Unilever Bestfoods Beverages

GOOD MANUFACTURING PRACTICE
TEA PRIMARY PROCESSING
(Part B – Suppliers Use)

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INDEX

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1. Introduction

Unilever Bestfoods (UBF) products **must** adequately establish and reinforce the reputation of our **BRANDS** for both high quality and consumer satisfaction, whilst complying with relevant legislative requirements.

This document, **Tea Primary Processing Good Manufacturing Practice (GMP) Part B – Suppliers use,** specifies the minimum requirements for primary processing operations to ensure consistent quality products are produced conforming to UBF Mandatory standards in a safe, hygienic and environmentally friendly manner. It is relevant to **all** suppliers. It is used to define the reference for internal and external quality audits.

Some parts of this GMP may be more or less demanding than legal requirements. Where there are conflicting requirements, between local legislation and UBF, the most stringent ones **must*** be followed. Industry codes of practice should be considered.

This GMP covers facilities, equipment, operating procedures and skills spanning the supply chain from green leaf collection to storage and despatch of the made original or mixed black tea. It sets out the necessary **hygienic conditions for processing tea** which is safe and suitable for consumption. **It is complimentary to UBF Product Safety Policies and the UBF Consumer Safety Framework Standards**.

Deviations from mandatory requirements in this GMP **must** have written annual approval from UBF.

The document follows very closely Codex Alimentarius General Principles of Food Hygiene, (Ref. Http://www.codexalimentarius.net) as shown by its introduction that follows.

***See definitions section in this chapter.**

FOR ALL OTHER DEFINITIONS, REFER TO GLOSSARY (APPENDIX 8)

Codex Alimentarius General Principles of Food Hygiene

People have the right to expect the food they eat to be safe and suitable for consumption. Food-borne illness and food-borne injury are at best unpleasant; at worst, they can be fatal. But there are also other consequences. Outbreaks of food-borne illness can damage trade and tourism, and lead to loss of earnings, unemployment and litigation. Food spoilage is wasteful, costly and can adversely affect trade and consumer confidence.

International food trade and foreign travel are increasing, bringing important social and economic benefits. But this also makes the spread of illness around the world easier. Eating habits, too, have undergone major change in many countries over the last two decades and new food production, preparation and distribution techniques have developed to reflect this. Effective hygiene control, therefore, is vital to avoid the adverse human health and economic consequences of food-borne illness, food-borne injury and food spoilage. Everyone, including farmers and growers, manufacturers and processors, food handlers and consumers, has a responsibility to assure that food is safe and suitable for consumption.

These General Principles lay a firm foundation for ensuring food hygiene and should be used in conjunction with each specific code of hygienic practice, where appropriate, and the guidelines on microbiological criteria. The document follows the food chain from primary production through to final consumption, highlighting the key hygiene controls at each stage. It recommends an HACCP-based approach wherever possible to enhance food safety as described in *Hazard Analysis and Critical Control Point (HACCP) System and Guidelines for its Application (Annex).*

The controls described in this General Principles document are internationally recognised as essential to ensure the safety and suitability of food for consumption. The General Principles are commended to governments, industry (including individual primary producers, manufacturers, processors, food service operators and retailers) and consumers alike.

- Every company/supplier **must** have a written Product Safety and Quality Policy, Environmental Policy (Ref: Chapter 10), Occupational Health and Safety Policy (Ref: Chapter 9)

- Every company/supplier **must** ensure that its contents are fully understood at all levels within the organisation.

- Every company/supplier **should** communicate the principles of Good Manufacturing Practice to all departments.

  The Unilever Bestfoods "General Requirements for Food Third Parties (Contract Manufacturers and Suppliers)" **must** be followed and describes the general requirements of Quality Assurance Systems for both the Innovation and Supply Chains. Those details are not necessarily repeated here but are complimentary to this GMP document.

Scope

- This GMP covers the primary processing of green tea leaf (Camellia sinensis) from plucking at the field to production of made black tea (MBT). Processing and production of green tea, semi-oxidised tea (e.g. Oolong), and scented tea (e.g. Jasmine) **are not** covered in this GMP.

- It is recognised that there is more than one way to process a safe product. Whatever design and procedures are used, it is essential that they do not result in reduced levels of safety or increased levels of risk.

- Any future modification of the primary tea process **must not** lead to the inclusion of ingredients with unknown safety characteristics.

Definitions

In order to try and minimise confusion, words specifying the importance of various requirements and conditions are given the precise meaning shown below (refer also to Glossary, Appendix 8):

Must.	A practice that is, mandatory, for all UBF companies/suppliers.
Should.	A recommended practice that may become mandatory for all companies/suppliers in the future and that is compulsory in new investments.
Recommend.	Desirable, optional, preferred practice not necessary to be implemented.
Prevent (active).	Stop from happening, target zero occurrence.

The meaning of "avoid" is often ambiguous and, therefore, it is not used in the document, as it is not an acceptable principle of risk management.

Responsibilities

Each company/supplier should organise itself so that the technical, administrative and human factors affecting the quality of its products will be under control. All such control should be orientated toward the reduction, elimination and, most importantly, prevention of quality deficiencies throughout the total supply chain.

Structure of this GMP

Each chapter in the GMP states clearly both the objectives and the rationale behind it. Consumer use and predictable misuse are important aspects of product design and labelling and will be covered in the appropriate chapters of this GMP. NB: (Consumer abuse is **not** covered in the recommendations of this GMP).

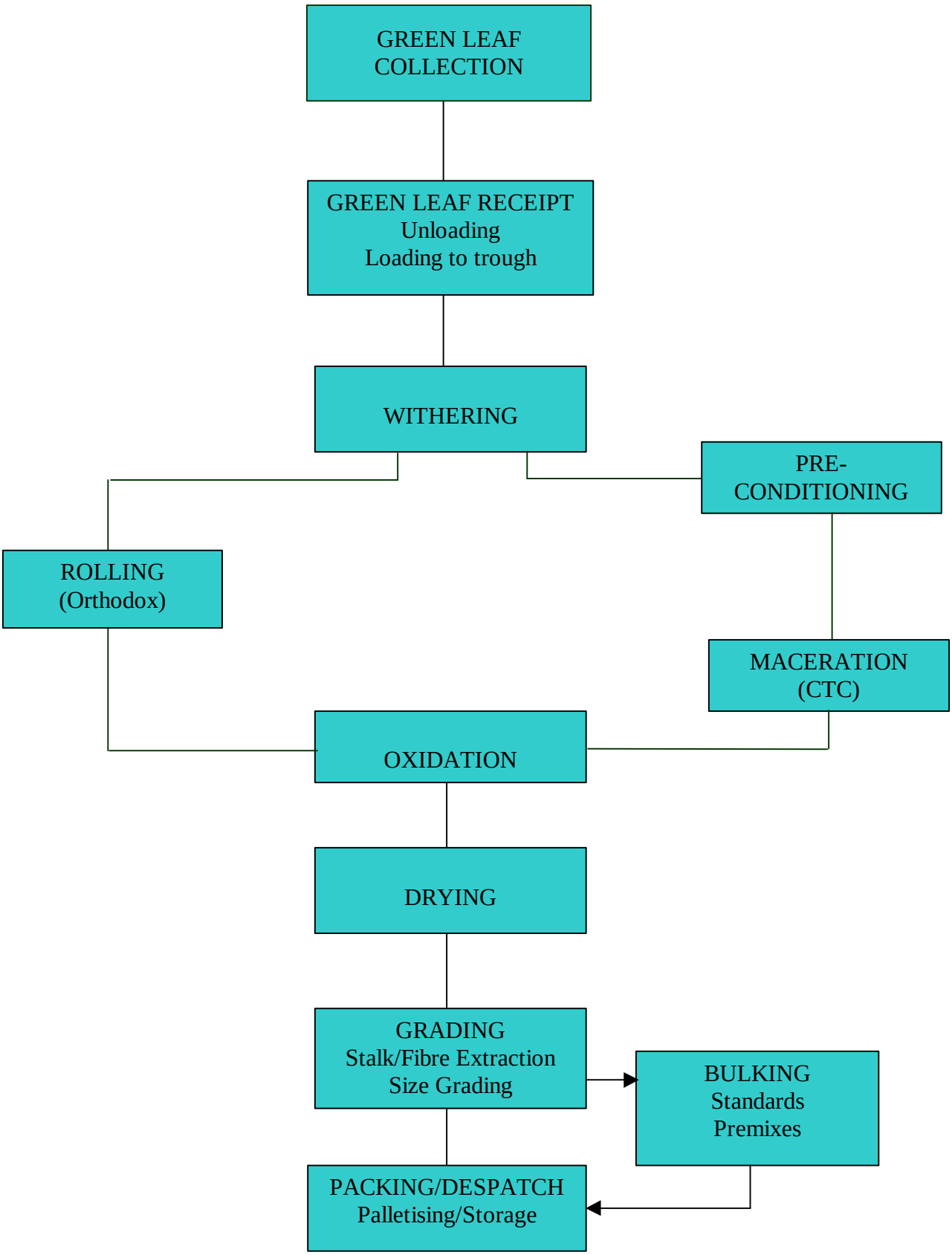
This GMP has "Generic Sections" as required by UBF which identify the general principles of hygienic manufacture. They are within the general headings shown in the Index and cover UBF policies/standards and procedures (Chapters 1-10).

There is a minimum of specific recommendations describing how to control or eliminate hazards.

The UBF requirement is that there **must** be a HACCP study for each production process, which **must** cover all products manufactured using that process. Guidance can be found in the UBF document SHE 12.4.

The GMP prescribes the use of HACCP for identifying and assessing safety hazards and risks associated with primary processing of tea leaves. To help with this, the Design Control Points (DCP's) for the various types of process are outlined in the Product Specific section (Chapter 11). This is intended to provide input to a systematic approach for the identification, assessment and control of the risks associated with realistic hazards. It **must not** replace an HACCP study because the study provides essential training for those involved in manufacture, besides providing an essential insight into the unique process conditions on a local manufacturing line. A general flow diagram is shown below.

General Primary Process Flowchart



CHAPTER 1 – INTRODUCTION

SUMMARY FOR QUALITY AUDITORS

- *Tea is grown on a cultivated bush (Camellia sinensis) and green leaves are harvested to process and produce MBT (Made Black Tea).*
  The purpose of this GMP is to set out the primary process design principles to produce beverage raw materials that are safe by design.

- *The scope of this GMP is limited to primary processing of green leaf to produce black tea from the harvesting and intake of green leaf to the despatch of made black tea.*

- *Where there are conflicts between local legislation and UBF directives, the more stringent **must** be followed.*

- *Every company/supplier **must** have a written Product Safety and Quality Policy, Environmental Policy and Occupational Health and Safety Policy and be able to demonstrate these have been communicated throughout the business, along with the principles of Good Manufacturing Practice.*

- *Each production process (covering all products) **must** have a current HACCP study for identifying and controlling hazards and risks. To help with this, design control points (DCP's) are outlined in Chapter 11.*

2. Product & Process Design

OBJECTIVES

To produce Made Black Tea (MBT), that is designed to meet specified requirements for safety, quality, processability, manufacturing, storage, and stability.
To clearly define existing requirements, sources of information and possible gaps in current understanding, that limits development.

RATIONALE

The control of safety and quality hazards is achieved by proper product design based on preventative measures that assure safety and suitability of made black tea and its packaging.

It should be noted that where UBF requests the development of any new tea product the Unilever Innovation Process Management (IPM) tool **must** be used. The process includes the use of the Innovation Funnel. (UBF Ref. Http://ipm.unilever.com)

2.1 Design Principles: Control of Product Quality

2.1.1 From wet leaf to dry tea

The overall objective of primary tea processing is to develop the characteristic aspects of black tea by a process called oxidation. Discussion of the chemical changes caused by this process is outside the scope of this document.

Key to the preservation of the long term storage stability and quality of MBT is low moisture content. Machineability, processability, product stability and shelf life of tea as a finally packed retail unit is affected by the moisture content and shelf life is best preserved at low moisture levels. The moisture content and shelf life, of the MBT, **must** be specified in its product design specification and the moisture level set as low as reasonably practical. It **must not** exceed 5%.

The reference method for moisture determination is Unilever Method of Analysis (UMA) UMA 0708 (Determination of loss in mass at 103^{o}C), based on ISO 1573-1980.

The shelf stability of MBT products is strongly dependent on the moisture content of the tea. At the end of the drying process the moisture level is typically 2-4%, but during grading and storage moisture will be picked up from the environment (typically 0.5-1%).Shelf stability is best achieved by even drying of tea, prevention of condensation on (hot) dried tea before bulk packing and good protection against moisture and water. Experience shows that by not exceeding 5% moisture level, tea quality can be preserved for up to two years.

2.2 Design Principles: Control of Microbiological Contaminants

Microbial contamination of tea can lead to safety and quality hazards. Quality hazards can be caused by uncontrolled microbial development during processing (withering and oxidation) of

wet leaf e.g. by inadequate cleaning of plant leading to too high microbial loads on equipment and quality loss due to microbial oxidation. Mould growth due to insufficient/ineffective drying is another possible source for quality loss of microbial origin. All these aspects should be included in the HACCP study of the operation from field to MBT.

Safety hazards are caused by the presence of bacterial pathogens such as Salmonella. Pathogens can gain access to the tea via environmental contamination in the field (birds, animals, pests) or by infestation with pests in the factory or by human contact if sanitary facilities and practices are not adequate. All data so far indicates that the probability for contamination of MBT with pathogens is very low, but it is good to realise that the drying process applied will have contributed to this.

2.2.1 Microbiological Stability and Quality

Within the tea processing area green leaf is brought into the factory and is "wet" until the drying operation. To prevent the potential transfer of bacteria from wet leaf, wet/damp tools and equipment, wet floors/shoes, a suitable separation **must** be constructed between the processing area and the dryer discharge thus separating the "wet" end from the "dry" end. (Refer Chapter 8.2.7 for details). Tools and equipment used in the wet area **must not** be transferred to or used in the dry area to prevent the possibility of cross contamination. The sorting area **must** then be treated as the hygiene area with doors closed and strip curtains in place, windows closed and fine meshed where openable, adequate and effective dust extraction management, ventilation, pest control procedures and foreign body control. Tea should be dried to 2-4% moisture content.

The microbiological quality of tea is measured in the form of a number of microbiological parameters: Aerobic Colony Count (or "Total Viable Count"), coliforms or Enterobacteriaceae, yeasts and moulds. UBF specifications for tea are given in Appendix 2. They are split into mandatory requirements for pathogens, which **must** be met, and guideline values for general hygiene criteria, which should be met. In a number of countries legal limits exist for tea and where these limits are stricter these **must** be respected.

2.2.2 Microbiological Safety

Infectious pathogens such as Salmonella are not usually associated with black tea, but can occur if mishandling or poor storage has been allowed. This is because tea is rarely contaminated with pathogens and the processing/drying of the tea leads to inactivation of heat sensitive pathogens. For this to happen it is important that the actual execution of the drying process is critically monitored to ensure that a defined reduction of pathogens is achieved. The target to be achieved is reduction by a factor 1000.

In the drying of tea it is common to set an upper time and temperature to prevent burning of the tea and quality loss. Similarly a minimum time and temperature must be specified and met to achieve the above pathogen reduction. It should be noted that **wet** tea processed quickly at high temperature (above $90^{o}C$) will cause inactivation of the heat sensitive microbial pathogens whereas holding **dry** tea for extensive periods at the same temperature may have no effect at all as dry microbial cells are very resistant to heat.

The design objective of the drying operation is to achieve a reduction of pathogens in order to meet the UBF requirement for safety.

The UBF specification for all tea products is the absence of Salmonella.

2.3 Design Principles: Control of Chemical Contaminants

Tea is subject to contamination with a range of chemicals (heavy metals, pesticides, etc.). Their possible presence is a point of concern in view of long-term safety hazards or the perceived safety. These hazards **must** be controlled to assure levels, which are within (tight) legal and UBF limits.

Information on most of the known chemical hazards of concern can be obtained from UBF and are found in the Lotus Notes "Chemical Contaminants in Raw Materials", in the "prioritised list" contained in this database (Tea – Camellia sinensis).

High risk chemical contaminant hazards, which **must** be considered in a HACCP study, are listed here and these may include (dependent on material used) heavy metals (e.g. Lead, Cadmium), mycotoxins (aflatoxin B and G), organochlorine and organophosphorus pesticides, polycyclic aromatic hydrocarbons (PAH's).

One of the contaminants easily overlooked are batching oils from jute bags ("hessian bags"). Jute bags may have a significant percentage of mineral oils, which could be transferred to the tea in case of a missing or damaged liner. The use of Kraft paper sacks or jute bags with food grade oil can eliminate this contamination.

Radioactive contamination of tea from particular sources may be another hazard to consider.

Potential chemical hazards **must** be identified in a HACCP study with means to control these hazards.

The above chemical contaminants are typically related to teas from a few origins only. Appendix 3 gives a summary of realistic hazards as input to the HACCP study. The hazards in this appendix are derived from the Chemical Contaminant database and should be checked against any new findings by reference back to UBF.

Mycotoxin formation in mouldy tea is a point of concern, but there is no evidence to date for aflatoxin formation in commercially available tea.

A survey of some existing and forthcoming pesticide maximum residue limits (MRL's) for tea is given in Appendix 4 of this GMP.

UBF carry out a programme of monitoring for chemical contaminants in line with the HACCP study to provide evidence that the hazards identified are in control. Guidance about this can be obtained from UBF.

Typical transport contaminants that cause taint (halophenols and haloanisols) **must** be equally considered in an HACCP study. Such taints may arise from preserved, wooden pallets, which have been treated with chemicals to control microbial degradation.

This type of taint can be prevented by selection of pallets, which are not preserved with agents containing the above chemicals (see Appendix 3).

Proper monitoring and application of any pest control agents within the tea processing factory **must** be assured to prevent contamination of final products.

2.4 Design Principles: Control of Physical Contaminants

Contamination of tea with foreign bodies like foreign leaf, string, wood, paper, stone, earth, plastic, metal, dead insects, glass etc, **is a known and significant hazard.**

The contamination can be perceived as a safety hazard or as an aesthetic hazard. It may prove difficult to eliminate physical contaminants totally, but every effort **must** be made through HACCP to control these hazards. Absence is the target and their presence **must** be controlled to meet specification.

Some physical contaminants arise in the green leaf e.g. foreign leaf, stone, earth, wood, and plastic before they reach the factory. A system **must** be in place to monitor and eliminate as much as possible before receipt into the factory. Some physical contaminants can arise during processing (plastic, wood, metal, glass). In the product design phase, measures **must** be taken to control or minimise the presence of these contaminants.

MBT **must** be packed in multi-wall Kraft paper sacks with polyethylene/ aluminium liner, as specified in ISO standard 9884 Parts 1 and 2 unless agreed and approved in the contract by UBF. Tea chests **should not** be used, as they are a known source of foreign bodies e.g. (saw dust, nails, wood, aluminium foil).

The overall approach to control physical hazards is the application of HACCP within the factory and close co-operation with the green leaf growers/suppliers to eliminate physical contaminants before entry to the factory. Systems to control metal contamination (magnets) and sieves **must** be used in the appropriate places as identified in the HACCP studies.

A “no glass” policy **must** be implemented.

2.5 Design Principles: Control of Allergens

Allergens are not normally associated with tea but the unintended presence of trace amounts of allergens such as nuts, egg, milk products and the like could cause significant health hazards for the consumer. More information on allergens can be obtained from UBF and reference to Appendix 6

CHAPTER 2 - PRODUCT & PROCESS DESIGN

SUMMARY FOR QUALITY AUDITORS

- *It should be noted that all new tea developments **must** make use of the Unilever Innovation Process Management Funnel.*

- *Moisture content of the Made Black Tea **must not** exceed 5%.*

- *To prevent the potential transfer of bacteria from the wet area to the dry area a suitable separation **must** be constructed between the processing area and dryer discharge thus separating the "wet" end from the "dry" end.*

- *The sorting/grading/packing area becomes the hygienic area and **must** be closed (strip curtains for doors, fine mesh for openable windows, adequate and effective dust extraction, ventilation, pest control and exclusion of foreign bodies).*

- *Microbiological legal limits and standards **must** be met as described in Appendix 2 through regular testing of the MBT.*

- *Drying **must** be controlled and adequate to inactivate heat sensitive pathogens.*

- *Chemical contaminants **must** be controlled through the use of HACCP (and comply with legal limits). Reference should be made to Appendices 3 & 4. Records of tests made **must** be maintained.*

- *Physical contaminants **must** be controlled through the use of HACCP. Good agricultural practices and inspection/control procedures **must** make every effort to eliminate foreign bodies before entry into the processing factory. In the processing factory systems and procedures **must** be in place to eliminate foreign bodies entering or caused by the process (typically magnets and sieves).*

- *Allergens **must** be controlled by the HACCP process (Ref: Appendix 6)*

- *Multiwall Kraft paper sacks with PE/AL liner should be used as the packaging format for tea supplied to UBF companies and **must** comply with ISO 9884 Parts 1 and 2 and Appendix 7.Other packaging formats **must** have UBF approval.*

- *A "no glass" policy **must** apply throughout.*

3. Raw Materials

OBJECTIVES

Green leaf is not consumed as such, but is the only component being processed to produce black tea. For this reason it is essential:

- To select and buy green leaf according to agreed specifications to achieve the desired organoleptic, physical, chemical, microbiological and quality standards of the made black tea (MBT).
- To ensure the green leaf is transported and received at the processing site in an appropriate manner and according to specification.

RATIONALE

Green leaf is an agricultural material and as such there is no perfect control of the raw material due to product heterogeneity and seasonality. Therefore knowing the source of raw material and its associated hazards, promoting Good Agricultural Practices and assessing green leaf samples before purchasing/processing are key elements of the quality assurance programme.

3.1 General

Leaves should be transported quickly to the processing factory in a manner that keeps them fresh and undamaged.

The key issues to ensure good quality products are:

- Maintenance of plucking standards.
- Not allowing leaf to heat up (exothermic reaction in cell).
- Gentle handling so as not to damage the leaf (no rupture of cell membrane).
- Protection against contamination.

3.2 Green Leaf

3.2.1 Raw Material Buying Principles

Green leaf tea buying requires relevant expertise to assess, select and purchase the leaf, to manage the original leaf supply chain and prepare made black tea standards (MBT).

All Companies/Suppliers **must** have their own buying and leaf standards preparation criteria.

Green leaf may be supplied to a factory from owned and managed tea bushes or from third party suppliers (outgrowers/small holders). All sources of supply **must** be approved by the company

through a positive audit. All suppliers **must** conform to Good Agricultural Practices and be contracted to supply green leaf to appropriate regional, international and legal standards. **These standards typically will not include limits for pesticides, heavy metals or other chemical contaminants or microbial contamination as these hazards are controlled by Good Agricultural Practice and can not be checked at point of purchase**. All suppliers should have a copy of the agreed G.A.P. and appropriate quality and foreign body specification, which should be signed by both supplier and purchaser where appropriate. In the case of individual small holders they **must** be made aware of the specification and agree to comply. All suppliers **must** have a copy of the agreed plucking standards and purchasing conditions signed by both supplier and purchaser where appropriate or in the case of individual small holders they **must** be made aware of the standards and agree to comply.

3.2.2 Selecting and Buying Leaf

All leaf purchasing **must** be based upon approval by the leaf quality purchasing expert at the purchasing point.

Sampling will include:

- Compliance with leaf pluck standards. Each operation **must** have its own "Leaf Pluck Standards" dependent upon its requirements for final product quality and the availability/agricultural standards from outgrowers or own gardens
- Assessment of wetness of leaf (normally by visual inspection/feel/experience, which could lead to a reduction in payment due to weight of water on leaf). This is particularly appropriate if leaf is bought from third parties.
- Foreign bodies exclusion e.g. All foreign leaves, oily leaf, stones, earth, insects, animal life etc.
- Yield of leaf versus stalk etc. may be a requirement in own company grown leaf (e.g. shoots/kg). This is normally also part of the leaf pluck standards.
- Weight and registration for payment.

All companies should have a written agreed procedure in the event of rejection of any leaf purchasing opportunities for whatever reason.

3.2.3 Collecting Points and Process.

- Purpose

Hand (and hand held machine) plucked leaf will typically be received in baskets, sacks, wraps etc. and brought to a collecting/purchasing point in the gardens (or direct to factory compound in some cases), which would have vehicle access for onward transportation**. The collecting site is a key incoming quality control point.**

- Construction of Collecting Point

Ideally a simply constructed, block work, building with a smooth clean concrete floor should be used. The building should be well aerated but solid from floor to 1m height and designed to deter sheltering wildlife.

It **must** contain no glass objects (lights, where used, **must** be well protected). It **must** be conducive to the exclusion of foreign bodies.

Should solid collection points not be available the use of clean, sound tarpaulins in a manner which will exclude foreign body contamination is sufficient. Tarpaulines **must** be maintained exclusively for green leaf collection and should be included as part of the HACCP study.

- Activities of "expert" leaf buyer

The leaf buyer **must** assess the leaf quality according to the plucking standards and decide on acceptance or rejection.

- Activities after purchasing

Where appropriate the leaf should be spread out on the collecting point floor to a carpet depth of between 30-50cm depending on the seasonal quality difference and weather conditions. The residence time here should be as short as possible and all leaf should be transported to the factory within 16 hours from the time of purchase to ensure maximum control of the withering leaf within the factory. Where leaf is purchased from third party suppliers and not spread in the collecting points but stored in woven PP sacks until collection the maximum residence time should not exceed 9 hours. In some areas leaf is delivered direct to the factory and spread into troughs. Whatever system is used adequate control procedures **must** be implemented. FIFO should be implemented to maximise quality and a traceability system should be in place to enable a link between MBT and tea collected from purchasing points. It is recommended that traceability to individual outgrowers is preserved.

Transport to the factory

Wrapped green leaf should be kept as cool as possible, loosely packed and not exceed a weight of 40 kg in wraps or 15/18kg in sacks, be despatched as soon as possible and be covered during the journey
Where sacks/wraps are used they **must not** provide a source of chemical or physical contamination of the green leaf. Jute/Hessian sacks **must not** be used.

Where bulk transportation of leaf is used all procedures and limits **must** be defined.
Where a third party transport company is used a contract **must** be made and include details of:

- Cleanliness and suitability for use of all transport vehicles with inspection checklist.
- Maximum weight of each truck load and stacking method to minimise damage.
- Maximum direct transport time to factory should be no more than 2 hours. There should be no stopovers.
- Written procedure in the event of a vehicle breakdown, accident or delay.

If own transport is used the above principles also apply.

3.2.4 Intake Controls

- Traceability

All leaf entering the processing factory should be weighed. Weight, date, time, vehicle registration number, identification, origin data etc. **must** be recorded for traceability purposes.

All intake procedures **must** be documented with controls and checks recorded. A sample from each delivery **must** be taken and sent to the laboratory to check the following

- Green Leaf Quality

Measure the green leaf quality against the standard documented standard e.g. (shoots/kg). (Refer to Chapter 3.2.2). A procedure **must** be in place to deal with out of specification leaf.

Other Checks

- Foreign Bodies

No foreign body should be present. This is normally checked in the withering troughs.

- Moisture Measurement

Traditionally, the moisture content of leaf is assessed by expert staff during the withering process, to set or adjust the withering parameters. It is considered good practice to measure this with an instrument and record changes and settings if a real benefit can be achieved.

- Microbiological Contamination

Routine testing of original leaf is not required, but it is recommended to do so when problems are suspected. Microbiological monitoring of primary tea processing is covered in Chapter 2.

- Chemical Contamination

Pesticides and heavy metals need only be monitored by tea source in line with the hazards identified in the HACCP study. See Appendix 3 “Chemical Contaminants”, 4 “Maximum Pesticide Residue Limits”. This is typically done by monitoring adherence to G.A.P.
Any out of specification tea **must** be separated and blocked.

CHAPTER 3 - RAW MATERIALS

SUMMARY FOR QUALITY AUDITORS

- *Green leaf buying requires relevant expertise to assess, select and purchase the leaf, to manage the original leaf supply chain and prepare made black tea standards (MBT).*
- *All Companies/Suppliers **must** have their own buying/selection and leaf standards preparation criteria.*
- *All sources of supply **must** be approved and conform to Good Agricultural Practices.*
- *All suppliers and company estates **must** be aware of the agreed specification and plucking standards.*
- *All leaf acquisition **must** be approved by the "expert".*
- *Collecting and receiving points **must** be well aerated, properly managed, and free of glass and exclude foreign bodies.*
- *Experts **must** assess plucking standards. Leaf should be transported to the factory in as short a time as possible but < 2 hours.*
- *When using a third party transport company a contract **must** be made.*
- *All tea entering the factory should be weighed and the origin **must** be documented for traceability.*
- *Intake controls include weight, assessment of leaf quality and foreign body content.*
- *Microbiological examination is not necessary at this stage.*
- *Chemical contamination need only be measured in line with hazards identified in HACCP study. This typically will include monitoring adherence to Good Agricultural Practice.*

4. Packing Materials

OBJECTIVES

To ensure that, by correct selection, handling and use of Packing Materials, the containment, safety and quality of the product is maintained throughout the supply chain.

Key elements for the achievement of these objectives are:

- Pack design.
- Toxicological acceptance.
- Product compatibility.
- Protection from environmental conditions.
- Protection from conversion/transit damage.
- Customer usage.

RATIONALE

The correct selection, handling and use of Packing Materials will result in conformity for the product, producer and customer.

4.1 Introduction

Packing Materials have functions that require attributes achieved by methods.

- **Functions** Containment of product.
  Protection.
  Customer usage satisfaction.

- **Attributes** Need to satisfy the following criteria:
  - Safety.
  - Environmental.
  - Usage - filling (Processor).
  - Usage - emptying (Mixer).
  - Functional achievement.

- **Methods**
  - Approved supplier.
  - Correct specification.
  - Suitable transport.
  - Suitable warehousing.
  - Lot identification.
  - Correct product description and legal declaration (weight).
  - HACCP.

4.2 Packing Materials – Black Leaf Tea (Specifications)

These typically could include:

Containers:
- Paper/foil sacks (Kraft).
- Gunny sacks (Jute/PE).
- Cartons/PE Bags.
- Big bags (also used as bulk containers).
- Wooden chests (not recommended).

> The currently preferred container, especially for export (but not exclusively), is the multiwall Kraft paper sack with PE/AL liner as specified in ISO 9884 parts 1 & 2. Construction materials used **must** be free from recycled paper and conform to the regulations in Appendix 7.

Where alternative packaging to Kraft PE/AL lined sacks are used, approval **must** be obtained in writing from the buyer and consideration made of the following:

- Staples.
- Adhesives.
- Thread.
- Tape.
- Metal edging strips.}
- Wood. }for on site chest construction
- Nails. } (not preferred).
- Aluminium foil. }
- Paper. }

Hazards presented by these materials may include:
- Contamination from recycled paper/board. Packing material in direct contact with black leaf tea **must not** contain recycled paper/board.
- The use of PE liners in direct contact with tea should be discouraged as there is a risk of sweating and subsequent mould growth where there are high temperature differentials.
- Tainting from printing ink solvents, adhesives etc.
- Mould growth from poorly stored packing materials e.g. sacks, cartons etc.
- Tainting from wood (chests).
- Nails from chest construction.
- Foreign bodies inside pre erected chests.
- Contamination from recycled big bags – e.g. mould, taints and foreign bodies, etc.
- Chemical contamination from gunny (Jute) bags. Mineral oils used as batching oils should be replaced by food grade oil. (Refer to IJO standard 98/01 - Indian Food Grade Jute Bag).

4.3 Suppliers

All Packing Material suppliers **must** be approved using the Unilever Bestfoods Supplier Management Manual/System. Approval should include the following criteria:

- Risk analysis.
- Audits.
- Vendor rating
- Corrective action meetings.
- Factory trial systems.

A list of Approved Suppliers should be maintained and used.

Proof of Suppliers Process Control should be obtained. This may be by:

- Certified delivery.
- ISO 9000 certification.
- Batch related control charts.

4.4 Intake Control

Intake inspection **must** be carried out for condition of transit vehicle and signs of damage/contamination of materials. Material identification and Lot coding should be recorded.

Quality checks of material attributes should be used if risk analysis requires them, but the emphasis should be on process control of the supplier.

4.5 Document Control

All documentation concerning packing materials such as specifications, Q.A. procedures and vendor assurance should be controlled and stored for reference purposes in the event of customer complaint, transit damage, legal requirements or audit purposes.

4.6 Transport, Warehousing, Palletising & Storage

All transport condition requirements should be advised to suppliers and hauliers to prevent contamination and damage. This should include consideration of:

- Vehicle type/suitability.
- Previous use.
- Integrity (damage/hygiene).
- Joint loads (contamination).

The method of transit protection of all packing materials, together with pallet configuration (e.g. layer pads etc.) should be specified to ensure receipt of undamaged loads.

All Packing Materials **must** be stored off the floor, preferably on pallets, and protected against contamination.

Pallets may be of wood or plastic. Whatever the material used, they **must** be clear of taints, odours, soiling and fit for the purpose. Wooden pallets **must** be dry, free of visible mould and treated with approved fumigants only. Pallets **must not** be constructed of timber preserved with PCP (Pentachlorophenol). Ref. Appendix 3.

All Packing Materials **must** be clearly identified and stored in designated areas to allow FIFO to take place.

Packing Materials in storage should be managed to take account of recommended storage conditions and shelf life.

Warehousing **must** conform to UBF requirements for Food usage. Refer Unilever Bestfoods General Requirements for Third Parties (Contract Manufacturers and Suppliers. Chapter 7).

Primary Packing Materials in production use **must** be tracked and recorded for traceability requirements. Usage of packing materials in production areas **must** be included in the HACCP study and plan.

4.7 Environmental Aspects

Attention should be given to the following areas when selecting and using packing materials:

- **Supply of Base Material**
  Sustainability of Resource.

- **Supplier Material Processing**
  Process Energy consumption.
  Process Waste products.
  Waste product disposal.

- **Producer Material Conversion**
  Conversion Energy consumption.
  Conversion Waste products.
  Waste material disposal.

- **Recycling of Material (for reuse)**
  Kraft paper sacks, cartons, gunny bags, big bags, may be reused when due attention is given to possible (foreign body) contamination resulting from defective packs. To prevent cross contamination due to tea residues or external contamination, all reused packs should have new internal liners.

4.8 Disposal of Redundant Material

Packing material can be described as redundant for the following reasons:

- Unusable through age – shelf life.
- Unusable through damage – self inflicted.

Disposal of packing materials is dealt with under the Environmental Chapter 10.

4.9 Printed Information

Printed information should include:

Type (grade).
Weight.
Origin
Manufacturer
Garden mark.
Invoice number.

And may also include:

Production Date
Shipping marks.
Port of destination.

CHAPTER 4 – PACKING MATERIALS

SUMMARY FOR QUALITY AUDITORS

- *The correct selection, handling and use of packing materials are vital to the overall acceptability of the product throughout the supply chain.*

  The product/process design should take account of the following key points in order to achieve this acceptability:

  ***Toxicological clearance** – **must** be obtained for all primary contact packaging materials.*

  ***Compatibility with the product** – this applies to all primary packaging materials and contact construction materials.*

  ***Functional acceptance** should include:*
  Filling/sealing suitability trials.
  Handling/emptying suitability trials.

  ***Product containment/protection** should include:*

  Storage testing under controlled environmental conditions to check moisture/oxygen transfer and may be by reference to UBF Approved grades/design.

  For transit protection materials, acceptance should include transit testing under monitored conditions.

  ***Correct Specifications,** fully agreed, between customers, producers, quality departments and buyers **must** cover all of the above points.*

  ***Suppliers must** be approved and monitored by verification through audits, performance records and regular contact.*

  ***Transport and Warehousing** should be specified in contracts, working procedures and should conform to UBF standards. This **must** include Lot marking for traceability. Intake inspection **must** be carried out for condition of transit vehicle.*

- *Environmental requirements should be addressed with reference to Chapter 10.*

- *The packing material contribution to the total supply chain should be reviewed regularly with regards to ongoing innovation and impact reduction.*

5. Processing

OBJECTIVES

To convert acceptable Green Leaf into Made Black Tea (MBT) of desired/specified quality and grade through the use of effective processing equipment and control systems.

To pack the graded tea into protective, secure packaging containers to preserve product quality and safety.

RATIONALE

Product conformity to specification can be assured by using suitably controlled processes.

5.1 General

- There **must** be a comprehensive product specification against which each activity is measured. Processing breaks down into a number of discrete stages (refer to General Process Flow Diagram on page 7).

Documented work instructions/operating procedures **must** be available for each stage, they should identify how to operate the equipment, and include any Critical Control Points (CCP's) from HACCP studies, and Quality Control Points (QCP's) identified from the quality plan.

Where operators are required to make non-measurable judgements about product quality these should be backed-up with written explanations and/or approved visual standards using drawings, photographs or actual physical samples.

When quantifiable measurements are taken e.g. moisture, temperature, weight etc., these should be done using calibrated equipment and test methods **must** stipulate frequency of testing, target, limits and action values. Results **must** be recorded using either hard copy or computer systems. It is recommended that Statistical Process Control (SPC) techniques are considered to control product parameters.

Because green leaf attributes are affected by seasonality and ambient operating conditions vary from location to location, processing parameters need to be monitored, controlled and adjusted to achieve the desired result.

The drying of tea is the key operation as this stage acts as a type of pasteurisation and gives a significant reduction in microbiological hazards. It **must** be controlled to specified limits.

The sorting/grading/packing area **must** be treated as the “hygienic” area. This should be dry (no wet cleaning), suitably separated from the processing area, before the discharge of the dryer, and **must** be suitably constructed to prevent the ingress of insects/birds etc. (Refer Chapter 8.2.7 for details). The area **must** be adequately fitted with effective dust extraction that complies with local Occupational Health and Safety regulations and **must** eliminate any explosion and fire risks associated with tea dust. (Guidance can be obtained from UBF).

If control systems identify product that is out of specification, there **must** be a formal system for the identification, rework and disposal or release of any affected product.

Regular management reviews of reasons for all non-conforming products, and wastage levels should be made. A planned preventative maintenance system should be in place to ensure process lines run efficiently. This should be monitored and corrective actions undertaken in the case of non-compliance. (Refer to 5.8)

The processing function **must** be audited to ensure compliance.

5.2 Key Processing Steps

Unilever Bestfoods have systems and procedures in place which set certain standards and good practices to maintain good, consistent quality of MBT. These parameters of course differ depending on the process employed. Should any company wish to discuss this further then please contact the buying company. The key processing steps are seen as follows:

- Withering
- Rolling
- Pre-conditioning
- Cell disruption
- Oxidation
- Drying
- Sorting/Grading

5.3 Storage

The made black tea (MBT) **must** be stored in protective containers to ensure no additional moisture pick up before bulking and/or packing. Storage containers when used should be constructed of materials which are of approved food grade (not wood) and **must** have protective covers. The cleanability of the containers **must** be ensured.

All the storage containers **must** be labelled and identified.

5.4 Packing/Coding

Both gravimetric and volumetric filling systems can be used for the dosing of the product. The dosing system **must** be capable of filling to the required target weight to meet local weight legislation. All weighing equipment **must** be calibrated and records maintained. If gross weighing is used, then regular weighing of the relevant packaging materials **must** occur to ensure that this is not a source of inaccuracy.

The packaging formats **must** comply with UBF requirements identified in chapter 4.

Each package **must** be properly labelled and coded as per details given in Chapter 6.1.1 - Finished Products.

5.5 Palletising

This is an optional stage depending on the distribution systems within the country of production and or the customer's requirements. Where palletising is used, there **must** be a standard pattern for each type of packaging format. The pallets should be stabilised by the use of straps, stretchwrap, layer boards. Pallets **must** comply with the requirements specified in Chapter 4: Packing Materials.

5.6 Despatch

Finished product **must** be transported in clean vehicles. Care **must** be taken to ensure that the safety and quality of the product is maintained during transportation and that damage to the pack is prevented. Distribution/warehouse centres should be audited annually to ensure hygienic warehousing conditions.

Procedures should be in place with appropriate actions to be taken in case of damage or in case distribution/warehousing conditions are out of specification.

5.7 Reclaim

A written reclaim procedure **must** be in place and understood for all rework situations. In a tea processing operation there are a few areas where green leaf or MBT can be reworked.

Foreign body contamination of incoming green leaf

Where the incoming green leaf has foreign body contamination e.g. foreign leaf, stones, sand, plastic etc. the leaf **must** be resorted.

Spillage of green leaf in the processing factory

Green leaf can spill on the floor from process equipment, transport belts etc.

All leaf that falls on the floor or falls on non-operational parts of the machinery **must not** be reclaimed. If certain parts of the process inherently spill leaf then it is common practice to place a PE sheet/steel tray on the floor. All leaf collected on the PE sheet/steel tray should be replaced into the process before the end of its cycle. The use of clearly identifiable bins for scrap leaf and reuse leaf **must** be used.

Spillage of MBT in the sorting/grading area

MBT can be spilt in the grading area. Any tea accidentally spilt on the floor in a heap can be collected manually by use of a steel/plastic shovel; however the layer in contact with the floor **must** be disposed of. All reuse tea **must** be checked by QA before re-entry into the process. Clearly identifiable bins **must** be used for scrap tea and reuse tea.

Does not meet grade specification

If the tea does not meet the grade specification, e.g. not dry enough, it can be passed through the dryer again. Mixed tea can be passed through grading sieves again.

In all instances reclaim is only allowable if it is certain that the product has not been contaminated by dust, oil, taint, foreign bodies or other products.

5.8 Planned Preventive Maintenance

Factories should have a documented planned preventive maintenance programme in place, which covers all aspects of the mechanical, electrical and civil maintenance required for a high level of operational efficiency.

The aim of this is to ensure that plant/machinery breakdown does not contribute to the risk of Quality and/or Consumer Safety issues occurring in the finished products.

CHAPTER 5 - PROCESSING

SUMMARY FOR QUALITY AUDITORS

- *There **must** be a product specification that should identify all microbiological, chemical, local legal requirements, quality and organoleptic/sensory parameters.*

- *Processing parameters can be varied dependant on seasonal and ambient operating conditions.*

- *Drying of tea is a type of pasteurisation and considered key to producing a safe product. It **must** be controlled to specified limits.*

- *A suitable separation **must** be constructed between the wet end of the processing area and the discharge of the dryer to prevent potential bacterial contamination.*

- *The sorting/grading/packing area **must** be considered as an hygienic area where the following **must** apply:-*

    - *Doors **must** be closed and fitted with strip curtains.*
    - *Openable windows fitted with a fine mesh.*
    - *Dry cleaning only.*
    - *Fitted with effective dust extraction where necessary.*

- *All processing procedures **must** be written and include how to operate the equipment with all CCP's and QCP's identified from HACCP studies.*

- *Written process control procedures and methods with limits, targets and corrective actions **must** be available.*

- *All measuring instruments **must** be regularly calibrated and recorded.*

- *Product traceability throughout the process **must** be maintained and sufficient data recorded on final package.*

- *Rework/reclaim **must** be defined and a policy/procedure in place.*

- *The processing function **must** be regularly audited.*

- *All packaging and pallets **must** comply with the specifications in Chapter 4 and Appendix 7.*

6. Finished Products

OBJECTIVES

To manufacture, store and distribute products to meet the design requirements with respect to:

- Microbiological, Chemical and Physical hazards.
- Key product attributes Customer satisfaction and Legal requirements.

Products to bear appropriate information to ensure that:

- Information is available to the next person in the food chain to enable them to handle, display, store and use the product safely and correctly.
- Legal requirements are met.
- The lot or batch can be identified and recalled in the event of a problem.

RATIONALE

Customers should receive finished products according to the designed quality, together with the necessary information to store and use the product safely.

6.1 Finished Products Specifications

All finished product specifications **must** be written and be part of the QA procedure. There should be an associated document that identifies sampling, testing and recording procedures to monitor the safety and quality standard of the produced products. The QA procedures should be identified, implemented, maintained and reviewed on the basis of the principles of HACCP. The product should be in line with the principles as discussed in Chapter 2: Product & Process Design.

Products **must** be clearly identified and where possible, be kept in a dedicated area. When products are on hold because of failure to meet the specifications, or for other reasons, release **must** only be carried out through a formal release procedure.

6.1.1 Labelling and Coding

Each individual consumer unit **must** be coded in such a way that it can be traced back to a defined batch.

- Type (grade).
- Weight.
- Origin.
- Manufacturer.
- Garden mark.
- Invoice number.
- Production Date.
- Shipping marks.
- Port of Destination.

6.1.2 Microbiological Specifications/Analyses

Reference should be made to Appendix 2 Microbiological specifications.

Salmonella

For all products, the following limits **must** be met, in line with legal limits and the UBF guideline on Salmonella: **Salmonella absent in 5 samples of 25g.**

Infectious pathogens, e.g. Salmonella are normally not present in black tea because the processing/drying stage leads to inactivation of heat sensitive pathogens. However, due diligence testing and recording of trends is recommended.

Frequency of Microbiological analysis

Limited end product testing is recommended, e.g. quarterly (in line with the parameters outlined in Appendix 2) in order to demonstrate compliance to specifications.

6.1.3 Chemical Parameters

Suppliers **must** comply with the contractual specification. Reference should also be made to Appendices 3 & 4. Because there are increasingly strong national/international legal limits then these hazards **must** be controlled and so periodic due diligence testing and trend recording should be conducted.

6.1.4 Physical Parameters

All tea grades are processed to a specific leaf size/bulk density and **must** comply with the product specification in respect to:

- Size.
- Bulk density.
- Sieve analysis.
- Moisture content.
- Weight.

Every effort **must** be made in the process to minimise the inclusion of foreign bodies. This can be achieved by good manufacturing practices, housekeeping and maintenance with appropriate magnets and screens in position at strategic places. This should be reflected in all HACCP studies and controls.

6.1.5 Sensory Parameters

The sensory, organoleptic characteristics are of course vitally important to achieving the final product specification and therefore there **must** be a system in place to measure these,

This **must** be done by trained, qualified tea experts and recorded against known standards.

6.2 Storage & Distribution

6.2.1 Storage

The finished product and pack **must** be handled and stored in such a way that the environment, temperature, humidity etc. cannot cause damage to the pack or product.
A FIFO procedure **must** be followed in the warehouse, taking into account the lot tracking system.

6.2.2 Distribution

The storage and distribution chain **must** be included in the scope of HACCP. Finished products **must** be transported in vehicles and ships/containers that do not adversely affect the safety or quality of food products. Loading and transport should be done in such a way that damage of the packs is prevented.

Procedures **must** be drawn up giving actions to be taken in case of damage or in case distribution conditions are out of specification.

Distribution outlets should be audited. It is recommended that this is performed annually.

6.3 Incident Management & Recall Procedures

Each company **must** have written procedures for incident management and finished product recall that **must** be in line with UBF requirements.

CHAPTER 6 – FINISHED PRODUCTS

SUMMARY FOR QUALITY AUDITORS

- *Finished product specifications **must** be available in written form and in line with UBF requirements.*
- *Out of specification products **must** be dealt with according to an approved procedure.*
- *Each individual consumer unit **must** be coded so that it can be traced back to a defined batch.*
- *All legislation requirements in the country of sale **must** be followed.*
- *Microbiological guidelines should be met and limits for product safety (i.e. Salmonella) **must** be met.*
- *Due diligence testing of pesticide and heavy metal levels **must** take place.*
- *Sensory parameters **must** always be assessed by a trained, qualified tea expert.*
- *All made black tea sales should be safeguarded by an Incident Management & Recall Procedure.*
- *Finished product **must** be distributed and stored so as to maintain its safety and quality.*

7. Cleaning & Disinfection

OBJECTIVES

To guarantee safety of product, from contamination, both Microbial and Chemical due to unhygienic equipment, machinery, tools and surroundings.

RATIONALE

Written and implemented cleaning procedures will result in effective elimination of contaminants.

7.1 Introduction

Cleaning and disinfection plays a key role in ensuring that the final product achieves the desired safety and quality standards. There are increasing legislative and commercial pressures for hygiene standards to be improved across the UBF world to protect its valuable brands.

To ensure that thorough cleaning and disinfection is carried out, a detailed process flow diagram needs to be part of the cleaning protocol. The responsibilities, (ownership), of cleaning usually lie with the plant manager and hence his/her involvement during cleaning protocol preparation **must** be utilised.

Water for cleaning of the tea processing equipment should be suitable for the purpose and **must** comply with local legislation and WHO Guidelines for Drinking Water (Ref. Guidelines for Drinking Water Quality 2nd Ed. (1996): http://www.who.int/water_sanitation_health/GDWQ/index.html)

7.2 Wet area cleaning (Shredding, Rotorvane, CTC, Orthodox Rollers, Oxidation Equipment, Tools and Associated Conveyors)

- A weekly wet cleaning procedure (as determined by the relevant HACCP study) **must** be carried out with water meeting the above mentioned WHO standards.
- Additional cleaning with a sanitiser may be required once or twice a week. The frequency of such cleaning and sanitation **must** be defined in the relevant HACCP study.
- The correct dilution of disinfectant **must** be followed according to the approved specification/recipe to remove residual leaf/particles.
- All equipment should be dismantled and guards removed according to a written procedure to allow access for effective cleaning.
- Equipment and tools should first be flushed with copious amount of water before application of the disinfectant solution.
- The application of the disinfectant solution is normally by brushes into critical areas.
- The disinfectant solution **must** be allowed to rest on the equipment as per the manufacturer's recommendation.
- To prevent aerosol formation, the equipment **must** then be thoroughly rinsed with low pressure, water meeting the above mentioned WHO standards.
- All equipment **must** be allowed to thoroughly dry to prevent potential microbial growth.

- The cleaning supervisor **must** document the type of disinfectant used, concentration and effectiveness of rinse.
- Tools used in the wet area **must not** be transferred to or used in the dry area

7.3 Wet Floor Cleaning

A weekly wash down of the floors **must** be completed after equipment cleaning. This is to be done with water meeting the above mentioned WHO standards. Adequate, hygienic drainage **must** be used to remove water, residue and disinfectants from the factory. Appropriate filtering and disposal of residue and water **must** comply with environmentally approved procedures. Adequate drying time **must** be allowed to prevent potential microbial growth.

7.4 Dry area cleaning: Dryers, Sorting Machinery and Packing area

- Dismantle all equipment in this section as stipulated in the manual during weekly cleaning.
- Daily and weekly dry cleaning should be carried out using a vacuum to remove dust and debris from equipment and vacuum cleaners to clean the floors.
- All dust hang ups in corners, cracks and rails should be removed using a vacuum cleaner.
- Remove all the dust, twines and any other dirt in the dryer exhaust fan inlet area.
- Ensure all rubber rollers are cleaned and all spongy sections of the Fibrex is dust free (if appropriate).
- It is the responsibility of the factory manager to ensure the area remains clean at all times.
- The supervisor in charge **must** document the cleaning details and visually approve final status.

Health & Safety

Cleaning and maintenance crews should ensure that suitable protective clothing is worn at all times (rubber gloves, overalls, gum boots, goggles, and respirators). All non-essential personnel, during cleaning, **must** be excluded from the specific factory area.

7.5 Cleaning Agents

For suitable cleaning agents, reference should be made to UBF who can give specialist advice.

The detergent used for manual cleaning should match the following criteria:

- It **must** have UBF Toxicological Approval.
- A manufacturer's fact sheet **must** be available which **must** include the material safety and use data.
- The detergent **must not** be corrosive to the equipment.
- It **must** be safe for the operators and the environment.
- It **must not** cause a subsequent taint or odour to the tea.

7.6 Tests and Results

After cleaning, tests should be made to ascertain the effectiveness. This will include visual and biological/chemical assessment of the machinery and/or end product.

Visual Inspection of equipment

- Free from visible residues on surfaces.
- Crevices and dead-ends should have no visible deposits.
- Should not give a greasy feeling to clean fingers when rubbed on the surface.
- Free from any objectionable odour.

Microbiological/Chemical tests

Each supplier/operating factory should build up a database of microbial loads before and after cleaning to ensure effectiveness of procedures. If these prove to be consistently within acceptable levels, complying with Appendix 2, (Microbiological Specifications) then further after cleaning tests should be done on a random basis for due diligence purposes.

If results do not comply then improvements to procedures **must** be made.

CHAPTER 7 - CLEANING & DISINFECTION

SUMMARY FOR QUALITY AUDITORS

- *Cleaning & disinfection plays a key role in ensuring that the final product achieves the desired safety and quality standards.*
- *Detailed process flow diagrams should be prepared and used to determine the cleaning protocol.*
- *Water complying with the WHO Guidelines for Drinking Water Quality 2nd Ed. (1996)* ***must*** *be used.*
- *Detailed "wet" weekly cleaning schedules* ***must*** *be compiled indicating, procedures, cleaning equipment, disinfectant solutions, timings etc. for all process equipment, and general wet areas. Frequency of cleaning and sanitation* ***must*** *be defined in the relevant HACCP study.*
- *Adequate attention* ***must*** *be paid to health and safety during wet cleaning by issue of appropriate PPE.*
- *Detailed "dry" cleaning procedures* ***must*** *be compiled and followed for all dry equipment and general areas.*
- *All disinfectants* ***must*** *have UBF Toxicological Approval.*
- *After cleaning, tests should be made to ascertain the effectiveness of cleaning.*

8. Factory Design & Layout

OBJECTIVES

Depending on the nature of the operations and the risks associated with them, premises, equipment and facilities should be sited, designed and constructed to ensure that:

- Design and layout permit adequate maintenance, cleaning and where necessary, disinfection.
- Materials, in particular those in contact with food, are non-toxic, compatible with the product to be handled and, where necessary, suitably durable, hygienically designed and easy to maintain and clean.
- There is a physical separation of the wet end from the dry end of the operations to reduce risk of micro contamination.
- Safety of all personnel is maintained.
- There is effective protection against pest access and harbourage.

RATIONALE

Attention to good hygienic design and construction, appropriate siting, and the provision of adequate facilities is necessary to enable hazards to be effectively controlled and environmental issues to be addressed.

8.1 Design Principles

The factory design and layout **must** comply with all relevant local legislation and UBF requirements, taking into account the location of the factory, the impact the factory operation has on the environment and the destination of the products. Many factories are over 50 years old, in remote locations and construction materials used very often comprise wood for mezzanine floors, ceilings/roofs etc., especially in the withering areas.

Factory design should prevent cross-flows of product in progress, final product and packaging materials, where appropriate.

Contamination and cross-contamination of the foodstuff by micro-organisms, foreign bodies, chemicals (like pesticides, allergens) and other injurious or prohibited materials **must** be prevented.

Waste material **must** be collected and stored in such a way that it presents no risk to food products. It **must not** allow or encourage infestation.

A dedicated area separated from normal products may be necessary for non-conforming products.

The processing equipment **must** be properly earthed and procedures **must** be in place to ensure frequent checks by the maintenance personnel.

8.2 Design & Construction

8.2.1 General

The building **must** conform to the local legal standards with respect to construction, materials, safety, fire resistance, hygiene, etc. The factory design and layout **must** comply with all UBF and relevant legal requirements taking into account the location of the factory and the destination of the products. No new factories **must** use wood for construction purposes but for those existing buildings which have that style of construction then there **must** be an implemented "wood " policy which monitors and controls the condition to prevent infestation, degradation and ultimately product contamination.

8.2.2 Floors

Floors in the "wet" area **must** be of waterproof, non-absorbent, washable, non-slip and non-toxic materials. All floors should be in a state of good repair.

An epoxy coating to minimise dust generation is recommended in the dry area.

8.2.3 Ceilings

Ceilings may be solid or suspended. Care **must** be taken that spaces above suspended ceilings do not accumulate dirt or moisture, or harbour infestation. Proper sealing of service pipes, provision of inspection ports applying positive pressure in the space above suspended ceiling is recommended. N.B. Asbestos **must not** be used in any new building construction & should be replaced in existing buildings.

8.2.4 Overhead Structures & Walls

The design should aim for minimal pipework, cables and ducting in the processing area. Pipework, cables and ducting should be designed and maintained so as not to be a source of contamination and should be bracketed away from walls to allow access for cleaning. Insulation should be cleanable and maintained in good repair. Other wall fitments, such as hose reels, electrical sockets, notice boards, etc., should be installed in such a manner that the cleanability of the walls is not compromised.

If overhead beams or roof supports exist then a regular cleaning programme **must** be in place to prevent any possible product contamination. N.B. Wood is not an acceptable construction material for flooring (including mezzanine), door/window frames, doors/windows, beams, process machinery etc. as could be affected by wet processing and harbour infestation and moulds etc. (Refer paragraph 8.2.1)

8.2.5 Doors & Windows

Doors and windows should be well fitting in their frame to prevent entry of insects. All measures **must** be taken to prevent contamination with glass. The type of glass that is used **must** minimise the chance of breakage. Where glass is used, its siting **must** be such that breakage does not place the product at risk from contamination. If glass windows are at risk to the product, from breakage, then alternative materials **must** be considered e.g. a film covering or Polycarbonate. Where appropriate, the application of UV absorbing film to minimise attraction of insects to internal lighting may be considered.

Where doors need to remain open for operational reasons (e.g., loading bays), then strip or air curtains should be considered. Where windows or ventilation points are openable, fine mesh **must** be fitted to prevent ingress of birds and insects. Insectocutors should be strategically placed.

8.2.6 Drains

Drains are not required as part of the dry sorting/grading area, but are required in the wet area. They could be a possible source of contamination by insects, rodents and spoilage or pathogenic organisms. All floor drains, if installed, **must**, be of hygienic "top hat" design therefore, be trapped and closed with a lid to prevent dust & debris accumulation when not in use and not situated directly below process equipment which handles open products. All drains **must** be regularly inspected and cleaned. (Refer 8.2.7 re gullies).

8.2.7 Wet & Dry Areas

A Tea Primary Processing factory is normally built very close to or within the tea gardens/tea estates and by definition can be in remote, hilly areas with minimal local resources and infrastructure. Building construction is therefore normally fairly rudimentary.
The building can be divided into three sections:

- **Open Area**
  Green Leaf Reception and Withering

  It is quite normal for this part of the operation to have open sided construction to ensure ease of operation and adequate airflow.

- **Wet Area**
  Maceration, Oxidation and Drying.

  This area **must** be enclosed and all openable doors, windows, ventilation suitably protected with, fine mesh, strip curtains etc. Drains or drainage gullies **must** be provided to facilitate wet cleaning. Any gullies in the floor which take away excess water **must** be designed in such a way that no water rests there to become stagnant. The area should prevent the entry of pests. A physical separation, e.g. wall/partition, **must** be built between the processing area (wet) and the sorting area (dry), before the discharge of the dryer. Where dryer design is such that the discharge is more or less underneath the input then the dry tea **must** be adequately covered between the dryer, the wall and the sorting area, to prevent any contamination. The wall should be solid to a minimum height of one metre (to prevent water from the cleaning process, wet leaf and personnel migrating to the sorting area). The partition could be completed with appropriate materials to prevent ingress of birds and insects etc. to the sorting area. A controlled access way to the sorting area **must** be provided. This ensures the 'wet' area remains separated from the 'dry' area, personnel access is controlled and the risk of cross contamination is minimised.

- **Dry Area**
  Dryer discharge, Grading/Sorting, Bulking, Packing

  Access to the dry area **must** be controlled. It **must** be closed and treated as the hygienic area with all openable windows, doors and ventilation suitably protected with fine mesh, strip curtains etc. The area should prevent the entry of pests.

8.2.8 Storage

Storage areas for packaging materials and final made black tea **must** be considered integral parts of the processing area. Therefore, the storage or transport of packaging materials, and made black tea should be under conditions that will:

- Prevent entry of pests.
- Ensure security from tampering or theft.
- Protect against undesirable deterioration of the product and the container.
- Assure the delivery of safe, clean and wholesome products to the consumer.

All items **must** be stored free from the ground, e.g. on pallet and/or on racking and away from warehouse doors, walls and windows. Slip sheets or a tarpaulin on the ground are not considered GMP. All food containers **must** be closed and all primary packaging materials should be covered.

A procedure should be in place to identify and deal with obsolete materials which **must** be disposed of promptly.

Any strong smelling products/ingredients **must** be stored separately if there is a risk of tainting.

Hazardous chemicals and cleaning agents **must** be stored in such a way as to prevent contamination of foodstuffs, food contact surfaces or to present a risk to personnel.

Forklift trucks or powered vehicles operating inside the warehouse should ideally be electrically powered although LPG would be acceptable in storage areas but not in production. (Electrical trucks only). No diesel-powered trucks **must** be used.

Lorry fumes from exhaust **must not** be allowed to enter the warehouse.

8.3 Services

8.3.1 Boiler Fuel (for raising process steam, hot water, hot air)

A range of different fuels are used such as gas, oil, coal and wood depending on local availability and costs.

The preferred option is natural gas.

Which ever fuel is used, emissions from the boiler chimney **must** comply with all UBF and local environmental regulations. Incomplete combustion when using coal, its derivatives and wood could give rise to the production of PAH's (Polycyclic aromatic hydrocarbons). This is undesirable in tea and **must** be prevented by adequate boiler maintenance. Refer to Appendix 3 Chemical Contaminants, for further detail.
It is common in S. India to burn wood/leco/coke in a furnace to create the hot air for drying. Air, is drawn by a fan through a series of tubes, to the dryer and the flue gases are exhausted through a chimney. The air reaches circa 150 C and does not come into contact with the product. Regular smoke tests should be performed to ensure no leakage.
It is common in Assam to use open type gas burners where natural gas is used to heat ambient air to circa 150 C for the withering and drying operations. This is DIRECT heating as the hot air

comes into contact with the product. Tests on final product for PAH levels should be made. (Refer to Appendix 3 Chemical Contaminants, for further detail).

8.3.2 Steam/Hot Water

The steam/hot water used in the withering, oxidation and drying processes **must** be contained in steam coils or radiators. No "live" steam should be used. Steam additives (to prevent corrosion, scale formation and inhibit oxygen) **must** be food grade and have UBF toxicology clearance. A procedure **must** be in place to ensure adherence to the approved formulation.

8.3.3 Air

Compressed air which is in contact with food or food contact surfaces **must** be dry, clean and free from oil or any other undesirable contamination. For environmental purposes, the pressure should be kept as low as possible.

8.3.4 Water

Where water comes into direct contact with tea or equipment e.g. cleaning, humidifying sprays or mists in withering or oxidation processes and in some Tea Science Applications it **must** comply to the WHO Guidelines for Drinking Water Quality 2nd Ed. (1996): (http://www.who.int/water_sanitation_health/GDWQ/index.html). UBF should also refer to Refer to Guideline for Safe Product, Utility and Domestic Water (SHE 11).

8.3.5 Cleaning Agents

All cleaning agents **must** be suitable for use, safe to use by operative and environmentally safe. Cleaning procedures with formulations **must** be strictly adhered to. All cleaning agents **must** have UBF toxicology Clearance and be stored in a separate safe identified area.

8.3.6 Electricity

Mains supplied power **must** comply with all UBF and local safety regulation and guidelines. Voltage stabilisation could be necessary for any sensitive equipment. Self generated power used continuously or for backup to the mains supply **must** comply with all UBF/local guidelines and safety regulations. Environmental issues **must** be observed.

8.3.7 Lighting

Lighting **must** be appropriate and adequate for the tasks being performed and comply with local legislation.

All lamps and tubes **must** be shatterproof or protected to prevent contamination by glass should a light break.

8.3.8 Temperature and Relative Humidity

Some parts of the world, where extremes of temperature and humidity occur, may benefit from a controlled atmosphere in the grading and packing area. If it is justified and installed, adequate means should be provided to maintain and monitor the required condition.

8.3.9 Amenities

- Changing Rooms

  Each factory **must** have adequate changing facilities for employees to change from their personal clothing into their work clothes. No work clothes (uniforms/overalls/coats etc) **must** be worn or taken outside of the factory compound The Company **must** provide a secure means of storage for employee's personal items and a supply of clean clothing. The company could provide their own laundering service.

- Toilets

  Adequate, hygienic facilities **must** be provided in suitable locations for all personnel. They **must** be fitted with hand-washing facilities having hot and cold water, soap dispensers and a hygienic means of drying hands e.g. disposable paper towels. (Hands off taps are preferred). Suitable notices advising personnel to wash hands after use of toilets **must** be displayed.

- Hand-wash Facilities

  Suitable hand-wash facilities **must** be provided at the entrance to the processing and sorting/packaging areas. They should be equipped with hot and cold water, soap dispensers and a hygienic means of drying hands e.g. disposable paper towels. (Hands off taps are preferred). An alternative would be alcoholic gel dispensers. **All** personnel, factory and office staff, management, contractors, visitors, etc.), **must** use these facilities before entering.

8.4 Plant Layout

The plant layout design should:

- Be based upon the knowledge of the Design Control Points (Refer chapter 11).
- Ensure the uni-directional flow from raw materials to final product with minimum hold-ups.
- **Must** ensure the prevention of recontamination of the product.
- Ensure the safe movement of people, materials and equipment without risk of contamination or cross-contamination of the product, equipment or process area.
- Ensure adequate space for the safe operation, cleaning and maintenance of equipment and of the process area.
- Not site leaf or tea carrying conveyors at or below floor level to minimise risk of undue contamination from the floor.

All equipment:

- **Must** be adequately earthed.
- Fitted with guarding where appropriate.
- Fitted with dust extraction (where appropriate) to meet UBF and legal requirements. If no local limits exist, then the following UK Health and Safety Executive Guideline should be used: 10mg/m3 total dust and 4mg/m3 respirable dust.

The layout should facilitate any necessary fire & explosion protection measures such as venting/relief, isolation, suppression or containment. The electrical installation should comply with the appropriate guidelines and local regulations. Electrical motors and instruments should comply with IP55T3. Further advice can be obtained from UBF.

The layout should be such as to allow effective management of personnel and operations.Services and storage areas **must** be sited such that they present no risk to the safety of products or of personnel.

CHAPTER 8 – FACTORY DESIGN & LAYOUT

SUMMARY FOR QUALITY AUDITORS

- *The factory design, layout, services & amenities **must** comply with all relevant local legislation and UBF requirements.*
- *The design **must** prevent cross contamination of all types.*
- *A suitable separation **must** be constructed between the processing area and sorting area before the dryer discharge thus making the grading/sorting/packing area into the hygienic area.*
- *No new factory should use wood or asbestos in its construction.*
- *Factories with wooden construction **must** have a wood policy in place.*
- *Drainage in the wet area **must** be hygienic by design and employ procedures to ensure regular inspection and cleaning.*
- *The dry area of grading/sorting/packing **must** have a controlled access from the process area and **must** be closed with all openable windows, doors and ventilation suitably protected with fine mesh, strip curtains etc. The area should prevent entry of pests.*
- *Storage areas for packing materials and finished goods **must** be suitable to prevent contamination.*
- *Forklift trucks should be electrically powered although LPG is acceptable in storage areas but not production. (Electrical only). Diesel trucks **must not** be used.*
- *Steam/hot water **must** be contained in steam coils or radiators. No 'live' steam to be used.*
- *Water **must** comply with the WHO Guidelines for Drinking Water Quality 2nd Ed. (1996).*
- *All lamps and tubes **must** be shatterproof or protected.*
- *Adequate changing rooms, toilets and hand-wash facilities **must** be provided.*
- *Plant layout should be based on knowledge of the Design Control Points (Ref Chapter 11).*
- *All processing plant, machinery and equipment **must** be properly earthed, suitably guarded and fitted with dust extraction where appropriate.*

9. Personnel & Management Systems

OBJECTIVES

To guarantee that all the personnel involved in the processing operation are adequately trained and understand:

- Critical aspects of the product quality and process control and the reasons for specified hygienic standards.
- Their responsibility for managing process deviations, so that quantities of non-conforming product are minimised.
- The environmental issues.

RATIONALE

Well trained and motivated personnel make an important contribution to the control of product quality, safety and, costs and reliability of the manufacturing operation.

9.1 Personnel

9.1.1 Education & Training

All personnel who work in a food production process **must** comply with local, national and UBF regulations, and consider further guidelines and Codes of Practice on food hygiene measures. The standards of hygiene facilities required and the extent of hygiene training necessary for personnel are likely to vary according to the sensitivity of the area in which they work and national requirements. The latter include training in HACCP and process control.

All personnel (including operatives, fitters, supervisors, line management and temporary or seasonal staff) **must** undergo formal training which enables them to make their contribution to assuring the safe manufacture of the product range. The training **must** include education in personal and process hygiene. Training in environmental issues should also be given.

Management **must** actively promote compliance with the hygiene requirements in the processing areas. The regular review of hygiene standards **must** be a management goal to ensure optimum practices are employed.

Line and other operatives **must** be provided with the right skills, tools, facilities and sufficient time to allow them to complete tasks effectively. Management **must** make sufficient resources available to fully implement staff training and education programmes.

Training **must** ensure that personnel understand not only which practices/procedures are required (or not permitted), but also why they are necessary. At the completion of the training, all individuals **must** be informed of the need for reliable process control, high standards of hygiene and the value of their contribution. All staff (company and contractual) should have access to the applicable work instructions, specifications and other documents necessary for them to do their job. Training requirements of all personnel **must** be regularly reviewed and top-up courses should be organised. The use of ‘on the job’ training is a key element to understanding. The use of pictorials can also be of benefit.

9.1.2 Medical Requirements

An on site Occupational Health Service should be provided for all personnel. It should be sited so it can be accessed easily in case of emergency. A satisfactory Occupational Health Staff should be available. The main objective of the Occupational Health Service is to promote and protect the health of the employee and to assist in safeguarding against microbiological contamination of product from the food handler by promoting high personal hygiene standards and ensuring effective health screening.

9.1.3 Health Screening

Health screening **must** be carried out in order to ensure that all personnel working in the factory have the required standard of health and personal cleanliness. Health screening can be performed by Occupational Health nurses with support from a medical officer. Personnel should be made aware of the necessity of health screening.

Screening **must** be carried out before employment on all permanent and seasonal employees.

9.1.4 Employee Hygiene

All personnel **must** cover or change from their "street" clothes into clean, protective clothing prior to entry into a food processing area. Work wear **must not** be worn outside the factory premises. Clothing should:

- Be clean.
- Be suitable for repeated laundering.
- Be able to cover most of the body.
- Allow ventilation and be comfortable in use.
- Have no outside pockets.
- Preferably be water and dust repellent.
- Be changed when dirty.

Effective hair covering **must** be worn in all processing areas of unpacked products. All employees **must** wash/clean their hands prior to entry into the process or packaging areas with exposed product. Jewellery or watches **must not** be worn in the process and production areas. Stud earrings, fixed body piercings and plain wedding bands are not recommended; they may however be permitted at management discretion. Strong smelling perfumes/toiletries **must not** be worn.

Maintenance personnel and contractors **must** be advised of and adhere to the hygiene rules applicable to production personnel.

9.1.5 Visitors

It is recommended that all hygiene rules are posted outside the production room and brought to the notice of all visitors.

Visitors to food manufacturing, processing or handling areas **must** wear protective clothing and observe the other hygiene provisions for employees in this Chapter. Visitors **must not** touch food contact surfaces, ingredients/product or primary packaging materials.

9.2 Management

Personnel and processes **must** be effectively managed in order to prevent product contamination. The overall philosophy of management **must** be one of preventative quality assurance, rather than retrospective quality control.

Production requirements **must not** conflict with hygiene requirements on the factory floor. However, the relative levels of assurance and control activities should be based on careful risk analysis in order to ensure cost effectiveness of quality management methods.

Appropriate records of processing, production and distribution **must** be retained for a defined period that equals the shelf life of the product.

Management **must** regularly review the effectiveness of the Quality and Environmental Management systems.

Management **must** be seen to be leading by example in complying with the hygiene requirements applicable to staff in the processing areas. Staff should be provided with the right tools, procedures, training and sufficient time to allow them to complete tasks effectively. Management should make available sufficient budget and resource to implement staff training and education programmes.

The regular review of hygiene standards **must** be an essential management goal to ensure optimum practices are employed. This is best achieved by internal auditing.

CHAPTER 9 – PERSONNEL & MANAGEMENT SYSTEMS

SUMMARY FOR QUALITY AUDITORS

- *It is vital that management and all personnel involved in the processing operation are adequately trained and understand:*

  - *Critical aspects of the product and process control.*
  - *The reasons for specified hygiene standards.*
  - *Responsible behaviour.*
  - *Procedures for managing process deviations so that quantities of sub-standard quality product are minimised.*

- *Management **must** actively promote compliance with the GMP.*

- *Line and other operatives **must** be provided with the right skills, tools, facilities and sufficient time to allow them to complete tasks effectively.*

- *It is essential that all personnel (including operatives, engineers, supervisors, line management and temporary seasonal staff) undergo formal training which enables them to make their contribution to assuring the safe manufacture of the product range; this **must** include education in personal and process hygiene.*

- *Health screening **must** be conducted is to ensure personnel working in the factory have the required standard of health and personal cleanliness.*

- *All personnel **must** cover or change from their "street" clothes into clean, protective clothing prior to entry into a food processing area. Protective clothing should be changed when dirty.*

- *Effective hair covering **must** be worn. Jewellery or watches **must not** be worn. Stud earrings, fixed body piercings and plain wedding bands are not recommended but may be permitted at management discretion. Strong smelling toiletries and perfumes **must not** be worn.*

- *All personnel, staff, management, contractors and visitors **must** wash/clean and dry their hands before entering the process area.*

10. Environmental

OBJECTIVES
To ensure environmental issues, particularly factory emissions, dust and solid waste, are identified and control measures applied.

RATIONALE
Environmental management is an increasingly important part of Company/plant operations and **must** be incorporated in day-to-day business in order to be effective.

10.1 Introduction

Site management is responsible for the environmental impact of processes and products. Environmental impact results from airborne and waterborne emissions, emissions to soil and solid waste and is related to raw and packaging material, consumption and disposal of the product. Site management **must** have a written environmental policy in place. An environmental risk analysis of the factory operations **must** be undertaken. Emergency plans should be reviewed to include environmental hazards. Targets for improvement of environmental impacts **must** be set.

10.2 Environmental Legislation

Site management **must** identify a Site Environmental Manager. The site environmental management system **must** be in compliance with all applicable national, regional and local regulations and satisfy the Customers environmental management criteria.

10.3 Environmental Impact of Processes

Environmental impact results from material flows other than the product flow, leaving the primary process. Raw material losses, rework, product out of specification, emissions from energy production and the liquid effluent stream (where appropriate), which may contain not only product related compounds but also, cleaning agents. Site management **must** set up a suitable monitoring system for:

- Emissions and waste streams (e.g. SO_2, CO_2, CO, NOX).
- Consumption of utilities (e. g. energy, water, air, cooling agents, firewood, etc.)

The size and nature of the environmental impact of the site should be established by monitoring emissions, waste streams and utility consumption. Factory management **must** identify opportunities for improvement.

Minimisation of waste streams is important. Efficient processing is essential, especially in foods processing where considerable environmental impact is generated in upstream processes (agriculture). However, some waste is understandable. Look for opportunities to handle, recycle or dispose of this material in a way that it can serve as a raw material in other industries, e.g., composting. In this way, waste is turned into a by-product.

Upgrading of waste should be carried out by segregating waste at the source, e.g., keeping corrugated board, paper, plastics etc. segregated from organic material which can for example, be returned to the tea estates.

Site management is responsible for ensuring that all waste streams leaving the site are adequately handled by accredited waste handlers. Site management **must** also set targets for improvement of environmental impacts. Good housekeeping practices are the basis of environmentally responsible behaviour.

Handling of dry materials creates dust, which can cause explosion risks and poses a health risk to workers (respiratory diseases). Adequate ventilation and prevention of build up of static electricity **must** be managed. Vent streams may have to be filtered to prevent dust release to the outside environment. In this case, a solid waste stream will be generated consisting of filtered out tea dust.

Energy consumption is in general an important issue. Monitoring at sufficient level (e.g. departmental) is, therefore essential.

10.4 Packaging

Many countries consider packaging to be an environmental issue, mainly because packaging, by its nature, will end up as waste. Product packaging (packaging leaving the site), should be kept to a minimum and the use of recycled/recyclable materials considered where appropriate.

10.5 Miscellaneous

If possible, identified cleaning agents should be used that are environmentally safe and biodegradable. Appropriate training **must** ensure use of the right chemicals and equipment and prevent use of excess cleaning agents and water.

Liquid material storage tanks (fuel oil, chemicals, and cleaning agents) **must** always be bunded to prevent spills into the drainage system or to the soil in case of break down of the tank. Bunds **must** be big enough to contain 110% of the contents of the tank. Consider recycling lubricants and cleaning fluids where systems exist.

Good preventative maintenance of draining systems is essential to prevent leakage and spills of waste water to the soil.

Maintenance of green areas on site should preferably be done by eliminating use of pesticides and fertilisers. Systems **must** be in place to ensure all external communications, and in particular those which stem from complaints or regulatory authorities, are captured and responded to. The site environmental management system **must** be subject to an internal audit process.

CHAPTER 10 - ENVIRONMENTAL

SUMMARY FOR QUALITY / ENVIRONMENTAL AUDITORS

- *Environmental management **must** be incorporated in day-to-day business, in order to be effective.*
- *Site management is responsible for the environmental impact of processes and products and targets for improvement of environmental impacts **must** be set.*
- *Site management **must** have a written environmental policy in place to cope with these matters.*
- *Site management **must** have one of their managers identified as the Site Environmental Manager.*
- *The site environmental management system **must** be in compliance with all applicable rules and regulations.*
- *Environmental communications from external sources should be recorded, dealt with and replied to promptly.*
- *Internal audits **must** be carried out.*

11. Product Specific Section

OBJECTIVES

To specific Design Control Points (DCP's) for tea manufacturing processes.

RATIONALE

To show how QA principles as specified in this GMP are applied to the processing of particular products.

11.1 Introduction

Each Tea Primary Processing site produces its own unique range of MBT, however similar to tea made in other locations it has its own identity. Green leaf is converted to MBT using different process machinery and conditions. A Design Control Point (DCP) table listing typical process steps, hazards/defects, control measures, DCP, limits and monitoring procedures is included for your guidance and use in a HACCP study.

11.2 Design Control Points (DCP) Table for Tea Primary Processing

Process Step 1	**Hazard/Defect**	**Control measures**	**DCP**	**Limits**
Green Leaf – cultivation/ harvesting/ receipt/ transportation.	• Chemical contaminants. - Pesticide residues. - Heavy metals.	Good agricultural practices. Use of approved pesticides. Field Training.	DCP	UBF/local sp
	• Transport related contaminants.	Vehicle inspection.	DCP	Clean vehicle
	• Foreign bodies. - Sand, stone, non tea leaves, jute fibres etc.	Good agricultural practices. Field Training.	DCP	Green leaf sp
	• Mould growth and spoilage due to pathogens.	Personal Hygiene. Good agricultural practices. Delivery time.	DCP	No visible m green leaf.
	• Disease/pest infested leaf.	Good agricultural practices. Use of approved pesticides.		
Process Step 2	**Hazard/Defect**	**Control measures**	**DCP**	**Limits**
Withering.	• Microbiological contamination due to manual handling.	Personal hygiene.	DCP	Hygiene stat facilities.
	• Chemical contamination due to oil/grease from overhead conveyors.	Oil drip trays.	DCP	No oil/grease product.
	• Foreign bodies. - Glass. - Wood.	Implementation of “no” glass policy. Implementation of “wood” policy.	DCP DCP	No glass. No wood.

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Process Step 3	**Hazard/Defect**	**Control measures**	**DCP**	**Limits**
Crushing, tearing, curling. (CTC)/Rolling .	• Foreign bodies. - Loose nuts, bolts etc. • Unclean machines. • Microbiological growth. • Lubricant contamination	Inspecting to a machine checklist. Cleaning procedure. Sanitation of machines/ procedure. Use of SEAC cleared sanitisers. Use of Safety SEAC cleared Food Grade Lubricants. Drip trays.	DCP DCP DCP DCP	No foreign b Clean machi Chemical/co contact time. Use of safet lubricants.
Process Step 4	**Hazards**	**Control measures**	**DCP**	**Limits**
Oxidation.	• Mould/microbial growth.	• Clean trays/clean VFB. Cleaning procedure/ sanitation. • Oxidisation time, temperature and humidity.	DCP	Adherence t procedures. oxidation Time/temper regimes.

April 2003

Part B Suppliers Use

Process Step 5	**Hazard/Defect**	**Control measures**	**DCP**	**Limits**
Drying.	• Microbial contamination.	Drying time and temperature. Calibration procedures for temperature scanners.	DCP	Adherence to temperature
Process Step 6	**Hazard/Defect**	**Control measures**	**DCP**	**Limits**
Grading/sorting/winnowing	• Metal contamination. • Entry of pests/foreign bodies. • Contamination.	Metal separators (magnets). Pest Control programme. (Outside dry room). Line covers/lids, sieves. Cleaning schedule for grading equipment. Good house keeping.	DCP DCP DCP	No metals. No pests. No foreign b

Part B Suppliers Use

Process Step 7	**Hazard/Defect**	**Control measures**	**DCP**	**Limits**
Packing Material intake and storage.	• Chemical Contaminants.	UBF SEAC clearance of primary packaging materials and contact materials. (Refer to contract)	DCP	UBF SEAC materials. (Refer to co
	• Foreign bodies. • Pest contamination.	Clean storage conditions. Approved suppliers	DCP DCP	Clean storag
Process Step 8	**Hazard/Defect**	**Control measures**	**DCP**	**Limits**
Filling.	• Foreign body contamination	Sieves, line covers.	DCP	No foreign b
Storage.	• Metal contamination.	Metal detectors and separators.	DCP	No metal.
Packing.	• Entry of pests.	Pest control programme. Cleaning procedure and schedules, line covers. Cleaning schedule for containers. Container covers /lids. Undamaged Containers.	DCP DCP DCP DCP	No pest cont Cleaning sch Container co No damage.
	• Defective coding.	Coding procedure/check list. Coding specification.	DCP	UBF/local re

Part B Suppliers Use

Process steps 9	**Hazard/Defect**	**Control measures**	**DCP**	**Limits**
Despatch & Distribution.	• Transport related contamination. - Chemical contaminants.	Vehicle inspection/transport contract. Specifications for safe transportation.	DCP	Clean vehicle
		Approved transporters. Protective packaging.	DCP	No chemicals transportatio
	• Pest contamination.	Good housekeeping of warehouse. Compliance to GMP policies.	DCP	Clean wareh

APPENDIX 1

ISO Standard for Tea 3720-1986 Black tea – Definition and basic requirements

Introduction

Tea is grown and manufactured in numerous countries of the world and is blended and/or drunk in many more. Black tea may be produced from tea from one garden or region or may be a blend of teas from two or more origins.

The desired characteristics of a black tea and the resulting liquor depend on many factors including the type of water to be used for brewing, whether the liquor is to be drunk with or without milk or lemon, and on individual tastes.

The objects of this international Standard are to specify the plant source from which black tea is to be manufactured and to set requirements for certain chemical characteristics which, if met, are an indication that the tea has been subjected to recognised good production practice.

It is a matter for the parties concerned whether to apply the requirements of this International Standard to a consignment or lot of black tea. The quality of teas is usually assessed by tea tasters, who base their judgements on their previous experience of tea from the producing area and their knowledge of national or regional conditions and preferences in the consuming country. Account may be taken or characteristics such as the appearance of the tea before preparation of a liquor, the appearance of the infused leaf and the appearance, odour and taste of the liquor. An expert tea taster can assess whether a tea would be unlikely to comply with the chemical requirements. Thus, in practice, time and expense can be saved by submitting teas for chemical analysis only if the tea is considered "suspect" by a tea taster.

Scope and field of application

This International Standard specifies the parts of a named plant that are suitable for making black tea for consumption as a beverage and the chemical requirements for black tea that are used to indicate that tea from that source has been produced in accordance with good production practice.

It also specifies the packing and making requirements for black tea in containers.

It is not applicable to decaffeinated black tea.

References

ISO 1572, Tea – Preparation of ground sample of known dry matter content.

ISO 1573, Tea – Determination of loss in mass at 103°C.

ISO 1574, Tea – Determination of water extract.

ISO 1575, Tea – Determination of total ash.

ISO 1576, Tea – Determination of water-soluble ash and water-insoluble ash.

ISO 1577, Tea – Determination of acid-insoluble ash.

ISO 1578, Tea – Determination of alkalinity of water-soluble ash.

ISO 1839, Tea – Sampling.

ISO 3103, Tea – Preparation of liquor for use in sensory tests.

ISO 5498, Agricultural food products – Determination of crude fibre content – General method.

ISO 6078, Black tea – Vocabulary.

Definition

Black tea: Tea derived solely and exclusively, and produced by acceptable processes, notably oxidation and drying, from the leaves, buds and tender stems of varieties of the species Camellia sinensis (Linnaeus) O. Kuntze, known to be suitable for making tea for consumption as a beverage.

(Definition reproduced from ISO 6078).

Basic requirements

General requirements

The tea shall have no taint and shall be reasonably free from extraneous matter. Liquor for assessment of taint shall be prepared by the method described in ISO 3103. The assessment shall be described in the test report using terms defined in ISO 6078.

Chemical requirements

The tea shall comply with the requirements specified in the table, in which all the figures given are expressed on the basis of the material over-dried at 103± 2 °C by the method described in ISO 1572.

No limit is specified for the "moisture" content of the tea as received. If desired, the actual loss in mass at 103°C of the sample as received may be determined and the result recorded in the test report. In such cases, the determination shall be carried out by the method described in ISO 1573.

Table – Chemical requirements for black tea

Characteristic	Requirement	Method of test
Water extract, % (m/m), minimum	32	ISO 1574
Total ash, % (m/m), Maximum Minimum	 8 4	ISO 1575
Water-soluble ash, % (m/m), of total ash, minimum	45	ISO 1576
Alkalinity of water-soluble ash (as KOH), % (m/m), Minimum Maximum	 1,0* 3,0*	ISO 1578
Acid-insoluble ash, % (m/m), maximum	1,0	ISO 1577
Crude fibre, % (m/m), maximum	16,5	ISO 5498

* When the alkalinity of water-soluble ash is expressed in terms of millimoles of KOH per 100g of ground sample, the limits shall be
- minimum 17,8
- maximum 53,6

Sampling

See ISO 1839.

Methods of test

The samples of tea shall be tested for conformity with the chemical requirements of this International Standard by the methods of test stated in the table.

The determinations specified in the table shall be carried out on a ground sample, prepared in accordance with ISO 1572.

Packing and marking

Packing

The tea shall be packed in closed, clean and dry containers, made of material which does not affect the tea.

Marking

The packages of tea shall be marked in accordance with any relevant legal requirements and agreements between the interested parties.

APPENDIX 2

MICROBIOLOGICAL SPECIFICATIONS FOR TEA

The microbiological specifications below represent the UBF final product specifications for **hot infused** tea and the "Penguin" product, although there is little legislation concerning microbiological limits. The values below are based on current realistic data collected by UBF companies and UBF Research for black tea.

Where stricter limits apply in the country of sale of the product, these stricter limits **must** be followed.

1. Black Tea

The specifications for tea are divided into Guidelines and Limits. Values for Total Viable Count (TVC), Enterobacteriaceae or Coliforms, Yeasts and Moulds, are seen as general hygiene criteria. As such the figures below are provided for guidance only. The Salmonella specification is a limit, taken from the Unilever Salmonella Policy and Guidelines (08/97 5.1), which **must** be adhered to.

Microbiological Criteria Mixed Black Tea
(Equally applicable to Green and Asian teas).

Hygiene Criteria (Guideline)

Parameter	n	c	m	M
Total Viable Count (Aerobic Colony Count)	5	3	1×10^4/g	1×10^6/g
Enterobacteriaceae/Coliforms	5	3	1×10^2/g	1×10^3/g
Yeast	5	3	1×10^2/g	1×10^5/g
Mould	5	3	1×10^3/g	1×10^5/g
Pathogenic Organisms (Limit)				
Salmonella	5	0		Absent in 5 x 25g
N.B. Penguin product only has stricter limits.				
Total Viable Count (Aerobic Colony Count)	**5**	**2**	**1×10^2/g**	**2×10^3/g**
Enterobacteriaceae/Coliforms	**5**	**0**	**1×10^1/g**	
Yeast/Mould	**5**	**2**	**3×10^1/g**	**1×10^2/g**
E.coli	**5**	**0**	**Neg/25g**	
Salmonella	**5**	**0**	**Neg/100g**	

n = number of samples to be analysed.
c = number of samples allowed with counts between m and M.
m = organisms/g lower limit corresponding with Good Manufacturing Practice.
M = organisms/g upper limit which makes the product unacceptable.

APPENDIX 3

CHEMICAL CONTAMINANTS IN TEA

Chemical contaminants arise in tea from a number of sources:

- Environmental (e.g. heavy metals such as lead).
- Agricultural chemicals (e.g. pesticides).
- Primary processing (e.g. polycyclic aromatic hydrocarbons [PAH's] during the drying process or in the smoking process during the production of Lapsang Souchong teas).
- Transport and storage (e.g. taints).

These contaminants are fully dealt with in the Unilever Lotus Notes QA Guide on Chemical Contaminants in Foods, which assesses the risks associated with such contaminants on an origin basis and gives expert guidance on the precautions and QA practices needed to manage them. The following summarises the main areas of concern and lists contact points for further information and assistance. The main risk areas are addressed below.

1. Pesticides

Pesticides are the contaminants subject to most intensive regulatory controls (particularly in developed world markets such as Europe, North America and Australia) in the form of maximum residue limits (MRL's: Appendix 4a). These limits often apply at the point of import as well as retail sale (e.g. in the USA and the EU) and both to unblended original teas as well as blended retail products.

Teas should comply with MRL's laid down in national regulations in the country of sale. Where national regulations give no specific or general pesticide limits applicable to tea, tea should comply with relevant regional (e.g. EU) or international (e.g. Codex Alimentarius) limits. Failing this, German limits (or the limit of detection - LOD) may be taken as a target. A list of such limits, for the year 2003, is contained in Appendix 4a for guidance, but they are subject to frequent change.

Up-to-date information on these and other national limits may be obtained from the contaminants experts in either Beverages Innovation (URD Colworth House UK), Regulatory Affairs (URD Colworth House UK) or Lipton Tea Supply (Crawley UK).

Extensive data on pesticide residues found in original teas from most producing countries have been accumulated for some time. Recent European Tea Trade data indicate that a number of producing countries have problems meeting the EU pesticide limits, namely **China, Vietnam, Japan** and to a lesser extent **India**. This issue is now at such a sensitive level that the European Tea Trade has agreed a code of practice for its members which is designed to minimise the importation of non-compliant teas (See Appendix 4b).

European surveillance data may be obtained from the contaminants experts based at Colworth House UK. A summary of the most recent surveillance results for the “problem” countries is contained in Appendix 4c.

2. Heavy metals

UK heavy metal limits are now in line with the EU (i.e. no set limits). Limits exist for a few countries listed below.
Up to date information on these and other national limits may be obtained from the contaminants experts in either Beverages Innovation URD (Colworth House UK), Regulatory Affairs (Colworth) or Lipton Tea Supply (Crawley, UK)

Nonetheless contaminant levels are required to be kept as low as can reasonably be achieved by good practice. Moreover, it is not permitted to place on to the market foods containing a contaminant in an amount that is unacceptable from the public health viewpoint and in particular at a toxicological level.

Heavy Metal Limits for Tea

Country	ARSENIC [mg/kg]	CADMIUM [mg/kg]	COPPER [mg/kg]	LEAD [mg/kg]	MERCURY [mg/kg]	TIN [mg/kg]	ZINC [mg/kg]
ARGENTINA	1						
BRAZIL	1						
BULGARIA	1		100	10		25	
CHINA							5
CROATIA	1			2 (5)**			
CZECH REPUBLIC	1	0.1		0.2			
ESTONIA	1	1	100	10	0.1		
INDIA			150	10			
JAMAICA	1		150	10			50
KENYA	1		150	10			50
MALAYSIA	1	1	150	2	0.05	40	40
POLAND	0.3	0.1	*	1	0.02	20	50
ROMANIA	0.5	0.5	50	5			50
SINGAPORE	1	0.2	150	2	0.05	250	
SLOVAK REPUBLIC	1	1	100	10			
SLOVENIA	1	1	100	10			
SPAIN	1			5			
TRINIDAD & TOBAGO	1		150	10			50
UNITED KINGDOM	1		150***	****		200	50**
ZAMBIA	1		150	10			50
ZIMBABWE	1		150	10		250	50

* Information awaited as to the current limit
** Limit in brackets of 5 is for domestic tea
*** Recommended limit
**** The previous legal limit for lead in the UK was 5 mg/kg; the legislation has now been revoked.

The principal toxic heavy metal contaminant of tea is lead (Pb) but this exists in tea in a form that is not significantly extracted into the consumed beverage. (The beverage levels reflect mainly the lead level in the water used for tea preparation).

Extensive surveillance data (UR, Colworth House, since 1976, ETC and LTS since 1993) indicate that, with the exception of Poland and the Czech Republic both of whom have considerably lower lead limits than any other country, national lead limits give very few problems. Teas from China and Taiwan occasionally contain higher levels of lead - symptomatic of unfavourable environmental factors (air pollution) or processing factors (leaking dryers). Both of these factors may also carry undesirable quality (taste) consequences and it is recommended that:

- **Where no official limit exists original unblended teas should normally contain no more than 2mg/kg lead. (Certain China teas on occasion approach this limit, and remain under LTS surveillance).**

3 Other Metals

In certain national markets there exist additional limits for other metals, which occasionally give problems even for blended products (e.g. total iron in Egypt and magnetic iron in Russia). At the levels found in tea iron presents no consumer health hazard, but special attention is necessary for products destined for these markets, where the limit is frequently enforced.

Sources of assistance and advice
Samples of tea from all origins used by UBF marketing companies are tested Annually, by LTS, as heavy metals are environmental hazards only. Additional Sample testing may be performed if there are any concerns about specific areas.
The results are retained in a database and information about the results is available on request from the contaminants experts in either Beverages Innovation (URD Colworth House UK), Regulatory Affairs (URD Colworth House UK) or Lipton Tea Supply (Crawley UK).

4. Polycyclic Aromatic Hydrocarbons (PAHs)

PAH's are formed in the incomplete combustion of carboniferous fuels. Some PAH's are carcinogenic (e.g. benz-a-pyrene, dibenzanthracene). PAH's occur in tea as a result of process contamination in the drying step of tea manufacture (direct or leaking indirect dryers) or in the case of smoked teas as a result of the smoking process. Levels are lowest for indirectly dried teas (the majority), higher for directly dried tea (North India and China) and highest of all for smoked tea (Lapsang Souchong).

PAH's are virtually insoluble in water and so are not extracted significantly into the consumed beverage, and do not constitute a consumer health risk in tea. In general there are no regulatory limits for PAH's in tea (Switzerland and the Czech Republic are exceptions to this and special attention is necessary for products destined for these markets). Nevertheless, incorrectly operated direct dryers and leaking indirect dryers can produce tea with smoky off-flavours. Trained tasters will identify these faults and not buy. Consignments of tea with unusual/undesirable smoky off-flavours should be examined for PAH's to support the need for corrective action in the producing factory.

Sources of assistance and advice
Sample analysis can be commissioned with SEAC Contaminants (URD Colworth House UK). Historic data on PAH levels can be obtained from Beverages Innovation or Regulatory Affairs (URD Colworth House UK).

5. Transport & Storage

These are the parts of the supply chain in which the most frequent and costly problems arise with tea, due to the taints that both bulk and retail packed tea can and frequently do acquire. These taints are most frequently due to chlorophenols and chloroanisoles, which arise from the use of:

- Pallets treated with halophenol wood preservative (crude pentachlorophenol) in association with inadequate protective packaging.
- Halophenol preservatives and fungicides in adhesives used in primary packaging.
- Halophenol-containing sanitisers used for cleaning transport containers in a association with inadequate protective packaging.

These tainting contaminants cannot be managed by analytical monitoring. They **must** be prevented by specification of:

- Adequate protective packaging such as Kraft multiwall paper sack with aluminium / polyethylene barrier ply specified in ISO 9884 Parts 1 & 2. This also protects tea against cross-contaminating taints from other cargoes.
- Non use of halophenol-containing fungicides / sanitisers in ANY elements of primary packaging (e.g. glues, inks) and transport containers / pallets.

Sources of assistance and advice

In cases of tainted shipments, assistance of identification and source of taint may be obtained from SEAC Contaminants (URD Colworth House UK).

APPENDIX 4a

MAXIMIM PESTICIDE RESIDUE LIMITS

Pesticide	MRL (mg/kg)					Comments on EU MRLs
	USA	Japan	Codex	Germany	EU	
1,1-Dichloro-2,2-bis(4-ethylphenylethane)					0.10*	
1,2-Dibromoethane (ethylene bromide)					0.10*	
2,4,5-Trichlorphenoxyacetic acid					0.05*	
Abamectin					0.02*	sum of isomers Effective
Acephate		10.00		0.10	0.10*	
Acetamiprid		50.00				
Acinathrin		10.00				
Aldicarb					0.05*	
Aldrin / Dieldrin		0.00		0.02	0.02	singly or combined, as di
Aminotriazole					0.10*	
Amitraz					0.10*	
Aramite					0.10*	
Atrazine					0.10*	
Azimsulfuron					0.10*[d]	
Azinphosethyl				0.05	0.10*	effective as of 1July 2001
Azocyclotin					0.10*	sum of Azocyclotin and c January 2003
Azoxystrobin		10.00			0.10* [a]	
Barban					0.10*	
Benalaxyl					0.10*	
Benfuracarb					0.10*	
Benomyl					0.10*	
Bentazone					0.10*	
Binapacryl					0.10*	
Biphenthrin		25.00		5.00	5.00	Effective as of 1 January

Part B Suppliers Use

Pesticide	MRL (mg/kg)					Comments on EU MRLs
	USA	Japan	Codex	Germany	EU	
Bitertanol					0.10*	Effective as of 1 January
Bromophos-ethyl				0.10	0.10*	
Bromopropylate				0.10	0.10*	Effective as of 1 January
Buprofezin				0.02		
Camphechlor (Toxaphene)					0.10*	
Captafol		0.00			0.10*	
Carbendazim					0.10*	
Carbofuran					0.20*	
Carbosulfan					0.10*	
Chlorbenside				0.01	0.10*	
Chlorbufam					0.10*	
Chlordane				0.02	0.02*	
Chlorfenapyr		50.00		0.01		
Chlorfenprop				0.05		
Chlorfenson				0.01	0.10*	
Chlorfluazuron						
Chlormephos				0.01		
Chlormequat					0.10*	
Chlorobenzilate					0.10*	
Chlorothalonil		10.00		0.10	0.10*	
Chloroxuron					0.10*	
Chlorpyrifos				0.10	0.10*	
Chlorpyrifos-methyl		3.00	0.10	0.10	0.10*	
Chlorthion				0.01		
Chlorthiophos				0.01		
Chlozolinate					0.10*	will be effective as of 1Ja
Clofentezine		20.00			0.05*	Effective as of 1 January
Coumaphos				0.01		
Cyanofenphos				0.01		
Cyanophos				0.01		
Cyfluthrin		20.00			0.10*	effective as of 1 July 200

Part B Suppliers Use

Pesticide	MRL (mg/kg)					Comments on EU MRLs
	USA	Japan	Codex	Germany	EU	
Cyhexatin						
Cypermethrin		20.00	20.00	20.00	0.50	
Daminozide		0.00			0.10*	
DDT (Total)		0.20		0.20	0.20*	
Deltamethrin		10.00	10.00	5.00	5.00	
Demeton-S-methyl				0.05		
Dialifos				0.01		
Diallate					0.10*	
Diazinon		0.10		0.05	0.05*	
Dicapthon				0.01		
Dichlofenthion				0.01		
Dichlofluanid		5.00				
Dichlorprop					0.10*	
Dichlorvos		0.10		0.10	0.10*	
Dicloran				0.10		
Dicofol	45.00	3.00	50.00	20.00	20.00	
Dienochlor				0.01		
Difafenthiuron		20.00				
Difenoconazole		10.00				
Diflubenzuron		20.00		0.05		
Dimefox				0.01		
Dimethoate				0.20	0.20	a limit of 0.05* mg/kg will
Dinoseb					0.10*	
Dinoterb					0.10*	effective as of 1July 2001
Dioxathion				0.10	0.10*	
Diphenylamine					0.05*	effective as of 1 April 200
Disulfoton				0.05	0.05*	
Ditalimfos				0.01		
Dithiocarbamate						
DNOC					0.10*	effective as of 1July 2002

Part B Suppliers Use

Pesticide	MRL (mg/kg)					Comments on EU MRLs
	USA	Japan	Codex	Germany	EU	
Edifenphos				0.01		
Endosulfan	24.00		30.00	30.00	30.00	
Endrin		0.00		0.01	0.01*	
EPN		0.10				
Esfenvalerate	0.05				0.05*	(sum of RS and SR isom
Ethephon					0.10*	
Ethiofencarb		0.05				
Ethion	10.00			2.00	3.00	Effective as of 1 January
Ethoprophos				0.01		
Ethyl Bromide				0.01		
Etofenprox		10.00				
Etoxazole		15.00				
Etrimfos				0.01		
Famophos				0.01		
Fenamiphos				0.05		
Fenarimol					0.05*	
Fenbutatin oxide		1.00			0.10*	
Fenchlorphos				0.10	0.10*	
Fenitrothion		0.20	0.50	0.05	0.50	
Fenobucarb		0.30				
Fenpropathrin		25.00		0.02		
Fenpropimorph					0.10*	Effective as of 1 January
Fenyproximate		10.00				
Fensulphothion				0.02		
Fentin					0.10*	
Fenvalerate	0.05	1.00		0.05	0.05*	(sum of RR and SS isom
Flucythrinate		20.00	20.00		0.10*	Effective as of 1 January
Flufenoxuron		15.00				

Part B Suppliers Use

Pesticide	MRL (mg/kg)					Comments on EU MRLs
	USA	Japan	Codex	Germany	EU	
Fluorimide		30.00				
Flupyrsulfuron-methyl					0.05* [f]	
Fluroxypyr					0.10* [e]	
Fonofos				0.01		
Formothion				0.05		
Furathiocarb					0.10*	
Glufosinate		0.50				
Glyphosate	1.00	1.00			0.10*	
Halfenprox		10.00				
Heptachlor				0.02	0.02*	
Heptenophos				0.01		
Hexachlorbenzene (HCB)				0.01	0.01*	
Hexachlorocyclohexane (HCH)		0.20		0.20	0.20	sum a and ß isomers
Hexaconazole					0.05*	Effective as of 1 January
Hexaflumuron		15.00				
Hexylthiozox		35.00				
Imazalil					0.10*	
Imibenconazole		20.00				
Iminoctadine		1.00				
Iodofenphos				0.01		
Iprodione		20.00			0.10*	
Isobenzan				0.01		
Isofenphos				0.01		
Kresoxim methyl					0.10* [b]	
Lambda-cyhalothrin		15.00		1.00	1.00	
Leptophos				0.01		
Lindane				0.20	0.20	a limit of 0.05*mg/kg will l
Lufenuron		10.00				
Malathion				0.05	0.50	

Part B Suppliers Use

Pesticide	MRL (mg/kg)					Comments on EU MRLs
	USA	Japan	Codex	Germany	EU	
Maleic hydrazide					1.00*	
Maneb					0.10*	and Mancozeb Metiram F
Mecarbam				0.05	0.10*	
Metalaxyl					0.10*	
Methacrifos				0.01	0.10*	Effective as of 1 January
Methamidophos				0.10	0.10*	
Methidathion			0.50	0.10	0.10*	
Methomyl / thiodicarb					0.10*	
Methoxychlor				0.05	0.10*	
Methyl Bromide					0.05*	
Metribuzin		0.10				
Mevinphos				0.05		
Monocrotophos				0.01	0.10*	
Monolinuron					0.10*	effective as of 1July 2002
Myclobutanil		20.00			0.05*	Effective as of 1 January
Naled	0.50			0.01		
Nitenpyram		10.00				
Omethoate				0.10	0.10	
Oxydemeton-methyl					0.05*	and demeton-S-methylsu
Paraquat				0.10	0.10*	
Parathion					0.10*	will be effective as of 1 M
Penconazole					0.10*	Effective as of 1 January
Pendimethalin				0.10		
Permethrin		20.00	20.00	0.10	2.00	a limit of 0.10* mg/kg will
Phenkapton				0.01		
Phenthoate				0.01		
Phorate				0.10	0.10*	
Phosalone	8.00			0.05		

Part B Suppliers Use

Pesticide	MRL (mg/kg)					Comments on EU MRLs
	USA	Japan	Codex	Germany	EU	
Phosmet				0.01	0.10*	
Phoxim				0.05	0.10*	
Phropham					0.10*	effective as of 1July 2001
Pirimiphos-methyl		10.00		0.05	0.05*	
Prochloraz					0.10*	sum of prochloraz and its
Procymidone				0.10	0.10*	
Profenofos				0.10	0.10*	Effective as of 1 January
Prohexadione					0.10* [d]	
Propetamphos				0.01		
Prothoate				0.01		
Propargite			10.00		5.00	
Propiconazole		0.10			0.10*	
Propoxur					0.10*	
Propyzamide					0.05*	
Prothiofos		5.00		0.01		
Pymetrozine					0.10* [f]	
Pyraclofos		5.00				
Pyrazophos				0.05	0.10*	effective as of 1July 2002
Pyridaben		10.00		0.01		
Pyridate				0.01	0.10*	
Pyrifenox		5.00				
Quinalphos				0.10	2.00	a limit of 0.10*mg/kg cam
Quintozene				0.01	0.05*	sum of quintozene and pe
Resmethrin					0.20*	sum of isomers Effective
S-421				0.01		
Silafluofen		35.00				
Spinosad		2.00				

Part B Suppliers Use

Pesticide	MRL (mg/kg)					Comments on EU MR
	USA	Japan	Codex	Germany	EU	
Spiroxamine					0.10*[c]	
Sulfotep				0.10		
Sulprofos				0.01		
Tau Fluvalinate		10.00		0.05		
Tebfenozide		25.00				
Tebufenpyrad		2.00				
Tecnazene				0.05	0.10*	will be effective as of 1
TEPP					0.02*	
Terbufos				0.05		
Tetrachlorvinphos				0.01		
Tetraconazole						
Tetradifon	8.00			0.05		
Tetraflubenzuron						
Tetrasul				0.01		
Thiabendazole					0.10*	
Thiometon				0.01		
Thionazin				0.01		
Tolyfluanid				0.10		
Tralomethrin				0.01		
Triadimefon					0.20*	sum of triademefon and
Triallate				0.10		
Triazophos				0.05	0.05*	effective as of 1 July 20
Trichloronate	0.50			0.10		
Tridemorph					20.00	Effective as of 1 Januar
Trifluralin	0.05			0.10		
Triforine					0.10*	
Vinclozolin				0.10	0.10*	

Part B Suppliers Use

Pesticide residues most frequently found in teas

* indicates lower limit of analytical determination (LOD)
[a] on 1 August 2003 the provisional level is definitive.
[b] on 19 October 2004 the provisional level is definitive.
[c] on 1 January 2004 the provisional level is definitive.
[d] on 1 January 2006 the provisional level is definitive.
[e] on 21 August 2005 the provisional level is definitive.
[f] on 1 December 2005 the provisional level is definitive

April 2003

APPENDIX 4b

ETC CODE of PRACTICE – PESTICIDE RESIDUES IN TEA

1. INTRODUCTION

Tea, *Camellia sinensis*, is an agricultural product that is predominantly grown and manufactured in developing countries. It is sold on the world market either by Public Auction or Private Treaty (either directly by the producer or via a broker or trader). Whilst the growing of tea without the use of pesticides is, in principle, possible, the worldwide demand is such that a regulated and controlled use of approved pesticides is often necessary to produce a sufficient quantity of appropriate quality tea at an acceptable cost. The use of approved pesticides under Good Agricultural Practice (GAP) results in residues below the maximum residue levels (MRL) given in the relevant legislation. The use of non-approved pesticides and/or the failure to follow Good Manufacturing Practice (GMP) will result in non-conformance with legislation and is not acceptable to the European Tea Committee (ETC). It is generally impractical for the European Tea Trade to exert any direct control over the growing or processing of tea and consequently has to encourage the growers to apply good agricultural practice, using pesticides only when essential and thus minimising the level of pesticide residues in tea.

The ETC has produced this Code of Practice for use by its members to:

- Facilitate a common approach to discharging their responsibility to supply safe products that conform to the relevant pesticide legislation.
- Provide factual data to assist in effective and ongoing dialogue with the producers relating to pesticide residues and, where appropriate, work with them to reduce, or eliminate, the use of pesticides and thus bring the residue levels within limits recognised as safe by European Authorities.

This Code recommends members of the ETC to:

- Actively monitor pesticide residue levels in the teas, employing enhanced levels of sampling where problems are found.
- Encourage countries of origin towards self-certification using competent local laboratories[1].
- Purchase only teas meeting the relevant MRLs.
- Submit their monitoring data to the ETC for collation and submission to the EU, National Governments and Producing countries as appropriate.
- Apply this Code to all purchases of tea they intend to import into the EU as it considers that conformance with it provides a high level of assurance that their products are safe and legal

2. SCOPE

The monitoring of pesticide residues forms an integral element in the HACCP process as detailed in the ETC's HACCP Guidance Notes[2]**.** This Code of Practice applies to green, black and oolong tea from the plant, *Camellia sinensis.* Raw materials from other plants used to prepare infusions that are sometimes generically referred to as 'teas' are specifically excluded from the scope of this Code.

3. PROCEDURES

This Code provides details of the level of sampling to be employed, the sampling procedure, and the acceptance criteria and gives guidance on the analytical methodology.

3.1 ACCEPTANCE CRITERIA

Conformance with current EU legislation and, where no EU MRL exists, the German MRLs will apply. A list of current MRLs is given in Appendix 4a.

ETC Members should also take note of Regulation (EC) No.178/2002 of 28th January 2002, Article 12 which states:

1. Food and feed exported or re-exported from the Community for placing on the market of a third country shall comply with the relevant requirements of food law, unless otherwise requested by the authorities of the importing country or established by the laws, regulations, standards, codes of practice and other legal and administrative procedures as may be in force in the importing country.

In other circumstances, except in the case where foods are injurious to health or feeds unsafe, food and feed can only be exported or re-exported if the competent authorities of he country of destination have expressly agreed, after having been fully informed of the reasons for which and the circumstances in which the food or feed concerned could not be placed on the market in the Community.

2. Where provisions of a bilateral agreement concluded between the Community or one of its Member States and a third country are applicable, food and feed exported from the Community or that Member State to that third country shall comply with said provision.

3.2 DEFINITIONS

Offer Sample	Sample of the tea being offered to the Trade prior to sale and which Is fully representative of the bulk of the tea to be sold.
Shipping Sample	Sample taken from the tea after it has been contracted and prior to shipment from the country of origin.
Landed Sample	Sample taken from the tea at the first opportunity after landing in the country of receipt e.g. after the tea has been unloaded and brought to account.
Lot	An identifiable quantity delivered at one time and having common characteristics e.g. an invoice.
Sub-lot	A designated part of a large lot, e.g. a second delivery of the invoice.
Primary Sample	A quantity taken from a single place in the lot or sub-lot, i.e. a package. Primary samples must be taken randomly from various places distributed throughout the lot or sub-lot. Primary samples should be 50 g [a]
Bulk Sample	The combined primary samples homogeneously blended.

Laboratory Sample A portion of the bulk sample submitted for analysis. Laboratory samples should be a minimum of 100 g.

[a] If the amount of tea in each package is less than 50 g the package will constitute a primary sample.

3.3 SAMPLING PROGRAMME

The use of pesticides on tea estates and the degree of control exercised in their use varies widely both between and within origins. As a consequence it is impractical to define a single sample plan to be applied for all purchases. Consequently the buyer is free to employ a sample plan based upon the information available to them. This information may for example include, the purchaser's knowledge of the estate or origin, the results of any audits they may have carried out, the results of analyses on previous purchases from the estate or origin, the annual ETC pesticide surveillance report etc. This Code specifies three levels of sampling, 'reduced', 'normal' and 'enhanced' each of which relates to the potential for a lot to meet the acceptance criteria and it is for the buyer to determine at what level to commence sampling.
The sampling levels are:

Reduced - applied to teas that have been shown to consistently meet the acceptance criteria, i.e. 10 or more consecutive lots. In this instance analysis of landed samples is at a frequency necessary to verify the continuance of reduced sampling and it is recommended that the sampling level be 1% or once per crop season whichever is the greater.

Normal - used when between 6 and 10 consecutive lots have met the acceptance criteria. In this instance each offer and/or corresponding shipping sample be analysed. Sampling and analysis of the tea delivered (landed) should be sampled and analysed at the discretion of the buyer.

Enhanced - used until 6 consecutive delivered lots have met the acceptance criteria. This sampling level requires that each offer and/or corresponding shipping sample be analysed **and** if the tea is subsequently purchased the delivery (landed) should be sampled and analysed.

Teas from a new origin, region or estate where no independent historical data or information is available, e.g. from the ETC pesticides surveillance report, will be the subject of enhanced sampling until such time as normal or reduced sampling is justified.

3.4 SAMPLING PROTOCOL

Effective sampling is a key element in achieving reliable results since residues are unlikely to be spread evenly across a 'lot'. The sampling frequency given in this Code is based on ISO 1839-1980 Methods for Sampling Tea which the ETC considers to be equivalent to Commission Directive 2002/63/EC of 11th July 2002 on official control sampling for pesticides and is easier to apply to tea as traded between producers and European packers.

The number of packages to be sampled from a lot or sub-lot shall be as per the table below. The packages to be sampled shall be randomly selected by the use of random number tables. Spoons, scoops, borers, sample thieves or other such equipment suitable for taking samples from inside the packages shall be used as well as dividing apparatus for reducing the aggregate sample to the laboratory sample. Samples shall be packed in clean, dry sealed containers and protected from light during storage. Each sample shall be clearly labelled with the place and time of sampling, the name of the estate or blend, the invoice and lot number and any other relevant information.

NUMBER OF PACKAGES TO BE SAMPLED

Packages containing more than 20kg of loose tea
The minimum number of packages to be sampled from a lot shall be as shown in Table 1

TABLE 1	
NUMBER OF PACKAGES IN LOT	**NUMBER OF PACKAGES TO BE SAMPLED**
2 to 10	2
11 to 25	3
26 to 100	5
101 and above	7

Packages containing less than 20kg of loose tea

The minimum number of containers to be sampled from a lot shall be as shown in Table 2, provided that the mass specified for each laboratory sample is obtained.

TABLE 2	
NUMBER OF PACKAGES IN LOT	**NUMBER OF PACKAGES TO BE SAMPLED**
Up to 25	3
26 to 100	5
101 to 300	7
301 to 500	10
501 to 1,000	15
1,001 to 3,000	20
3,001 and above	25

4. ANALYTICAL METHODOLOGY

The methodology shall be suitable to produce accurate and reliable results and providing limits of detection and quantification such that compliance with the legislation can be reliably determined. A typical method[3] will involve the following steps, extraction, liquid-liquid partition, gel-permeation chromatography, gas chromatographic separation, followed by detection/identification of individual residues with thermionic (N/P), flame photometric (FP), electron capture (EC) and/or mass spectrometric (MS) detector and quantification of the residues detected

In addition to those pesticides for which MRLs are given in the EU and, where relevant, the German legislation, teas will also be monitored for a broad spectrum of organochlorine, organophosphorus and pyrethroid pesticides to enable other pesticides, for which MRLs do not exist and which may have been used illegally to be detected.

References/Notes

[1] Laboratories are deemed to be competent if they meet the requirements of a recognised accreditation scheme, complying with ISO 17025. Guidance on the requirements for compliance with such a scheme can be found in EU Documents, No. SANCO/3103/2000 and No. SANCO/85/00 rev6 20.06.00
[2] ETC HACCP Guidance Notes (current version)
[3] Specht W, Pelz S, Gilsbach (1995) Fresnius J Anal Chem **353**, 183-190

APPENDIX 4c

2001 PESTICIDE SURVEILLANCE RESULTS

Summary

The 2001 survey results indicate a continuing reduction in non-compliant teas from China but little improvement in the pesticide situation in Vietnam. Residues of the pyrethroids fenvalerate, fenpropathrin and to a lesser extent cypermethrin were frequently detected in both black and green teas from the Far East.

The continued use, by some tea producers (mainly in China, Vietnam and India), of organophosphorus (OP) pesticides, in particular acephate, methamidophos and monocrotophos, and/or OPs with low maximum residue limits (e.g. phosalone and triazophos) is still evident.

The application of buprofezin to tea in China and Vietnam shows no sign of significantly decreasing.

A large number of non-compliant tea samples were recorded from unspecified regions of India. A comparatively high incidence of DDT and Chloropropylate was evident from the surveillance data, with a large proportion of samples containing levels in excess of the EU limits. A number of Indian tea samples were also found to contain fenpropathrin, all at levels that exceeded the German MRL of 0.02mg/kg. Evidence was also manifest of an increasing use of the organophosphorus pesticides ethion and quinalphos. A significant number of Indian tea samples contained levels of these pesticides in excess of the EU MRL.

China

An analysis of the Chinese pesticide results indicate that actions taken by the Chinese Authorities to ban the use of certain pesticides has resulted in a further improvement in the quality of teas from this source. Nonetheless China remains a tea producing area with a high incidence of pesticide residues and with a significant number of incidences at actual or potentially higher levels than the EU maximum residue limits (MRLs).

Some of the pesticide problems, still encountered with China teas, are summarised below:

- **Organochlorine Pesticides**

  The trend showing a decrease in the incidence of **DDT** positives observed for the past few years has continued during 2001. The current incidence of DDT in black China teas is running at 0.7% (a further decrease from the 7.5% in 2000 and a large decrease from the 46.2% recorded in 1998). The number of samples with DDT levels above the 0.2mg/kg limit has now decreased to insignificant levels.

- **Pyrethroids**

  The ban instituted by the Chinese Authorities on the use of **fenvalerate** on tea appears has had the effect of reducing the incidence of fenvalerate in black tea to 35.8% (compared to an incidence of 47.7% in 2000), and in Jasmine tea to 47.6% (compared to an incidence of 67.7% in 2000). There was no similarly observed reduction in fenvalerate incidences in Green China Tea. In fact an increase from 42.8% in 2000 to 52.4% in 2001 was recorded.

Also of concern is the continued use of **fenpropathrin** on the Chinese tea crop. There is currently no EU MRL specified for this pesticide which means that it should not be present above its limit of detection. Nevertheless a number of samples continue to exceed the German MRL for fenpropathrin. Thus the proportion of samples with fenpropathrin levels above the 0.02mg/kg German limit remains unacceptably high (12.1% for black tea, 12.5% for green tea and 4.8% for jasmine tea).

- **Organophosphorus pesticides**

The organophosphorus pesticides **methamidophos** and **triazophos** continue to appear in China teas - sometimes at levels that exceed the EU limits of 0.1 and 0.05 mg/kg respectively.

The incidence of **methamidophos** positives and number of samples with levels exceeding the current MRL has increased slightly in green tea from 4.3% (1.4%>MRL) in 2000 to 6.4% (2.1%>MRL) in 2001. For black China tea, the number of positives has however decreased from 5.3% (0.9%>MRL) in 2000 to 2.2% (0.1%>MRL) in 2001.

The incidence of **triazophos** positives and number of samples with levels exceeding the current MRL has decreased in both green tea from 10.1% (7.2%>MRL) in 2000 to 2.1% (0.7%>MRL) in 2001 and black tea from 6.3% (3.4%>MRL) to 2.5% (1.3%>MRL) in 2001.

- **Buprofezin**

The use of the nitrogen containing pesticide, **buprofezin** has apparently reduced from that observed in 2000. The incidence of buprofezin positives and number of samples with levels exceeding the current MRL has decreased in green tea from 27.5% (26.1%>MRL) in 2000 to 7.7% (1.3%>MRL) in 2001 and in black tea from 10.7% (8.6%>MRL) in 2000 to 5.4% (0.9%>MRL) in 2001.

There is still no EU MRL for this pesticide although a German MRL of 0.02mg/kg is in operation. The ETC dossier on buprofezin (together with diflubenzuron and pyridaben) remains with Belgian Ministry of Health who have yet to apply realistic limits for these pesticides.

Vietnam

- **Organochlorine Pesticides**

Black Vietnamese teas recorded lower incidences of **dicofol** (57.0% in 2001 compared to 96.2% in 2000), **DDT** (16.0% in 2001 compared to 62.6% in 2000) and **endosulfan** (67.0% in 2001 compared to 86.3% in 2000) residues. Again, none of these residues were present at levels greater than the EU MRL.

- **Pyrethroids**

Fenvalerate remains a residue that is frequently found in Vietnamese teas and a large proportion of the recorded positives exceeded the EU MRL. The proportions of fenvalerate positives and samples with levels exceeding the current MRL have however decreased from 99.7% (44.3%>MRL) in 2000 to 72.0% (22.0%>MRL) in 2001.

The year 2001 has seen little decrease in the use by Vietnamese tea producers of **cypermethrin**. Thus 91.0% of the Vietnamese black teas tested contained detectable levels of cypermethrin

although a lower proportion (21.0% in 2001 compared with 53.4% in 2000) of the black tea samples were found to contain levels in excess of the 0.5mg/kg EU limit.

- **Organophosphorus pesticides**

The continued appearance of **methamidophos** and **phosalone** in many tea samples from Vietnam (a high proportion at a level in excess of EU limits) was also observed.

The incidence of methamidophos positives decreased marginally in black Vietnamese tea from 60.3% in 2000 to 55.0% in 2001 and the proportion of samples exceeding the EU MRL also decreased from 54.2% to 36.0% during the same time period. The incidence of phosalone decreased from 33.6% in 2000 to 8.0% in 2001. There was also a corresponding decrease from (24.4% to 3.0%) in the proportion of samples exceeding the EU MRL for phosalone.

Japan

- **Organochlorine Pesticides**

Although organochlorine pesticide residues (e.g. **dicofol** and **endosulphan**) were recorded in a few Japanese teas, no samples contained levels above the EU MRLs for these compounds.

- **Pyrethroids**

In 2001 the incidence of **fenvalerate** decreased in Japanese green tea (from 42.1% in 2000 to 16.2% in 2001). During the period under review there was a corresponding decrease in the proportion of samples tea (from 15.8% in 2000 to 8.1% in 2001) that were in excess of the 0.1mg/kg lower limit.

Other pyrethroids continue to be detected in the Japanese tea samples. Of particular concern was the continuing incidence of **fenpropathrin** residues in green Japanese teas (27.0%) most of which contain levels above the default (German) limit of 0.02mg/kg.

The incidence of **tau-fluvalinate** has decreased in Japanese green tea from 10.5% in 2000 to 2.7% in 2001. None of the recorded 2001 incidences exceeded the German MRL.

- **Organophosphorus pesticides**

The frequency of occurrence of the organophosphorus pesticide residues, **prothiofos** and **methamidaphos** remained comparatively unchanged from that recorded in 2000 i.e the proportion of prothiofos positives was 10.8% in 2001 (compared with 10.5% in 2000) and the proportion of methamidaphos positives was 5.4% in 2001 (compared with 5.3% in 2000). One half of the 2001 Japanese green tea samples with detectable levels of methamidaphos were above the EU MRL for this pesticide.

- **Other Pesticides**

The widespread use of **chlorfenapyr -** a persistent pyrrole based insecticide registered for use in Japan but not listed by the EC for use on tea – was again observed. The incidence of chlorfenapyr positives and number of samples with levels exceeding the current MRL has increased in Japanese green tea from 36.8% (31.6%>MRL) in 2000 to 43.2% (40.5%>MRL) in 2001.

The incidence of **buprofezin** in Japanese green tea has decreased from 42.1% (26.3% > 0.02 mg/kg default German limit) in 2000, to a level of 8.1% (0%>MRL) in 2001. There is however evidence that the alternative pesticides **diflubenzuron** and **pyridaben** are being applied to the Japanese green tea crop. These pesticides were detected at levels above their LOD (i.e. default MRL).

India

- A few **Assam** samples were shown to contain residues of other organophosphorous pesticides (e.g. **acephate, methamidophos, monocrotophos** and **quinalphos**). There were three recorded incidences of samples exceeding the EU limit for these pesticides.

- A small proportion of the Darjeeling tea samples was found to contain **cypermethrin** (4.1%), **fenpropathrin** (0.8%) and **fenvalerate** (0.8%) residues. One sample contained fenpropathrin at levels in excess of the default (German) limit of 0.02mg/kg.

- Evidence of a continued but infrequent use of **monocrotophos** and **quinalphos** on Darjeeling teas was obtained. One sample contained levels of these pesticides above the EU recommended MRL.

- A number of **DDT** incidences were recorded in **India tea samples (region unspecified)** during 2001 - 53.9% (compared with 13.6% in 2000) and 39.5% of the samples contained DDT levels in excess of the EU limit of 0.2mg/kg.

- A large increase in the incidence of **Chloropropylate** was found (50.2% compared to 8.2% in 2000) in the tea samples from an unspecified region of India. Two thirds of these samples contained levels above the 0.01 mg/kg default limit of detection.

- A number of samples (13.6%) were found to contain **fenpropathrin**, all at levels that exceeded the German MRL of 0.02mg/kg.

- **Quinalphos** usage was also evident from the surveillance data. Whilst no incidences of quinalphos were recorded during 2000 the proportion of quinalphos positives recorded during 2001 was 14.8% (11.1%>MRL).

APPENDIX 5
ROUTINE QA METHODS FOR MADE BLACK TEA

Compaction Volume Bulk Density

Purpose
To measure the volume (bulk density)-(tapped) of leaf tea.

Equipment
Analytical balance. Capable of reading to 2 decimal places.
Kartell Transparent Polypropylene 250ml measuring cylinder with subdivisions of 2ml.
Vankel Tap Density Tester with dual rotating platform. 3mm vertical drop. (Suitable for 250ml cylinders).
Supplied by Jencons.

Method
- Place a clean, dry 250ml measuring cylinder onto a balance and tare off.
- Weigh out 50g ± 0.10g into the measuring cylinder.
- Set Vankel at 35 counts.
- Place the cylinder/s on the Vankel platform and press the start button.
- Using the graduated scale on the cylinder note the Bulk Density reading.
- Test twice and report average result.

Dust Content of Leaf Tea

Purpose
To measure the dust content of leaf tea.

Equipment
710, 630 & 250micron stainless steel sieves (manufactured to ISO 3310-1 or equivalent).
Sieve Brush.
Analytical Balance capable of reading to 2 decimal places.
Plastic Beaker.
Retsch Sieve Shaker Model AS 200 Digit.

Method
- Establish required sieve size.
- Weigh 100g ± 0.10 g of tea.
- Pour weighed tea into sieve. Set the dial marked “Amplitude” to the position which ensures a vibration strength of 0.50mm (this is usually 45 on the dial scale), now press the “start” button.
- Place appropriate sieves* on the Retsch sieve shaker, clamp on the lid and set timer for four minutes. Set the switch marked "Amplitude" to the position which ensures a vibration strength of 1.35mm (this is usually 45), 45, now press the "start" button.
  * 710 & 630micron sieves are only used when performing particle size analysis of Orthodox leaf blends. For Fannings blends only use the 250micron sieve. Refer to the blend specification for definition of blend type.
- When sieves have finished vibrating, remove and tip dust from base into a beaker already tared on a balance.

- Read the balance and take reading as a percentage.

Inspection of Sieves

Purpose
To ensure the accuracy of measurements made using a sieve.

Equipment
Visual Inspection.

Method
The general condition of the sieve should be noted considering such things as:

- Damage to edges.
- Bent/twisted.
- Worn markings.
- Corrosion, holes etc.

Sieves that do not appear satisfactory should be discarded and removed from the inventory.

NIR method for the determination of Moisture Content of Tea

The definitive method for measuring moisture content of MBT is ISO 1573 (determination of loss of mass at 103 degrees C). The following describes a recognised rapid means of determining MBT moisture content.

Purpose
To determine the moisture content of tea.

Equipment

Infralab TM5000E Gauge:	Infralab Engineering
Plastic Tray:	Galliford Road
	The Causeway
	Maldon
	Essex
	CM94XD
	UK Tel: (+44) 01621 852244

Method
- From Main Menu - select sample measurement. Press return.
- From sample measurement menu - select sample to file. Press return measurement menu.
- For Group - Press “F4” for list & select name. Press return and “description” will appear on screen, press “enter”. Select tray size and press “enter” then press F1.
- For sample ID - Put blend number & tea type. (E.G. 656979-TB1).
- Tea Tray - Put sample in plastic tray, so that the tray is filled to the top, and place on the metal tray. Push the tray manually until it automatically draws the tray in.
- The scanning of the sample will take place, and eventually show the word “scanned” in the sample status column and the moisture content value in another column.

- To Exit – press “F10” and a screen appears with “Save” “Abandon” or “Cancel”.
- To Save – press return and another screen will appear with “overwrite” and “cancel”.
- To Overwrite – press return. A screen asking for sample to be removed from metal tray will appear.
- Remove plastic tray and press any key. This will return to the sample measurement menu. For next blend, repeat as above.
- If a mistake is made on a sample when scanning is complete, then by pressing “F2” for edit, the cursor keys can be used to move upwards to select the previous blend. From the menu displayed at the bottom of the page you can select to ignore “F7” or delete “F8”. (To remove either ignore or deleted from the sample status column, just press “F7” or “F8” respectively, again to change the status back to scanned).When exiting it will ask if you want to delete this data, just press return to delete the data.

Calibration
The above method **must** be calibrated at specified intervals against the UMA 0708 (determination of loss in mass at 103^{o}C).

Sampling method for Tea

Purpose

To ensure a representative sample of original or mixed teas are taken for testing purposes.

Equipment

Large sheet of paper.
Pallet knife or spatula.

Method

- Pour a large (500g+) sample of tea onto the sheet of paper, and using the pallet knife or spatula work into mound (cone).
- Using the pallet knife or spatula divide the mound of tea into approximately half, then discard one half, and rework the other half into another mound.
- Repeat the exercise until the mound of tea approximates to the required sample size.
- Using the sheet of paper as a funnel tip the required weight of tea into the testing vessel.

APPENDIX 6

UNILEVER BESTFOODS ALLERGEN LIST (based on Codex)

1. **Peanuts and peanut products**

2. **Tree nuts** (Almonds, Brazil nuts, cashews, hazelnuts, macadamia nuts, pecans, pine nuts, pistachios, walnuts)

3. **Milk** (and milk by-products, whey, casein)

4. **Eggs** (and egg containing material)

5. **Fish** (and fish containing material)

6. **Crustaceans** (crab, crayfish, lobster, shrimp) and **shellfish** (clams, mussels, oysters, scallops)

7. **Wheat** (flour and by-products)

8. **Soy and Soy products**

9. **Seeds** (sesame seed)

APPENDIX 7

Tea Primary Packaging Positive Assurance List

*All packaging components **must** comply with at least one of the following appropriate regulations;*

ADHESIVES – **must** have regulatory support from at least one of the following:
FDA 21CFR 175.105
FDA 21CFR 175.300
90/128/EEC
BGVV XIV
BGVV XXVIII
Japanese Food Sanitation Law
Japanese Welfare Ministry Regulations 1959 370.3D2
Japanese Welfare Ministry Regulations 1982 - 20

ALUMINIUM – **must** be made to at least one of the following standards and confirmed as suitable for direct food contact:
EN 602
ASTMS B479-97
Mercosur decree 28/96 GMC 27/93 GMC 48/93
Japanese Food Sanitation Law
Japanese Welfare Ministry Regulations 1959 370.3D2
Japanese Welfare Ministry Regulations 1982 – 20

PAPERS – **must** have regulatory support from at least one of the following:
FDA 21CFR 176.180
FDA 21CFR 176.170
BGVV XXXVI or XXXVI/1
Japanese Food Sanitation Law
Japanese Welfare Ministry Regulations 1959 370.3D2
Japanese Welfare Ministry Regulations 1982 - 20

POLYETHYLENES - must have regulatory support from at least one of the following:
90/128/EEC and amendments
FDA 21CFR 177.1520
FDA 21CFR 177.1600
FDA 21CFR 177.1610
FDA 21CFR 177.1615
FDA 21CFR 177.1620
BGVV III
BGVV XLVI
Mercosur decree 26/96 and Resolution 105 where applicable
India IS: 10146-1982
AUSTRALIA AS 2070.1
Japanese Food Sanitation Law
Japanese Welfare Ministry Regulations 1959 370.3D2
Japanese Welfare Ministry Regulations 1982 – 20

APPENDIX 8

GLOSSARY

Abuse:	Intentional improper use of product.
Auction:	Selling of MBT by competitive bidding.
Banjhi:	A dormant bud.
BCT:	Beverages Category Team.
Black Tea:	Camellia sinensis leaf manufactured and oxidised to convert green leaf to black tea.
Codex Alimentarius:	A code of food standards for all nations, jointly developed by the Food and Agriculture Organisation of the United Nations (FAO) and the World Health Organisation (WHO).
CTC Tea:	Tea manufactured by maceration through stainless steel crushing, tearing and curling rollers.
Critical Control Point (CCP):	A step at which control can be applied (and is essential), to prevent or eliminate a food safety hazard or reduce it to an acceptable level.
Design Control Point (DCP):	A step where the study of a conceptual line design, process design or plans and layouts identified a hazard and where there is a need for the hazard to be prevented, eliminated or reduced. DCP will be identified prior to HACCP studies during development/clearance of proposed product/process design.
Dhool:	The leaf after passing through the oxidation process.
Drying:	Exposing the tea to hot air, stopping oxidation. Deactivate the enzymes and reduce moisture content to 2-4%.
Fibrex:	Electrostatic fibre extracting machine.
FIFO:	First in first out.
Flow Diagram:	A detailed sequence of steps for the process under study.
Flush:	The upsurge in growth of the tea bush.
Food Allergy:	An immunologically based adverse reaction to a food protein.
GAP:	Good Agricultural Practices.

Grades:	All teas are categorised by leaf size as follows:
	Leaf: - Large leaf always Orthodox.
	Brokens - Orthodox or CTC intermediate size normally used in packets.
	Fannings - Small intermediate size Orthodox or CTC used in tea bags.
	Dusts: - Smallest size Orthodox or CTC for very specific markets.
Garden Mark:	The tea garden name under which it sells its tea. Printed on each sack/chest.
Grading:	The act of separating different tea sizes, by use of sieves, to the required product specification (sometimes called sorting).
HACCP:	Hazard Analysis of Critical Control Points. A system that identifies, evaluates, and controls hazards, which are significant for food safety.
Hazard:	A biological, chemical or physical agent in, or condition of, food with the potential to cause an adverse health effect.
HD:	Hygromatic Difference.
High Grown:	Tea grown above 1,200 metres.
Hygiene:	All factors affecting the wholesomeness and safety of manufactured food.
ISO:	International Standards Organisation.
Item:	A category grouping of teas of similar characteristics.
Lot:	Specific grade of homogenous tea from one garden packed as a unit (usually 1-5 tonnes).
Low Grown:	Tea grown below 500 metres.
LTS:	Lipton Tea Supply
Maceration:	Disruption of the leaf cells by orthodox rollers or CTC process to squeeze out the juices and break the leaf.
Maintenance Foliage:	Dark green and brittle leaf.
MBT:	Made Black Tea.
Misuse:	Unintentional improper use of product.

Mix:	One batch of a specified blend.
Mix Assembly:	Collecting together teas from different origins according to the quantities in the blend sheet.
Mixing:	The physical act of mixing teas of different origins into a homogenous blend.
Monitoring:	The act of conducting a planned sequence of observations or measurements of control parameters to assess whether a CCP is under control.
MRL:	Maximum Residue Limits.
Must:	A practice that is mandatory for UBF operations.
Mycotoxins:	A group of toxic metabolites produced by moulds. (Ref. SHEACO Food Safety Fact Sheet No 16: Mycotoxins in Food.).
Original Tea:	Tea in its original garden packed format.
Orthodox Tea:	Tea manufactured with a roller that twists the leaves.
Oxidation:	A chemical process that takes place within tea turning it from green to black that drives the development of the characteristic colour, flavour and aroma.
Pieces:	Any material that cannot be classified as a shoot in a tea sample.
Pluck or Shoot:	Two or three leaves and a bud.
Prevent:	Stop from happening. Target zero occurrence.
Preventative Measure:	Any system in place at a process step that controls the identified hazard(s).
Pruned Bush:	A bush that has been cut back to reduce the height and rejuvenate the growth.
Quality Control Point (QCP):	A point, step or procedure at which control can be applied and a quality defect can be prevented, eliminated or reduced to acceptable levels.
Reclaim:	Faulty product that is to be separated from its packaging and checked with a possible view to re-use.
Recommend:	Desirable, optional, preferred practice. Not mandatory, to be implemented.
Reference Method:	The standard method for calibration of any locally determined test.

Rework:	The re-use of reclaimed product.
Risk:	The probability that a hazard will take place.
Rollers:	A machine in Orthodox manufacture that gently twists and squeezes the leaf to release the juices.
Rotorvane:	A machine that reduces leaf size in the CTC process and releases juices.
SEAC:	Safety & Environmental Assurance Centre.
SEAC Toxicology:	Provides toxicological expertise and knowledge for the UBF integrated clearance/approval process (formerly known as ESL).
Should:	A recommended practice that may become mandatory for all operations in the future and that is compulsory in new investments
Skiffings:	Very coarse leaf obtained by soft pruning of fields just prior to the actual pruning work.
Sorting:	The act of sorting different tea sizes by means of sieves, to the required product specification (sometimes called grading).
Specialist Taster:	A qualified person trained in all the sensory skills required for consistent buying and blending decisions.
Step:	A discrete functional stage or unit operation within the process that forms a single operation on the flow diagram.
Tea Fluff:	Waste, fine residue collected in "dust extractors" and/or fine residue adhered to packing machine surfaces, etc. To be disposed of.
UBF:	Unilever Bestfoods
UR:	Unilever Research.
Water Activity:	Water activity is a measurement of available water of a food or solution. It is the ratio of the water vapour pressure of the food (p) to that of pure water (p0) at the same temperature $aw = p \div p0$.
Winnowing:	The process of separating particle sizes in tea using air and baffles within an enclosed structure.
Withering:	The act of allowing the leaf to reduce its moisture content by controlling time and temperature in both a physical and chemical way.