Technical Specifications for the manufacture of:

Canned Mackerel in Tomato Sauce
-CANNED MACKEREL -

Specification reference: Canned Mackerel
Version: V2.0
Date of issue: 23rd August, 2010

1. SCOPE
This specification applies to Canned Mackerel distributed by WFP, hermetically sealed and processed by heat to achieve commercial sterility and prevent spoilage. The fish will be packed in a medium of tomato sauce with or without vegetable oil and brine.

2. RAW MATERIALS

2.1 Mackerel
Canned fish shall be manufactured from fresh or frozen fish of a quality fit for human consumption. As mackerel belongs to the family of fish with high risk from scombroid toxin, post-harvest handling of the starting raw material must prevent histamine formation through strict time and temperature controls. The following species can be used in mackerel canning:
- Atlantic mackerel Scomber scombrus
- Chub mackerel Scomber japonicus

2.2 Vegetable Oil and Fat
Vegetable oil, if used in pre-cooking fish or as an ingredient, should conform to:
- Codex Standard for Named Vegetable Oils (CODEX STAN 210-1999);
- Codex Standard for Olive Oils and Olive Pomace Oils (CODEX STAN 33-1981);

2.3 Tomato and Tomato Sauce
Tomato used in manufacturing tomato sauce shall conform to Codex Standard for Tomatoes (CODEX STAN 293-2008) or Codex Standard for Preserved Tomatoes (CODEX STAN 13-1981).
Tomato sauce used as a medium for filling shall be manufactured in accordance with Codex Standard for Tomatoes (CODEX STAN 293-2008).

2.4 Other ingredients and food additives
All other ingredients and food additives used for canning shall be of food grade quality and conform to all applicable Codex standards.
3. PROCESSING

**Canned Mackerel** shall be manufactured in accordance with:

- Code of Practice for Fish and Fishery Products (CAC/RCP 52-2003);
- Codex Standard for Canned Finfish (CODEX STAN 119 - 1981, REV. 1 – 1995);
- Recommended International Code of Practice for Canned Fish (CAC/RCP 10-1976);
- Recommended International Code of Hygienic Practice for Low-Acid and Acidified Low-Acid Canned Foods (CAC/RCP 23-1979);

For compliance with Codex standards, the processor must be able to demonstrate by principle and practice the adoption, implementation and recording of:

- Good Manufacturing Practices
- Hazard Analysis Critical Control Point program

In this context an appointed WFP Inspector / Quality Surveyor is entitled to visit the factory without prior notice during any period when WFP product is being manufactured to check that the GMP and HACCP systems are in place. The Inspector / Quality Surveyor may request to see:

- **Records** (i.e. names of people in charge of the process and quality control, temperatures and other details of the thermal process establishment, retort records, visual inspection and teardown for empty and seamed cans, incoming inspection of empty cans, cooling water chlorination, Cook-Chex monitoring records, swab test results, etc).
- **Procedures** (e.g. SSOPs such as cleaning, personnel hygiene and their verification; HACCP; sampling and analysis protocols for raw material and finished products, decomposition controls, retorting by-pass controls, etc)
- **Instructions** (e.g. process instructions, cleaning instructions, testing instructions).
- **The SSOPs, HACCP Plan and Quality Manual** for the process or factory.

The producer must be **registered under national food law** as a processor of foods for human consumption. In addition, the producer must have a **legal authorization** to produce this commodity in the country where the factory is located and the country where the product will be exported (e.g. **FCE- Food Canning Establishment- and SSID- Process Filing- numbers in the USA or equivalent**).
4. PRODUCT SPECIFICATIONS

4.1. General Requirements

**Number of fish** *(headed, gutted, viscera, tail and fins are removed)*: 5-7 pieces*

**Net weight**: 425 grams.

**Drained weight**: 255 grams (60% of net weight).

**Odour, flavour and texture**: Canned mackerel shall have an odour, flavour and texture characteristic of the mackerel genus and the tomato sauce used as fill medium and shall not contain any objectionable odour, flavour and texture of any kind.

* number of pieces shall be adjusted to obtain an appropriate headspace during filling

4.2. Thermal Process Establishment

The manufacturing facility shall establish the thermal processes used to assure commercial sterility of its canned products through scientific validation studies. Thermal process establishment must consist of two parts: 1) temperature distribution studies specific to the process lines and retort systems used; and 2) heat penetration studies specific to the product form, fill medium, ingredients and can size. The results for such studies must determine how the minimum *Fo* value to achieve commercial sterility is achieved when the operating parameters for the facility’s cook schedules are followed. The studies shall also determine the critical factors for the thermal process, provide alternative process schedules, document the retort configuration and instrumentation, determine vent schedules and cooling protocols. Retort records must provide proof that these are monitored and complied. Such records shall be reviewed by a trained individual within 24 hours of the completion of the cook. Thermal processes must be established prior to use and validated at a frequency that reflects any changes that may impact the safety of the process or product. In the absence of such validation triggers, thermal process validation may be done annually or once every two years.

4.3. Microbiology

Microbiological contamination in the **Canned Mackerel** shall not exceed the following levels:

<table>
<thead>
<tr>
<th>Microorganisms</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Coliform</td>
<td>Max 40/g</td>
</tr>
<tr>
<td>Escherichia Coli</td>
<td>Max 10/g</td>
</tr>
<tr>
<td>Salmonella</td>
<td>0 (in 25g of sample)</td>
</tr>
<tr>
<td>Staphylococcus aureus</td>
<td>0 (in 25g of sample)</td>
</tr>
<tr>
<td>Clostridium botulinum</td>
<td>0</td>
</tr>
<tr>
<td>Lysteria monocyteogenes</td>
<td>0 (in 25g of sample)</td>
</tr>
<tr>
<td>Vibrio cholerae</td>
<td>0 (in 25g of sample)</td>
</tr>
</tbody>
</table>

4.4. Chemical Contaminants and Toxins

Contaminants and toxins in the **Canned Mackerel** could come from the fish itself, the fishing grounds, from ingredients, equipment, utensils and even from the cans. These shall not exceed the following levels or country-specific regulatory requirements, whichever is stricter:
Table 2: Limit of contaminants and toxins in Canned Mackerel

<table>
<thead>
<tr>
<th>Item</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mercury (Hg)</td>
<td>Max 0.5ppm</td>
</tr>
<tr>
<td>Cadmium (Cd)</td>
<td>Max 0.05ppm</td>
</tr>
<tr>
<td>Lead (Pb)</td>
<td>Max 0.5ppm</td>
</tr>
<tr>
<td>Arsenic (As)</td>
<td>Max 1.0ppm</td>
</tr>
<tr>
<td>Tin (Sn)</td>
<td>Max 200ppm</td>
</tr>
<tr>
<td>Melamine</td>
<td>Max 250ppm</td>
</tr>
<tr>
<td>Para red</td>
<td>0</td>
</tr>
<tr>
<td>Rhodamine</td>
<td>0</td>
</tr>
<tr>
<td>Sudan red dyes (I, II, II and IV)</td>
<td>0</td>
</tr>
<tr>
<td>Histamine*</td>
<td>Max 10 mg/100 g of average sample</td>
</tr>
</tbody>
</table>

* Not exceed 20 mg/100 g in any sample unit; some countries may require 5 mg / 100 g

Canned Mackerel shall not contain pesticide residues in amounts which may represent a hazard to health. In some markets, there are chemical requirements about can lacquers.

4.5 Hermetic Seal

The manufacturing facility shall have an incoming goods sampling program for empty cans and lids. Specifications for can bodies and ends must be on file and specific to the can supplier. They shall include details of can dimensions, end profile, can body weight, can body and end thickness, side seam weld, empty can water capacity, external and internal lacquers (coatings), seam dimensions of the sealed end. The seam dimensions must specify acceptable range or limits for parameters, such as seam thickness, seam length, body hook and cover hook, needed to calculate overlap as well as those, such as vacuum, countersink, wrinkle, that could indicate potential can defects from the seaming operation.

During production, the manufacturing facility shall ensure that seamers are operated to match the can properties and obtain a vacuum to maintain a hermetic seal. Checks for defects in seamed finished product cans shall be done visually at a minimum of every 30 minutes. In addition, seam teardowns must be carried out at minimum every four hours, using either a micrometer or a seam projector. All seaming records are considered legal documents and therefore, must be recorded accurately and reviewed within 24 hours of production.

4.6. Shelf life

It shall retain normal product qualities for at least three years from the date of manufacture when stored dry at ambient temperatures prevalent in the country of destination. Thermal processing, seaming and other HACCP records shall be kept for a minimum of shelf-life plus one year.

5. PACKAGING

Canned Mackerel can be packaged into 425g tin can to constitute the primary packaging. The secondary packaging is cartons to facilitate transportation and storage.
5.1. Tins

The metal containers (tins) must be coated internally and externally with lacquers appropriate for
the product. Specifications and guarantees for the material, lacquers and other treatments used
shall be available. Likewise, the facility must obtain the acceptable ranges and limits for the
double seam dimensions and other characteristics of the filled can specific to the can type, size
and supplier. Together with fill standards required for the product, these specifications will be
used to ensure the finished product is hermetically sealed during the seaming operation.

Some guidelines follow:
- Internal tin coating mass: 8.4-11.2g/m²
- External tin coating mass: 2.8-11.2g/m²
- Can size: 115 x 75 mm.
- Can weight: 59g.
- Lid type: regular or easy open.

5.2. Cartons

Cartons should be new, strong cardboard cartons containing 24 tins, manufactured from well-
constructed single wall, fluted paper, corrugated board with a specific weight of
approximately 750g per square meter. This specific weight corresponds to a carton weight of
approximately 560g.
- Cartons should have burst strength (edge crush test) of approximately 44 pounds per
  square inch or 3.2 kg/ cm² or equivalent.
- Carton sides and flaps should be glued, not stapled or strapped.
- Substance of cartons 275-120-275 (750g per m²).

Slip sheets or plywood should be placed inside each container at every three layer of cartons
to provide the required stacking strength. Pallets with appropriate stacking configuration
could also be used

6. MARKING

6.1. On tins

The following information should be available on tins:
- Name of the product
- Net weight
- Name of manufacturing facility (including country of origin)
- Batch number (should be traceable to retort and seamer used for manufacturing)
- Production date (and shift, if there is more than one shift)
- Best before date / Expiry date
- Additional marking as per contractual agreement

6.2. On cartons

The following information should be available on each carton:
- Name of the product
- Number of tins per carton
- Net weight
- Name and address of the supplier (including country of origin)
- Production date
- Expiry date
- Additional marking as per contractual agreement

7. STORING

Canned Mackerel must be stored under dry, ventilated and hygienic conditions.
### 8. ANALYTICAL REQUIREMENTS

**Table 3: Limit of compulsory tests and reference method**

<table>
<thead>
<tr>
<th>No</th>
<th>Item</th>
<th>Requirement</th>
<th>Reference method*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Fish species</td>
<td>Atlantic mackerel (<em>Scomber scombrus</em>) Chub mackerel (<em>Scomber japonicus</em>)</td>
<td>Visual</td>
</tr>
<tr>
<td>2</td>
<td>Number of fish</td>
<td>5-7 pieces (headed, gutted, viscera, tail and fins are removed)</td>
<td>Visual</td>
</tr>
<tr>
<td>3</td>
<td>Organoleptic (texture, color, smell, taste)</td>
<td>Characteristic of fresh fish and good quality fill medium</td>
<td>CAC-GL31-1999 or equivalent industry standards</td>
</tr>
<tr>
<td>4</td>
<td>Net weight</td>
<td>425g</td>
<td>CODEX STAN 119 - 1981, REV. 1 – 1995</td>
</tr>
<tr>
<td>5</td>
<td>Drained weight</td>
<td>Min 255g (60% of net weight)</td>
<td>CODEX STAN 119 - 1981, REV. 1 – 1995</td>
</tr>
<tr>
<td>6</td>
<td>Can size and weight</td>
<td>115 x 75 mm, 59 g.</td>
<td>Can manufacturer specifications</td>
</tr>
<tr>
<td>7</td>
<td>Thermal Process - Incubation Tests</td>
<td>Minimum Fo value, cook schedules, - Temperature distribution, heat penetration study, retort records - GB/T4789.26 (2003); TIS 335; BAM Chapter 21A</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Seam checks</td>
<td>Specific to can size, type, supplier</td>
<td>Vacuum, overlap; seam records</td>
</tr>
<tr>
<td>10</td>
<td>Total Coliform</td>
<td>Max 40/g</td>
<td>BS 5763:1991 Part 2</td>
</tr>
<tr>
<td>11</td>
<td>Escherichia Coli</td>
<td>Max 10/g</td>
<td>AOAC 966.23B, BS 5763:1991 Part 8</td>
</tr>
<tr>
<td>12</td>
<td>Salmonella</td>
<td>0 (in 25g of sample)</td>
<td>BS 5763:1991 Part 4 ISO 6579:2002</td>
</tr>
<tr>
<td>13</td>
<td>Staphylococcus aureus</td>
<td>0 (in 25g of sample)</td>
<td>AOAC 975.55, AOAC 987.09</td>
</tr>
<tr>
<td>14</td>
<td>Lysteria monocytogenes</td>
<td>0 (in 25g of sample)</td>
<td>AOAC 993.09, AOAC 994.03</td>
</tr>
<tr>
<td>15</td>
<td>Mercury (Hg)</td>
<td>Max 0.5ppm</td>
<td>AOAC 977.15 or equivalent</td>
</tr>
<tr>
<td>16</td>
<td>Cadmium (Cd)</td>
<td>Max 0.05ppm</td>
<td>AOAC 945.58 or equivalent</td>
</tr>
<tr>
<td>17</td>
<td>Lead (Pb)</td>
<td>Max 0.5ppm</td>
<td>AOAC 972.23</td>
</tr>
<tr>
<td>18</td>
<td>Arsenic (As)</td>
<td>Max 1.0ppm</td>
<td>AOAC 986.15</td>
</tr>
<tr>
<td>19</td>
<td>Tin (Sn)</td>
<td>Max 200ppm</td>
<td>AAS</td>
</tr>
<tr>
<td>21</td>
<td>Para red</td>
<td>0</td>
<td>HPLC or LC-MS/MS</td>
</tr>
<tr>
<td>22</td>
<td>Rhodamine</td>
<td>0</td>
<td>HPLC or LC-MS/MS</td>
</tr>
<tr>
<td>23</td>
<td>Sudan red dyes (I, II, II and IV)</td>
<td>0</td>
<td>HPLC or LC-MS/MS</td>
</tr>
<tr>
<td>24</td>
<td>Histamine</td>
<td>Max 10 mg/100 g</td>
<td>AOAC977.13</td>
</tr>
</tbody>
</table>

* or equivalent