



Raising the Bar: Considerations When Upgrading to a Larger Modern Brewhouse.

GEA Brewery Systems

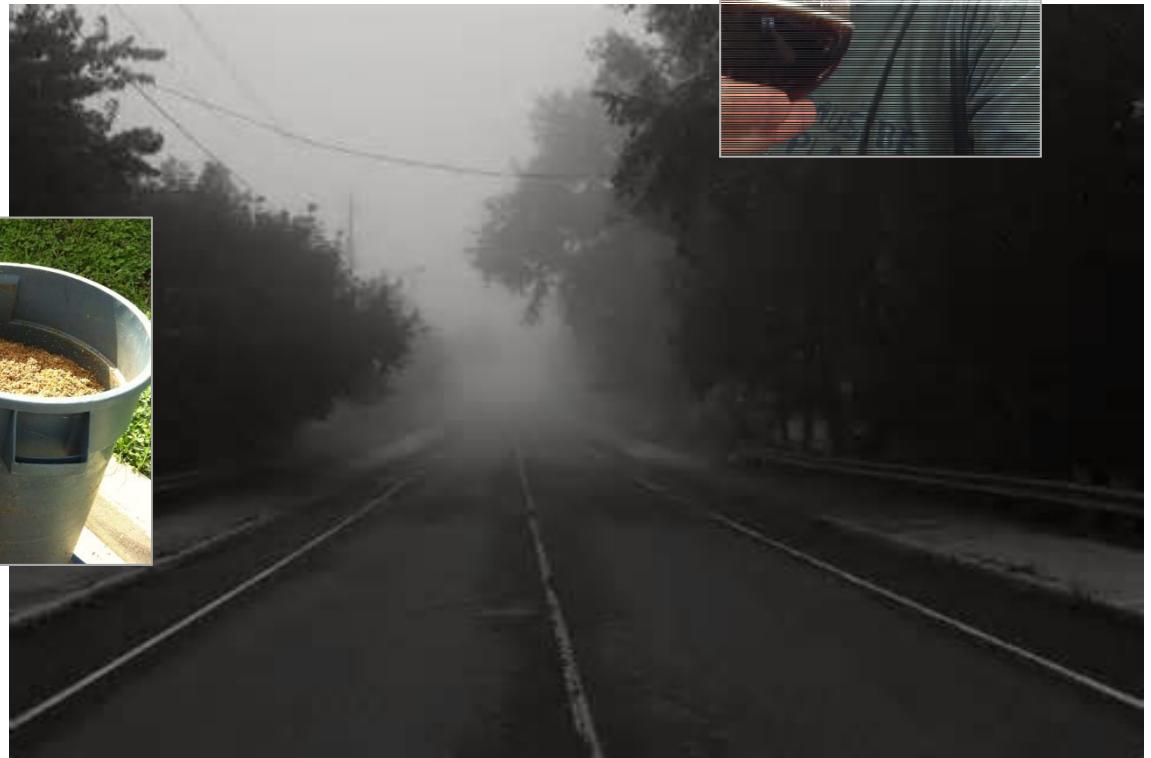
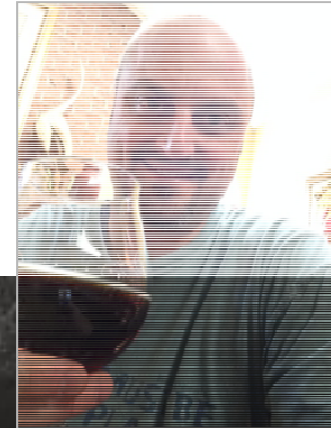
Huppmann Tuchenhagen

1. The Mental Game
2. Flavor Matching
3. Benefits
4. Conclusions



The Mental Game

- The Great Unknown
- But we won't be "Craft" any more
- Automation
- The Brewer's Ego



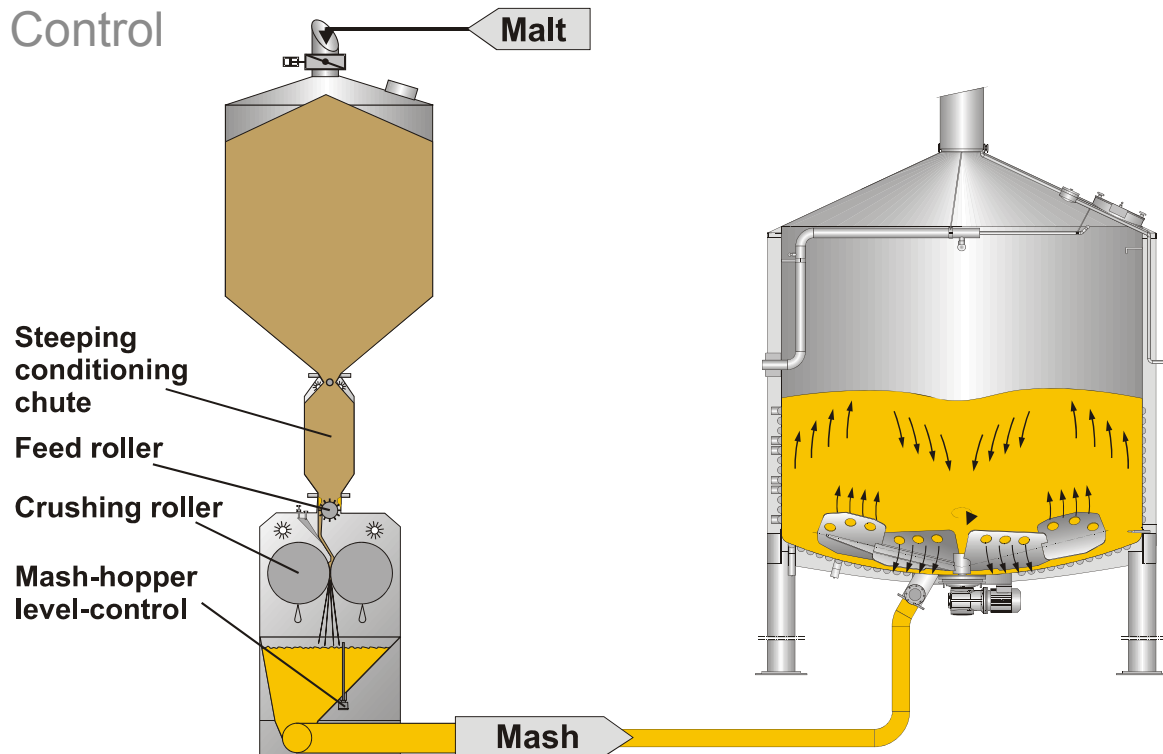
When modernizing your brewhouse operations, you will find new efficiencies that may ultimately influence the flavor of your beer.

Lets take a look at a few these factors and how one works to maintain the intended beer flavor.

Flavor matching – Mill and Mash Mixer

Milling and Mashing Flavor Influencers

- Mill quality
- Thorough grist hydration
- Hitting targeted grist / water ratios
- Proper mixing and precise temperature control
- Attenuation Control

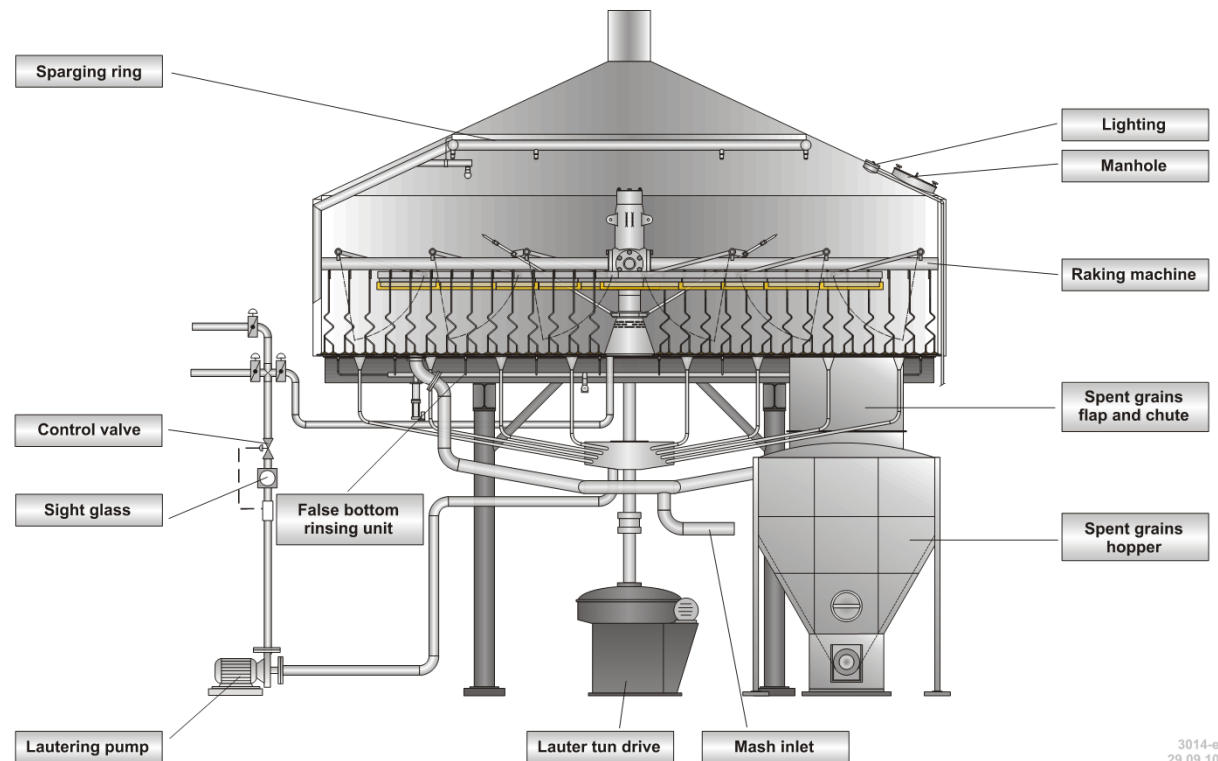


- Improved conversion means lower terminal extract in beer and many popular craft beers require sweetness for balance.
- May need to adjust:
 - Mash temperatures
 - Mash times
 - Grain bills
 - Mash step procedure

With a well designed mash mixer you have the flexibility to recreate what you made before as well as make changes or even new products not possible on your former system.

Lautering Flavor Influencers

- Extract recovery
- Mash / wort inlet location
- Turbidity
- Run off time

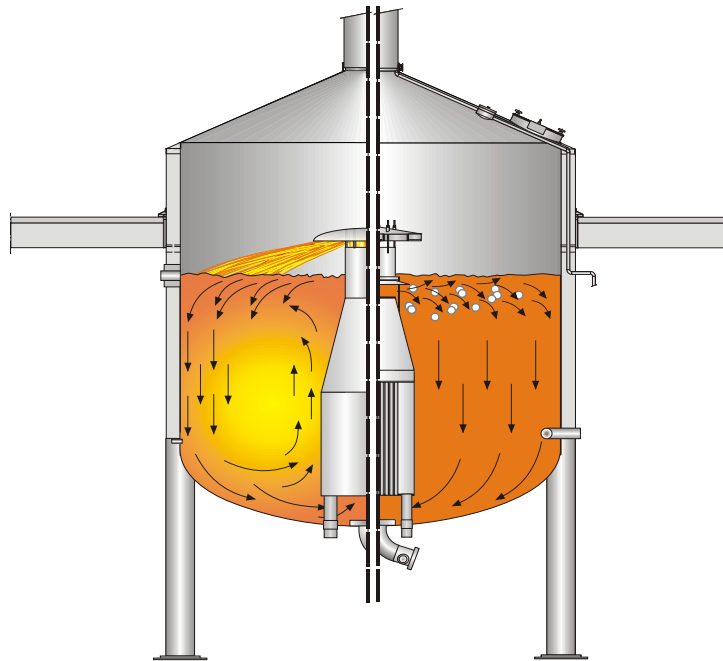


3014-e
29.09.10

- A properly sized and well designed lauter tun means better yields, faster turn-around and cleaner worts.
- Better yield means adjusting malt bill.
- Less turbid worts, lower oxidation, less contact time with husk are usually perceived as flavor improvers.

Wort Boiling Flavor Influencers

- Smart boiling technology
- Gentler boiling
- Volatile removal



- When it comes to flavor matching, the brew kettle seems to get all the press!
- With the advent of new boiling techniques focused on lower evaporation percentage and reduced energy usage, brewers show concern for flavor matching.

Sterilization ✓

Protein precipitation ✓

Hop extraction / Isomerization ✓

Evaporation / Volatile removal ✓

Carmelization / color development ?

Reliability – A well designed and built brewhouse with sophisticated componentry means fewer delays and repairs.

Repeatability – Automated process control ensures that you make the same beer on third shift as you do by day. Luck is not repeatable!

Savings – Engineered to minimize energy consumption and maximize ingredient yields. Optimize water consumption.

Safety – Very infrequent entry into vessels. Lockout devices protect operator from making poor, high risk decisions.

Shelf Life Improvements – Brewhouse oxidation minimized, cleaner run offs, better trub piles

More Style Options – Increased capability from former system

The brewmaster will always be challenged by change. Ingredients change with every new crop year. Personnel and ownership changes will affect how we brew. The public demand drives style changes. And yes, necessary equipment changes need to be understood as you grow. Change is a brewer's motivator to create wonderfully consistent beer!

A modern automated brewhouse lets the brewer focus on the technical adjustments that influence taste and gives him the flexibility to implement those changes. It broadens the possibilities for new product development while offering repeatability and minimizing human error.

You are an accomplished brewmaster! Your flavor match will be made and product improvements will be realized.

Thank you for your kind attention!

GEA Process Engineering
GEA Brewery Systems GmbH

Gregg Norris

Tel. +1 410 259 5177

Fax +1 410 997 5021

gregg.norris@gea.com

www.gea.com

