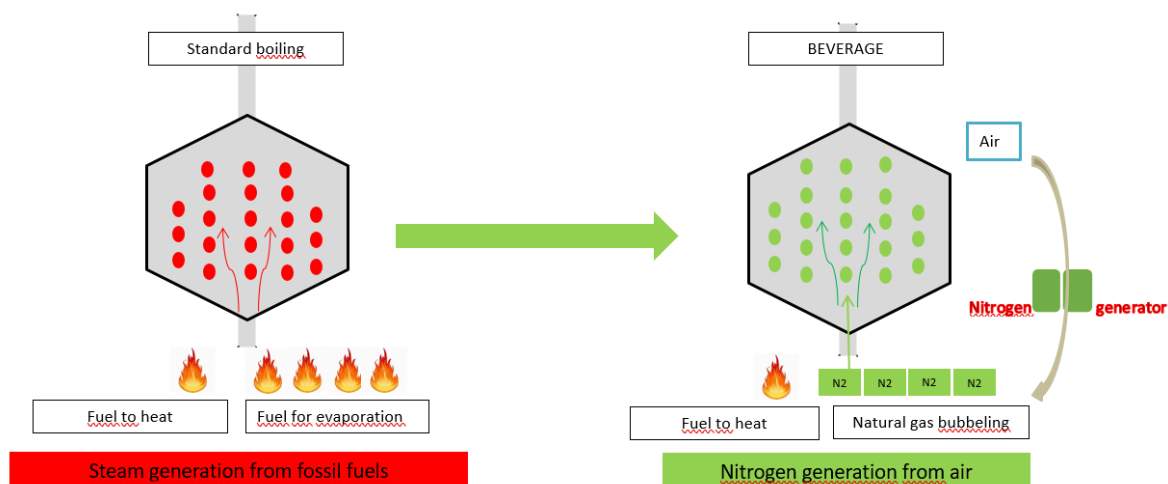


LIFE BEVERAGE PROJECT

LIFE BEVERAGE aims to **reduce the emission of greenhouse gases caused by beverage production** through a new process technology piloted at breweries in Belgium and UK.

LIFE BEVERAGE PROPOSED TO:

- Use **nitrogen bubbling** as an alternative for extensive evaporation to remove off-flavours in the wort.
- Simulate boiling effect **without any increased heat requirements** hereby reducing usage of fossil fuels
- Pilot the technology in **two industrial sized breweries**, Jupille and Magor, with different design of boiling kettles
- **Potential worldwide roll-out to other breweries if successful**



The key success criteria proposed in LIFE Beverage was to impact the following KPIs

- Reduction of water usage by 2% on top of the level achieved in 2014*
- Reduction of energy usage by 12%*
- Reduction of carbon footprint by 8%*

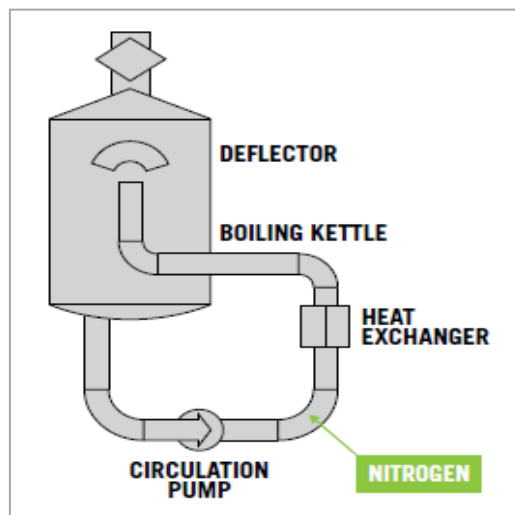
While aiming at reaching these environmental goals, the **brand integrity** and high-quality standards of our beers needs to be maintained or improved.

**Scope measured within the 4 walls of the brewery. (e.g. not considering full value chain)*

Pilot plants

To increase the success rate of the project 2 different designs were developed and implemented.

JUPILLE PILOT – External Sparging System



The engineering, design and realisation of the pilot line in the Jupille brewery, Belgium, commenced in **2016**.

1. the wort is taken out from the bottom and passed through the heat exchanger in the external loop
2. The wort then flows to the deflector, thereby spreading the wort onto the wort surface
3. Nitrogen is brought into the external loop of the boiling kettle and bubbled into the liquid.

The initial Jupille design was not successful due to excessive vibrations, overfoaming and sensory deviations. Consequently, AB InBev invested in an external ring system (fig. 1) to mitigate sensory deviations and vibrations, and deflectors (fig. 2) to reduce foam build-up. The further developments have substantially improved the KPIs and we expect to have complete validation of the Jupille technology in the near future.

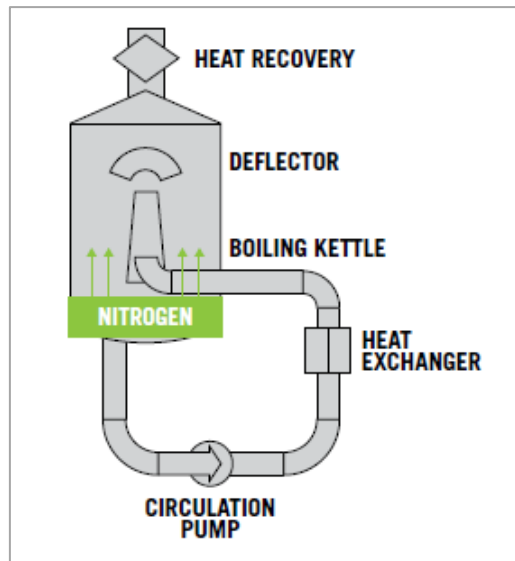


Figure 1 – Schematic Presentation of the bottom of the kettle equipped with an external ring system.



Figure 2 -Wort breaking down the foam due to deflector effect inside the kettle

MAGOR PILOT – Internal Sparging System



The pilot in Magor differed from than the one in Jupille as:

- 1) The Nitrogen in Magor was produced by a nitrogen generator that purified the air instead of supplying purchased Nitrogen.*
- 2) Nitrogen is not brought into the external loop of the boiling kettle, but it is bubbled into the liquid by a ring of sprayballs, installed at the bottom of the tank.*



Figure 1: Kettle Internal ring at Magor

This version of the technology showed much better results. No vibrations were jeopardizing the integrity of the equipment and a much higher flow of nitrogen was possible. A very good stripping efficiency could be achieved. Evaporation rate was brought from 6% down to below 1%. Achieving then substantial energy savings.

Results

The stated goals of the LIFE Beverage program were not attained as the original version in Jupille failed and merely the version in Magor was investigated. Magor is in progress to be validated for the brand integrity. So far, we have achieved the KPIs shown in the table below and we will continue to further optimise the process in order to reach the stated goals.

KPI Reduction*	Target	Result
Energy Usage	12%	8.47%
CO2 Emissions	8%	4.40%
Water Usage	2%	2.89%

**Measured within the 4 walls of the brewery*

Furthermore, the LCA report for the project confirmed the significant impact that this single technology had across the full value chain (seed to sip)

KPI Reduction*	Result
Fossil Resource Scarcity	5.81%
Global Warming Reduction	4.40%
Mineral Resource Scarcity	3.51%
Fresh Water Eutrophication	3.38%
Land Use	3.38%
Water Consumption	2.89%
Fine Particulate Matter Formation	0.88%
Terrestrial Acidification	0.79%

This innovative technique was patented by AB InBev with title “Method for treating a wort in a boiling kettle (EP 2871 227 A1)”, underlining the value conveyed to AB InBev.

After Life

We are excited about the results of the pilot trials and will roll out the technology globally (46 confirmed Breweries) as part of our 3 year plan to achieve our sustainability targets.

AB InBev will provide free patent licenses towards breweries with a capacity smaller than 1 million hl/year and will charge a license fee to bigger breweries (license revenue will be reinvested in developing clean technologies).

AB InBev's plan is to reach as many breweries as possible and make the LIFE Beverage technology a best practice across the brewing industry, hereby increasing the roll-out opportunities and decreasing the carbon footprint, water and energy consumption of beer brewing operations worldwide. This is aligned with the EC Joint Research Center (JRC) Best Environmental Management Practices (BEMPs) for Food and Drink.

Communications:

We presented the project to several events and conferences.

Trends in Brewing – 11th April 2018

*Life BEVERAGE project was presented at the 13th international **Trends in Brewing** symposium in Ghent.*

David de Schutter took the floor in front of an audience composed of brewing industry representatives and academics. The point here was to present this innovative green technology to the brewing world and offer them the possibility to receive licenses for the technology.



Presentation was followed by media coverage in Europe comprising 6 print articles in BE main newspapers, 3 radio & TV interviews and 21 online outlets covered the news.

Includes press articles:

European Business Summit – May 6th 2019

*LIFE Beverage was presented at the **European Business Summit** in Brussels. This event had 2000 participants and more than 250 key note speakers including the president Juncker and vice-president Katainen of the EU Commission. It gave companies the opportunity to engage directly with EU decision makers to demonstrate that their business can play a key role in developing solutions to the most pressing issues in Europe.*

During the “Meet the Expert” session, Esteban Martinez, our Global Grants and Incentives Manager, hosted a discussion about “EU Policies & Business Interests for a Joint Action for Sustainable Europe”.

Our Vice President of Procurement and Sustainability, Richard White, took part in a roundtable themed: “From R&D to Market Entry, What is Missing in the Race

for Innovation to Foster European Champions?”. The roundtable was hosted by Dan Michaels, from the Wall Street Journal, and included Keith Sequeira (senior advisor, Research, Science and Innovation at the EC), Ashild Hanne Larsen (Equinor), Reinhilde Veugelers (Bruegel). During the roundtable, Richard stressed again that sustainability isn’t part of our business, but that it is our business and how our LIFE Programs are helping us to meet those targets.

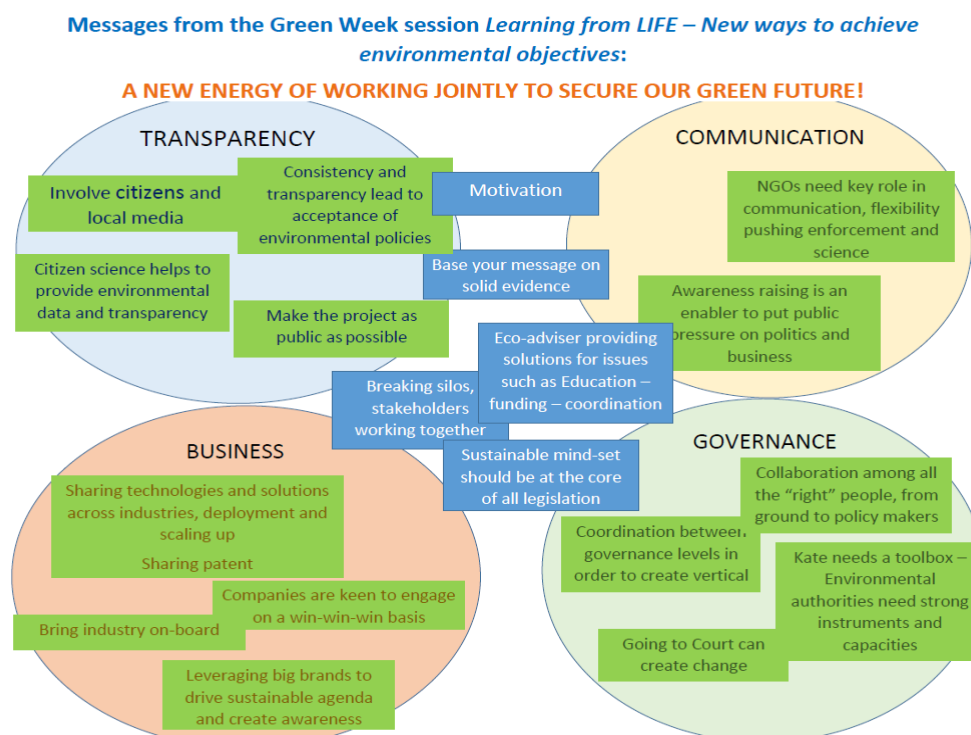
Finally, David De Schutter our EUR Zone Technical Director took part in a roundtable with vice-president Katainen on “Clean Technologies for a Greener Europe” where LIFE Beverage was used as an example of EU funded clean tech.

Green Week – 16th of May 2019

3 Members of the LIFE team participated in the “Learning from LIFE” workshop/roundtable at Green Week, Brussels. The goal was to share experiences and learnings with other LIFE project beneficiaries to drive the future of Life Program.

ABI LIFE Beverage exposed the importance of Business in driving the sustainability agenda by leveraging Scale, Communication, Execution and Brand power to amplify the results of the LIFE Program. The global roll out of the LIFE Beverage Technology was used as a clear example.

The outcome of the session is presented in the figure below:





Key Figures

Performance

+4.8%

revenue growth

22,080

million USD
2018 normalized EBITDA

567 million hl

2018 beer volumes

40.4%

EBITDA margin expansion
of 118 bps to 40.4%

+1/3

Revenue of our three
global brands represented
more than one-third of our
growth in 2018



Operations

50

Operations in nearly
50 countries

227

breweries

13,000

owned retail locations

150+

Beers sold in
150+ countries



Brands

>500 brands

377

377 beer awards won at 16 major
international competitions in 2018

8/10

8 out of the 10 most valuable
beer brands worldwide
according to BrandZ™

