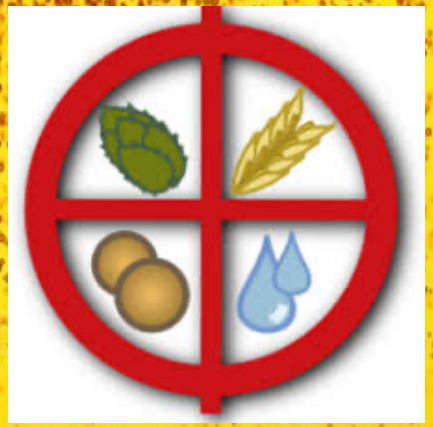
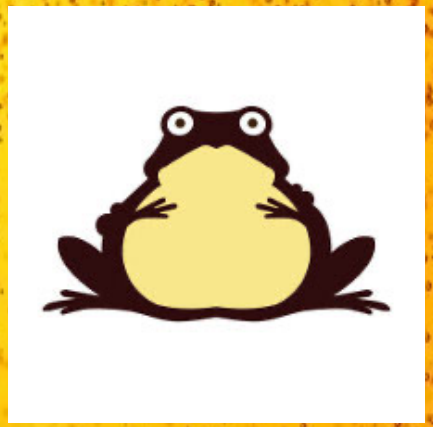
Scaling up your homebrew recipes

Software

BrewFather



Brewtarget



Brewtoad

AMERICAN BREWERS GUILD
BREWING SCHOOL

Spreadsheets

Kitten Death Star

DESIRED CHARACTERISTICS			
TARGET HOT VOLUME	1833 l	15.62 BBL	484.3 GAL
TARGET COLD VOLUME	1760 l	15.00 BBL	465.0 GAL
TARGET GRAVITY (°P/SG)	18.40 °P	1.076	
LIQUOR:GRIST RATIO	3.00		
TARGET BITTERNESS	80 IBU		

EVAP RATE	6%
KETTLE FULL	492.9 GAL
BOIL FOR	90

SYSTEM CONSTANTS		
BREWHOUSE YIELD	80%	
MASH TEMPERATURE (°F / °C)	149 °F	65 °C
MALT TEMPERATURE (°F / °C)	65 °F	18 °C

MASHING REQUIREMENTS			
LIQUOR VOLUME	1685 l	14.36 BBL	445.2 GAL
IQUOR TEMPERATURE (°F / °C)	161 °F	72 °C	

SPECIAL MALT TYPE	WEIGHT (LB)	WEIGHT (KG)	HWE AS-IS	% OF EXTRACT	COLOR (°L)	COLOR CONTRIB.
Weyermann Pils	1047.56	475.30	78.00	85.1%	2	3.92
Weyermann CaraRed	110.00	49.91	74.00	8.5%	20	3.90
Simpsons Golden Naked Oats	55.00	24.95	78.00	4.5%	7	0.72
Weyermann Special W	25.50	11.57	73.00	1.9%	110	4.91
		0.00		0.0%		0.00
		0.00		0.0%		0.00
		0.00		0.0%		0.00
TOTALS	1238.06 lb.	561.73 Kg		100.00%	5.84	13.44
				COLOR FACTOR		0

HOP VARIETY	% ALPHA	% OF TOTAL BU'S	% UTILIZATION	WEIGHT (grams)	WEIGHT (oz)	Weight (lbs)
Chinook	12.5	25	30	938.67	32.85	2.1
Chinook	12.5	25	20	1408.00	49.28	3.1
Chinook	12.5	20	15	1501.87	52.57	3.3
CTZ	14	16	7	2298.78	80.46	5.0
Strata	12.2	14	7	2308.20	80.79	5.0

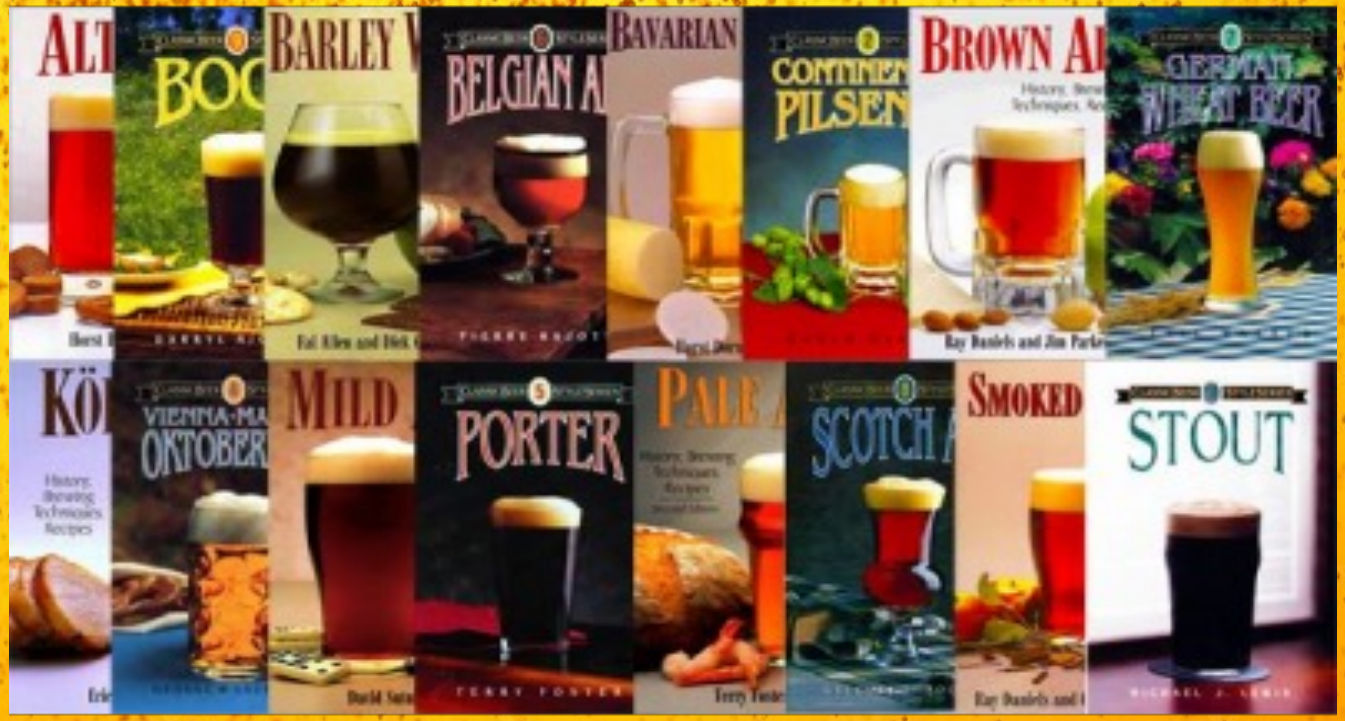
Name:		Date:	
Original Gravity:		*Degrees Plato:*	-668.96
Post Boil Volume (gals):		*Liters of Wort:*	0.00
		Barrels of Wort:	0.000
Efficiency of Pale Malt:		**Efficiency for Speciality Malt:**	
Percent Pale Malt:	100.00	**Type of Pale Malt:**	
Percent Specialty Malt #1:		**Name of Speciality Malt #1**	
Percent Specialty Malt #2:		**Name of Speciality Malt #2:**	
Percent Specialty Malt #3:		**Name of Speciality Malt #3:**	
Percent Specialty Malt #4:		**Name of Speciality Malt #4:**	
Percent Specialty Malt #5:		**Name of Speciality Malt #5:**	
Kg. Pale Malt Required:	#VALUE!	*Lbs. Pale Malt:*	#VALUE!
Kg. Speciality #1 Required:	#VALUE!	*Lbs. Speciality Malt #1:*	#VALUE!
Kg. Speciality #2 Required:	#VALUE!	*Lbs. Speciality Malt #2:*	#VALUE!
Kg. Speciality #3 Required:	#VALUE!	*Lbs. Speciality Malt #3:*	#VALUE!
Kg. Speciality #4 Required:	#VALUE!	*Lbs. Speciality Malt #4:*	#VALUE!
Kg. Speciality #5 Required:	#VALUE!	*Lbs. Speciality Malt #5:*	#VALUE!
Total Iso-Alpha Acid Desired:			
First Hop:		**Second Hop:**	
Time in Kettle (mins):		**Time in Kettle (mins):**	
% Alpha Acid:		**% Alpha Acid:**	
Desired Alpha Acid Fraction (%):		**Desired Alpha Acid Fraction (%):**	
Utilization (%):		**Utilization (%):**	
Hops required for Batch (kg):	#VALUE!	*Hops required for Batch (kg):*	#VALUE!
Hops Required for Batch (lbs):	#VALUE!	*Hops Required for Batch (lbs):*	#VALUE!
Hops Required (ounces):	#VALUE!	*Hops Required (ounces):*	#VALUE!
Third Hop:		**Fourth Hop:**	
Time in Kettle:		**Time in Kettle:**	
% Alpha Acid:		**% Alpha Acid:**	
Desired Alpha Acid Fraction (%):		**Desired Alpha Acid Fraction (%):**	
Utilization (%):		**Utilization (%):**	
Hops required for Batch (kg):	#VALUE!	*Hops required for Batch (kg):*	#VALUE!
Hops Required for Batch (lbs):	#VALUE!	*Hops Required for Batch (lbs):*	#VALUE!
Hops Required (ounces):	#VALUE!	*Hops Required (ounces):*	#VALUE!
Cost of Pale Malt (per lb.):		*Cost for Batch:*	#VALUE!
Cost of Malt #1:		*Cost for Batch:*	#VALUE!
Cost of Malts #2-#5:		*Cost for Batch:*	#VALUE!
Cost of Hops (per lb.):		*Cost for Batch:*	#VALUE!
Total Cost of Malt and Hops:	#VALUE!		

Brewing Calculations

- **Researching a style**
- **Commercial standards**
- **Calculations**
- **Measurements**
- **Adjustments**

AMERICAN BREWERS GUILD
BREWING SCHOOL

Researching a Style



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Researching a Style

Great American Beer Festival style guidelines

https://www.greatamericanbeerfestival.com/brewers-information/2023-gabf-competition/beer-styles/

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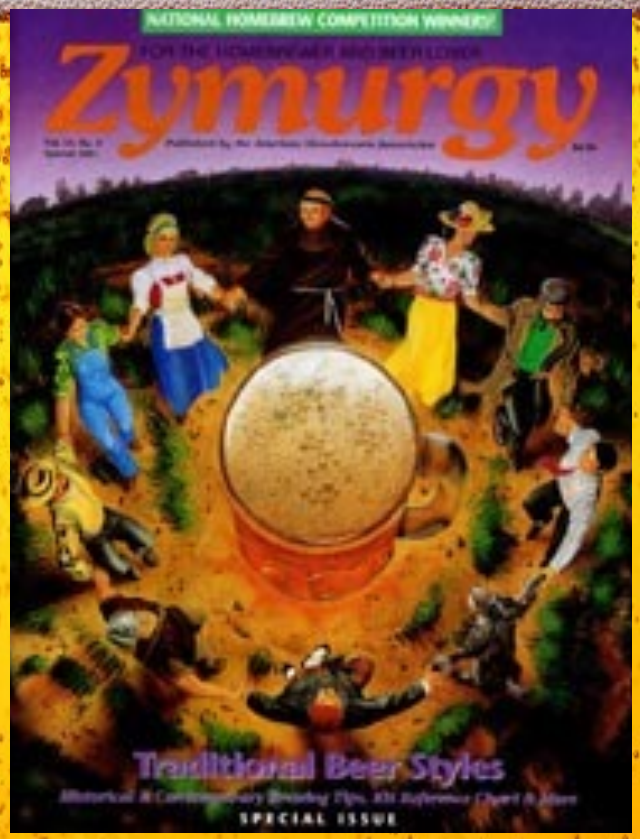
BREWING SCHOOL

Researching a Style

Homebrew magazines



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Researching a Style

Beer Judge Certification Program (BJCP)

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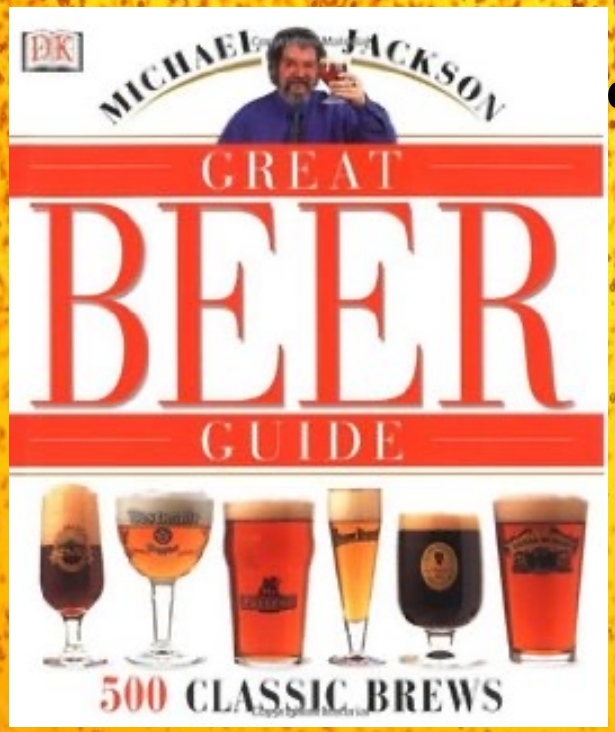
BREWING SCHOOL

Researching a Style



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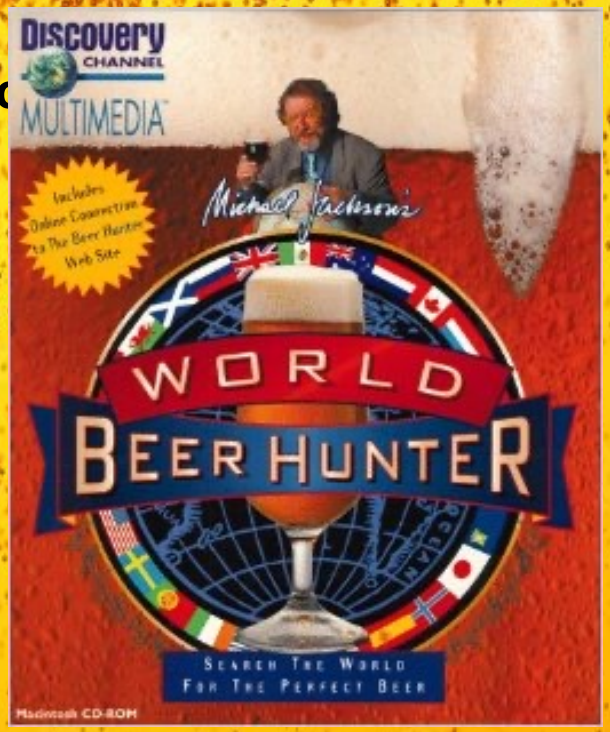
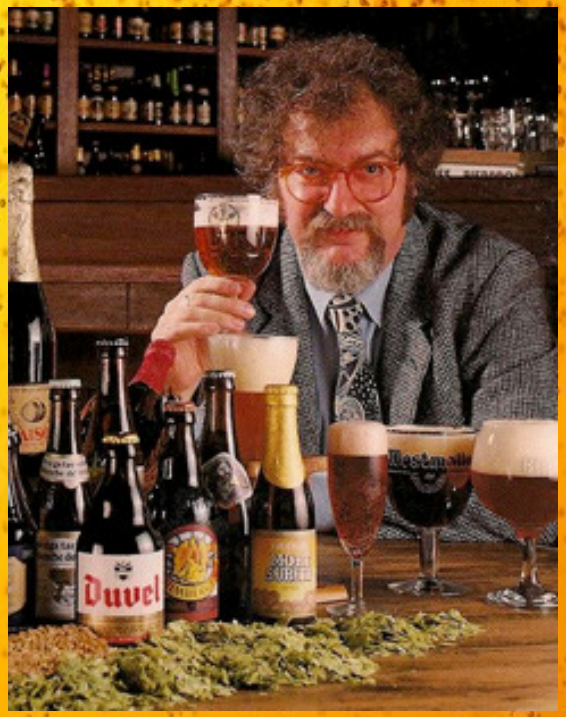




AMERICAN BREWERS GUILD
BREWING SCHOOL

Beer Vocabulary

- **Original Gravity (OG)** - is the specific gravity measured before fermentation. Specific gravity is the density of the wort compared to water (1kg/ 1 liter). The Plato scale is the mass (grams) of sugar in 100 grams of wort (°P).
  - S.G.= 1+ 0.004 X °Plato 12 °Plato = 1.048
- **Final Gravity (FG) -**
  - **(AKA - Terminal gravity, Apparent Extract)**
  - The Final Gravity is the specific gravity measured at the completion of fermentation.
- **Alcohol (ABV) - % alcohol by volume**

AMERICAN BREWERS GUILD
BREWING SCHOOL

Beer Vocabulary

Bitterness (IBU) - International Bittering Units

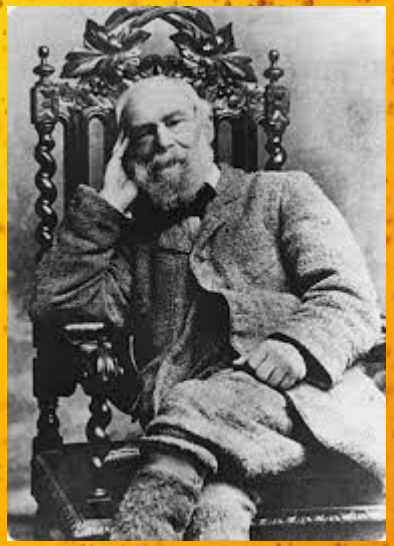
- An International scale measuring the level of bitterness contributed by alpha acids in hops
- IBU= mg iso-alpha-acids/liter of beer
- same as parts per million

AMERICAN BREWERS GUILD
BREWING SCHOOL

Beer Vocabulary

Color (SRM) - Standard Research Method

Joseph Lovibond (1921) created a method of how a particular malt will contribute color based on a 8° P reference wort and light absorption (430 nm) in a spectrometer.



AMERICAN BREWERS GUILD
BREWING SCHOOL

Color based on SRM

SRM	Style	Color
2	Pale Lager	
3	Maibock	
4	Weissbier	
6	Pale Ale	
8	Saison	
10	ESB	
13	Double IPA	
17	Dark Lager, Amber Ale	
20	Brown Ale, Dunkels	
24	Dopplebock, Porter	
29	Stout	
35	Baltic Porter	
40+	Imperial Stout	

Sample Brew
American-Style Amber/Red Ale

- **American-Style Amber/Red Ales are copper to reddish brown. Chill haze is allowable at cold temperatures. Fruity-ester aroma is low if present. Hop aroma is medium. Medium-high to high maltiness with low to medium caramel character is present. Hop flavor is medium, and characterized by American-variety hops. Hop bitterness is medium to medium-high. They may have low levels of fruity-ester flavor. Diacetyl can be absent or barely perceived at very low levels. Body is medium to medium-high.**

- **Original Gravity (ºPlato) 1.048 - 1.058 (11.9 - 14.3)**
- **Apparent Extract/Final Gravity (ºPlato) 1.012 - 1.018 (3.1 - 4.6)**
- **Alcohol by Weight (Volume) 3.50% - 4.80% (4.40% - 6.10%)**
- **Bitterness (IBU) 30 – 45**
- **Color SRM (EBC) 11-18 (22 - 36)**

*** source G.A.B.F. professional blind tasting style guides (2015)**

AMERICAN BREWERS GUILD BREWING SCHOOL

Malt Spec Sheet Sample

GAMBRINUS MALTING CORPORATION

TYPICAL ANALYSIS FOR GAMBRINUS MALTING

Malt	Pale	Pilsner	E.S.B. Pale	Munich 10L	Munich 30-35L	Vienna	Honey	Wheat
available as	conv/org	conv/org	conv	conv/org	conv	conv	conv	conv/org
Plumpness:								
<5/64"	<1	<1	<1	<1	<1	<1	<1	<1
5/64"	<5	<5	<5	<5	<5	<5	<5	<5
6/64"	15	15	15	20-25	20-25	25	20-25	25
7/64"	80	80	80	70	70	70	70	70
% H2O	4.0-4.5	3.5-4.0	3.5-4.0	3.5-4.0	3.5-4.0	4.5	3.5-4.0	4.5
Colour Deg. Lov	1.8-2.8	1.3-1.8	3.0-4.0	9.5-10.5	30-35	5.0-6.0	20-25	1.8-2.8
Extract Fine	~82	~82	~82	~81	~81	~81	~80	~84
Extract Coarse	~80	~80	~80	~79	~79	~79	~78	~82
Fine-Coarse difference	<2	<3	<2	<2	<2	<2	<2	<2
Tot. Malt Prot. % d.b.	<10.9	<9.9	<10.9	<10.9	<10.9	<12.0	<10.9	<12.0
Soluble Nitrogen mg/100ml	800-900	750-850	800-900	900-1000	900-1000	900-1000	1000-1100	800-900
% Soluble Protein d.b.	4.5-5.0	4.0-4.5	4.5-5.0	5.5-6.0	5.5-6.0	5.5-6.0	5.0-6.0	3.5-4.5
Kolbach ; S/T ratio	42-47	40-45	42-47	48-53	48-53	48-53	55-60	40-45
pH	5.8-6.0	5.8-6.0	5.8-6.0	5.5-5.8	5.0-5.4	5.8-6.0	4.5-5.0	5.8-6.0
Viscosity m Pa s	1.40-1.60	1.40-1.60	1.40-1.60	1.40-1.60	1.40-1.60	1.40-1.60	1.40-1.60	1.75-2.25

AMERICAN BREWERS GUILD BREWING SCHOOL

Weight of Malt

$$\text{Weight of Malt} = \frac{\text{weight of extract x \% malt used}}{\text{\% extraction efficiency}}$$

AMERICAN BREWERS GUILD BREWING SCHOOL

Color Chart

Color based on Standard Reference Method (SRM)

SRM/Lovibond	Example	Beer color	EBC
2	Pale lager		4
3	German Pilsener		6
4	Pilsner Urquell		8
6			12
8	Weissbier		16
10	Bass pale ale		20
13			26
17	Dark lager		33
20			39
24			47
29	Porter		57
35	Stout		69
40			79
70	Imperial stout		138

AMERICAN BREWERS GUILD
BREWING SCHOOL

Color

$$\text{Color} = \frac{(\%\ \text{extract Malt})\ (\text{color Malt})\ (^{o}\text{P Wort})}{(^{o}\text{P standard wort concentration})}$$

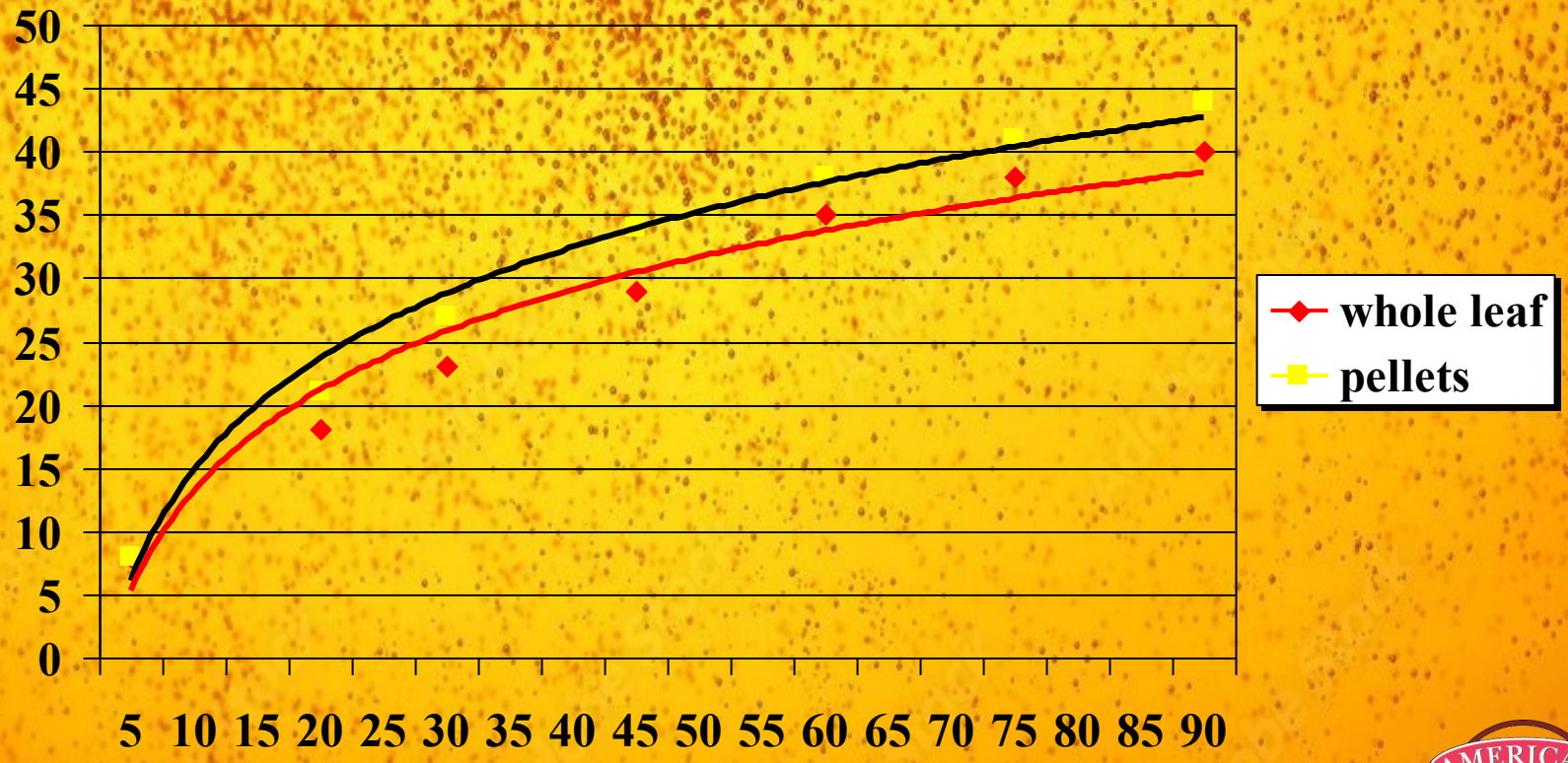
AMERICAN BREWERS GUILD
BREWING SCHOOL

Hop Calculations

$$\text{g hops} = \frac{(\text{Bitterness Units desired})\,(\text{litres of wort})\,(0.001)}{(\%\ \text{hop utilization})\,(\%\ \alpha\ \text{acid in the hop})}$$

AMERICAN BREWERS GUILD BREWING SCHOOL

Hop Utilization



AMERICAN BREWERS GUILD
BREWING SCHOOL

Strike H_2O Temp and Volume

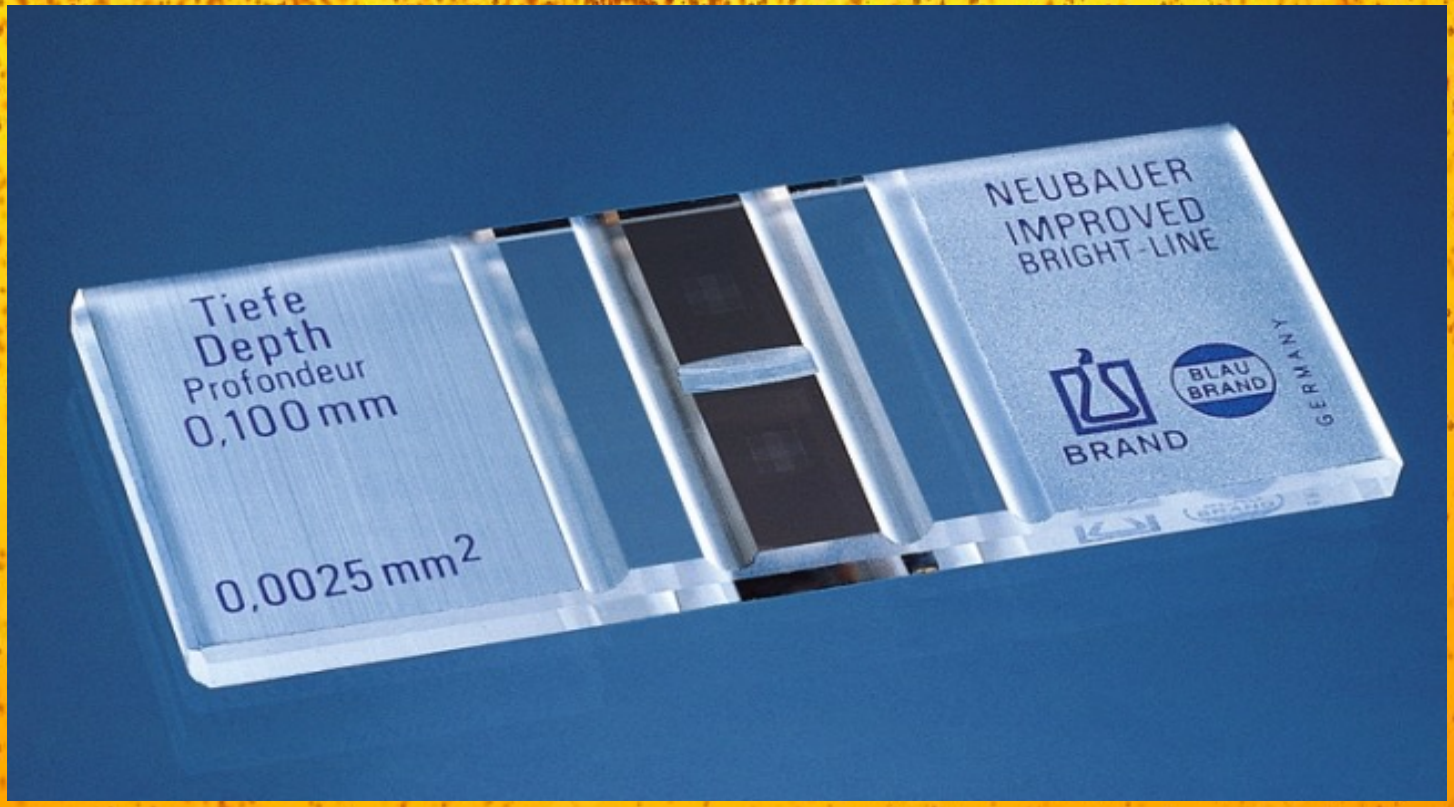
Liquor : Grist Ratio use similar units ie lbs water: lbs grain kg water:kg grain

$$T_{water} = \frac{(0.4)(T_{mash} - T_{malt}) + T_{mash}}{(L:G)}$$

(0.4 = grain heat capacity compared to water is 40%)

AMERICAN BREWERS GUILD BREWING SCHOOL

Hemocytometer



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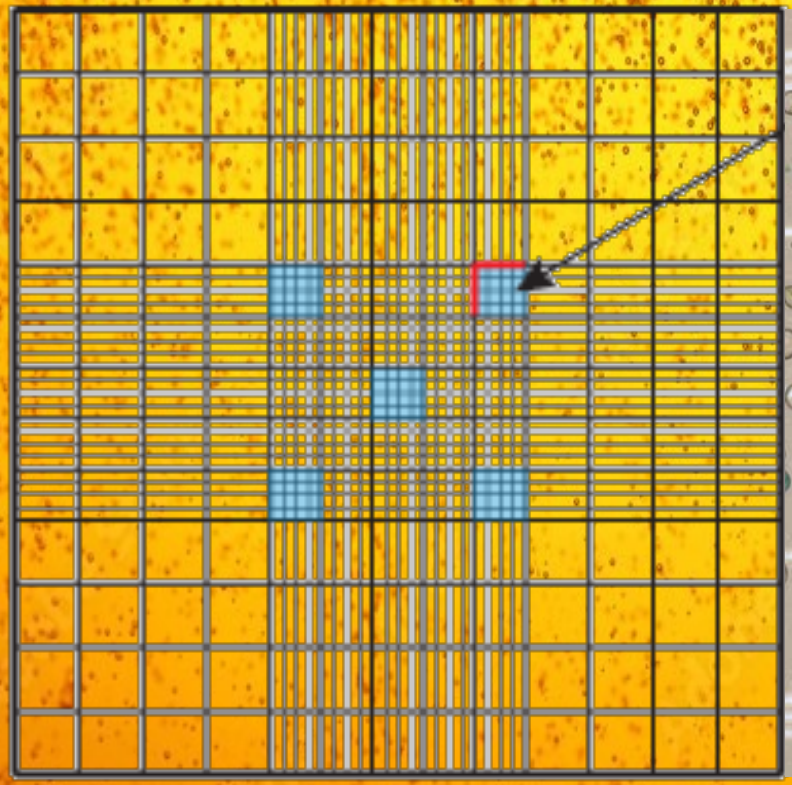
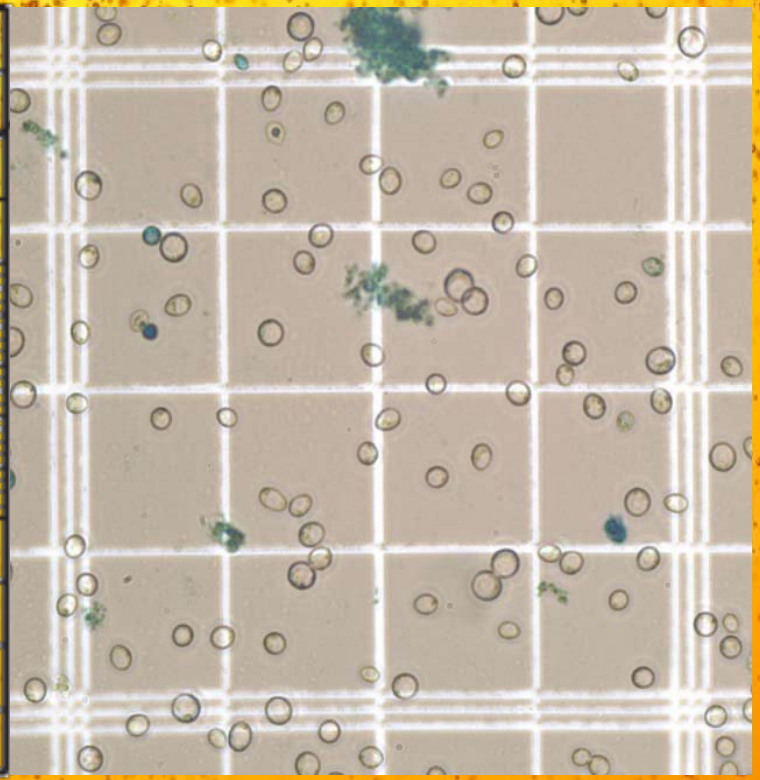
Yeast Counting





AMERICAN BREWERS GUILD
BREWING SCHOOL

Regional Water Profiles

Regional Water Profiles			units: mg/L(ppm)			
Name	**Ca^{2+}**	**Mg^{2+}**	**Na^{+}**	**$SO4^{2-}$**	**Cl^{-}**	**HCO_3^{-}**
Antwerp, Belgium	90	11	37	84	57	76
Breedonk, Belgium	68	8	33	70	60	143
Burton On Trent, England	268	62	30	638	36	141
Calistoga Mineral , CA	11.1	2.2	3.9	2.9	1	60
Cologne, Germany	104	15	52	86	109	152
Distilled Water	0	0	0	0	0	0
Dortmund, Germany	260	23	69	240	106	270
Dublin, Ireland	118	4	12	54	19	319
Dusseldorf, Germany	40	0	25	80	45	60
Edinburgh, Scotland	140	36	92	231	60	270
Filtered Water(R.O)	0	0	0	0	0	109.7
London, England	90	4	24	58	18	123
Marin County,CA	12	10	15	17	13	74
Middlebury, VT	28	13	9	3	14	119
Munich, Germany	76	18	1	10	2	152
Pilsen, Czech Republic	7	3	3.2	5.8	5	9

AMERICAN BREWERS GUILD
BREWING SCHOOL

Extract Efficiencies

- **Establish brewhouse efficiency**
- **Apply efficiency to recipe calculations**
- **Expect a lower efficiency for stronger beers**

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BREWING SCHOOL

Factors Increasing Hop Utilization

- **Intense rolling boil**
- **Longer boil time**
- **Higher wort pH i.e. 5.8-6.0**
- **Lower wort gravity**
- **Pelletized hops or hop extracts**
- **Lower hopping rates**

AMERICAN BREWERS GUILD
BREWING SCHOOL

Factors Decreasing Hop Utilization

- **Whole flower hops**
- **Strong wort**
- **Lower pH**
- **Large hot break**

AMERICAN BREWERS GUILD BREWING SCHOOL

Measure and Record Mash Information

- **Liquor : Grist ratio**
- **Time to mash-in**
- **Mash rest time**
- **Mash pH**
- **Time to a +/- ve iodine result**

AMERICAN BREWERS GUILD
BREWING SCHOOL

Measure and Record Run-Off Information

- **Vorlauf time and volume**
- **Run - off rate**
- **Sparge temperature and volume**
- **Kettle volumes and gravities**
- **Kettle full volume**

AMERICAN BREWERS GUILD
BREWING SCHOOL

Measure and Record Kettle Boil Information

- **Boil time**
- **Time and amount of hop additions**
- **Evaporation rate**
- **End of boil volume**
- **Whirlpool time**
- **Amount of hot break**

AMERICAN BREWERS GUILD
BREWING SCHOOL

Measure and Record Wort Collection Information

- **Time to collect wort**
- **Volume collected**
- **Original gravity**
- **Yeast volume pitched**
- **Fermenter cell count**

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BREWING SCHOOL

Tweaking The Recipe

- **Make gradual changes**
- **Change one thing at a time**

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When Are You Satisfied?

- **When you win a GABF medal**
- **Never!**

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