



Malting 101

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The best **handcrafted** beer starts with the **finest handcrafted** malt.

What are we talking about?

- Barley is a highly specialized crop!
- Malt is a "*processed raw material*"
- Barley is a very small, non food crop
- 4% of global grain and oilseeds, <1 % of U.S. grain and oilseeds
- U.S. barley production is mainly for domestic consumption
- Brewers are the only dedicated user base
- <22% of world barley to malting, >65% of U.S. barley to malting
- Barley thrives, along with wheat, only in areas that are less suitable for corn and soybeans



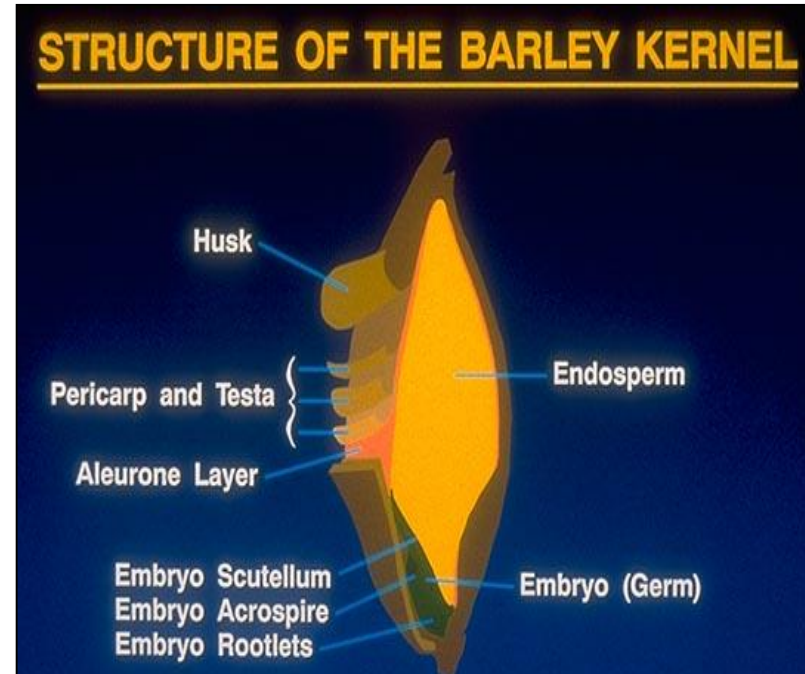
Principal means of obtaining fermentable extract from cereals

- Exclusively from malted barley using the naturally occurring enzymes of the malt
- From a mixture of unmalted cereal and malted barley again using the naturally occurring enzymes from the malt
- From unmalted cereal using bacterial or fungal enzymes



Purpose of Malting

- Activate enzymes for degradation of cell walls containing starch in the barley kernel, break down of proteins, and conversion of starch to sugar to nourish the germinating barley embryo during malting -- *AKA tricking Mother Nature it's time to grow a plant!*
- Conserve starch degrading enzymes for use during mashing
- Make malt friable for milling
- Develop color and flavor





Purpose of Malting



Malting is a *required step* to convert raw grain into beer



...And Of Course The Purpose of Mashing

- To convert starch from cereal grains to fermentable sugars, which through yeast fermentation are converted to ethanol
- This is driven by an enzymatic reaction at temperatures conducive to facilitate changes to the starch substrate that produces fermentable sugars



Super Basic Malting 101

- Drive moisture into barley kernel
- Sprout barley
- Remove moisture for storage

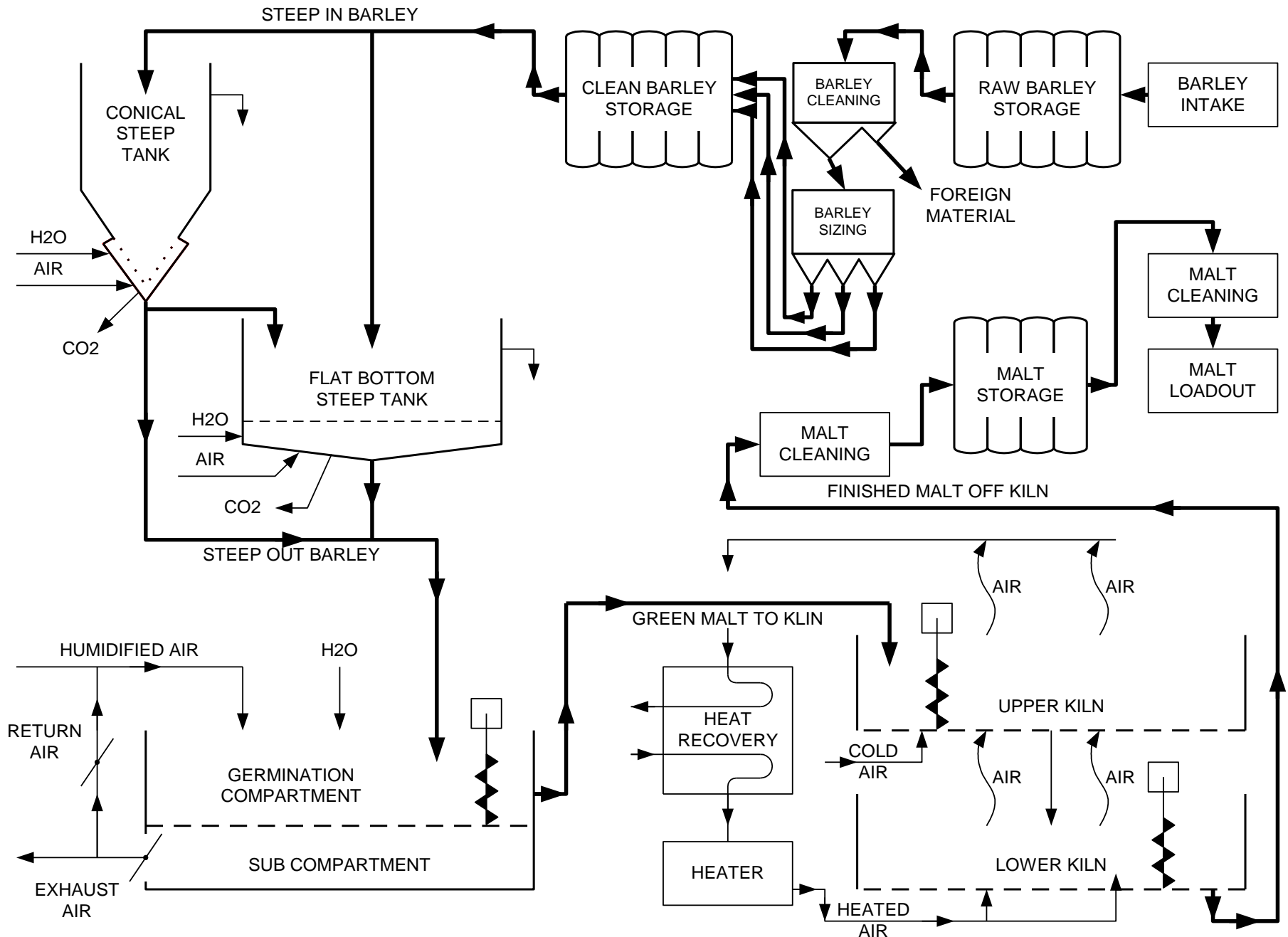
EASY RIGHT!

As Maltsters we are making a *processed raw material*



MALTING PROCESS FLOWSHEET

7 - 9 Day Process
50 Deg.F. → 190 Deg.F.



Why Malting and What's It For?

In Malting, the growth of a living embryo is *managed* to achieve:

- Maximum Recoverable Extract
- Target A-amylase Activity
- Target Protein Solubilization
- Target FAN



Steeping and Germination

Additionally different drying techniques are used to end the malting process also achieve:

- Target Diastatic Power
- Target Color
- Target Flavor



Curing: Kiln Drying or Roasting



3 Steps in Malt Production

1. Steeping
2. Germination
3. Color & Flavor Formation:
 - A. Kiln Drying
 - B. Roasting



The Malting Process: Step 1

Steeping

Barley is alternately submerged and drained for 40-48 hours. This activates the embryo where production of hormones initiate enzyme development and growth of the rootlets.



STEEPING



Steep Tank

©The Institute of Brewing & Distilling



Objective of Steeping

- Bring moisture content up rapidly to ~30% which initiates metabolic activity.
- Provide aerobic conditions by supplying oxygen and removing CO₂
- Target a final grain moisture of 40 – 45% to ensure full hydration of the starchy endosperm material
- Obtain uniform primary rootlet development or “chitting” at steep out





The Malting Process: Step 2

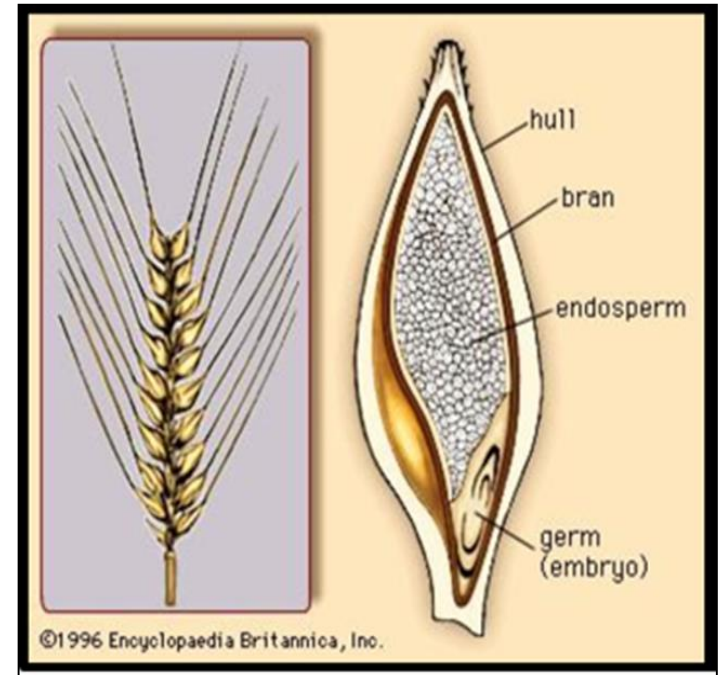
Germination

Germination continues in the compartment for 4 days where the acrospire develops and kernels undergo modification. Modification refers to the breakdown of complex proteins and carbohydrates which opens up the starch reserves.



Objective of Germination

- Control grain temperature with applied air temperature and applied air volume
- Untangle the grain bed with timed turning machine runs
- Target a Control grain moisture with timed water runs and water volume
- Looking to achieve uniform rootlets over the course of 4 days *variety specific!*



The Malting Process: Step 3

Drying

Drying on a **Kiln** or in a **Drum Roaster** stops germination. Gentle kiln drying preserves enzymes necessary for brewing while developing malty flavors. Higher temperature applications results in more unique flavor development.



Handcrafting

Hands-on small batch production allows for variations in the moisture, time and temperature of the drying process which develops the unique flavor and color characteristics of each specialty malt.

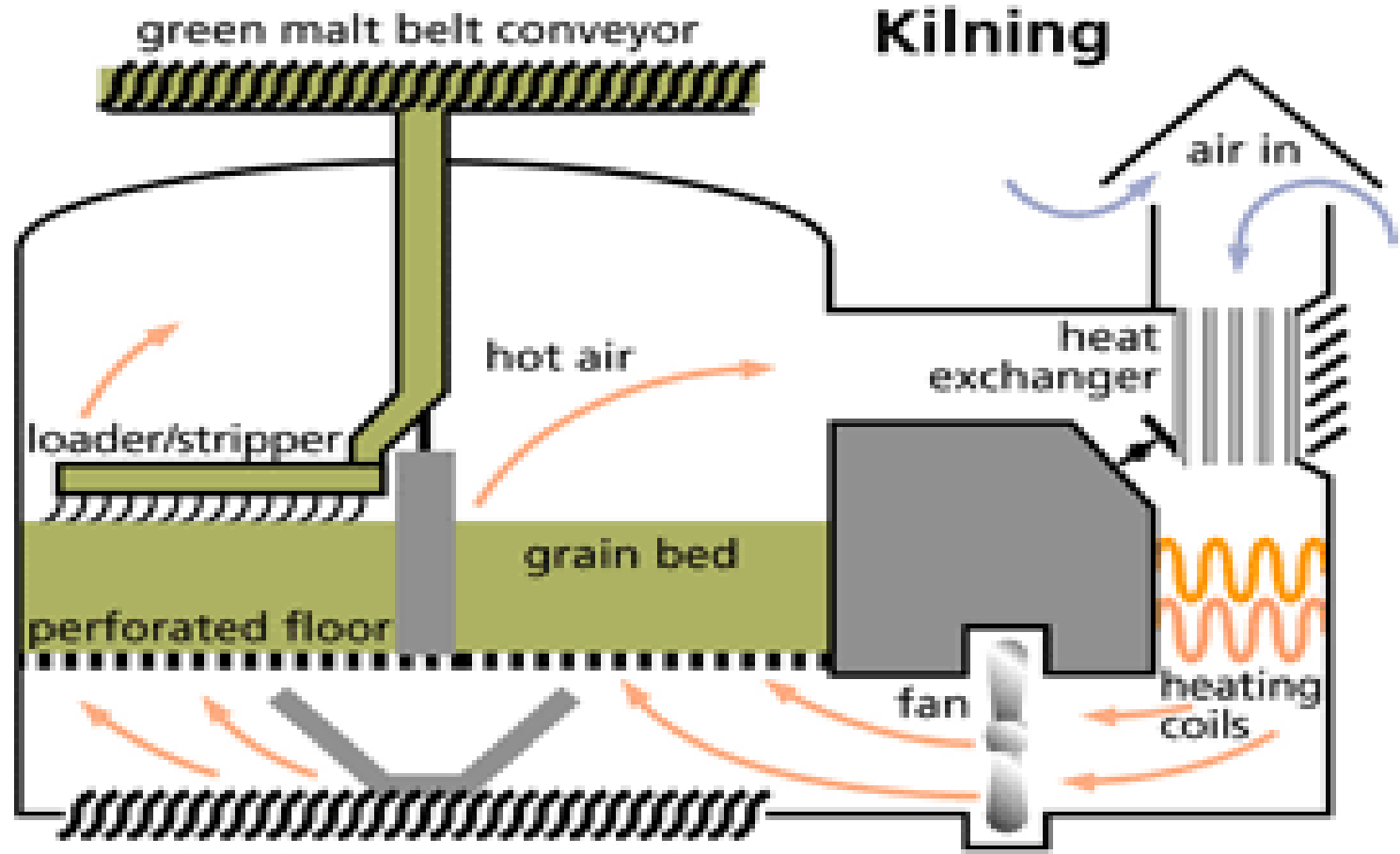


Objectives of Kiln Drying

- Stop growth and modification
- Create shelf stability by removing moisture to 4-5%
- Keep naturally developed enzymes “alive” and active for later use during mashing in the brew house
- Kiln = large batches @ low temps of 120F - 240F for 24 - 48 hours
- Clean, Slightly Sweet to Intense Malty, Biscuity
- Color: 1.0 – 30L



Kiln Dynamics



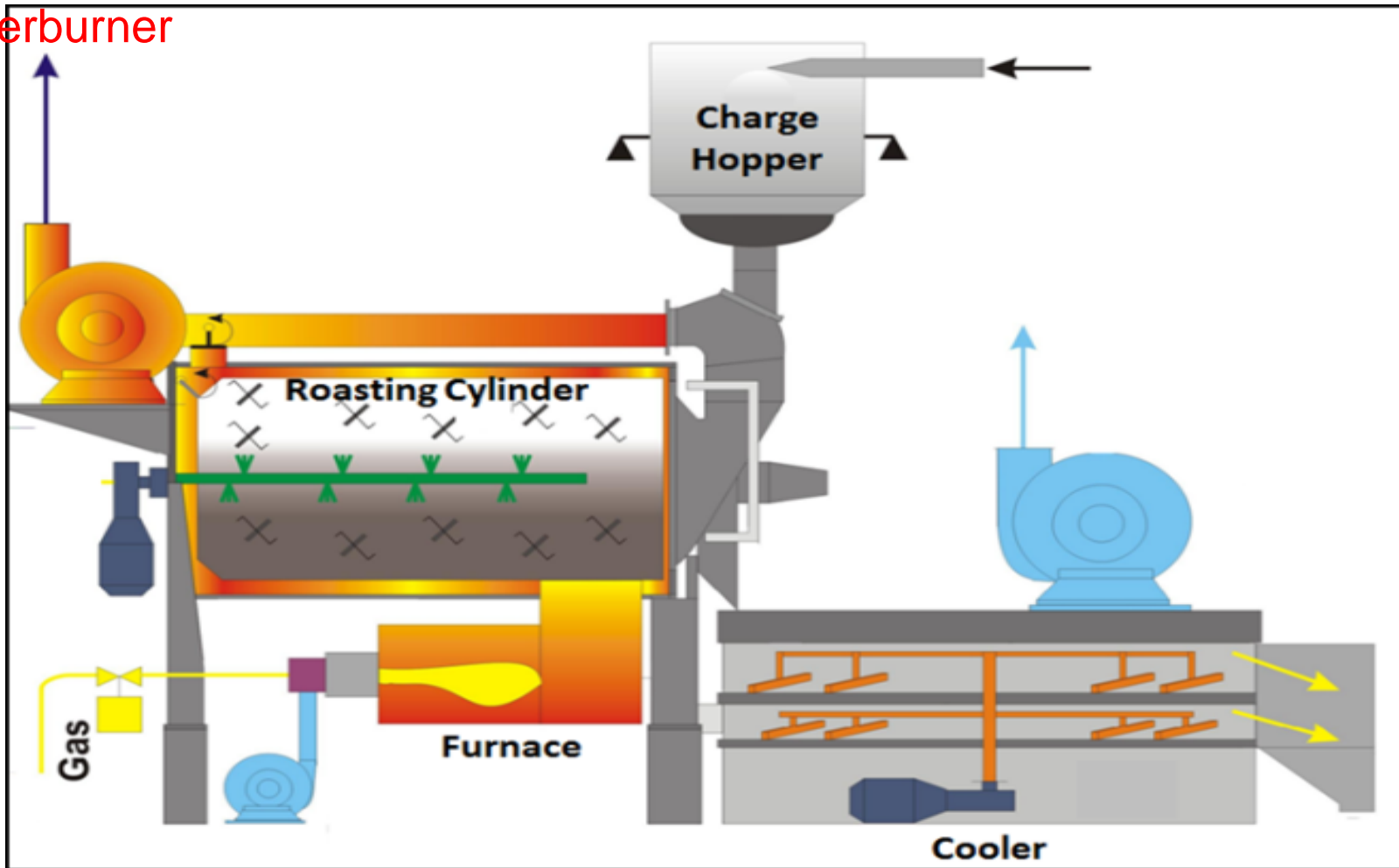
Objectives of Roaster Drying

- Stop growth and modification
- Create shelf stability by removing moisture to 4-5%
- Not interested in preserving enzymes
- Roaster = small batches @ high temps of 120F - 750F for 2 - 4 hours
- Intense Sweetness, Toffee, Caramel, Roasty, Raisin, Molasses, Nutty, Toasty, Woody, Chocolate, Coffee
- Color: 10 – 140L for Roasted Green; 25 – 500L+ Dry Roasted



Roaster Dynamics - Indirect Heating

To Cyclone and
Afterburner



Specialty Malts? Whaaa?!?

Definition: Any malt other than the standard brewers base malt (2 row, 6 row, wheat) that is designed to add unique characteristics to the finished product.

Specialty Malts are crafted by manipulating process conditions and raw materials to create a unique profile consisting of varying levels of the following attributes:

- ❖ Flavor
- ❖ Color
- ❖ *Body* (mouth-feel)
- ❖ Foam Development & Stability



Types of Kilned & Roasted Specialty Malts

Kilned Malts

- Rye Malt 3L
- Bonlander® Munich 10L
- Aromatic Munich 20L
- Dark Munich 30L

Kilned *AND* Roasted Malts

- Victory® 28L
- Special Roast 40L
- Carabrown® 55L
- Dark Chocolate 350L
- Black Malt 500L

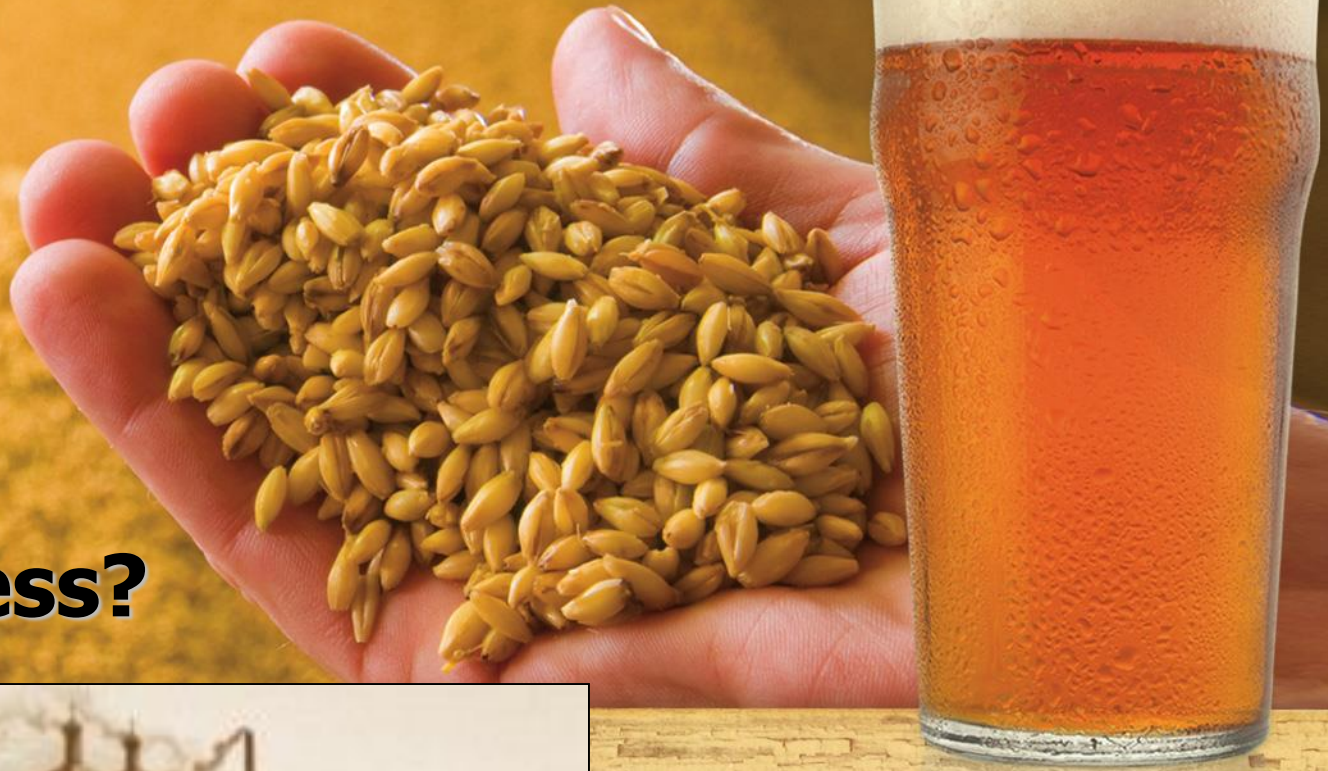
Roasted Green Malts

- Caramel Malts 10-120L
- Caramel Vienne 20L
- Caracystal® Wheat 55L
- Caramel Munich 60L
- Caramel Rye 60L
- Extra Special 130L

Dry Roasted Grains

- Roasted Barley 300L
- Black Barley 500L





Who Is Briess?



The best **handcrafted** beer starts with the **finest handcrafted** malt.



Wyoming and Montana



Seed Plant



U of WY



Grain Elevator





Wisconsin Malthouses

Chilton Malthouse



60,000 pound batch
Built in 1901

Waterloo Malthouse



217,000 pound batch
Built in 1902

Manitowoc Malthouse



432,000 pound batch
built in 1878, 1910, 1930
and 1982



*Barley varieties have to be good for the grower,
the maltster and the brewer*

Craft Brewers want Bright, Plump, High Extract, Flavorful Malt analytically similar to European Malt (lower protein, lower FAN and lower DP)

- Network of 250+ WY/MT barley growers
- Breeding program with University of Wyoming
 - 7 – 9 years for new varieties
 - Trials with Winter varieties, German varieties, Wheat trials
- Barley varieties off AMBA radar
 - Distillers - Odyssey (no GN), Full Pint (low GN)
GN = Glycosidic nitrile precursor of ethyl carbamate

