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
History of Czech beer

- Fermented cereal beverages known by Celts, Germans, Slovans
- First written document 1088 (Vratislav II.) - the duty to supply a church shot 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 fermentation process)
  - Invent and improved several measuring devices (still used e.g. saccharometer)
Pils type beer

1842

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

- Beer categories
  - Lager
    - Pale lager
      - Ostrumer
    - Hefe
      - Hefeweizen
    - Kellerbier
    - Vienna lager
    - Schwarzbier
    - Pale lager
      - Dortmunder
      - Dunkel lager
    - Bock
      - Doppelbock
      - Malzbock
      - Weizenbock
  - Lambic
    - Gueuze
    - Faro
    - Fruits

- Stout
- Porter
- Ale
  - Malt
  - Wheat beer
  - Mild
  - Pale ale
  - Brown ale
  - Dark ale
  - Belgian ale
  - Barley wine
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, balanced 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.
WATER (ca 1 hl per 1 hl)

BASE OF BEER

90 – 95% by volume

Different composition = different beer

(anions, cations, pH)
BEER PRODUCTION

- MASHING-IN
- MT
- LT
- WC
- WT
- water
- malt
- MC
- CCT
- lager cellar
- BBT
- BBT
Malt (ca 15 kg per 1 hl)

Body of beer
- barley malt

Important compounds:
- carbohydrates (starch)
- proteins
- (enzymes)
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
Mashing

- Conversion of unfermentable carbohydrates to fermentable = simple sugars able to be fermented to alcohol and CO₂

Decoction (typical for czech beer)  Infusion
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
BEER PRODUCTION

MASHING-IN → LAUTERING → WORT BOILING → WORT COOLING

MT → LT → WC → WT

water → MASHING-IN → spent grain → spent grain

malt → MASHING → MC → hops

WT → CCT

lager cellar

BBT → Heineken International
CCT (Cilindro-Conical Tanks)
BEER PRODUCTION

MASHING-IN

MT

LAUTERING

LT

spent grain

WORT COOLING

WT

spent grain

WC

WORT BOILING

WT

hops

CCT

yeast

malt

water

MC

MASHING

BBT

BBT

lager

cellar

CCT

Heineken
International
Yeast (ca 0.5 l per 1 hl)

**Saccharomyces (cerevisiae) uvarum**

Transform sugars into alcohol and CO₂
Quiz

How many yeast cells participate on fermentation of a 0.5l beer?

ca 50 billion
BEER PRODUCTION

MASHING-IN → LAUTERING → WORT BOILING → WORT COOLING

- MT: Mash Tun
- LT: Lauter Tun
- WC: Whirlpool Cylinder
- WT: Wort Filter Tower
- CCT: Cool Conditioning Tower

- MASHING: water + malt → spent grain
- WORT BOILING: hops + spent grain
- MAIN FERMENTATION: yeast + wort
- Cooled wort is transferred to CCT for conditioning and storage.

- BBT: Bottles and Kegs for distribution

- Lager Cellar for aging and maturation
Opened fermentation
BEER PRODUCTION

MASHING-IN
MT

LAUTERING
LT

WORT BOILING
WC

MASHING-IN
MC

spent grain

hops

WORT COOLING
WT

yeast

8–13°C; 5–10 days

MAIN FERMENTATION

0–3°C
2–15 weeks

MATURATION (LAGERING)

BBT

BBT

CCT

cellar

lager

CCT

water

malt
Lager cellar
BEER PRODUCTION

MASHING-IN → LAUTERING → WORT BOILING → WORT COOLING → CCT

- Water to MT
- Malt to MT
- Spent grain from LT
- Hops to WC
- Yeast: 8–13°C; 5–10 days
- 0–3°C; 2–15 weeks

MASHING

MAIN FERMENTATION

FILTRATION

MATURATION

BBT → BBT → CCT

Heineken International
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

MASHING-IN  LAUTERING  WORT BOILING  WORT COOLING

MT  LT  WC  WT

spent grain  hops

MASHING

8–13°C; 5–10 days
MAIN FERMENTATION

yeast

0–3°C  2–15 weeks  MATURATION

FILLING

BRIGHT BEER STORAGE

BBT  BBT  lager  cellar

FILTRATION

Heineken International
Filling
Average composition of lager beer

- Water 93%
- Alcohol 5%
- Carbohydrates 1%
- Carbon dioxide \((CO_2)\) 0.5%
- Proteins 0.3%
- Mineral substances 0.1%
- Volatile matter (higher alcohols, esters) 0.1%
- Fat 0.0%
- Vitamins \(B_1, B_2, B_3, B_4, B_6, B_{12}, H,\) 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
Heineken Czech republic portfolio
QUESTIONS?
THANKS FOR YOUR ATTENTION

NA ZDRAVÍ!!!