Llanblethian Orchards Cider Making Help Sheets Part one: Hydrometer, sugar and PH

Hydrometer temp correction chart
Temp in Celsius and hydrometer addition

C	+/-	C	+/-	C	+/-	C	+/-	C	+/-
0	-0.0007	10	-0.0006	20	0.0009	30	0.0035	40	0.0069
1	-0.0008	11	-0.0005	21	0.0011	31	0.0038	41	0.0073
2	-0.0008	12	-0.0004	22	0.0013	32	0.0041	42	0.0077
3	-0.0009	13	-0.0003	23	0.0016	33	0.0044	43	0.0081
4	-0.0009	14	-0.0001	24	0.0018	34	0.0047	44	0.0085
5	-0.0009	15	0	25	0.0021	35	0.0051	45	0.0089
6	-0.0008	16	0.0002	26	0.0023	36	0.0054	46	0.0093
7	-0.0008	17	0.0003	27	0.0026	37	0.0058	47	0.0097
8	-0.0007	18	0.0005	28	0.0029	38	0.0061	48	0.0102
9	-0.0007	19	0.0007	29	0.0032	39	0.0065	49	0.0106

Example: 1.045 at 10'C = 1.045 + (-0.0006) = 1.044.4

Potential Alcohol From Hydrometer Table

Gravity	ABV	Gravity	ABV
1.010	0.4%	1.050	6.4
1.015	1.2%	1.055	7%
1.020	2.0%	1.060	7.7%
1.025	2.8%	1.065	8.3%
1.030	3.6%	1.070	9%
1.035	4.5%	1.075	9.6%
1.040	5.1%	1.080	10.2%
1.045	5.8%	1.085	10.9%

Calculation of ABV

ABV = (OG – FG) * 125

OG = Original Gravity

FG = Final Gravity

Example:

OG 1.050, FG 0.990

(1.050 – 0.990) * 125 = 7.5%

Sugar Addition to Juice

56g sugar raises SG of 1 Gallon by 0.005

Sugar to add = (DSG – ISG) / 0.005*56*G

DSG = Desired SG

ISG = initial SG

G = Gallons

Example:

Initial SG of 5 Gallons 1.020

Desired SG 1.050

(1.050 – 1.020)/0.005*56*5 = 1680g Sugar

Adjusting apple juice pH

Due to bufferring malic acid addition is inaccurate. Test after each 1 g/L addition.

1 g/l of Malic acid lowers the pH by up to 0.3pH

Malic acid = litres * 3.333 * (initial pH – desired pH)

Example:

20L of apple juice pH 4.3 lower to pH 3.8

20 * 3.333 * (4.3 – 3.8) = 33.33g Malic Acid

Sucralose Sweetening

Sucralose 10% Stock solution

- 100g Sucralose in 1L water
- 1 ml Solution in 1L gives 100 mg/L/ppm
- **Legal limit 50ppm (mg/L)**

Sucralose Addition Table	
Sweetness	**Sucralose ppm (mg/L)**
Dry	0
Medium Dry	25
Medium	35
Medium Sweet	45

SG / Sweetness of finished cider

Dry 1.004

Med Dry 1.008

Medium 1.012

Medium Sweet 1.015

Sweet 1.020

Very Sweet 1.025

Llanblethian Orchards Cider Making Help Sheets Part two:

Sulphite

Sulphiting Rough Guide

50ppm Sulphite inhibits wild yeast

100+ppm Sulphite kills all yeast

Legal limit: 200ppm

Campden Tablets

1 tablet = 50ppm Sulphite in 1 Gallon

Example:

100ppm sulphite desired

Volume of container 6 gallon

2 tablets needed per gallon so 2 * 6 = 12 tablets needed

Direct Addition of sulphite powder

50ppm Sulphite in 1 Gallon = 0.44g Sulphite

S = 0.44*G

S = Sulphite in grammes

G = Gallons

Addition of 10% sulphite solution

5ml solution per gallon = 50ppm sulphite

Example:

100ppm sulphite desired

Volume of container 6 gallon

10ml needed per gallon so 10 * 6 = 60ml solution

Stock sulphite solutions

10% Sulphite solution

(free sulphur dioxide is 50% in solution hence often referred to as 5% solution)

Dissolve 100g sulphite in 1L water for 10% stock solution

5ml solution per gallon = 50ppm sulphite

Bottle rinsing 2% Sulphite solution

Dissolve 20g sulphite in 1L water. Stir in a tablespoon of citric acid.

Sulphiting using pH

pH affects useful or free S02 in solution

A higher pH reduces free SO2 so more needed

The legal limit is 200ppm

pH	Inhibit wild yeast mg/l or ppm	Kill all yeast mg/ l or ppm
2.8	15	30
2.9	18	36
3.0	21	42
3.1	25	50
3.2	30	60
3.3	36	72
3.4	43	85
3.5	52	103
3.6	63	125
3.7	76	151
3.8	92	184
3.9	114	227
4.0	138	276
4.1	171	341
4.2	210	420

Sulphite addition using Cambden tablets

For Litre containers
C = (S / 227.3) * L

For Gallon containers
C = (S / 50) * G

C = Cambden tables
S = required sulphite from table
L = volume of cider in litres
G = volume of cider in Gallons

Sulphite addition using 10% sulphite solution

For Litre containers
SL = (S / 50) * L

For Gallon containers
SL = (S / 11) * G

SL = ml stock solution
S = required sulphite from table
L = volume of cider in litres
G = volume of cider in Gallons

Example:
1 gallon of cider at pH 3.5
52mg/l sulphite needed to inhibit wild yeast

(52/11) * 1 = 4.7ml stock solution needed

Llanblethian Orchards Cider Making Help Sheets Part three:

Pasteurisation, Force Carbonation

Pasteurisation

Measured in Pasteurisation Units PU
1 PU = 60'C for 1min
For every 7'C rise there is a ten fold increase in pasteurisation

PU's needed for sterilisation
Cider: 50 PU+
Apple Juice: 500-1000 PU+

PU = t x 10^((T-60)/7)
PU = Pasteurisation Units
t = time in mins
T = temperature in 'C

Example:
Pasteurise cider at 67'C to achieve 50 PU
PU / (10^((T-60/7) = t = 5mins

Water bath pasteurisation of cider bottles / bib's
Set water bath at 75'C
When bottle / bib reaches 66'C remove and cap and lie on side / invert bib so the inside of cap is pasteurised.

Water bath pasteurisation of apple juice
Set water bath 80'c
When bottle / bib reaches 75'C remove and cap and lie on side / invert bib so inside of cap is pasteurised.

Filling Bag in Boxes

Fill bags by weight. Take the specific gravity in SG and multiply by the required volume in litres.

W = V*SG
W = weight in kg
V = Volume in litres
SG = Specific Gravity

Example:
20L bag in box SG 0.996
20 * 0.996 = 19.92kg

In-Line Pasteurisation

If bag in box is filled, capped and boxed at or above 64’c it will receive enough PU’s to achieve pasteurisation.

Set Pasteuriser at 67’c.

Allow holding tank to fill to allow tank to become pasteurised by the heat.

Fill bags up and cap and box up immediately.

Arrange boxes in rows with air gap between to allow bags to cool to limit cooked apple flavours.

Force Carbonation of Kegs

Kegs are force carbonated at high pressure.
Between 40-50 PSI

They are weighed before and during carbonation. Once weight achieved they are done.

Weight gain of various kegs with vols co2

Vols CO2	Corny Keg (17.5L)	20L Keg	30L Keg	50L Keg
2.0	69	79g	119g	198g
2.1	73	83g	125g	208g
2.2	76	87g	130g	217g
2.3	80	91g	136g	227g
2.4	83	95g	142g	237g
2.5	87	99g	148g	247g
2.6	90	103g	154g	257g
2.7	93	107g	160g	267g
2.8	97	111g	166g	277g
2.9	100	115g	172g	287g
3.0	104	119g	178g	297g

Flash pasteurisation

We will pasteurise at 75’c

Set pasteuriser to 79’C to achieve temp

If cider reaches 75’C it needs 21.6 secs to achieve 50 PU’s

With 20% margin cider must take >26 secs to travel through flash pasteurisation coil.

Coil is 19 meters with inner diameter of 6.7mm. So flow rate for 26 seconds would be 1.37 secs / m.

Therefore max flow rate is 2.9 L/min

Llanblethian Orchards Cider Making Help Sheets Part four:

Peracetic, Caustic, yeast nutrients and Apple Juice and keeving

Apple Juice

Ensure pH is below 3.8 to inhibit Clostridia sp

Ratio of sugar to acidity important

Brix(% Sugar) / % acid between 15-20

Add Vitamin C at 500ppm or 500mg per litre. (level teaspoon per 2 gallons)

Pasteurise in bottle immediately after adding Vitamin C

Set water bath to 80'C when bottles reach 75'C, remove, cap and lie on their side.

Caustic Cleaning

Caustic Soda is Sodium Hydroxide

Cleaning solution is 2-3% Sodium Hydroxide

20g / Litre gives 2% Caustic solution

- Always add caustic to water as it's exothermic.
- Always use eye protection and gloves.
- Latex gloves dissolve. Do not use!

For hot caustic cleaning temperature is between 50-75'C

Working time 15 mins and over.

Keeving

Keeving needs to be performed when the temperature is below 10'C to slow start of vigorous fermentation.

Sulphite should not be added until after keeving process to not inhibit apiculate yeasts needed for the chapeau Brun to rise.

pH MUST be above 3.6 for the enzyme to work.

Day 1

Mill very ripe fruit and leave overnight to macerate.

Day 2

Press the pomace and add 1-1.5ml of Pectin Methyl Esterase (PME) enzyme per 100L of juice. Mix thoroughly.

Day 3

Add 100ml of 40% calcium chloride solution per 100L of juice and mix thoroughly.

Day7-10

Once the Chapeau Brun has risen sufficiently carefully rack the clear juice off into a new container.

Stock 40% Calcium Chloride Solution

Dissolve 500g of hydrated calcium chloride flakes in hot water and make up to 1L

Peracetic Acid

Stock Solution is 5%

make up as needed as rapidly degrades after dillution

Dilution Rates:

Spraying (instant Sterilisation) 20ml /Litre

Soaking overnight 10ml / Litre

Yeast Nutrients

If fermenting cider smells of hydrogen sulphide (rotten eggs) yeast is stressed by high temp or lack of nutrients.

Diammonium Phosphate (DAP)

Needed by yeast to grow. Dosage up to 300mg /L

Thiamine (vitamin B1)

Needed by yeast to turn sugar to alcohol. Dosage up to 0.2mg/L

Stuck Fermentations

To proceed to dryness

50ppm (mg/L) DAP for each 0.010 SG drop to dryness.

To stick again at lower SG (for bottle conditioning)

25ppm(mg/L) DAP for each 0.010 SG drop

Formulae to stick at lower SG

DAP ppm= (InitalSG – DesiredSG) * 2500

DAP addition using 10% DAP solution

10% DAP ml = (DAP ppm / 100) * Litres

Stock 10% DAP Solution

(DAP solution does not keep make as needed)

Dissolve 100g DAP in 1L water

1ml Solution = 100ppm DAP if dissolved in 1L