



# Beer

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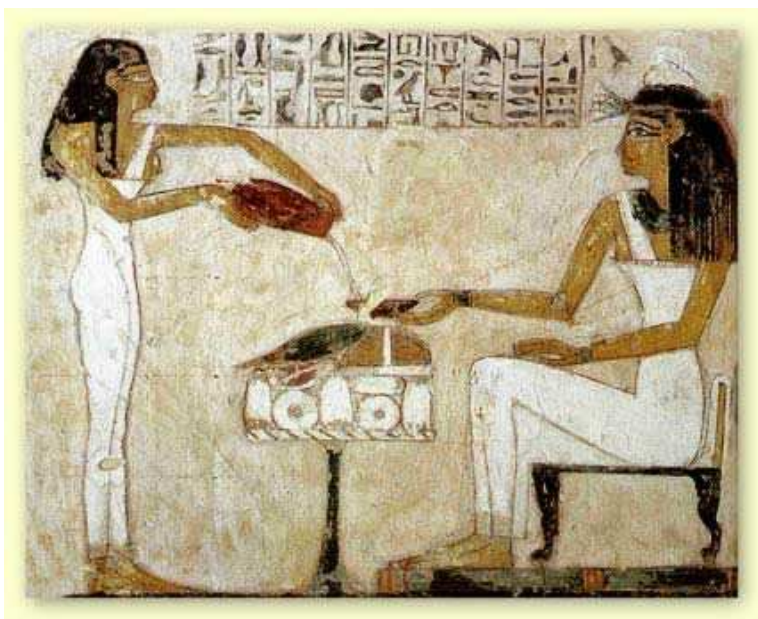
## Content

- History
- Beer types
- Raw materials
- Production
- Beer composition
- How to enjoy beer



## History of beer

- Egypt 5000 BCE
- Iraq - Mesopotamia 4000 BCE (probably earlier)
- Europe 300 BCE (Celts)



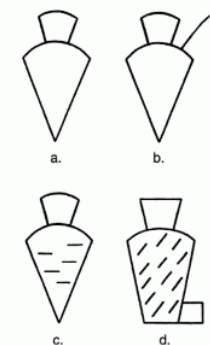
An accident!  
 Stored cereals wetted  
 and spontaneously  
 fermented.

Result?

**BEER**



Mesopotamia ca 4000 BCE





## History of czech beer

- Fermented cereal beverages known by Celts, Germans, Slovans
- First written document 1088 (Vratislav II.) - the duty to supply a churchshot of hops for beer brewing to Vysehrad's canonry
- 30's of 11th century (prince Břetislav) record of hops growing
- 12th century - boom of brewing (no regulations)
  
- František Ondřej Poupě (1753 - 1805)
  - Has established first brewing school in Europe
  - Improved brewing process
  - „wheat for cakes, oat for horses, barley for beer“
- Karel Napoleon Balling (1805 - 1868)
  - Professor of chemistry (Prague)
  - Defined attenuation principles (described fermentatation process)
  - Invent and improved several measurig devices (still used e.g saccharometer)





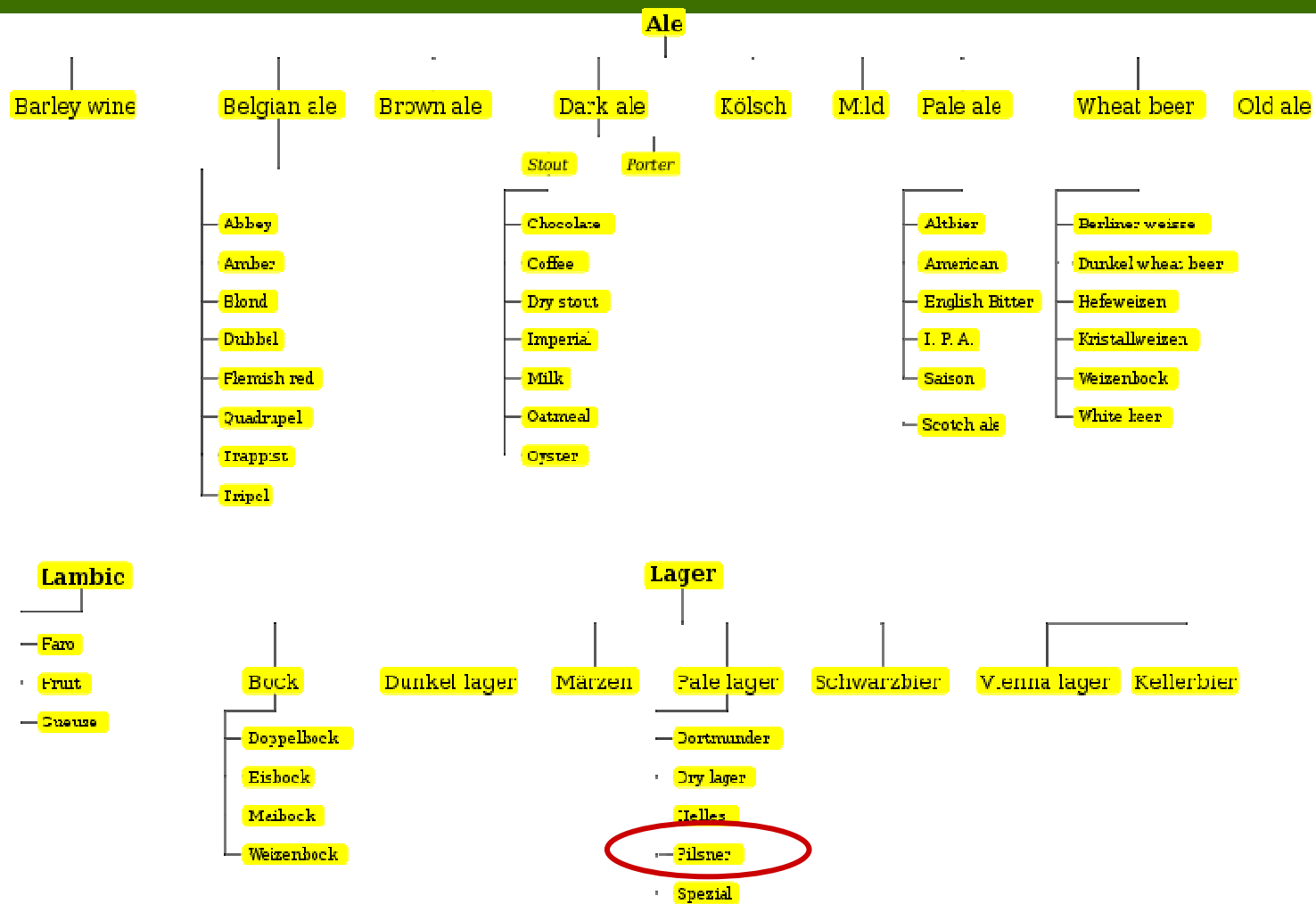
## Pils type beer

# 1842

Established the brewery in Pilsen and the most famous beer story began...



# Beer categories



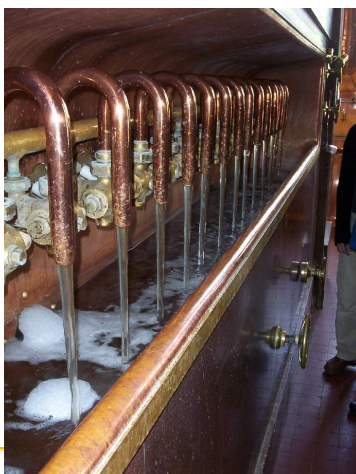


## Czech beer characteristic

- Foam - rich, creamy (small bubbles), long standing
- Colour - gold/yellow
- Smell - pure hoppy, malty, acceptable slightly yeasty and estery (fruity)
- Taste - full body, strong but smooth bitterness, ballanced bite, challenge to next drink



# Brewhouse (the heart of a brewery)





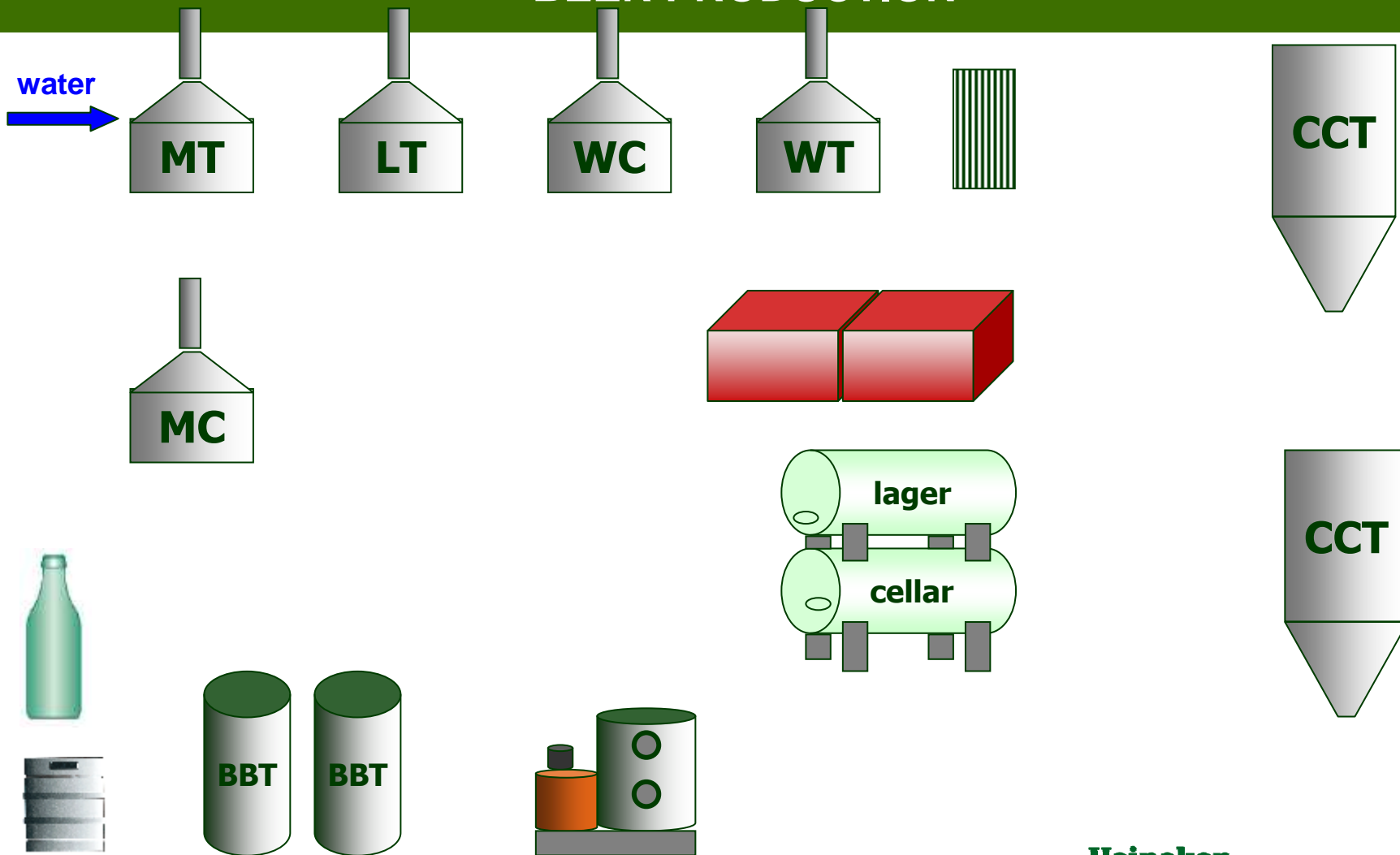


## Goal of brewing

Convert initially insoluble compounds of malt and hops into solution by physico-chemical processes and by activity of enzymes present in malt to get WORT - the first intermediate product of beer.



# BEER PRODUCTION





**WATER**

**(ca 1 hl per 1 hl)**

## **BASE OF BEER**

**90 - 95% by  
volume**

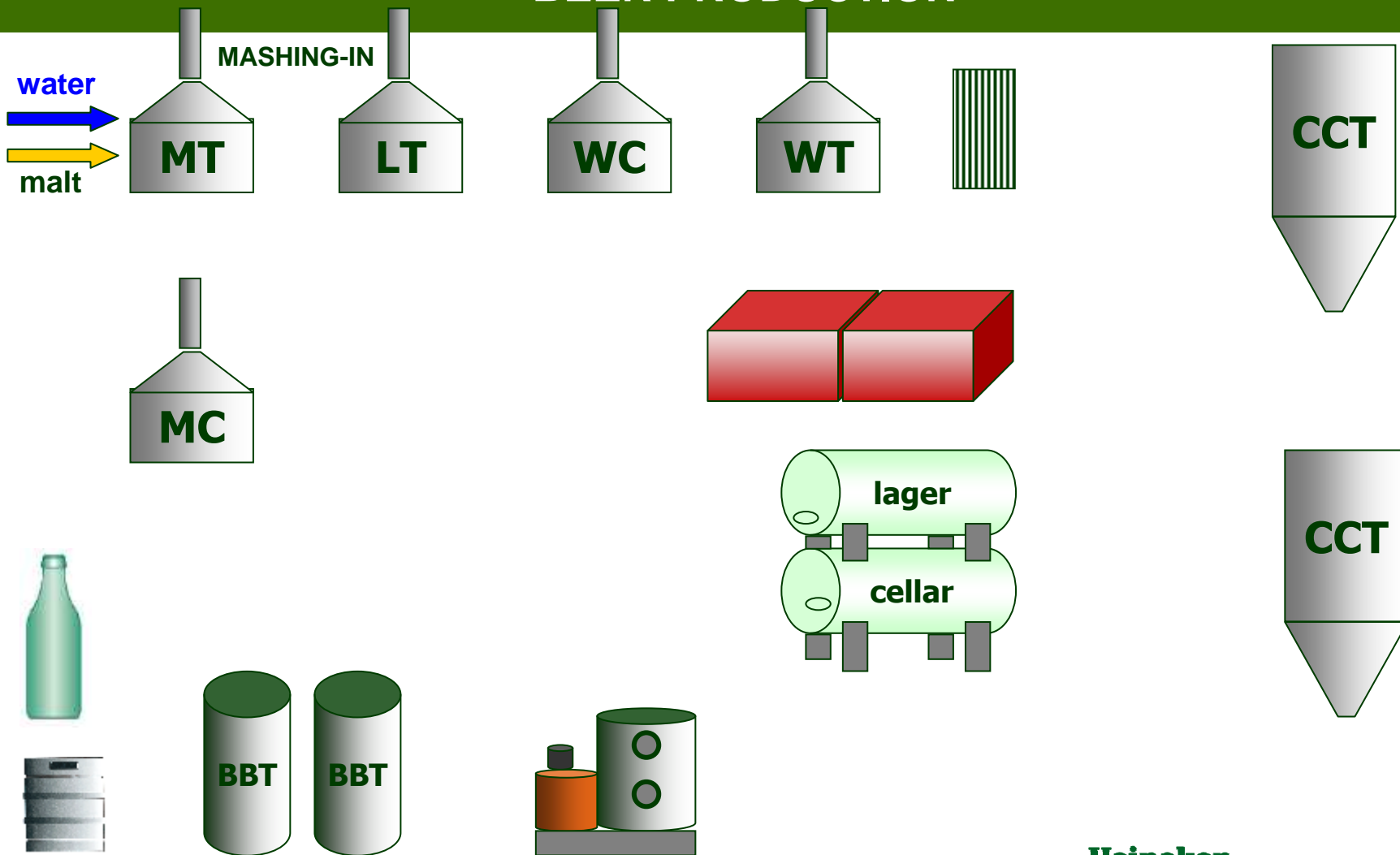
**Different  
composition =  
different beer**

**(anions,  
cations, pH)**





# BEER PRODUCTION





**Malt**

(ca 15 kg per 1 hl)



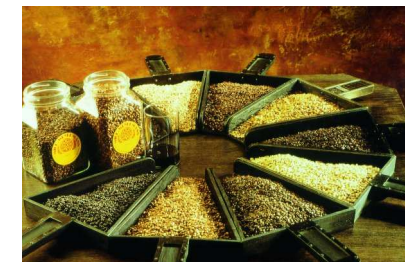
**Body of beer**

- barley malt



**Important compounds:**

- carbohydrates (starch)
- proteins
- (enzymes)



**Heineken**  
International



## Malt production

- Barley purification
- Steeping (wetting)
- Germination (growing)
- Kilning (drying)
- Roots removing

The goal is to activate enzymes and breakdown walls of starch grains



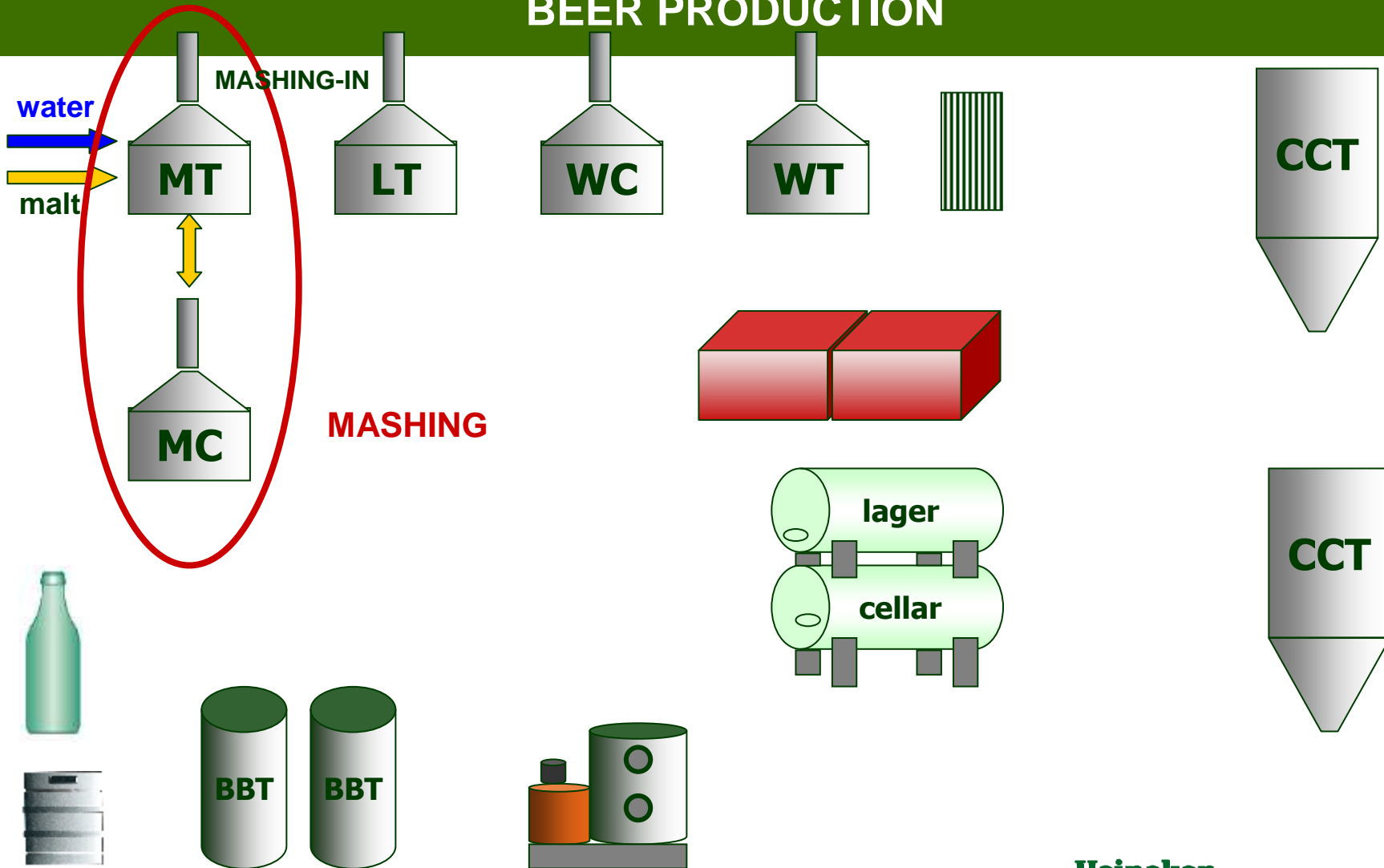
## Quiz

How many malt's grains (seeds) is necessary for production of a 0,5l beer?

**ca 2000 grains**



# BEER PRODUCTION

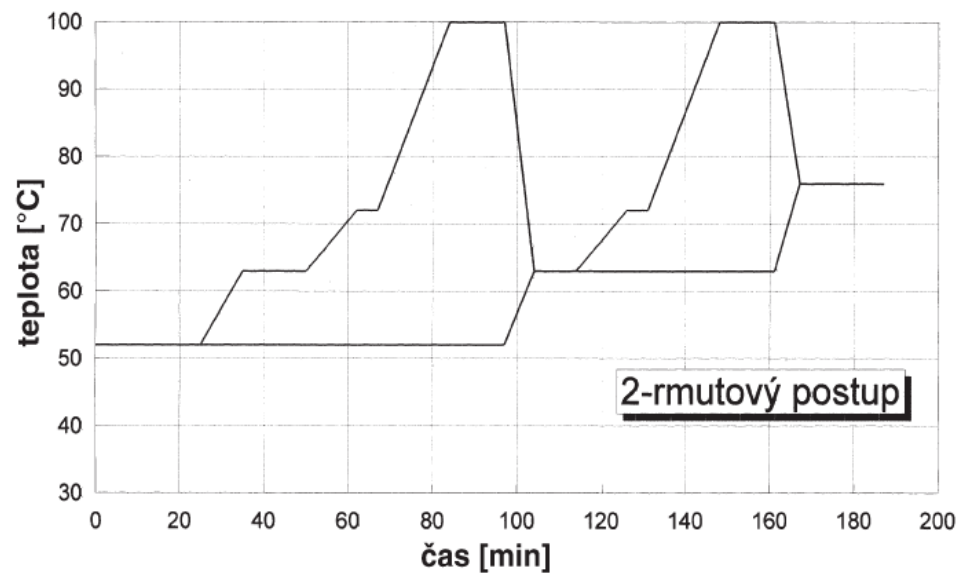




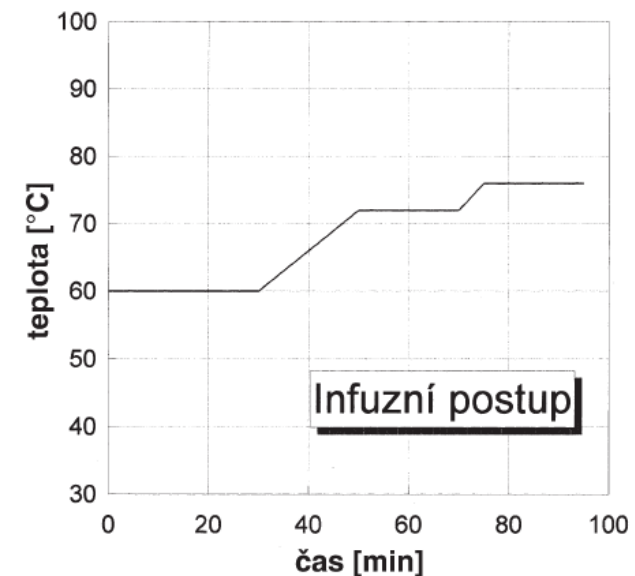


## Mashing

- Conversion of unfermentable carbohydrates to fermentable = simple sugars able to be fermented to alcohol and  $\text{CO}_2$



**Decoction (typical for czech beer)**

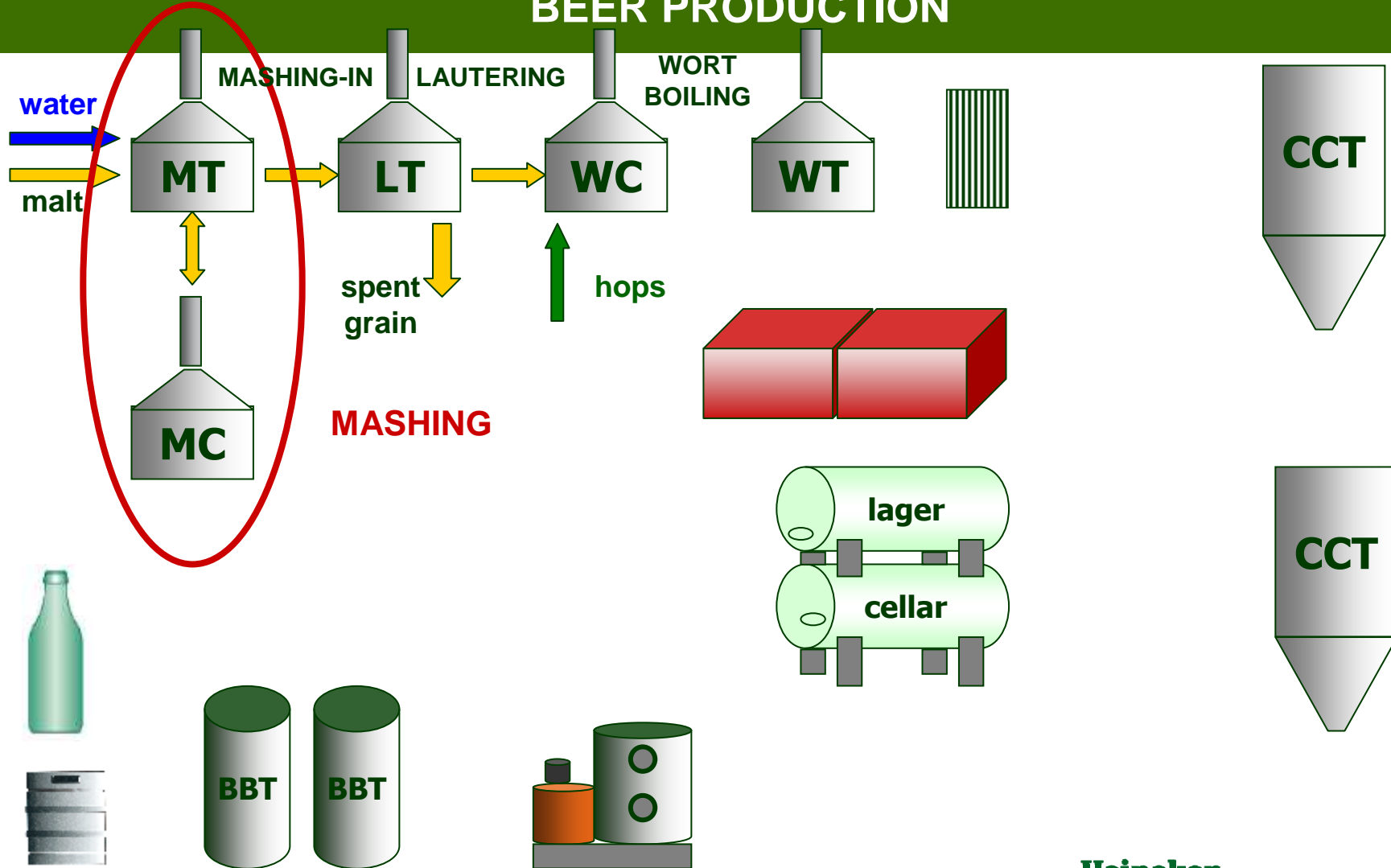


**Infusion**

**Heineken  
International**



# BEER PRODUCTION





Hops

(ca 100g per 1 hl)

## Magic of beer

bitterness  
aroma  
antioxidants



Hop products:

- fresh hops
- pellets
- extract

Czech varieties:

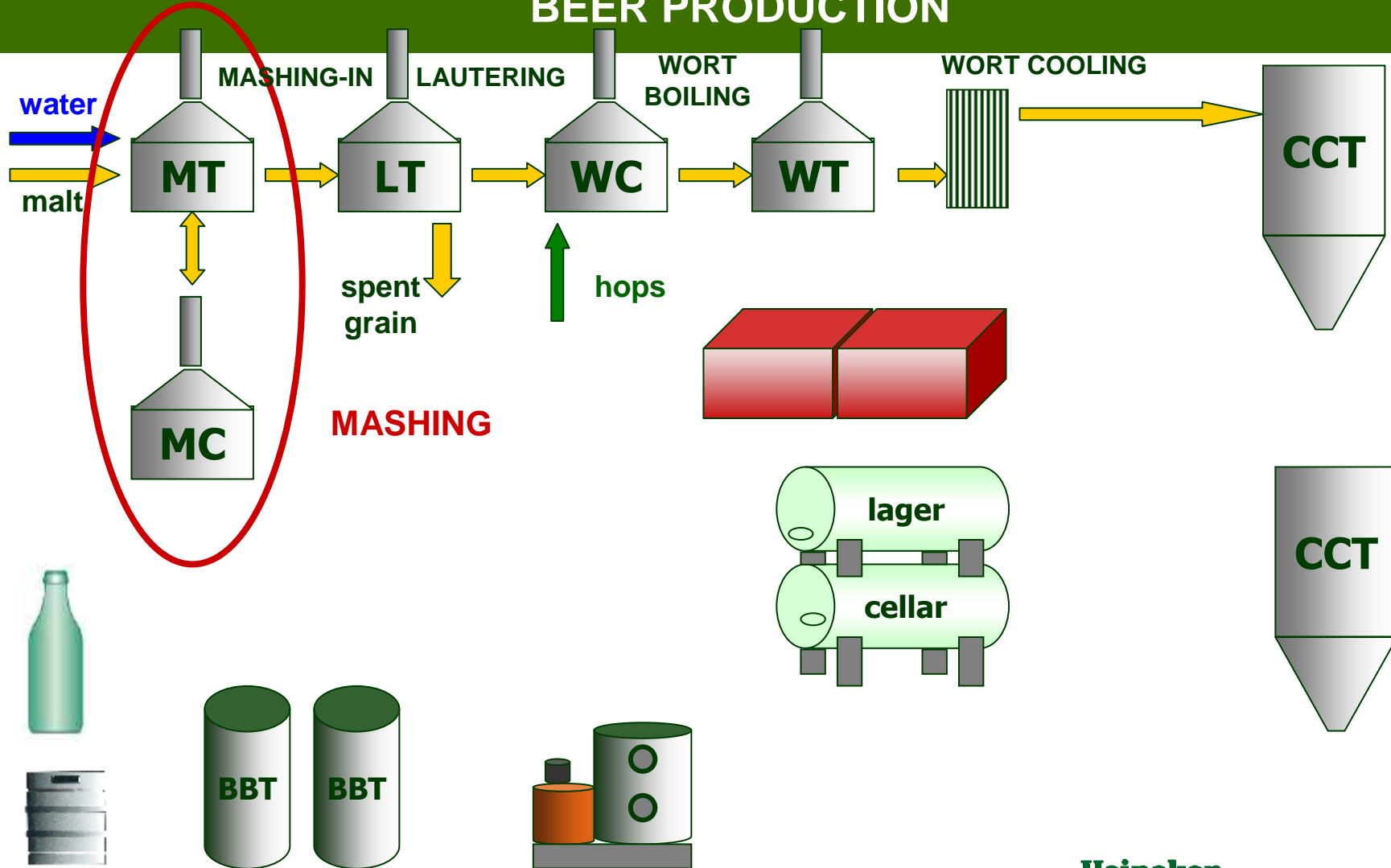
Žatecký poloranný červeňák (SAAZ)

Sládek, Premiant, Bor, Agnus

**Heineken**  
International



# BEER PRODUCTION





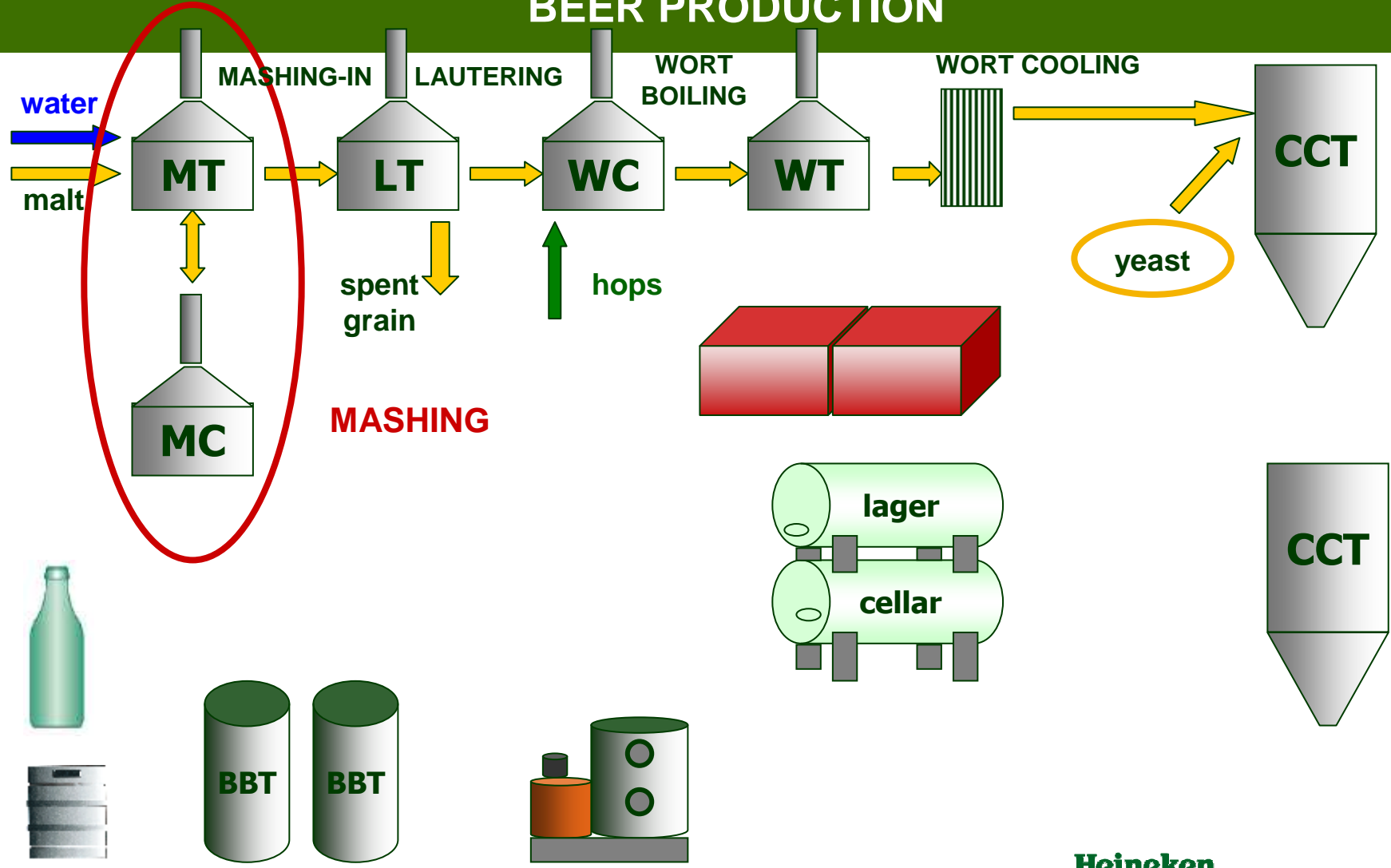
# CCT (Cilindro-Conical Tanks)



International



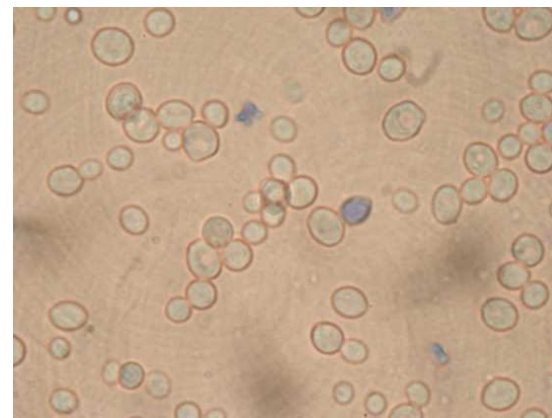
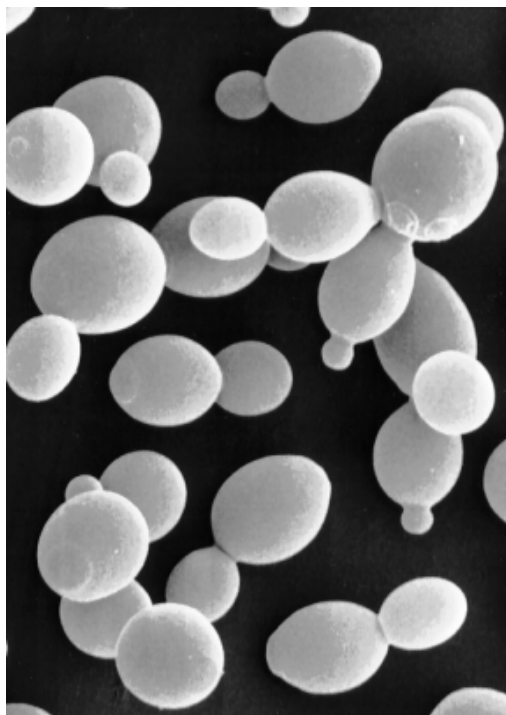
# BEER PRODUCTION





Yeast

(ca 0,5 l per 1 hl)



*Saccharomyces (cerevisiae) uvarum*

Transform sugars into alcohol and  $CO_2$



## Quiz

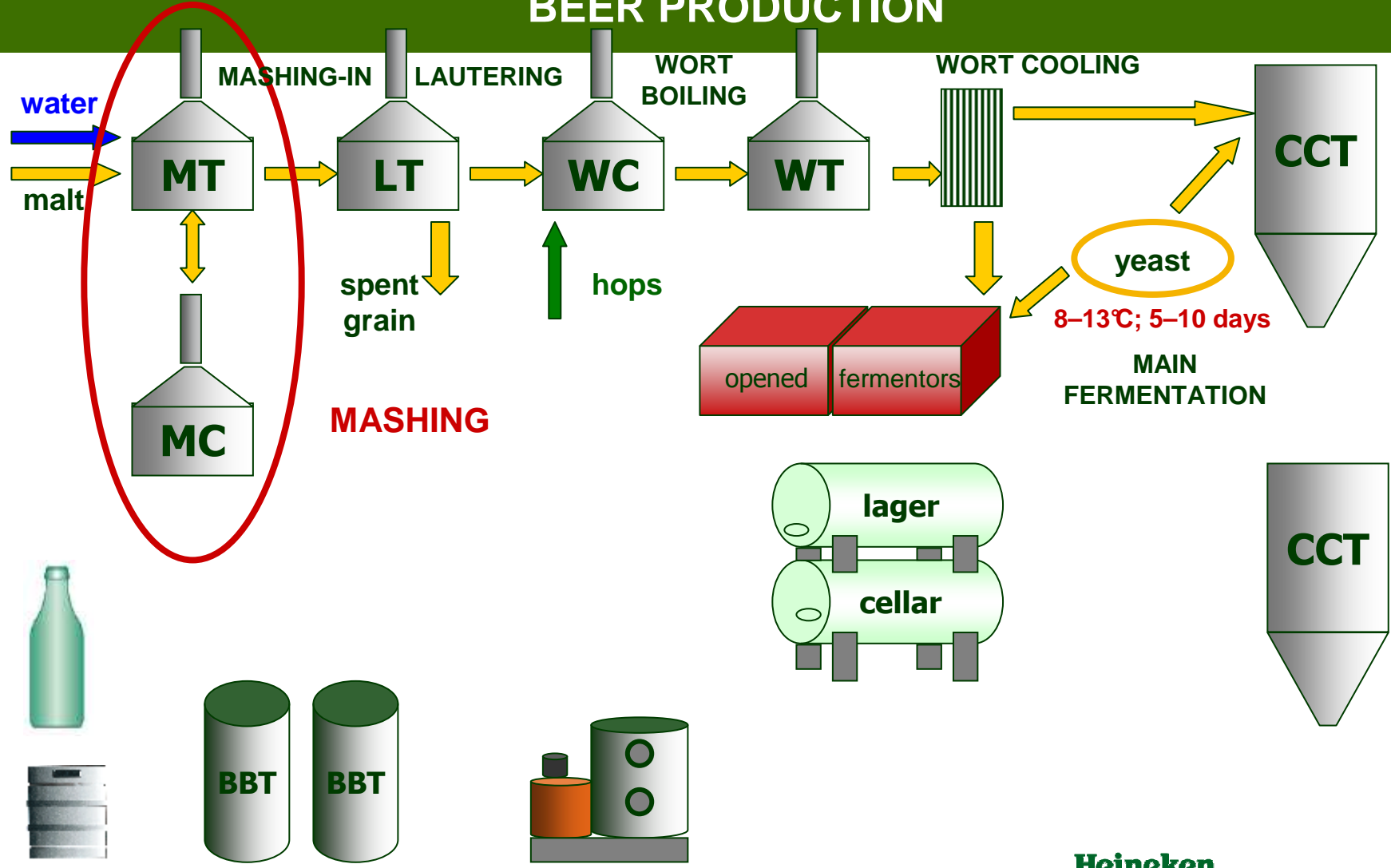
How many yeast cells participate on fermentation of a 0,5l beer?

**ca 50 billion**





# BEER PRODUCTION



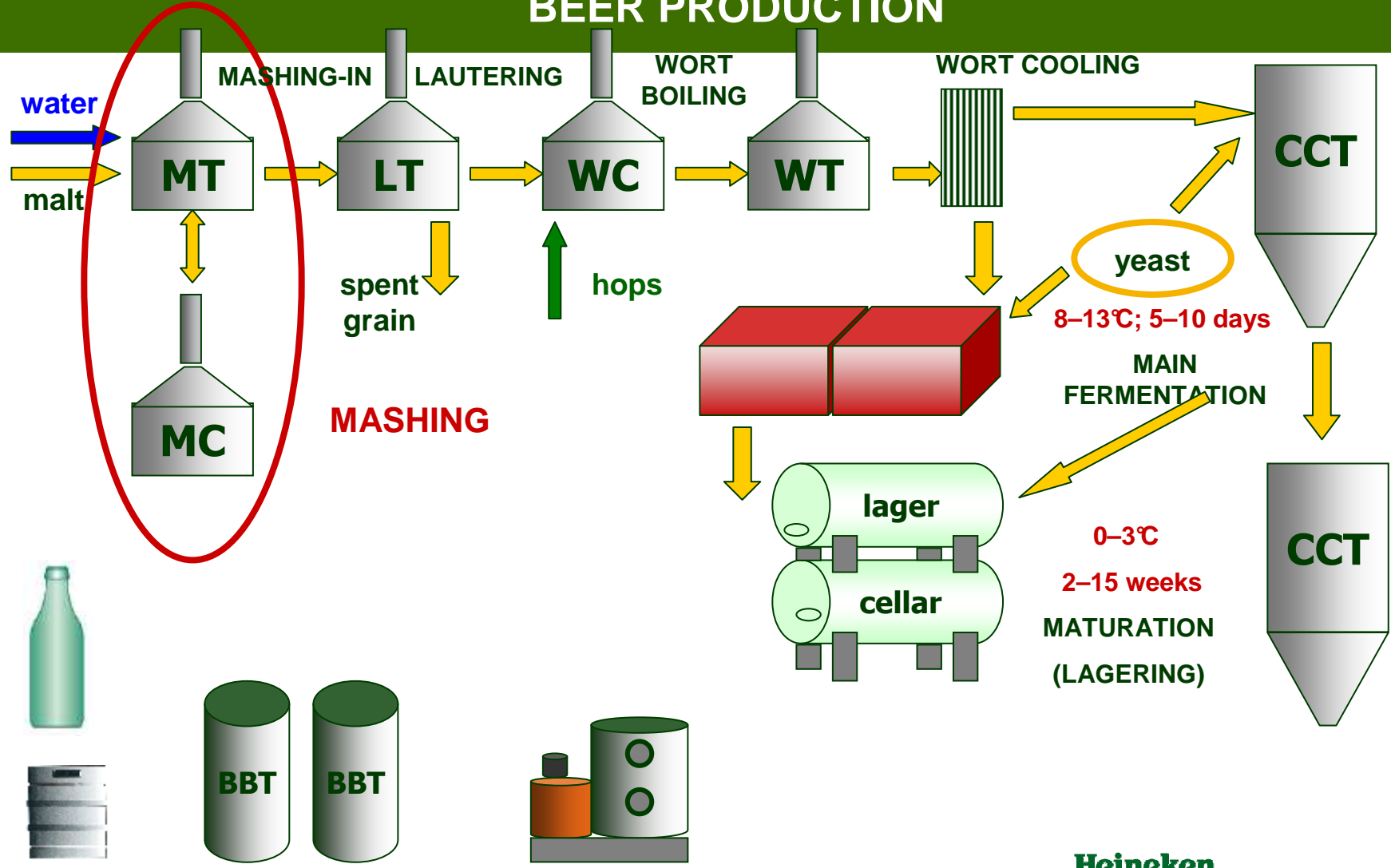


# Opened fermentation



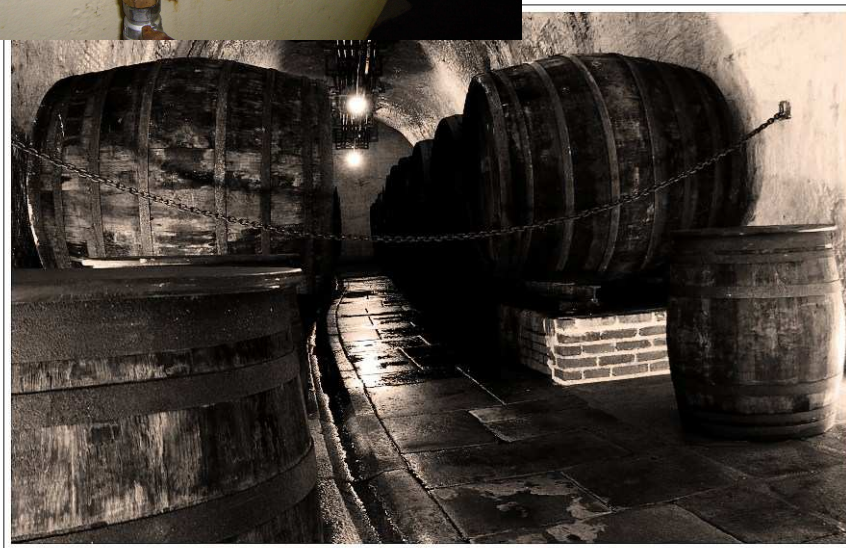


# BEER PRODUCTION





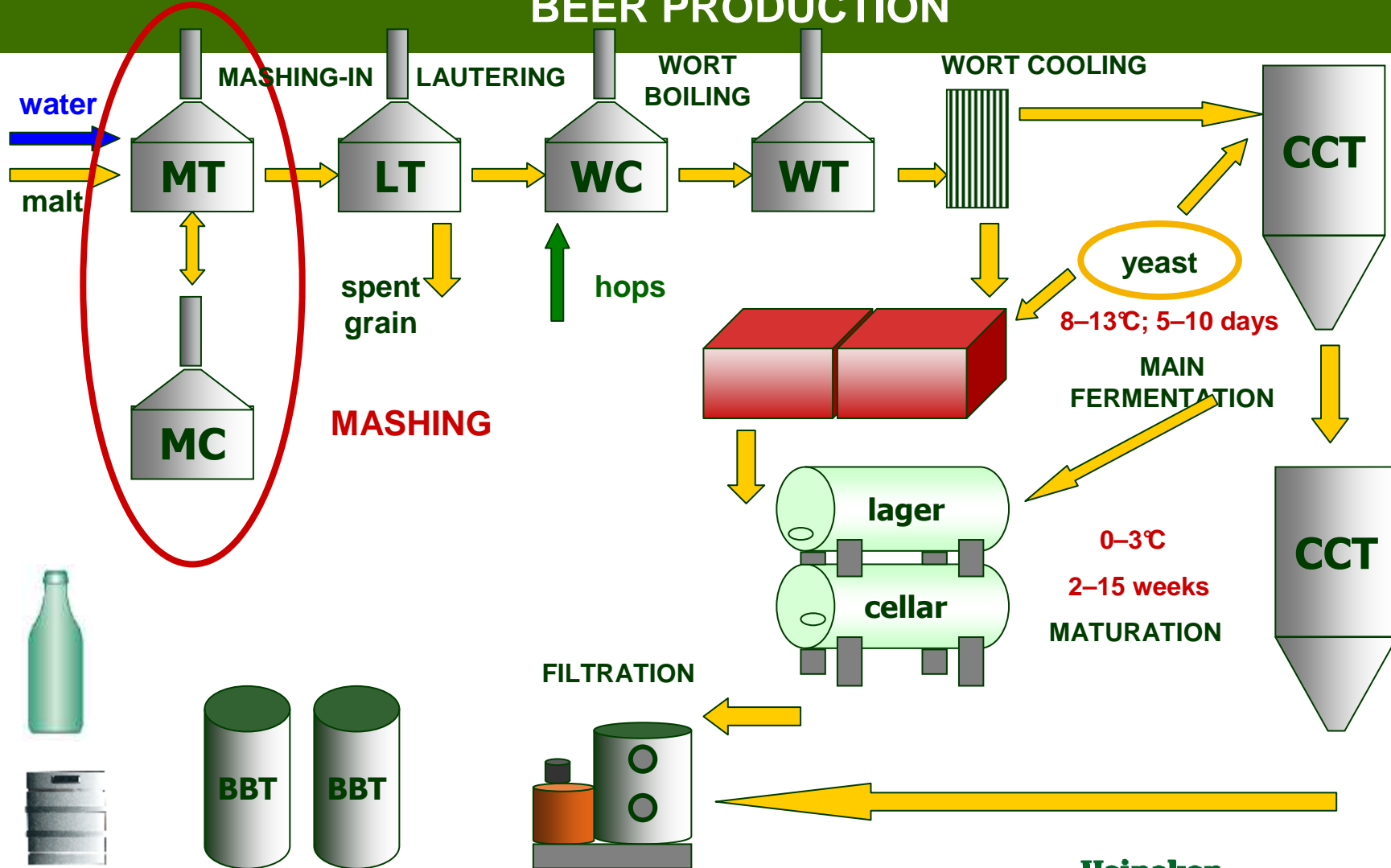
# Lager cellar



International



# BEER PRODUCTION





## Filtration



Beer is filtrated via layer  
of kieselguhr

Goal:

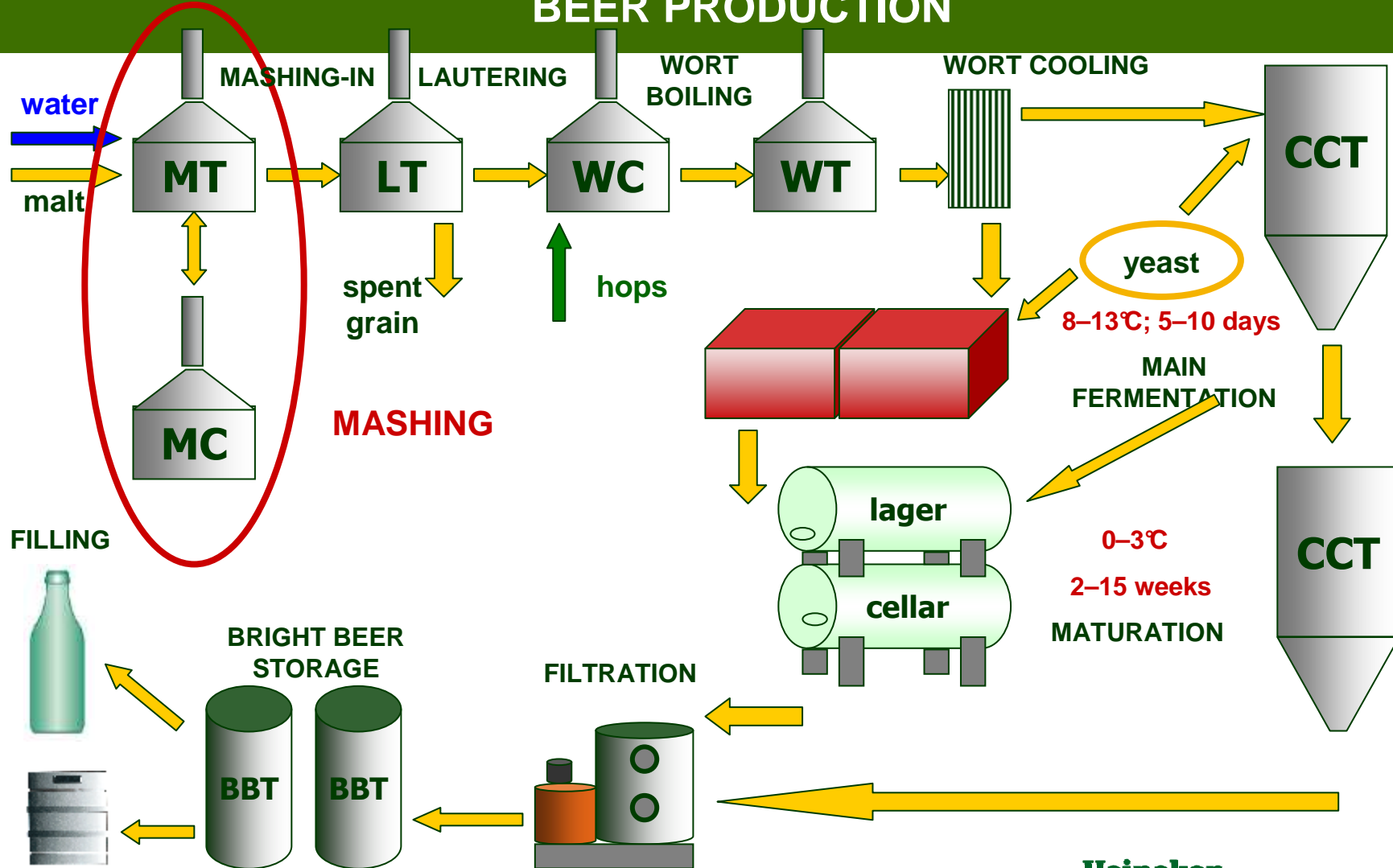
- removal of yeast
- removal of haze particles

→ **BRIGHT BEER**

Kieselguhr = diatomaceous earth (siliceous shells of prehistorical diatoms)



# BEER PRODUCTION





# Filling







## Average composition of lager beer

- Water 93%
- Alcohol 5%
- Carbohydrates 1%
- Carbon dioxide (CO<sub>2</sub>) 0,5%
- Proteins 0,3%
- Mineral substances 0,1%
- Volatile matter (higher alcohols, esters) 0,1%
- Fat 0,0%
- Vitamins B<sub>1</sub>, B<sub>2</sub>, B<sub>3</sub>, B<sub>4</sub>, B<sub>6</sub>, B<sub>12</sub>, H, folic acid
  
- pH 4,5 = slightly acidic beverage

SO FAR IDENTIFIED  
MORE THAN 2000  
DIFFERENT  
COMPOUNDS OF  
BEER



## How to enjoy beer?

- Serving temperature 6 - 9°C
- Should be served with foam (foam protects beer against oxidation - oxidation damages taste and smell of beer)
- As freshest as possible (longer time before expiry date = better beer)
- Opened bottle or can should be drunk immediately
- Store beer out of sun light
- For quality is better a brown bottle than green or transparent
- Protect beer against temperatures < 0°C and > 30°C
- Properly clean a glass for beer (remaining fat destroys foam)
- Drink good beer 😊



## Heineken Czech republic portfolio



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## Heineken Czech republic portfolio



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QUESTIONS?



THANKS FOR YOUR ATTENTION

NA ZDRAVÍ!!!