



Crisp Malt Webinar Series: Quick Guide to Malting & Speciality Malts

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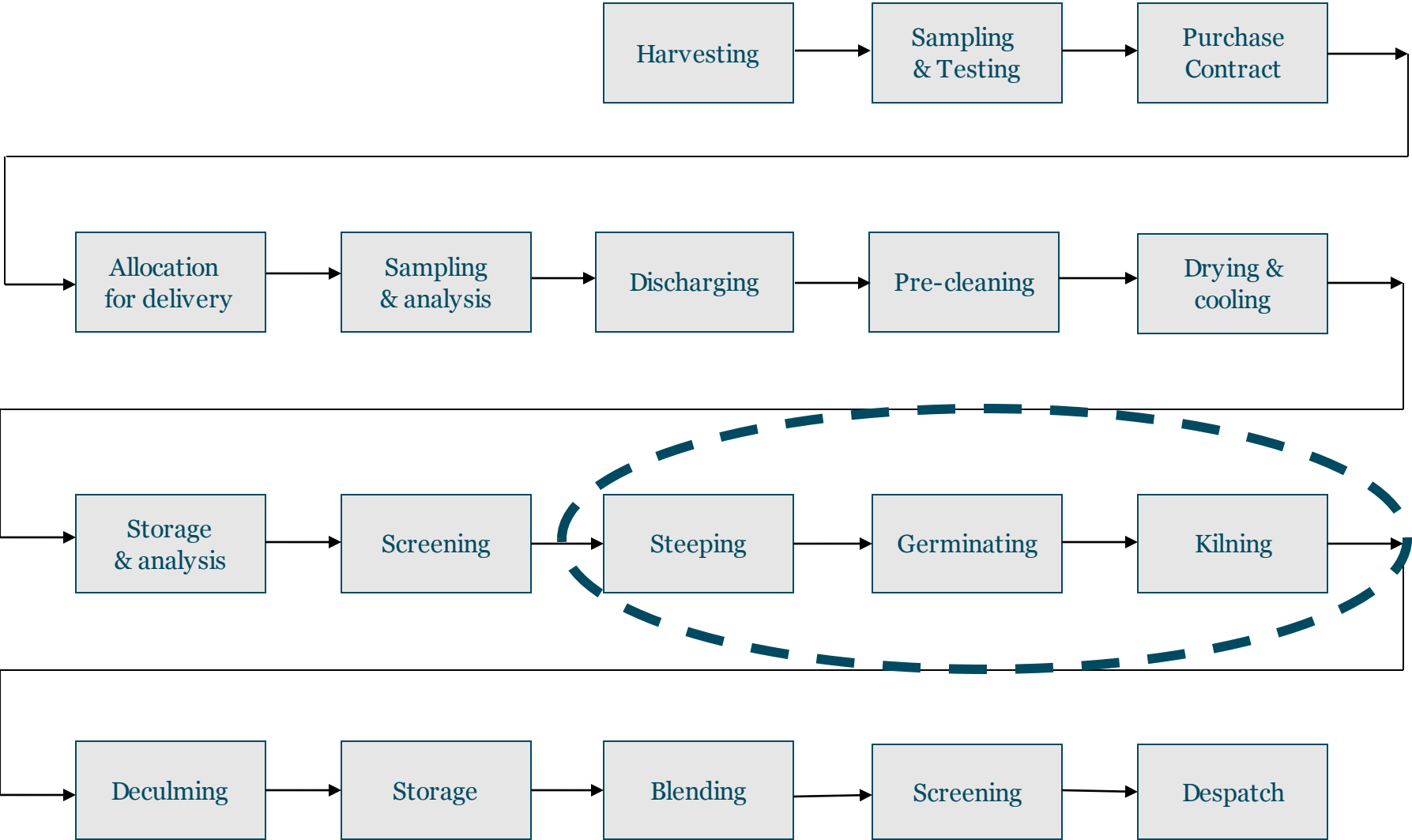
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What is Malting?

- Partial germination of cereals
 - Barley, wheat, rye, oats, sorghum etc.
- Under controlled conditions
 - Moisture, temperature and time
- Producing a raw material for further processing
 - Brewing, distilling and food uses
- Value added products
 - Provides extract, enzymes, colour and flavour

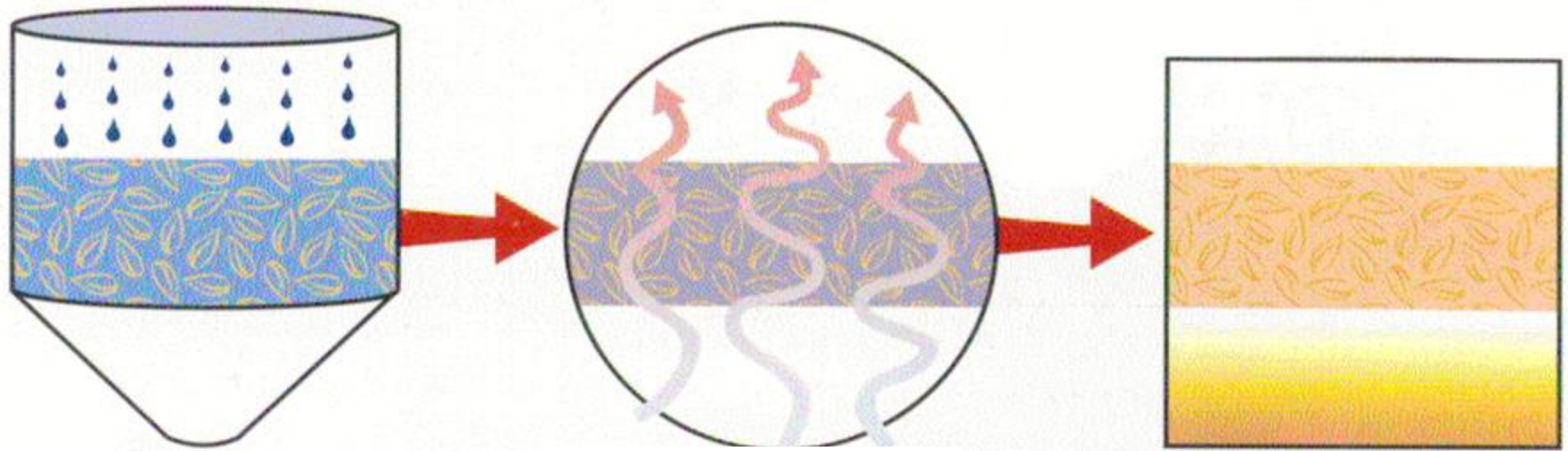


Process Flow



The Malting Process – “Normal” Malt

BARLEY → MALT



Steeping

Germination

Kilning

2 days

4 - 6 days

1-2 days

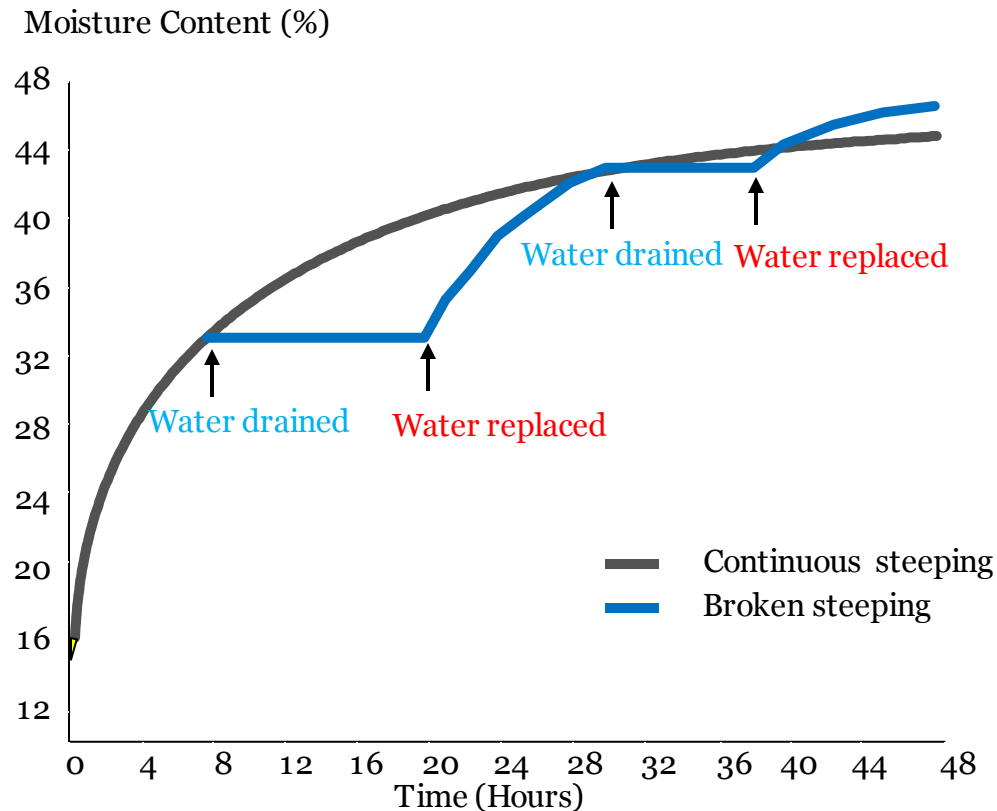




Steeping

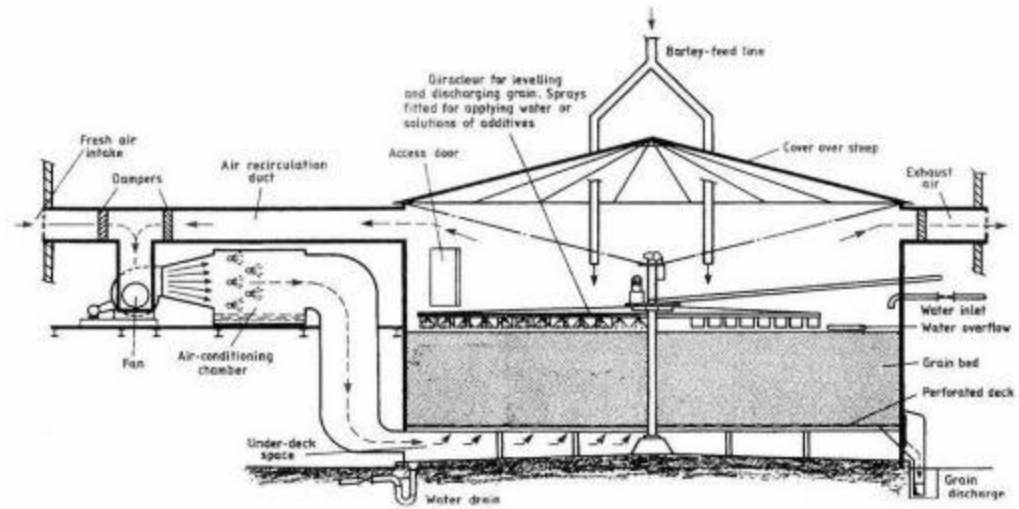
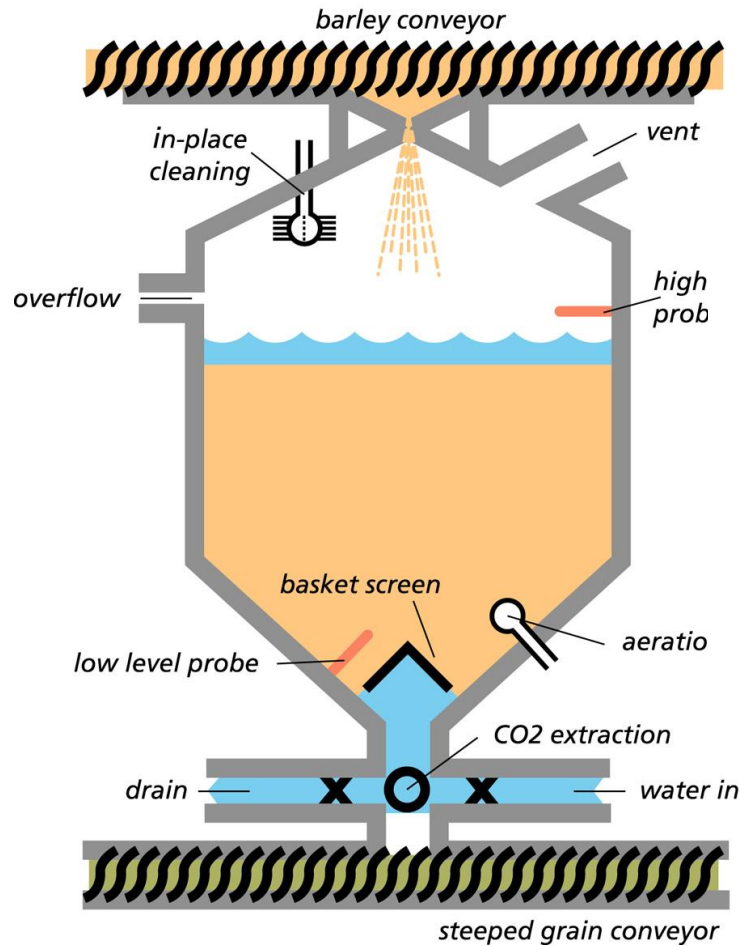
Steeping

- Objective:
 - Hydrate the grain, increasing the moisture content from around 12% to 44-46%
 - Initiate uniform germination



Steeping Process

Conical Steep Vessel



Steeping Tanks



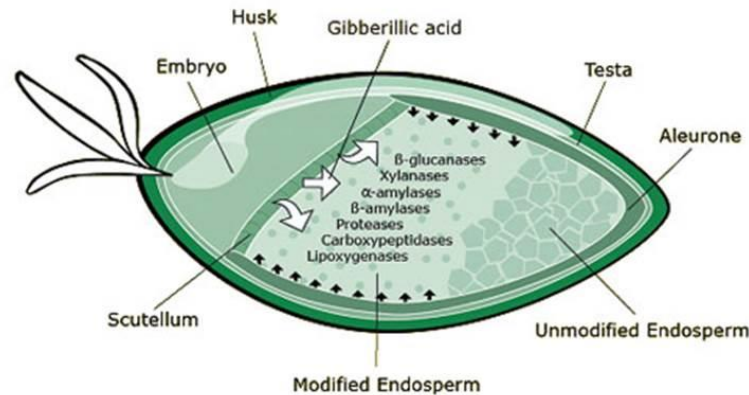


Germination



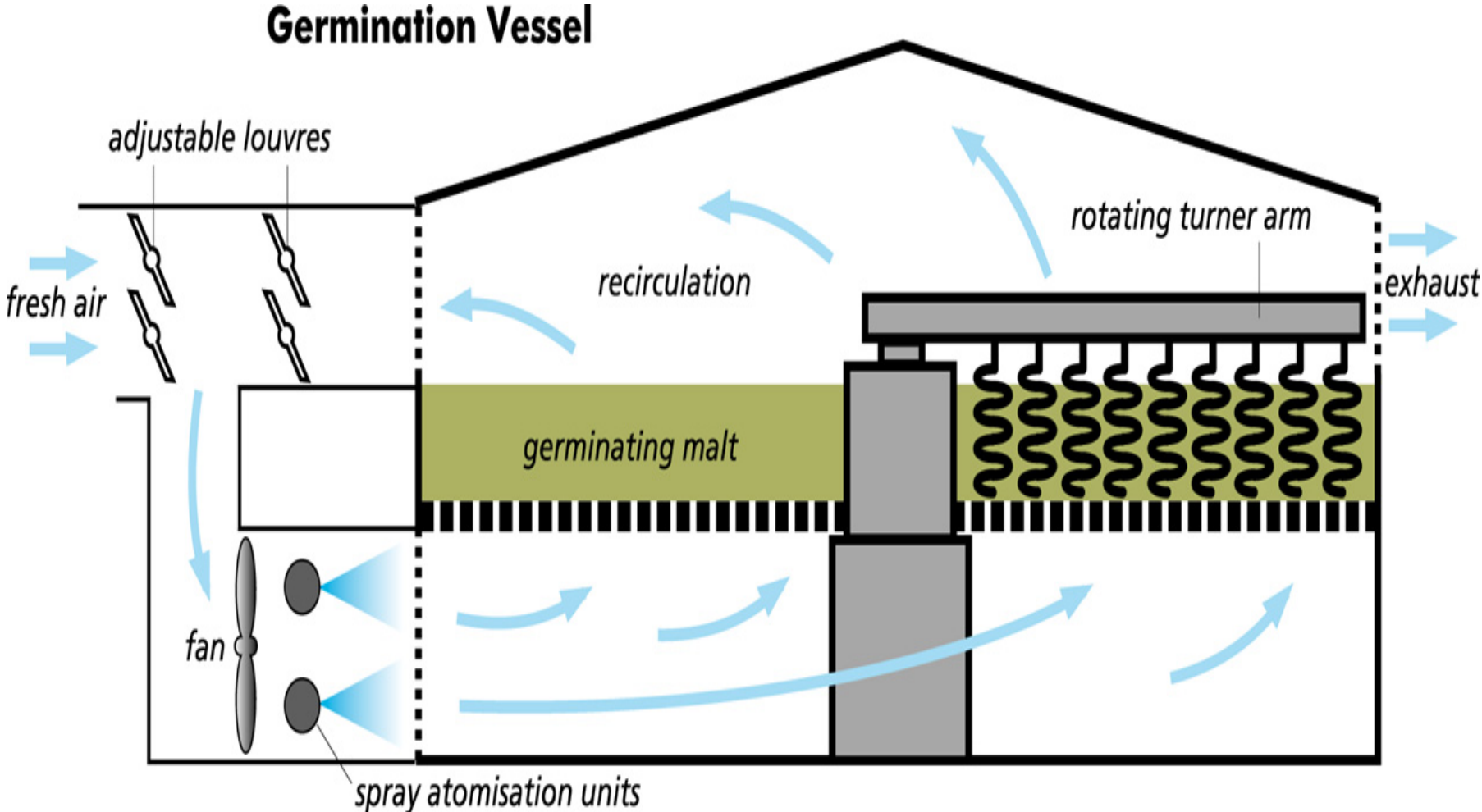
Germination

- Objective:
 - Synthesis and release of enzymes, creating DP and DU
 - Degradation of endosperm cell walls for increased friability
 - Limited solubilisation of endosperm storage protein such as TSN & FAN



- This is achieved by effective control of grain temperature by the application of attemperated, humidified air

Germination Process



Germination Vessel



Modification: Key Objectives

- Degradation of endosperm cell walls
- Solubilisation of appropriate amount of endosperm storage protein
- Synthesis and release of starch-degrading enzymes



Supply brewer with package of accessible starch and necessary enzymes to degrade to fermentable sugars plus other yeast nutrients



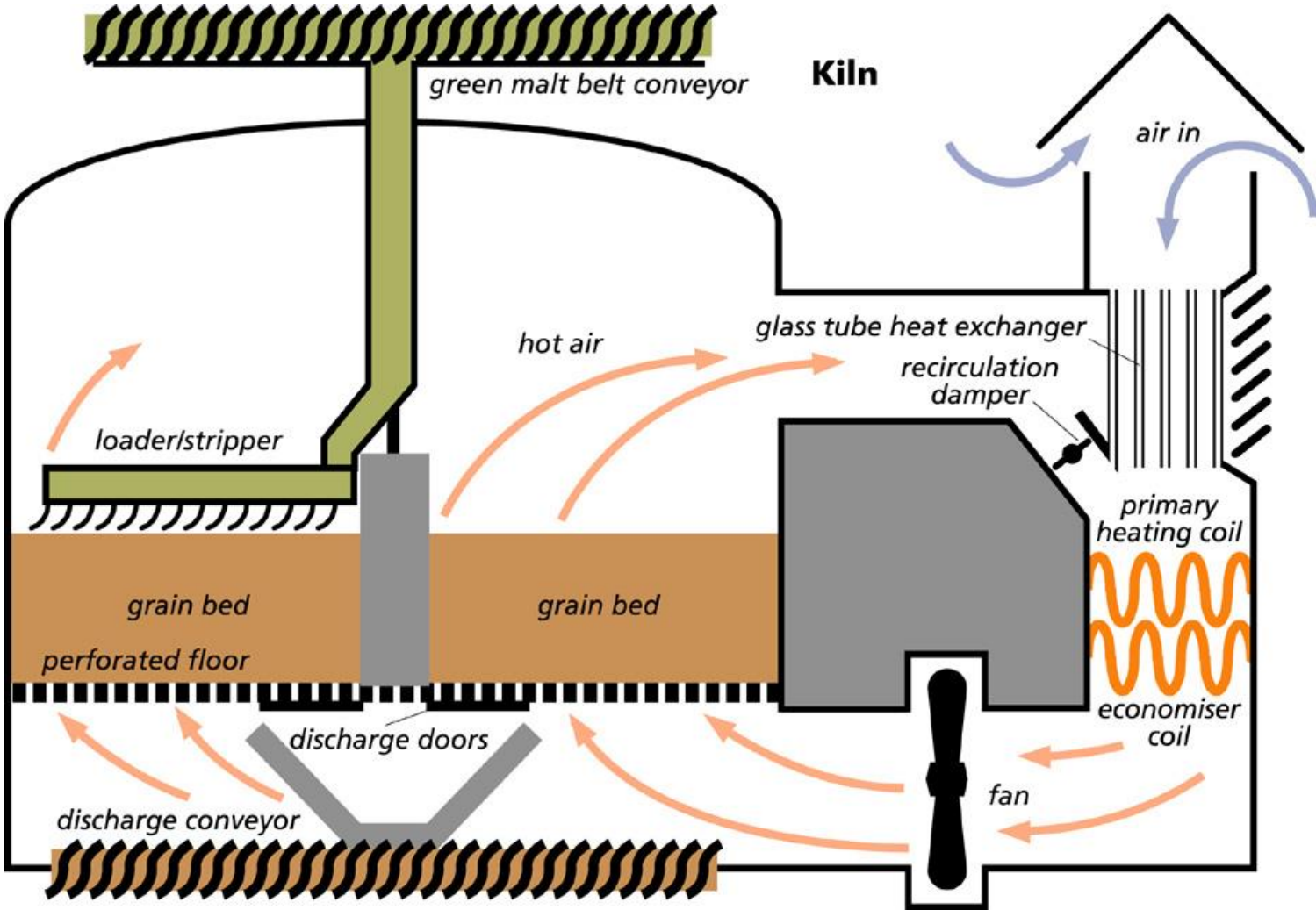
Kilning



Kilning

- Objective:
 - Halts germination
 - Reduce moisture content to 3-6%
 - Develop required colour and flavour characteristics
- This is achieved by passing heated air (55°C-100°C) through the grain bed
- Malt type will dictate applied air temperature used

Kilning Process



Kilning Vessel



The Physical Phases of Kilning

- Free drying
 - ‘Loosely’ bound moisture removed
 - Rate of drying dependent on air volume rather than air temperature
- Forced drying
 - Bound moisture removed
 - Increased air temperature required
- Curing
 - Formation of colour and flavour compounds
 - Reduction of DMS

White or Base Malt Barleys

- Produced from approved barley varieties
- 2 or 6 row, in the UK we only grow the superior 2 row for malting



Two-row barley



Six-row barley

- Winter or spring sown, winters tend to have a tougher husk and are better suited to speciality malt production than spring varieties



WINTER

September

October

April

May

June

July

July

SPRING

March

April

May

June

July

August

August

- Winter barleys - ale malts: Spring barleys - lager malts

Base Malt Specification

- Ale malts
 - total nitrogen – 1.4 to 1.65%
 - soluble nitrogen ratio – 38 to 43%
 - colour – 5 to 7 EBC
 - diastatic power – 45 °IoB minimum
- Extra pale malts
 - total nitrogen – 1.4 to 1.65%
 - soluble nitrogen ratio – 38 to 43%
 - colour – 2.5 to 3.5 EBC
 - diastatic power – 60 °IoB minimum
- Lager/Pilsner malts
 - total nitrogen – 1.55 to 1.85%
 - soluble nitrogen ratio – 36 to 40%
 - colour – 2.5 to 3.5 EBC
 - diastatic power – 60 °IoB minimum



Base Malt Differences

- Ale malts have a deeper flavour than extra pale and lager malts due to higher kilning temperatures
 - use for milds, bitters, pale ales, stouts and porters

- Traditional varieties like Maris Otter and Chevallier are more biscuity and complex



- use for IPA's, best bitters, imperial porters/stouts and barley wines

- Extra pales are slightly sweeter and suit lighter coloured styles
 - use for blondes, NEIPA's, pale ales and golden beers

- Clear Choice malt has a sweeter character due to the lack of astringent compounds found in other varieties
 - use for hop forward pales and sweet NEIPA's and DIPA's





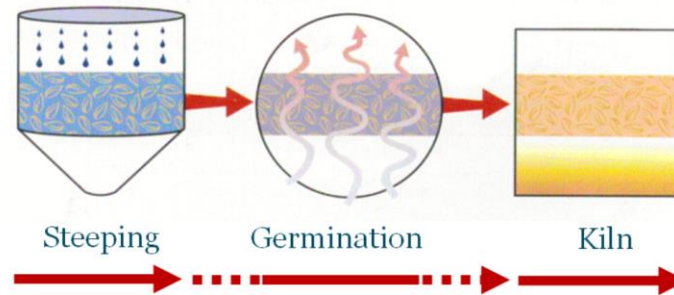
Speciality Malts



The Malting Process – Speciality Malt

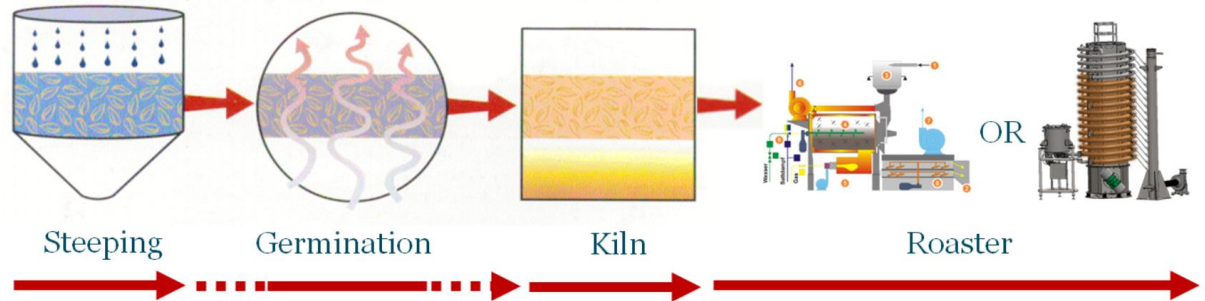
Those produced from green malt on conventional kiln

- Vienna
- Munich



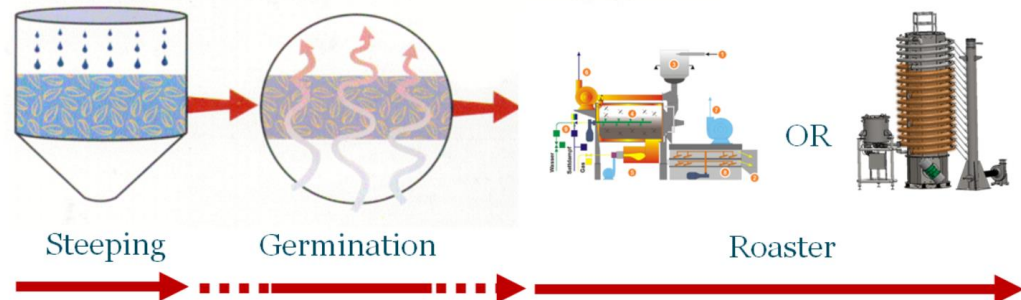
Those produced from kilned malt in roasting facility

- Amber
- Brown
- Chocolate
- Black



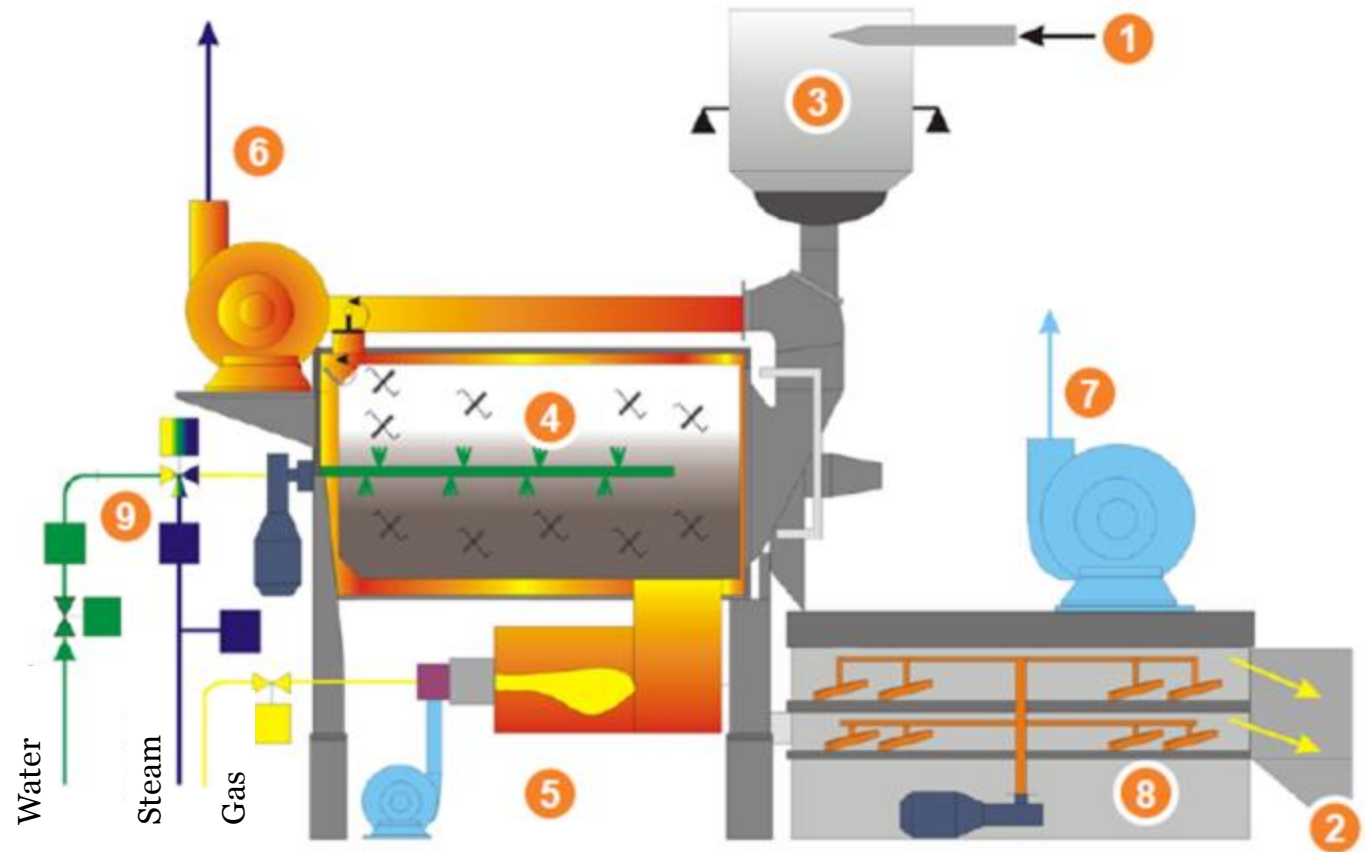
Those produced from green malt in roasting facility

- Crystal
- Caramel



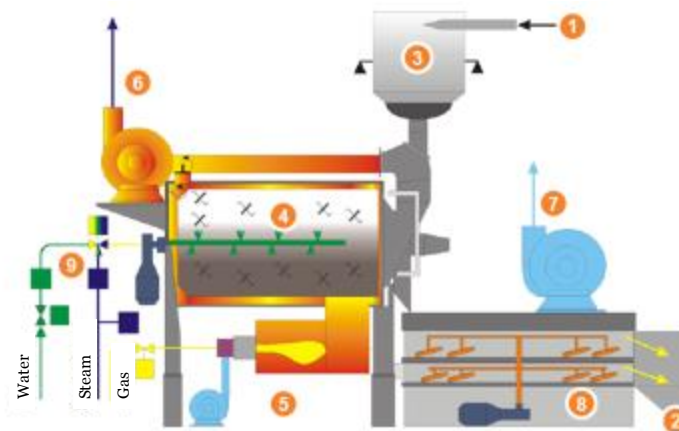
Drum Roasting Process

- 1.) Raw Material Inlet
- 2.) Product Outlet
- 3.) Weighing Hopper
- 4.) Revolving Drum
- 5.) Burner
- 6.) Exhaust Air Fan
- 7.) Cooling Fan
- 8.) Cooler
- 9.) Utilities



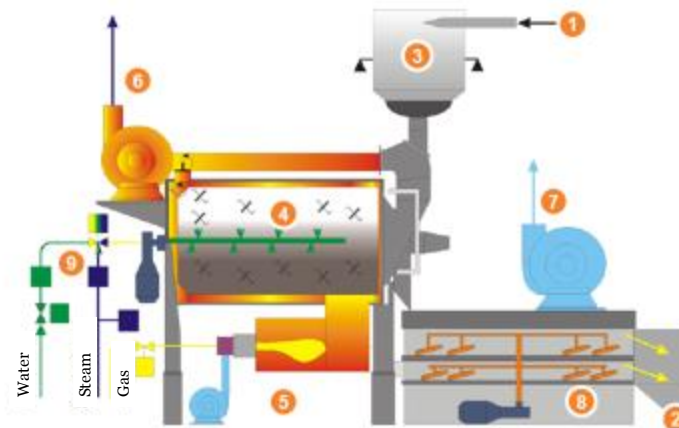
Roasted Malts and Roast Barley

- Raw material (kilned malt) is fed into the drum.
- For the lighter malts, i.e. Amber Malt, the temperature of the drum starts around 93°C, for 20 minutes, and then gradually heats up to 140°C, and held until the desired colour develops.
- For the darker coloured malts, i.e. Chocolate and Black Malt, the temperature of the drum can reach up to 225°C for 2 hours.
- Product is then cooled quickly to halt any further colour development.
- Roast Barley is made in a similar way, only using raw barley as the raw material



Crystal & Caramel Malts

- Green malt (unkilned malt) is fed into the drum.
- The malt is “stewed”, whereby it is heated without drying. The drum is heated externally with no air passing through it.
- During stewing, the endosperm begins to convert by liquefaction and saccharification.
- Following this, the malt is subjected to high temperatures, whereby the endosperm hardens to a glassy mass within the kernel.
- Caramel Malts are treated at a lower temperature than crystals as they are far lower in colour. The moisture content of Caramel Malts are higher than Crystal Malts.





Crisp's New Roasting Technology (SMP)



New Technology

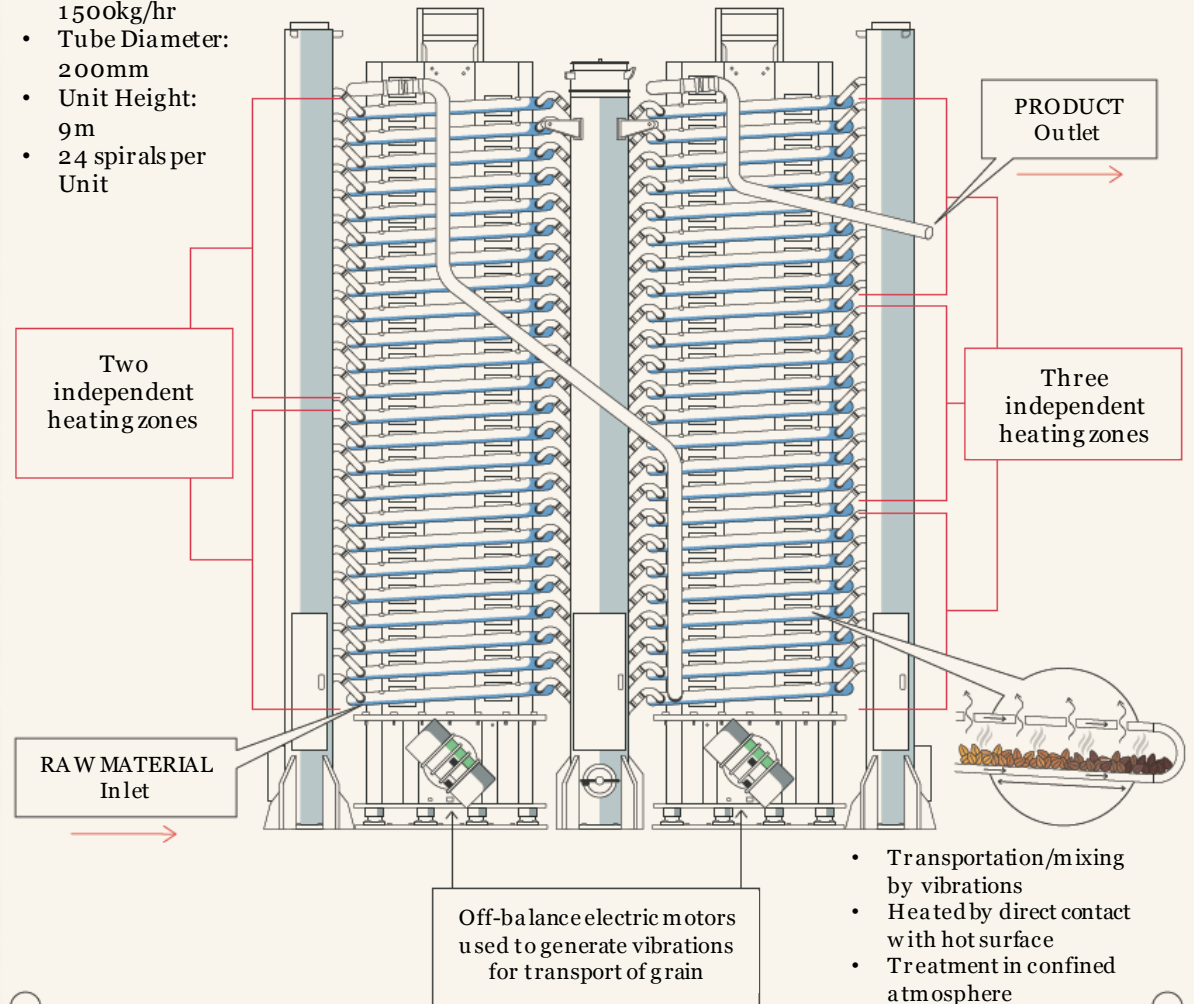


SPECIALITY MALT PLANT

(THE ONLY ONE IN THE UK)



- Flowrate: 1500kg/hr
- Tube Diameter: 200mm
- Unit Height: 9m
- 24 spirals per Unit



Roasted Malts and Roast Barley

- Raw material (kilned malt) is continuously fed into the bottom of Unit 1 between 1,000kg/h – 1,500kg/h.
- Temperature is gradually increased through each independent heating zone
- Temperatures are set higher for the darker colours.
- Product exits the top of Unit 2, is quenched and cooled immediately.
- Roast Barley is made in a similar way, only using raw barley as the raw material

Crystal/Caramel Malts

- Raw material (green malt) is fed into the bottom of Unit 1 at rates between 800kg/h – 1,000kg/h.
- Material travels the same way through the system.
- Unit 1 acts as the ‘stewing’ column, whereby the material is heated by direct contact with the electrically heated tube, without drying (no hot air introduced into the system).
- Temperature is kept constant throughout the First Unit.
- Temperatures in the Second Unit are increased so as to harden the liquefied endosperm. Hot air is introduced into Unit 2 to encourage drying.
- Product exits the top of Unit 2 and cooled immediately.

	Drum Roaster	Speciality Malt Plant
Process	Batch Process (0.5 – 5.0 MT)	Continuous Process (Up to 1,500 kg/h)
Product Changeover	Drum emptied and cleaned and new material fed into system.	Continuous process whereby one colour can be run immediately after another.
Heat Source	Direct heating by natural gas or light oil	Indirectly heated by electricity
Colour Analysis	Requires operator who continually takes samples to assess them for colour. Stops process immediately when colour is achieved.	Recipe set as per product. Operator performs quick colour check of product exiting Unit 2. Adjustment to temperatures made accordingly.
End Product	Can be inconsistent both within batches and between batches	Consistent both within and between production runs.
Labour	Intensely hands on process	Fully automated system
Grain Treatment	Rough process on grain – high heat and tumbling can cause damage to grains.	Gentle transportation and treatment of grain. No damage to grain. Potential for treatment of huskless material.
Products	Coloured Malt; Roast Barley; Crystal Malts; Caramel Malts	Coloured Malt; Roast Barley; Crystal Malts; Caramel Malts

Vienna and Munich Malts

- Produced from green malt on normal kiln
 - Kilning conditions promote formation of colour precursors leading to increased final colour and flavours
- Vienna malt 9-15 EBC
- Munich malt 20-60 EBC
- Provide richer 'malty' flavour
- Contribute light golden through to orange-red hues
- Enzymically active, Vienna can be used as 100% of the grist also known as mild ale malt



Roasted Malts

- Lighter colour

- Amber 50 – 100 EBC

- Brown 120 – 150 EBC



- Provide colour, but more importantly a biscuit/toasted flavour, with Brown malt more intense than Amber

- Darker colour

- Chocolate malt 800 – 1000 EBC

- Black malt 1100 – 1300 EBC

- (Roast barley) 1100 – 1300 EBC



- Provide colour and roasted, bitter, astringent, burnt flavours.

- Roasted barley more bitter and astringent than Black Malt despite same colour range

Crystal and Cara Malts

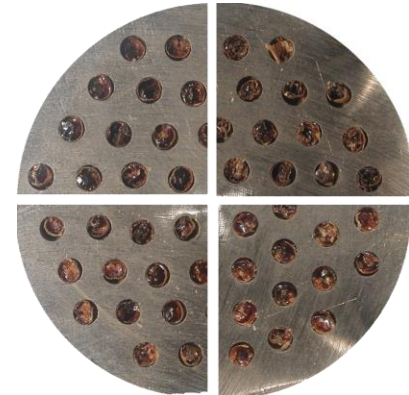
- Caramalt

- typical colour range 12-32 EBC
- low colour Cara can be used to add body to beer with little impact on colour
- conventional Cara can be used to adjust colour and flavour of lightly colour beers



- Crystal

- typical colour range 100 – 450 EBC
- crystal malts provide sweet, caramel and dried vine fruit flavours and colours from golden to deep red.





Thank You

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