

Soft drink and fruit juice problems solved

Philip R. Ashurst and Robert Hargitt



Contents

Pr		levelopment of new soft drinks and fruit juices
. 1		issues affecting product development
	1.1.1	How do I obtain the main brief for a new or modified product?
	1.1.2	What factors need to be considered at an early stage and how much data is needed before development starts?
	1.1.3	How much technical input should there be in deciding the brief?
	1.1.4	What are the main issues affecting the development of a product?
	1.1.5	What timescale should be allowed for the development of a product?
	1.1.6	What microbiological tests should be carried out on a developmental product?
.2	The n	narketing brief
	1.2.1	Who should be the main driver in preparing the marketing brief: the technical or the marketing department?
	1.2.2	How detailed should the product brief be? How much technical and marketing information should be
		provided?

	1.2.3	Do special regulations exist for sports drinks? What is
		an isotonic drink?
	1.2.4	Are there any special regulations for drinks for
	125	babies?
	1.2.5	
1.2	1.2.6	What issues surround 'tooth-friendly' drinks?
1.3		constraints
	1.3.1	Should the initial product concept be developed
	122	without reference to cost?
	1.3.2	When should the impact of cost be assessed?
	1.3.3	How much influence should the company accounting
	1.3.4	function have on product development?
	1.3.4	How do I establish a likely selling price?
1 4		Will new capital plant be needed?
1.4	1.4.1	Should the issues of packaging be raised at the early
	1.4.1	stages of product development and how important is
		packaging to the product concept?
	1.4.2	What considerations should be raised in deciding the
	1.4.2	preferred packaging?
	1.4.3	What influence does packaging have on production
	1.4.3	and its costs?
	1.4.4	
1.5		Can I design my own packaging?
1.5	1.5.1	What are the principal limitations to be considered in
	1.5.1	the early stages of development?
	1.5.2	How can a new product be assessed for manufacture
	1.3.2	without large-scale production?
	1.5.3	When should I consider outsourcing the initial
	1.0.0	manufacture of a new product? Is contract packing
		a viable option?
	1.5.4	Can existing production facilities be modified?
	1.5.5	Do some ingredients require special handling
	1.5.5	facilities?
	1.5.6	Can test plant data be scaled up?
1.6		-life prediction
1.0	1.6.1	Can shelf-life be predicted?
	1.6.2	
	1.6.3	What facilities do I need to conduct shelf-life tests?
	1.6.4	How does shelf-life impact on the business plan?
	1.6.5	Should shelf-life be continually assessed after a product
	1.0.3	is in regular production?
1.7	Asses	sing consumer reactions to new products
***	1.7.1	How can likely consumer reactions to new products be
		best assessed?

	1.7.2	Can I outsource market research and, if so, to	
		whom?	18
	1.7.3	How long should a new product be given to find its	
		place in the market?	18
	1.7.4	How can I predict likely sales volumes?	18
2 Ing	gredien	ts in soft drinks and fruit juices	20
2.1	Water	as an ingredient	20
	2.1.1	How much does water quality affect soft drinks?	20
	2.1.2	Should water treatment be installed in a soft drink or	
		fruit juice processing plant?	21
	2,1,3	Is there an ideal specification for water to be used in	
		soft drinks?	22
	2.1.4	How frequently should water testing take place?	22
	2.1.5	Can I use natural mineral water or spring water to make	
		a soft drink or reconstituted fruit juice, and can I bring	
		these waters in by tanker?	22
	2.1.6	Is a 'flavoured' water a soft drink or a water?	23
2.2		components as ingredients	23
	2.2.1	What types of fruit components are readily available	
		and what are the differences between juices, comminutes,	
		fruit purées and fruit extracts?	23
	2.2.2	What, if any, special processing is needed for packed fruit	
	222	juices and products containing fruit ingredients?	24
	2.2.3	How do I calculate the fruit content of a product when	2.1
	224	using a concentrated fruit preparation?	24
	2.2.4	What factors do I need to consider in the specification	25
	225	for fruit ingredients?	25
	2.2.5	What kind of problems can arise from the use of fruit in a soft drink?	26
	2.2.6	Are all exotic fruits permitted in beverages and how can	20
	2.2.0	I establish which are allowed?	26
	2.2.7	Can a product be labelled 'sugar free' if only fruit	20
	2.2.1	components are added?	27
	2.2.8	How can I be sure of the authenticity of fruit	2,
	2.2.0	materials?	28
2.3	Carbo	hydrate sweeteners	29
		What carbohydrate sweeteners are available for use in	
	2.5.1	soft drinks?	29
	2.3.2	How do other sweeteners compare with sucrose?	30
	2.3.3	Do different sweeteners affect product stability?	31
	2.3.4	How do different sweeteners affect production and	
		process control?	31
	2.3.5	What are 'fruit extracts' and how should they be	
		labelled?	32

	2.3.6	Are special technical or process requirements needed
		to enable the handling of bulk carbohydrates in dry
		or syrup form?
	2.3.7	What typical specifications should I apply to carbohydrates?
2.4	Intens	e sweeteners
~	2.4.1	How do I select the right intense sweetener for my
		product?
	2.4.2	Do different intense sweeteners have different taste
		profiles?
	2.4.3	What kind of stability can I expect from intense
		sweeteners?
	2.4.4	Why does aspartame require special labelling?
	2.4.5	Are there any natural intense sweeteners?
	2.4.6	Why are intense sweeteners blended?
	2.4.7	Why has the use of cyclamate declined?
	2.4.8	Can I use sugar alcohols such as xylitol?
2.5	Flavo	urings
	2.5.1	What types of flavourings are available and why are
		they used?
	2.5.2	How are flavourings best assessed in the development
		laboratory?
	2.5.3	What kind of shelf-life do flavourings have?
	2.5.4	How do flavourings affect product stability?
	2.5.5	How much interaction can I expect between flavourings
		and other ingredients?
	2.5.6	What different types of flavourings are available?
	2.5.7	How do specific ingredients that add flavour, such as
		quinine and caffeine, have to be labelled?
	2.5.8	Do I need approval for 'novel' flavours?
2.6	Colou	rings
	2.6.1	What factors are to be considered in selecting natural
		or artificial colourings?
	2.6.2	How much added colour can I expect from fruit or
		other components?
	2.6.3	Are there any ingredients that will give colour to a
		product but do not require a label declaration as such?
	2.6,4	What are the main factors that affect the stability of
		colour in a product?
	2.6.5	There are several different types of caramels; what are
		the differences between them?
	2.6.6	Why are the media so critical of colourings?
2.7	Preser	rvatives
	2.7.1	What factors should be considered in deciding whether
		to use any preservative?

	2.7.2	How can the right preservatives be selected for a
	2.7.3	product?
	2.7.3	it does not need to be pasteurised?
	2.7.4	Do preservatives in product deteriorate with time?
	2.7.5	Does dimethyl dicarbonate (DMDC) (trade name
	2.7.3	Velcorin) have to be declared as a preservative?
	2.7.6	Why will some local authorities not purchase products
	2.7.0	containing benzoic acid?
	2.7.7	Why may both sorbic and benzoic acids be unsuitable
	2.7.7	for tea drinks?
2.8	Nutra	ceutical ingredients
2.0	2.8.1	What are nutraceutical ingredients, how can I use them
	2.6.1	and how should they be labelled?
2.9	Misce	llaneous additives
2.)	2.9.1	What miscellaneous additives can I use in a product
	2.7.1	and what functions do they perform?
	2.9.2	If an additive is used as a process aid, does it have to
	2.7.2	be declared on the label?
	2.9.3	Is there an industry standard for carbon dioxide?
	2.9.4	How is carbonation measured?
	2.9.5	How are additives in ingredients declared?
	2.9.6	Can I use antifoam?
	2.7.0	Can't use antiform.
3 M	anufact	ture of soft drinks and fruit juices
3.1		lient sourcing and storage
	3.1.1	How much responsibility for ingredient quality can be
		transferred to the supplier?
	3.1.2	What storage conditions should I use for ingredients? .
	3.1.3	Are compound ingredients best outsourced or mixed
		locally?
	3.1.4	What are the best ways of storing carbon dioxide,
		sugar, fruit juices, flavours and other additives?
	3.1.5	How do I avoid product 'drift'?
	3.1.6	What standards should I operate to and what standards
		should I demand from my suppliers?
	3.1.7	Do some ingredients demand special production
		plant?
	3.1.8	What do I need to specify on a supplier contract?
	3.1.9	Do I need to audit suppliers?
3.2		ig, compounding and related problems
٠.ــ	3.2.1	What type of mixing plant is ideal for soft drinks?
	3.2.2	Is there an ideal order of addition for ingredients?
	3.2.3	If undissolved materials remain in the syrup mix, what
	0.2.0	action should be taken?

	3.2.4	What steps should be taken to minimise the introduction
		of air into the product?
	3.2.5	Why do I have an oily film on the surface of my
	3.2.6	syrup?
	3.2.0	surface of my syrup during manufacture?
	3.2.7	Can I make milk/yoghurt and fruit juice drinks in my
	3.2.1	soft drinks plant?
	3.2.8	Should I dissolve ingredients prior to addition?
	3.2.9	Should turbulence be avoided during mixing?
		How much automation should be installed?
	3.2.11	
	J. L	to pure fruit juices?
3.3	Pasten	risation, homogenisation and related issues
0.0	3.3.1	When is pasteurisation necessary?
	3.3.2	What pasteurisation conditions are needed and how
		can these be calculated?
	3.3.3	When is it desirable to homogenise a product?
	3.3.4	What are the best types of pumps to use?
	3.3.5	Are changes to the taste or appearance of a product
		likely as a result of pasteurisation?
3.4	Filling	operations and related issues
	3.4.1	Do different filler types affect product quality?
	3.4.2	What regular quality checks should be made on fillers?
	3.4.3	What is a typical cleaning regime for a filler?
	3.4.4	At what temperature should products be filled?
	3.4.5	Why do some products froth (fob) and how can this be
		avoided?
	3.4.6	What is the average fill system (e-mark)?
	3.4.7	How should I deal with broken bottles in the filler?
	3.4.8	How do I ensure the absence of foreign bodies in
		product?
	3.4.9	What hygiene requirements apply to manufacturers of
		soft drinks and fruit juices?
3.5		dary packaging
	3.5.1	How does secondary packaging affect product
		quality?
	3.5.2	What protection is needed from secondary packaging?
3.6		ed product storage
	3.6.1	What are the ideal conditions for product storage?
	3.6.2	What product problems can occur during storage?
	3.6.3	When do products need to be quarantined?
	**. *	
		sues in soft drink and fruit juice processing
4 1	Ingred	ient quality

	4.1.1	How much deviation from ingredient specification is	
		needed to cause a noticeable alteration of product	
		quality?	8
	4.1.2	What are the key parameters that I should evaluate to	
		assess ingredient quality?	8
	4.1.3	A 'floc' forms in an otherwise clear soft drink; where	
		should I look for the likely cause?	8
	4.1.4	When can I switch to an alternative supply source	
		without extensive testing?	8
	4.1.5	How do I ensure consistent product quality and avoid	
		drift?	:
	4.1.6	How do I specify a flavour?	;
	4.1.7	How do I deal with variations in natural ingredients,	
		particularly fruit juices from different sources?	;
4.2	Ingred	lient interactions	:
	4.2.1	Are there any ingredients that are likely to cause	
		unwanted interactions with others?	
	4.2.2	What are the most likely effects of ingredient	
		interactions?	
	4.2.3	How are the conditions of storage likely to affect	
		ingredient interactions?	
	4.2.4	Can I use both benzoic and ascorbic acids in the same	
		product?	
	4.2.5	What are the ICBA guidelines on benzene formation	
		and where are they available?	
4.3	Ingred	lient specifications	
	4.3.1	Do I need to check every batch of ingredient against	
		specification?	
	4.3.2	How meaningful are specifications for natural ingredients	
		that may be standardised to only one or two parameters	
		(e.g. concentrated juices)?	
	4.3.3	What are the key issues that I need to have in mind	
		when considering ingredient specifications?	
	4.3.4	Is it possible to specify flavour character?	
	4.3.5	How much variation should I allow in natural	
		materials?	
4.4	Proble	ems during manufacture and safety issues	
	4.4.1	A process worker has added too much of one	
		ingredient; how is this best dealt with?	
	4.4.2	The final volume of a product has been exceeded;	
		how can the situation best be resolved?	
	4.4.3	A batch of product has been made up but not bottled	
		off. It is then noticed that a preservative (or other	
		ingredient) has not been added. Can the missing	
		ingredient simply be added to the bulk product?	

	4.4.4	The electrical supply has failed during flash
		pasteurisation; is it necessary to repasteurise the whole batch?
	4,4,5	What actions generally need to be taken during a stop
	1, 1,5	in production, particularly with respect to products in
		the pasteuriser?
	4.4.6	Is an HACCP system now a legal requirement and how
		do I set one up?
	4.4.7	How much record keeping is required and for how
		long should records be kept?
	4.4.8	What regular checks should be carried out on a tunnel
		pasteuriser?
	4.4.9	What are the main risks of contamination and how can
		I check for these?
4.5	Colou	ar and appearance changes
-	4.5.1	A normally clear product becomes cloudy on storage;
		what are the likely causes?
	4.5.2	A product displays a 'ring' at its upper surface; what
		is this likely to be and how can it be resolved?
	4.5.3	What are the causes of product colour fading?
	4.5.4	(a) A concentrated soft drink that is normally cloudy
		separates into a clear upper layer and a dense lower layer
		of pulp; what is the likely cause and how can it be
		resolved? (b) A concentrated soft drink has formed a
		gel on storage; what is the likely cause and how can it
		be resolved?
	4.5.5	Fruit pulp forms a plug or mat on top of the product;
		what causes this and how should it be dealt with?
	4.5.6	How can emulsion stability be best evaluated?
4.6	Flavo	ur deterioration
	4.6. I	What factors affect flavour deterioration?
	4.6.2	How is the flavour profile of a product best assessed? .
	4.6.3	What kind of sensory tests can be used to evaluate
		flavour changes in a product?
	4.6.4	Apart from the obvious source (i.e. the flavouring),
		which ingredients are most likely to cause flavour
		problems?
	4.6.5	Where can I get help in determining the likely origin of
		an unusual flavour taint?
	4.6.6	How important is the removal of chlorine in process
		water in avoiding flavour defects?
	4.6.7	How can packaging influence flavour deterioration?
	4.6.8	What kind of flavour deterioration can arise from
		microbial infections?
4.7	Packa	ging interactions

	4.7.1	What problems are most likely to arise when plastic
	4.7.3	packaging of any kind is used?
	4.7.2	When cans are used, what are the most likely interactions?
	4.7.3	What special problems, other than physical
	7.7.5	contamination, are possible if glass packaging is used?
	4.7.4	What issues are likely to arise when flexible packaging
	7.7.7	is used?
	4.7.5	Do aseptic packs have any particular problems
	7.7.5	associated with them?
	4.7.6	How much attention should I pay to the specification
	7.7.0	of packaging material?
	4.7.7	What are the major packaging problems?
	4.7.8	Why are product shelf-lives shorter in PET packages
	7.7.0	when compared with glass, cans or TetraPak/
		Combibloc?
	4.7.9	What is the best plastic in which to pack still drinks?
4.8		biological problems
4.0	4.8.1	What makes one soft drink more susceptible to
	4.0.1	microbial spoilage than another?
	4.8.2	What are the organisms that I need to be particularly
	4.0.2	m.
	4.8.3	Can soft drinks become contaminated with pathogenic
	4.0.3	organisms?
	4.8.4	
		What are the early signs of microbial contamination?
	4.8.5	How do I find the likely source of microbial
	100	contamination in a product?
	4.8.6	What value does a period of quarantine storage have?
	4.8.7	How can I best ensure that the water I use does not
	400	become a source of contamination?
	4.8.8	An equipment breakdown causes a delay of several
		hours before a product can be packed off; does this
		situation pose a serious threat to the microbiological
	400	condition of the product?
	4.8.9	Why is mould contamination not a problem for
	4010	carbonated drinks?
	4.8.10	What is Zygosaccharomyces bailii and why is it such
	4011	a problem?
	4.8.11	I know that most product spoilage results from yeast
		and/or mould contamination; what bacterial infections
		might affect soft drinks?
4.9		life issues
	4.9.1	What are the main factors affecting the shelf-life of a
		product?
	492	Can the shelf-life of a product be accurately predicted?

	4.9.3	What does the term 'shelf-life' of a product actually	114
	404	mean?	114
	4.9.4	Should the shelf-life of products be monitored on a	116
	405	regular basis? If so, how should this be done?	115
	4.9.5	Why do products need such a long shelf-life and how	
	40.6	can this be maximised?	115
	4.9.6	How does packaging affect shelf-life?	116
5 Bo		raters	117
5.1	Legisl		117
	5.1.1	What UK legislation applies to bottled waters?	117
	5.1.2	What are the differences between natural mineral	
		water, spring water and table water?	118
	5.1.3	How should different waters be labelled?	119
	5.1.4	What licences are required to extract and bottle water?	120
	5.1.5	What testing regime do I need to put in place?	120
	5.1.6	Do I need any discharge consents if I am only bottling	
		water?	121
	5.1.7	What other ingredients can I add to bottled waters?	121
5.2	Water	extraction	122
	5.2.1	How much information do I need about my borehole	
		and how much water can I extract?	122
	5.2.2	How does my borehole need to be protected?	122
	5.2.3	How close to the source do I need to bottle?	123
	5.2.4	How can I establish whether the water from my borehole	
		is of consistent quality?	123
	5.2.5	What action should be taken if the quality of water from	
		a borehole suddenly drops?	124
	5.2.6	Can extraction from a borehole be intermittent?	124
5.3	Water	treatment and bottling	125
	5.3.1	What treatments can I apply to different water	
		sources?	125
	5.3.2	Can I bottle water and soft drinks in the same plant?	126
	5.3.3	What is the best way to sterilise a water bottling	
		plant?	126
	5.3.4	Do I need to take any special precautions in a water	_
		bottling plant?	126
5.4	Oualit	y issues	127
	5.4.1	What are the most likely appearance defects affecting	
		bottled waters?	127
	5.4.2	What are the most likely sources of taints in bottled	
	J	waters?	127
	5.4.3	What kinds of organisms will grow in bottled waters?	128
	5.4.4	Does carbon dioxide added to bottled waters need to be	120
	J. 1. 1	of special quality?	128