The Brewing of Pilsner Beers

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Widmer Brothers Brewing Co.
The Brewing of Pilsner Beers

Origins of the Style

How Pilsner Urquell is Brewed

Rise of the Style

Variations on the Style

How German Pilsners are Brewed

QA Data from Commercial Examples

Our Panelists

QA Data from our Panelists

Questions and Answers
Triple Decoction Mash

Decoctions

Main Mash
Kettle -- Fermentation -- Lagering

2 hour boil with whole flower Saaz hops
  First wort hopping
  80 minutes to end of boil
  25 minutes to end of boil

Pitched with 15 million cells/ml at 39° F

Primary:  1530 bbl CCTs for 11 days with rise up to 48° F

Lagering:  blended into 2820 bbl CCTs for 35 – 40 days
Parameters of the Style

Bohemian Lager (BJCP)


Appearance: Very pale gold to deep burnished gold, brilliant to very clear, dense, long-lasting, creamy white head.


Brewed with: Very soft water, Moravian malted barley, Saaz hops, Czech lager yeast.

Medium-bodied, medium carbonation

OG: 11.25 to 12.5 Plato
AE: 3.25 to 4.25 Plato
ABV: 4.2 to 5.4 %
BU: 35 to 45
Color: 3.5 to 6 SRM
Germanic Variations of the Style

**Czech/Bohemian:** focus on soft, rich malt character balanced with spicy hop bouquet. Diacetyl not unexpected, when present increases mouthfeel. Not highly attenuated, so higher hop bitterness isn’t overwhelming.

**German variations in general:**

Use well-modified continental barley malts, hops from the Hallertau or Hersbruck regions, frequently harder water sources.

The Pils/Pilsners are more carbonated, often have higher amounts of DMS (different kilning temperatures 80 vs 100 C), and do not have perceptible levels of diacetyl.

**Southern German/Austrian:** similar to Bohemian, but lighter color, less sweet. Still focused more on malt than hops.

**Central German:** focus on clean malt backbone, often lightly grainy, with a correspondingly higher perceived, lingering hop bitterness. The balance between hops and malt is even.

**Northern German:** focus on very dry malt backbone and bracing bitterness. The balance is moved from malt to hops.
Effects of the Success of the Style

**Munich Helles:** Initial response to Pilsner beers by the Munich brewing community: Light in color, but more malt-accentuated with much lower bitterness supporting the sweet malt flavors.

**Dortmunder Export:** Malt profile of Helles, hop profile of a Pilsner. Starting gravity higher, sulfate-rich brewing water accentuates the hop bitterness.

**Kölsch:** Relatively new beer style in and around Cologne, the light, clean malt flavors are reminiscent of a crisp, though slightly fruity Pilsner beer.

**Pre-Prohibition American Pilsner:** German immigrants brought the technologies of Pilsner brewing and utilized corn and rice as well. Solid hopping and strength.

**Lagers of the Americas, Asia, Africa, Australia….the World!** Brewed with local grains, malts, sugars, etc. Typically lighter in body and intensity.
pH in Mash Tun and Kettle

Target in **Mash Tun: 5.4 to 5.6**

This is a compromise between the optimal pH ranges for glucanase (5.0) protease (4.5 to 4.7) and amylase (5.1 to 5.8) enzymes.

**Reduces:**
- Wort and beer viscosity,
- Wort color increase,
- Conversion time,
- Lautering time,
- Fermentation and lagering time.

**Increases:**
- Foam stability,
- Flavor stability,
- Brewhouse efficiency,
- Attenuation,
- Perceived hop flavor quality.

Target in **Kettle: 5.1 to 5.2**

**Reduces:**
- Alpha acid isomerization, resulting in a “smoother” bitterness.
- Wort color increase during boiling
- Possibility of microbiological infection

**Increases:**
- Polyphenol-protein trub formation, which leads to better hot and cold breaks
pH in Mash Tun and Kettle

Technologies for pH adjustment:

Water treatment to reduce carbonates:
  Heat 70 to 80 C precipitates CaCO3,
  Addition of Ca(OH)2 (reacts with Ca(HCO3)2 and precipitates CaCO3),
  Ion exchanger

Salt additions in Mash Tun and Kettle (CaCl2, CaSO4, MgCl2, MgSO4)

Use of Sauermalz (3% increments drops pH by ca. 0.20)

Adjustments with Phosphoric or Lactic Acid

Adjustments with Biological Acidification
Biological Acidification

2 vessel system -- 1st as reactor, 2nd as pitching source

Send first runnings blended with cold water to the reactor. 7 Plato is the target gravity. Try to avoid osmotic shocks.

Start with either a pure lactobacillus culture or by adding ground malt to the wort. The bacteria on the malt will suffice to sour the wort. The souring media will take on its own life even if a pure culture is used to start.

Maintain a constant temperature of 118 F for optimal bacterial growth.

Keep the vessels anaerobic (using CO2 stones) to maximize lactic acid production.

Used for mash and kettle pH adjustments.

Benefits: All-natural, Reinheitsgebot-friendly

Drawbacks: Did you see this process? Capital intensive, time intensive. Bugs under a scope don’t show you if they are dead or alive.
Step Infusion
Fermentation -- Lagering

Classic Fermentation Profile:

Pitch wort with 1 million cells/ml at 41° to 43° F

Cold fermentation: rise to maximum of 48° F
Warm fermentation: rise to maximum of 52° F
Primary lasts 6 to 8 days. After reaching maximum temperature the beer is chilled slowly (2° F per day) down to 39° to 41° F prior to lagering

Lagering: at 30° F until diacetyl reduction is complete, then one additional week

Other possibilities:

Cold primary, warm secondary (48° F, 48° F, 30° F)
Warm primary, warm secondary (54° F, 54° F, 30° F)
Pressure fermentation (57° F, 30° F)
Cold primary, forced secondary (48° F, 68° F, 30° F)
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**Thresholds**

- Diacetyl 10 to 40 ppb -- Iso-Amyl Acetate 1.4 ppm
- Acetaldehyde 5 to 15 ppm -- Ethyl Acetate 30 ppm
Panelists

Brendan Smith  Redhook Ale Brewery – RAB – Rope Swing Pilsner
Larry Sidor   Deschutes Brewing – DB – Sagebrush Pils
Will Kemper  Chuckanut Brewery & Kitchen – CBK – Pilsner
Don Barkley  Napa Smith Brewery – NSB – Pilsner
Lars Larson  Trumer Brauerei Berkeley – TBB – Trumer Pils

Questions/Topics of Discussion:

- Special technologies
- Inspirations for recipe development
- Sources for ingredients
- Where are you in the tradition of brewing this beer style (Continental to US craft)?
- What makes your lager a “Pilsner”? 
## QA Data

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Special Thanks to

All of our panelists

Brian Jordan and the rest of the Widmer Brothers QA Department

Larry Sidor of Deschutes Brewing (Photos of Pilsen)

Viewers like you...