PRODUCT DEVELOPMENT OF NEW SOFT DRINKS AND FRUIT JUICES

Initial issues affecting product development
How do I obtain the main brief for a new or modified product? What factors need to be considered at an early stage and how much data is needed before development starts? How much technical input should there be in deciding the brief? What are the main issues affecting the development of a product? What timescale should be allowed for the development of a product? What microbiological tests should be carried out on a developmental product?

The marketing brief
Who should be the main driver in preparing the marketing brief: the technical or the marketing department? How detailed should the product brief be; how much technical and marketing information should be provided? Do special regulations exist for sports drinks and what is an isotonic drink? Are there any special regulations for drinks for babies? How often should the marketing brief be reviewed? What issues surround ‘tooth-friendly’ drinks?

Cost constraints
Should the initial product concept be developed without reference to cost? When should the impact of cost be assessed? How much influence should the company accounting function have on product development? How do I establish a likely selling price? Will new capital plant be needed?

Packaging issues
Should the issues of packaging be raised at the early stages of product development and how important is packaging to the product concept? What considerations should be raised in deciding the preferred packaging? What influence will packaging have on production and its costs? Can I design my own packaging?

Manufacturing issues
What are the principal limitations to be considered in the early stages of development? How can a new product be assessed for manufacturing without large-scale production? When should I consider outsourcing the initial manufacture of a new product and is contract packing a viable option? Can existing production facilities be modified? Do some ingredients require special handling facilities? Can test plant data be scaled up?

Shelf-life prediction
Can shelf life be predicted? What methods are used to predict shelf life? What facilities do I need to conduct shelf life tests? How does shelf life impact on the business plan? Should shelf life be continually assessed after a product is in regular production?

Assessing consumer reactions to new products
How can likely consumer reactions to new products best assessed? Can I outsource market research and, if so, to whom? How long should a new product be given to find its place in the market? How can I predict likely sales volumes?

INGREDIENTS IN SOFT DRINKS AND FRUIT JUICES

Water as an ingredient
How much does water quality affect soft drinks? Should water treatment be installed in a soft drinks or fruit juice processing plant? Is there an ideal specification for water to be used in soft drinks? How frequently should water testing take place? 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? Is a ‘flavoured’ water a soft drink or water?
**Fruit components as ingredients**
What types of fruit components are readily available and what are the differences between juices, comminutes, fruit purees and fruit extracts? What, if any, special processing is needed for packed fruit juices and products containing fruit ingredients? How do I calculate the fruit content of a product when using a concentrated fruit preparation? What factors do I need to consider in the specification for fruit ingredients? What kind of problems can arise from the use of fruit in a soft drink? Are all exotic fruits permitted in beverages and how can I establish which is allowed? Can a product be labelled ‘sugar free’ if only fruit components are added? How can I be sure of the authenticity of fruit materials?

**Carbohydrate sweeteners**
What carbohydrate sweeteners are available for use in soft drinks? How do other sweeteners compare with sucrose? Do different sweeteners affect product stability? How do different sweeteners affect production and process control? What are ‘fruit extracts’ and how should they be labelled? Are special technical/process requirements needed to enable me to handle bulk carbohydrates in dry or syrup form? What typical specifications should I apply to carbohydrates?

**Intense sweeteners**
How do I select the right intense sweetener for my product? Do different intense sweeteners have different taste profiles? What kind of stability can I expect from intense sweeteners? Why does Aspartame require special labelling? Are there any natural intense sweeteners? Why are intense sweeteners blended? Why has the use of cyclamate declined? Can I use sugar alcohols such as xylitol?

**Flavourings**
What types of flavourings are available and why are they used? How are flavourings best assessed in the development laboratory? What kind of shelf life do flavourings have? How do flavourings affect product stability? How much interaction can I expect between flavourings and other ingredients? What different types of flavourings are available? How do specific ingredients that add flavour, such as quinine and caffeine, have to be labelled? Do I need approval for ‘novel’ flavours?

**Colourings**
What factors are to be considered in selecting natural or artificial colourings? How much added colour can I expect from fruit or other components? Are there any ingredients that will give colour to a product but do not require a label declaration as such? What are the main factors that affect the stability of colour in a product? There are several different types of caramels; what are the differences between them? Why are the media so critical of colourings?

**Preservatives**
What factors should be considered in deciding whether to use any preservative? How can the right preservatives be selected for a product? Does the use of a preservative in a product mean that it does not need to be pasteurised? Do preservatives in product deteriorate with time? Does Dimethyl Dicarbonate (DMDC) (Trade name Velcorin) have to be declared as a preservative? Why will some local authorities not purchase products containing benzoic acid? Why may both sorbic and benzoic acids be unsuitable for tea drinks?

**Nutraceutical ingredients**
What are nutraceutical ingredients, how can I use them and how should they be labelled?
**Miscellaneous additives**
What miscellaneous additives can I use in a product and what functions do they perform. If an additive is used as a process aid, does it have to be declared on the label? Is there an industry standard for carbon dioxide? How do I measure carbonation? How are additives in ingredients declared? Can I use antifoam?

**MANUFACTURING OF SOFT DRINKS AND FRUIT JUICES**

**Ingredient sourcing and storage**
How much responsibility for ingredient quality can be transferred to the supplier? What storage conditions should I use for ingredients. Are compound ingredients best outsourced or mixed locally? What are the best ways of storing carbon dioxide, sugar, fruit juices, flavours and other additives? How do I avoid product 'drift'? What standards should I operate to and demand from my suppliers? Do some ingredients demand special production plant? What do I need to specify on a supplier contract? Do I need to audit suppliers?

**Mixing, compounding and related problems**
What type of mixing plant is ideal for soft drinks? Is there an ideal order of addition for ingredients? If undissolved materials remain in the syrup mix what action should be taken? What steps should be taken to minimise the introduction of air into the product? Why do I have an oily film on the surface of my syrup? What is the most likely cause of white flecks on the surface of my syrup during manufacture? Can I make milk/yoghurt and fruit juice drinks in my soft drinks plant? Should I dissolve ingredients prior to addition? How much automation should be installed? Are there any special manufacturing issues that apply to pure fruit juices?

**Pasteurisation, homogenisation and related issues**
When is pasteurisation necessary? What pasteurisation conditions are needed and how can these be calculated? When is it desirable to homogenise a product? What are the best types of pumps to use? Are changes to the taste or appearance of a product likely as a result of pasteurisation? Should turbulence be avoided during mixing?

**Filling operations and related issues**
Do different filler types affect product quality? What regular quality checks should be made on fillers? What is a typical cleaning regime for a filler? At what temperature should products be filled? Why do some products froth (fob) and how can this be avoided? What is the average fill system (e-mark)? How should I deal with broken bottles in the filler? How do I ensure the absence of foreign bodies in my products? What hygiene requirements apply to manufacturers of soft drinks and fruit juices?

**Secondary packaging**
How does secondary packaging affect product quality? What protection is needed from secondary packaging?

**Finished product storage**
What are the ideal conditions for product storage? What product problems can occur during storage? When do my products need to be quarantined?

**QUALITY ISSUES IN SOFT DRINK AND FRUIT JUICE PROCESSING**

**Ingredient quality**
How much deviation from ingredient specification is needed to cause a noticeable alteration of product quality? What are the key parameters that I should evaluate to assess ingredient quality? A 'floc' forms in an otherwise clear soft drink; where should I
look for the likely cause? When can I switch to an alternative supply source without extensive testing? How do I ensure consistent product quality and avoid drift? How do I specify a flavour? How do I deal with variations in natural ingredients, particularly fruit juices from different sources?

**Ingredient interactions**
Are there any ingredients that are likely to cause unwanted interactions with others? What are the most likely effects of ingredient interactions? How are the conditions of storage likely to affect ingredient interactions? Can I use both benzoic and ascorbic acids in the same product? What are the ICBA guidelines on benzene formation and where are they available?

**Ingredient specifications**
Do I need to check every batch of ingredient against specification? How meaningful are specifications for natural ingredients that may only be standardised to one or two parameters (e.g. concentrated juices) Can you set out the key issues that I need to have in mind when considering ingredient specifications? Is it possible to specify flavour character? How much variation should I allow in natural materials?

**Problems during manufacture and safety issues**
A process worker has added too much of one ingredient; how is this best dealt with? The final volume of a product has been exceeded; how can the situation best be resolved? 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? The electrical supply has failed during flash pasteurisation; is it necessary to repasteurise the whole batch? What actions generally need to be taken during a stop in production, particularly with respect to products in the pasteuriser? Is a HACCP system now a legal requirement and how do I set one up? How much record keeping is required and for how long should records be kept? What regular checks should be carried out on a tunnel pasteuriser? What are the main risks of contamination and how can I check for these?

**Colour and appearance changes**
A normally clear product becomes cloudy on storage; what are the likely causes? A product displays a ‘ring’ at its upper surface; what is this likely to be and how can it be resolved? What are the causes of product colour fading? 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? Fruit pulp forms a plug or mat on top of the product; what causes this and how should it be dealt with? How can emulsion stability be best evaluated?

**Flavour deterioration**
What factors affect flavour deterioration? How is the flavour profile of a product best assessed? What kind of sensory tests can be used to evaluate flavour changes in a product? Apart from the obvious source (i.e. the flavouring), which ingredients are most likely to cause flavour problems? Where can I get help in determining the likely origin of an unusual flavour taint? How important is the removal of chlorine in process water in avoiding flavour defects? How can packaging influence flavour deterioration? What kind of flavour deterioration can arise from microbial infections?

**Packaging interactions**
What problems are most likely to arise when plastic packaging of any kind is used? When cans are used, what are the most likely interactions? What special problems, other than physical contamination, are possible if glass packaging is used? What issues are likely to arise when flexible packaging is used? Do aseptic packs have any particular problems
associated with them? How much attention should I pay to the specification of packaging material? What are the major packaging problems? Why are product shelf lives shorter in PET packages when compared with glass, can or TetraPak/Combibloc? What is the best plastic in which to pack still drinks?

**Microbiological problems**
What makes one soft drink more susceptible to microbial spoilage than another? What are the organisms that I need to be particularly aware of? Can soft drinks become contaminated with pathogenic organisms? What are the early signs of microbial contamination? How do I find the likely source of microbial contamination in a product? What value does a period of quarantine storage have? How can I best ensure that the water I use does not become a source of contamination? 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 condition of the product? Why is mould contamination not a problem for carbonated drinks? What is Zygosaccharomyces bailii and why is it such a problem? I know that most product spoilage is as a result of yeast and or mould contamination; what bacterial infections might affect soft drinks?

**Shelf-life issues**
What are the main factors affecting the shelf-life of a product? Can the shelf-life of a product be accurately predicted? What does the term ‘shelf-life’ of a product actually mean? Should the shelf life of products be monitored on a regular basis? If so, how should this be done? Why do products need such a long shelf life and how can this be maximised? How does packaging affect shelf life?

**BOTTLED WATERS**

**Legislation**
What UK legislation applies to bottled waters? What are the differences between Natural Mineral Water, Spring Water and Table Water? How should different waters be labelled? What licences are required to extract and bottle water? What testing regime do I need to put in place? Do I need any discharge consents if I am only bottling water? What other ingredients can I add to bottled waters?

**Water extraction**
How much information do I need about my borehole and how much water can I extract? How does my borehole need to be protected? How close to the source do I need to bottle? How can I establish if the water from my borehole is of consistent quality? What action should be taken if the quality of water from a borehole suddenly drops? Can extraction from a borehole be intermittent?

**Water treatment and bottling**
What treatments can I apply to different water sources? Can I bottle water and soft drinks in the same plant? What is the best way to sterilise a water bottling plant? Do I need to take any special precautions in a water bottling plant?

**Quality issues**
What are the most likely appearance defects affecting bottled waters? What are the most likely sources of taints in bottled waters? What kinds of organisms will grow in bottled waters? Does carbon dioxide added to bottled waters need to be of special quality? What shelf life can be expected from bottled waters? Do I need special closures or packaging for bottled waters?

**Storage and distribution**
Do bottled waters require any special storage conditions?
PACKAGING, STORAGE AND DISTRIBUTION OF SOFT DRINKS AND FRUIT JUICES

Selection of packaging
What factors should be taken into account when the selection of packaging is under consideration for a new product? How do I evaluate the likely performance of different types of plastic packaging? What factors should I consider? What do I need to look out for when selecting the closure? Where can I go for more help with packaging problems? Do cans pose a risk of metal pick-up to soft drinks? What special problems are likely to be associated with the use of returnable glass bottles? How does packaging relate to consumer expectations? What problems can I expect from the use of cartons? Are there any guidelines for sports closures?

Packaging defects
What are the most likely defects associated with glass bottles? Are cans likely to show particular defects? What inspection regime do I need to put in place to minimise the risk of any defective container reaching the consumer? Are there any types of defects that pose a special risk to the consumer? What is the best way to print 'best before' (BBE) dates on containers? Are there any guidelines relating to clear labelling?

Problems during filling and packaging operations
What are the most likely problems that can arise during packaging with any of the packaging types in regular use? Do such operational problems usually pose a threat to the integrity or safety of the product? What process quality checks should be in place to minimise the consequential problems of packaging defects? Do small changes in packaging need extensive trials? At what temperature should containers be after filling? What are appropriate carbonation levels for different products and container types?

Post-filling defects
What are post-filling defects and how do they arise? What special problems are posed when filled and closed packs are subject to tunnel pasteurisation? Are there any particular problems that can arise after secondary packaging is applied? What causes TEBO and what is the function of vertical slots in the threads of bottles containing carbonated drinks? What is stress corrosion of cans and how can it be prevented?

Storage conditions
How can I monitor the range of conditions likely to be experienced by my products between manufacture and consumption? What level of handling abuse do I need to consider when specifying secondary packaging? How quickly, in the event of a product recall, can I trace and withdraw a particular batch of product from storage and distribution? Are there particular storage conditions that need to be avoided for my products? What effect are strong aromas likely to have on stored products?

Distribution problems
How much do I know about the distribution network that handles my products? How much control do I have over the distribution network? Are there places where products are likely to be distributed out of order? How can damage during distribution be minimised?

HANDLING CONSUMER COMPLAINTS ABOUT SOFT DRINKS AND FRUIT JUICES

Recording and handling consumer complaints
What system should be in place for handling complaints? How should complaints be classified? Do customer complaints need to be justified? What procedures should a
manufacturer have in place to identify the likely cause of complaints and any corrective action necessary to prevent their recurrence? How quickly should a manufacturer respond to complaints? How can situations likely to result in a product recall be identified?

**Traceability systems and crisis management**

How effective should a traceability system be? Who needs to be in a crisis management team to deal with any major incidents? When is it necessary to obtain expert assistance in the event of a contamination incident? Where can further assistance be obtained to deal with complaints of a serious nature? Is it advisable to have a public relations advisor to deal with serious complaints? When do product problems require that enforcement authorities be informed and when should a product recall be instituted? What should be regarded as a complaint and what is a typical level of consumer complaints?

**ENVIRONMENTAL ISSUES IN THE MANUFACTURE OF SOFT DRINKS AND FRUIT JUICES**

How do I find out about which regulations and consents apply to my business?

What are the major sources of waste from my business?

Are all the necessary consents in place for me to discharge effluent?

Am I discarding valuable ingredients (such as sugar residues)? If so, can I recover all or part of them?

Am I meeting my obligations under the Packaging Waste Regulations?

Is there anything I can do to recycle any of my packaging components or to use recycled components?

Can I use recycled PET?

What is IPPC and does it relate to my business?

What is the Climate Change Levy and can I claim exemption?

Is my business affected by WEEE?

Do my containers have to be recyclable?

Are coloured plastics recyclable?

**REGULATORY ISSUES RELATING TO SOFT DRINKS AND FRUIT JUICES**

How much information should be available in product formulations?

How can compliance with legislation in markets other than that for which the product was originally designed be confirmed, and how can such information be kept up-to-date?

How can the fruit or juice content of a product be calculated for the purpose of declaring the QUID value or for confirmation of a claim?
How important is it to be able to access historical formulas?

Are current product labels accurate, up to date and legal?

Should the local Trading Standards Department (or other relevant enforcement authority) be involved in approving product labels?

How can nutritional claims be sustained, and how should nutritional data be obtained?

What does a responsible manufacturer have to do to keep up to date with statutory requirements?

Does allergen labelling apply to soft drinks?

What are the main statutory requirements with which a beverages manufacturer must comply in the United Kingdom?

What does a manufacturer need to be aware of when wishing to make nutritional claims for a product as listed in EU Regulation 1924/2006?

How is the nutritional value of a product calculated?

Are there any special health and safety issues that relate to soft drinks manufacture?