

English Craft Cider Making

What can Australians learn?

Andrew Lea

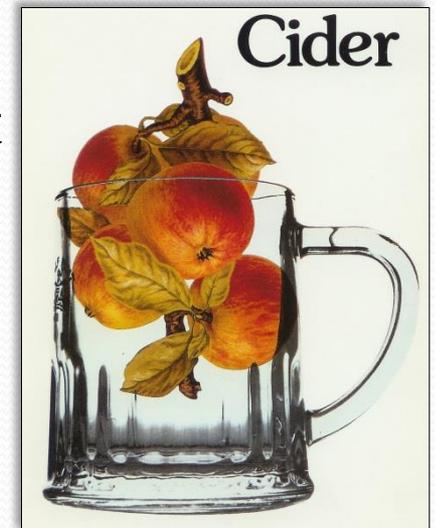
A little about me

- Worked at Long Ashton Research Station, UK
1972 – 1985
 - The UK's Cider Research Institute from 1903 – 1985
- Cadbury Schweppes / RSSL 1985 - 2007
 - Work included consultancy / analysis on cider
- Hobby cider maker from 1988



UK Cider Industry

- Production *ca* 900 M litres pa
- ~ 85 % made by Bulmers (Heineken), Gaymers (Magners), Aston Manor, Westons*, Thatchers*, Aspalls*, Sheppys* (* family owned)
- About 480 small firms account for the rest
- Differences in manufacturing practices
 - “Industrial” vs “Craft”
 - But it’s a continuum



“Industrial” cidermaking



- Concentrate based (mostly in-house)
 - Deseasonalised 3 week production cycle
 - CA stored dessert fruit is almost never used
- Low juice content
 - UK minimum (2010) is 35% juice at SG 1.033
- Colours, artificial sweeteners permitted
- Flavours not permitted except aroma addback
 - Flavoured ciders are sold as ciders but taxed as ‘made wines’
- Available bottled or draught (as keg beer) in pubs

“Craft” cidermaking

- No definition of what this is
 - Not legally distinct from mainstream cider
 - “Real” cider is a CAMRA construct
- Typically from 100% fresh juice made annually
- Wild or cultured yeast
- Available in many bottled formats
- Significant pub sale of dry still cider in bag-in-box
 - not generally dispensed from pressure kegs



We'll take a technical look at

- UK cider fruit
 - Oxidation
 - SO₂
 - Yeast
 - Lactic acid bacteria
 - Storage and finishing
-
- Compare “craft” and “industrial” approaches





Fruit Comparison

Type (UK data)	Tannin (mg/L)	Acid (g/L)
Bittersharp	> 2000	> 4.5
Bittersweet	> 2000	< 4.5
Sharp	< 2000	> 4.5
Sweet	< 2000	< 4.5
“Ideal” blend for UK craft cider	1000 - 2000	4 - 6

Type (US Virginia data)	Tannin (mg/L)	Acid (g/L)
Fuji	240	4.6
Granny Smith	360	10
Red Delicious	300	2.6
Pink Lady	210	9.4

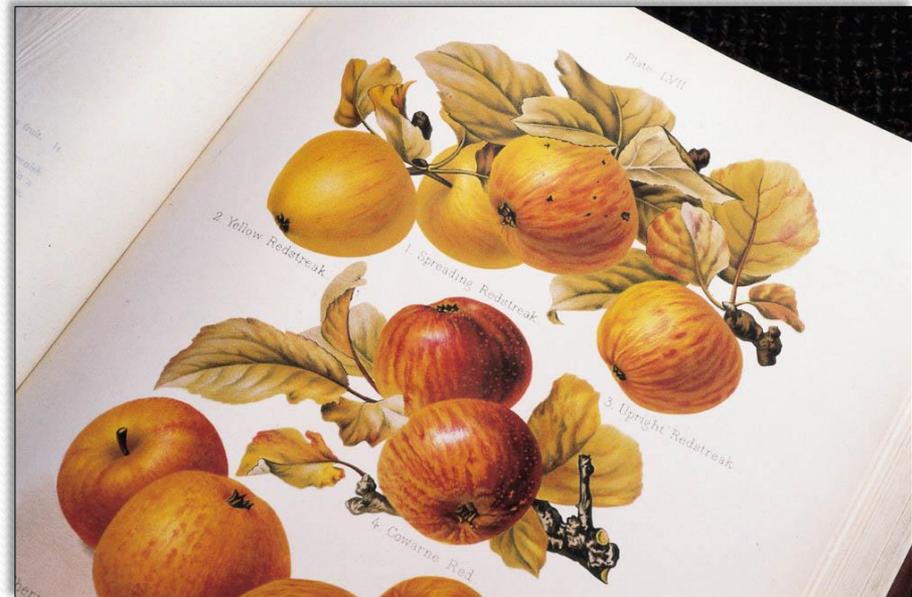
UK cider fruit

- No use other than cider
- Distinguished by high tannin, often low acid
 - pH > 4 is not uncommon for bittersweets
- “Bulk” and “**Vintage Quality**”

Term devised by Hogg 1886

Adopted by Barker 1910 to embrace superior qualities that could not be determined by analysis

Typically less fruit nitrogen hence slower fermentation



Vintage Quality Cider Apples

Sharps / Bittersharps

- Dymock Red
- Kingston Black
- Stoke Red
- Foxwhelp
- Browns Apple
- Frederick
- Backwell Red

Bittersweets

- Ashton Brown Jersey
- Harry Masters Jersey
- Dabinett
- Major
- White Jersey
- Yarlington Mill
- Medaille d'Or

Pure Sweets

- Northwood
- Sweet Alford
- Sweet Coppin

Cultivation and Harvesting

- UK cider apple production *ca* 200,000 tons p.a.
 - about 50% of **all** UK apple production
- Cultivation on bush or standard rootstocks
 - Standards permit grazing for low input systems
- Harvested mechanically from the ground as drops
- Stored 1 -2 weeks at ambient for sugar and flavour to develop

















Why are UK cider apples valued?

- Easier to press (fibrous structure)
- Tannins give body
 - allows greater dilution with water
- Higher sugar levels
- Other flavour precursors? (vintage quality)
- Raw material under direct control (contracts)

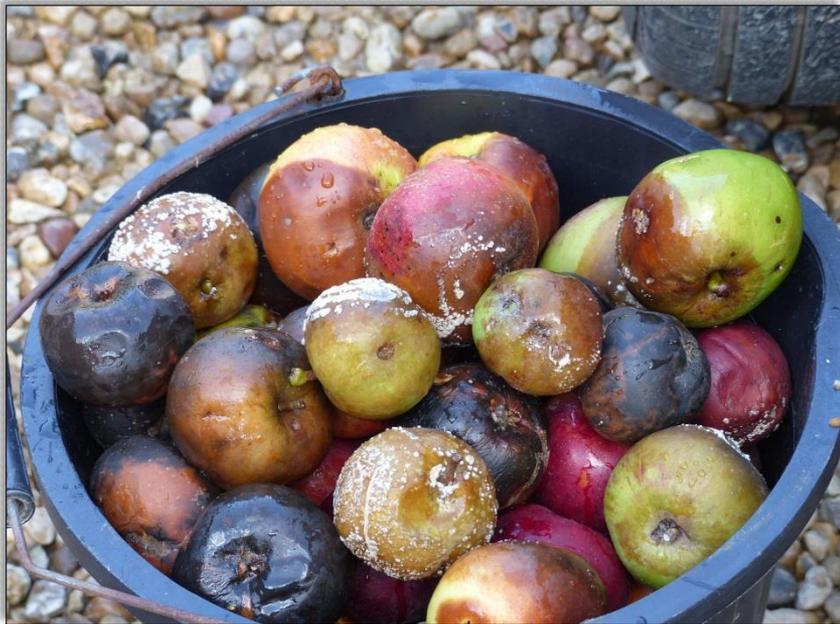


Reality check for Australians

- UK and French cider apples were developed in cooler wetter climates than most of Australia
 - Lack of winter chill can affect fruit set and yield
 - Sunburn can damage crops
- Alcohol levels *ca* 10% may be unwelcome
- Long lead times (topworking may help)
- Lack of alternative outlets for cider fruit
- Does the Australian market want high tannin ciders?

Fruit washing and grading

- Because of off-ground harvesting, this is an important step



Milling and Pressing

- Large companies use fully automated Bucher-Guyer HP piston press with integral scatter mill
 - The international apple juice industry standard
 - Yields up to 80% and can re-hydrate and re-press
- Craft makers are more likely to use pack presses with knife or scatter mills
 - Yields *ca* 75%
 - Some belt presses are used but are seen as inflexible
- Hydraulic bladder presses have a hobby following
 - Yields are poorer *ca* 60%
 - An efficient mill is important

Craft Scale Milling



Craft Scale Pressing



Oxidation while juice making

- Not restricted at all
- No sulphite at milling
 - Develops colour from polyphenols / PPO
 - Develops flavour from fatty acids / lipoxygenase

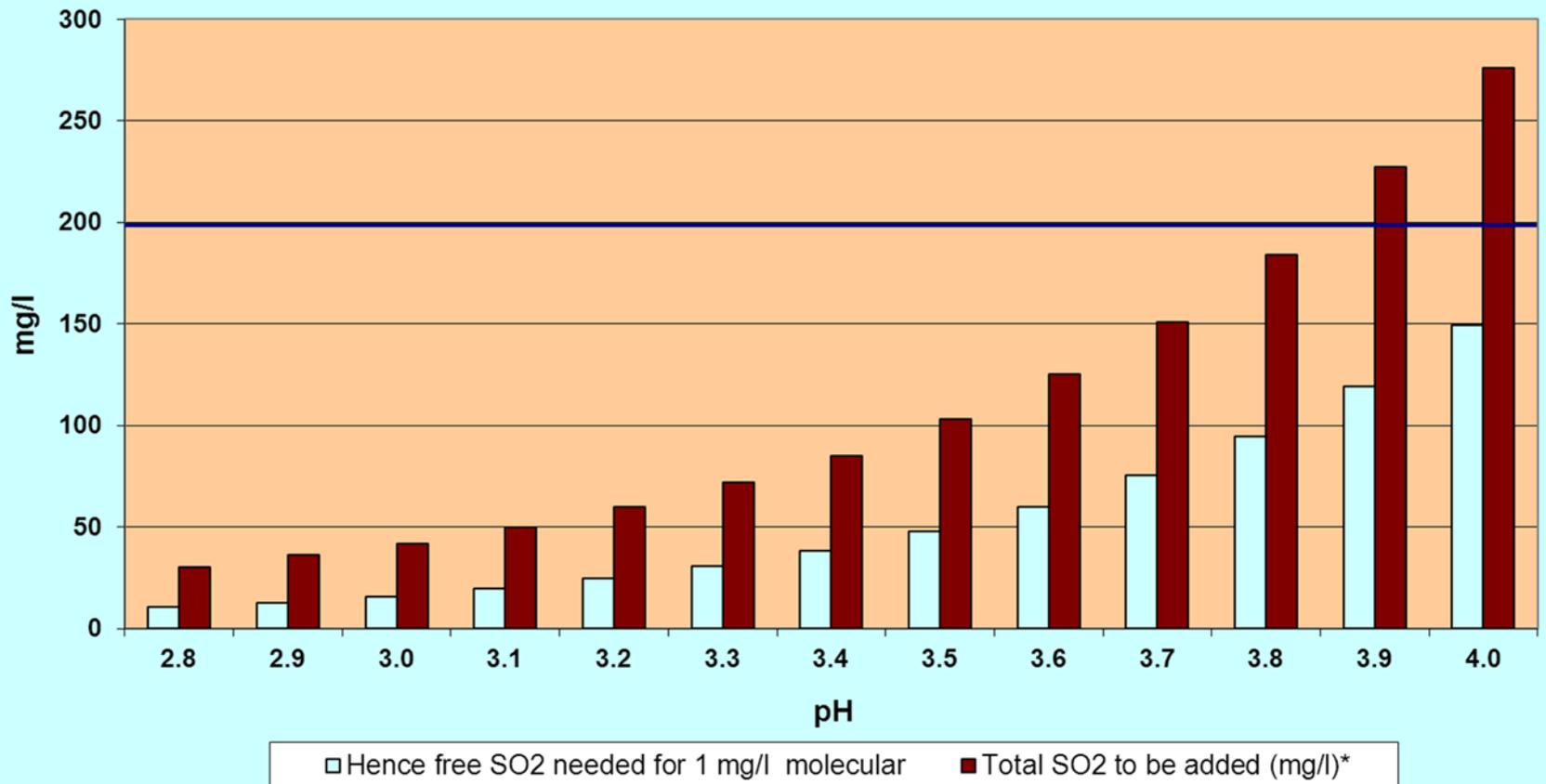


Sulphur Dioxide addition

- SO₂ added to juice before fermentation
 - Universal in large companies
 - Widespread by craft makers
- pH dependency to achieve *ca* 1 ppm molecular SO₂
- But binding assumptions may not be correct here
 - Established for ground harvested UK cider fruit in 1970's
 - Not verified for clean harvested dessert fruit in New World

Sulphur Dioxide addition

**Sulphite Addition Chart for Apple Juice Before Fermentation
(assuming typical binding components)**



Other pre-fermentation steps

- Removal of solids *per se* is never done
 - Higher solids gives higher fusels which is seen as +ve
- For large cidermakers who are concentrate-based
 - depectinisation and filtration is required before concentration to 72 Brix
- Nutrient addition
 - Large cidermakers may bring to 250 ppm YAN
 - Craft cidermakers aim to stay < 100 ppm YAN
 - hence usually add no nutrients

Yeast addition

“Industrial”

- Typically “champagne” yeast
 - Fermentation to 15% ABV
 - “Glucose wine” from rediluted AJC + syrups
 - Fast fermentation
 - 2 weeks at 20° C
- Neutral aroma
 - Less important if juice sweetened or aroma addback

“Craft”

- Typically wine or wild yeast
 - Fermentation to 7% ABV
 - Fresh 100% juice
 - Low nutrient
 - Slow fermentation
 - Typically 4 months at $\pm 8^{\circ}$ C
- “Cidery” aroma
 - From yeast or some specific fruit character

Some yeast selection criteria

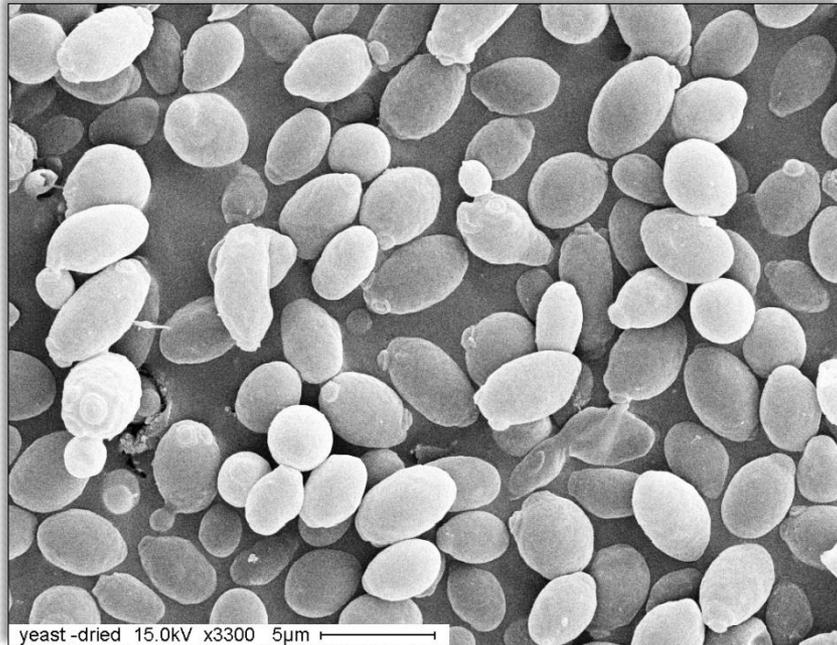
- Fruity floral aromas *V1116*
- Acid reduction *71B*
- Low nutrient requirements *QA23*
- Low H₂S production *AWRI 350*
- Polysaccharide production *D47*
- β -glucosidase activity (is this important?)

- Consider wild yeasts
 - or modern mixed / sequential cultures?

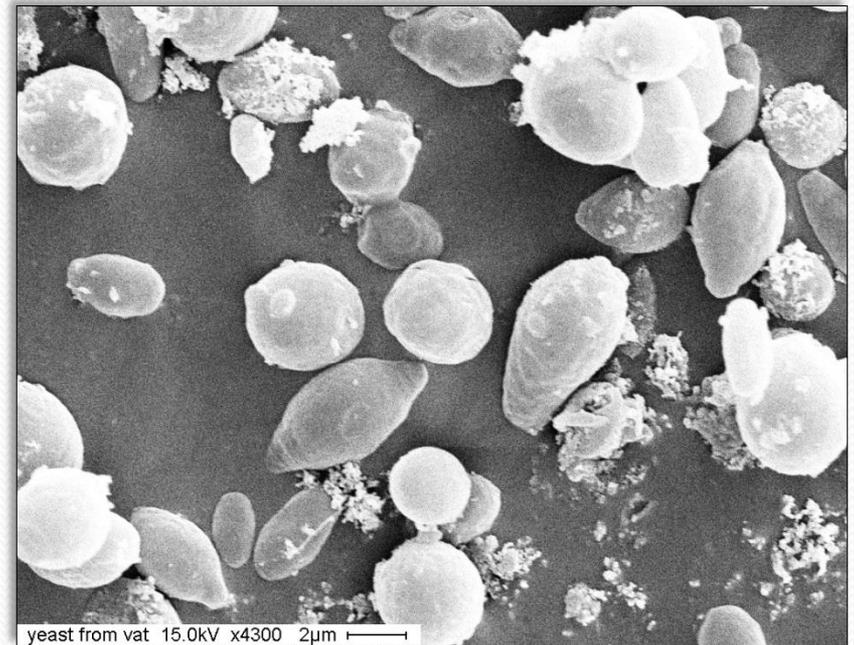
Experiment is worthwhile!



Yeast Choice



Cultured



Wild

Wild yeast fermentations

- Succession of yeasts
 - *Kloeckera*, *Hanseniospora* to start
 - These are on or in the apple
 - *Saccharomyces* to finish
 - These come from the cider house environment
- Can start very rapidly if not sulphited
- Use of SO₂ controls the 'wildness'
 - But slow start, can be 2 – 3 weeks lag phase
 - Low organism numbers need to build up
- Can ferment at 4° C

Finishing fermentation

- UK ciders typically ferment out to dryness
 - Stored and matured dry
 - Except for specialist “keeved” ciders
- Malo-lactic fermentation
 - Not required for most “industrial” ciders
 - deliberately inhibited by use of SO₂
 - Maturation in old wood may encourage bacterial growth
 - Plays a variable role in “craft” ciders
 - not usually well controlled

Malo-lactic fermentation

- Principal change is loss of malic acid to lactic
 - Can result in a 50% loss in total acidity
 - Renewed gas production in spring
- Two major groups of organisms
 - *Oenococcus oeni* (formerly *Leuconostoc oenos*)
 - *Lactobacillus* spp. (principally *L. collinoides*)
- Both occur wild in cider
 - *Oenococcus* cultures are available commercially



Wild *Lactobacilli* in old vats

Can be an important part of the maturation process

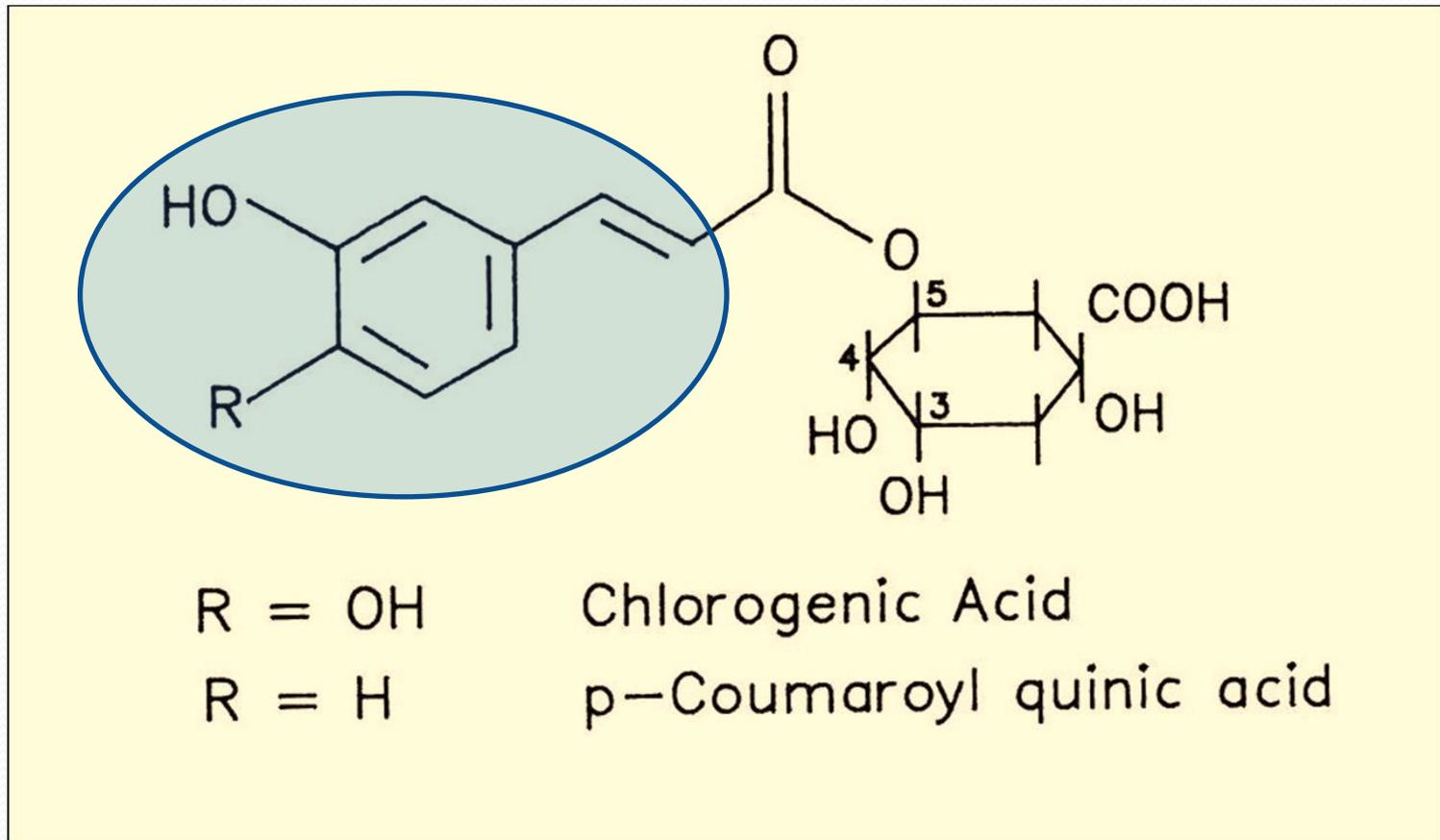
Flavours are not transferred from the wood itself

Lactobacilli live in the pores of the wood and generate volatile phenols

Malic acid doesn't always fall (MLE pH optimum *ca* 4.9)



Generation of volatile phenols



British and French “funky flavours”

- Volatile phenols (4EP, 4EC, 4EG)
 - “old horse”, “leathery”, “*sous bois*”
- Desirable threshold *ca* 1 ppm
 - At least one UK company monitors / controls them
- Can also be generated by *Brettanomyces*
 - But not regarded as principal route in cider
- Disliked by New World wine consumers?



Other flavour issues

- **Volatile acidity / ethyl acetate**
 - often a result of lactic acid bacteria
 - often higher in craft ciders; sometimes deliberately so.
- **Oxidation** – always a defect (*except for some diehards*)
- **H₂S** – probably slightly higher tolerance in UK
- **“Mouse”** – always a defect (*except for some diehards*)
- **Indole** – not uncommon in low juice industrial ciders

Cloudy? Added Flavours?

- Some people equate cloudy with ‘natural’
 - Perceived market demand
 - Difficult to ensure cloud stability
 - Natural cloud is complex in origin
 - Can add heat set cloudy juice and re-ferment.
- Flavoured ciders = alcopops unless subtle!
 - In UK there is a duty disadvantage as ‘made wines’
 - Flavours added as juice or concs at end of process
 - Hopped ciders (in the US especially)

Bulk storage and finishing

“Industrial”

- Stainless steel tanks of high alcohol ‘base ciders’ protected by 30 ppm SO₂
- Short storage (weeks)
- Diluted, blended, sweetened, acidified, filtered, aroma addback prior to final bottling or kegging
- “Recipe based” for consistent product

“Craft”

- Typically matured after blending, in steel, wood or LDPE
 - SO₂ not always used
- Longer storage (months)
- Minimal use of additives other than sweeteners
- Tend to celebrate annual variation rather than total consistency

Some UK permitted additives

- SO₂ (typically aim for 30 ppm free at bottling)
- Sorbate (never used because ineffective)
- Velcorin (DMDC) (not currently used AFAIK)

- Saccharin (in use since 1890's)
- Acesulfame K
- Sucralose (now supplanting saccharin)

- All permitted food colours
 - caramel most frequent



Sweetening

- UK ciders fermented to dryness
- Back sweetened with sugar
 - or increasingly with aseptically stored apple juice
 - adds fruitiness, reduces alcohol
 - especially useful for pressure keg draught dispense
- Supplementary sweetening - saccharin or sucralose
- Some small craft cidermakers only use synthetic sweeteners in their non-carbonated draught product
 - This is a legacy of the 'farmhouse saccharin' approach
 - allows for a sweet cider that doesn't referment
 - some are served dry and unsweetened



Carbonation



- All “industrial” ciders are force carbonated
- Many “craft” ciders are force carbonated on contract
 - A few are bottle conditioned
 - Some with artificial sweeteners
 - Even fewer are bottle fermented and disgorged
 - Definitely the high end of the market
 - Duty penalty as “sparkling cider”
- Some craft ciders are “keeved” in the French style to provide natural sweetness and carbonation
 - Challenging to do, but becoming slowly more popular

Finished Product types

“Industrial”

- Sweetened, carbonated, in-house sterile filtered and filled (bottle or keg)
- Draught pub dispense from pressure kegs as beer
- ‘Bag in box’ for still cider
 - Usually sugar sweetened and ‘hot filled’ to prevent refermentation

“Craft”

- Bottled / sweetened / carbonated / pasteurised in bottle – often on contract.
- Not normally pressure kegged
- ‘Bag in box’ for still dry cider
 - pasteurised in bag if sugar sweetened
- Some polycasks still used for festivals etc
 - oxidation problems



Consider drinking temperature

- Traditional UK draught still ciders are for room temperature drinking (15°– 20° C)
 - not intended to be served chilled
 - at low acid levels (3 g/L) they are dry but balanced
- Perception of sweetness diminishes
 - with lower temperature
 - with higher acid
 - with increased carbonation
- Would a “flat room temperature” cider be acceptable here?



Sales outlets

“Industrial”

- Pub
 - Pressure keg or bottle
- Supermarket
 - Bottle or ‘bag in box’
 - National listings



“Craft”

- Pub (local)
 - ‘Bag in box’ or bottle
- Supermarket
 - Occasional local distribution
 - Very few national listings
- Farmers markets, village shops, specialist foodstores
 - Strong presence



What might you think about?

- Fruit type?
 - Using European cider apples?
- Oxidative processing?
 - Allowing enzymic changes
- SO₂ levels?
 - What is appropriate with your fruit?
- Yeast choice?
 - Which cultured yeast and why? Wild yeast?
- Malo-lactic considerations
 - Benefits of wild or cultured or none at all?
- Cider style?
 - Is there a market here for UK traditional still and dry?



Acknowledgements

- Picture credits
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- Other thanks to
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 - NSW DPI
 - and many cidermakers worldwide from whom I'm always learning!