02 June 2015

European Union Comments

CODEX COMMITTEE ON FISH AND FISHERY PRODUCTS
Thirty-fourth Session
Ålesund, Norway - 19 – 24 October 2015

Codex Circular Letter 2015/1-FFP

Appendices for Optional Final Product Requirements for Commodities in the *Code of Practice for Fish and Fishery Products* (CAC/RCP 52-2003)

Member States Competence
Member States Vote

The Member States of the European Union (MSEU) would like to submit the following comments on the appendices:

APPENDIX I

MODIFIED ATMOSPHERE PACKAGING

GOOD PROCESS CONTROLS ARE ESSENTIAL WHEN PACKING FILLETS AND SIMILAR PRODUCTS IN A MODIFIED ATMOSPHERE

Modified atmosphere packing (MAP), in which the composition of the atmosphere surrounding the fillet is different from the normal composition of air, can be an effective technique for delaying microbial spoilage and oxidative rancidity in fish.
For white fish gas mixtures containing 35-45% CO_2, 25-35% O_2 and 25-35% N_2 are recommended**, however sometimes gas mixtures containing 50% CO_2 + 50% O_2 or 50% CO_2 + 50% N_2 or 100% CO_2 are used.**[1] Gas mixtures containing up to ~~60~~**80**%[2] CO_2 in combination solely with N_2 are recommended for oily fish. **For fresh shrimp or prawns packed in ice the atmosphere of 100% CO_2 is recommended.**[3] The inclusion of CO_2 is necessary for inhibiting common aerobic spoilage bacteria such as *Pseudomonas* species and *Acinetobacter/Moraxella* species**, however it results in dominance of more resistant organisms, such as *Lactobacillus* and *Alteromonas* in cooled fish. As an effect of their development some metabolites are formed, which can cause abnormal sensory**

---

[1] Stenstrom I.-M. 1985. Microbial flora of cod fillets (*Gadus morhua*) stored at 2°C in different mixtures of carbon dioxide and nitrogen/oxygen. J. Food Protect. 48, 585-589.

[2] 1. Brown W.D., Albright M., Watts D.A., Heyer B., Spruce B., and Price R.J. 1980. Modified atmosphere storage of rockfish (*Sebastes miniatus*) and silver salmon (*Oncorhynchus kisutch*). *J. Food Sci*. 45, 93-96.
2. Cai P., Harrison M.A. Huang Y.-W., Silva J.L. 1997. Toxin production by *Clostridium botulinum* type E in packaged channel catfish. *J. Food Protect*. 60, 1358-1363.

[3] Matches J.R., Lavrisse M.E., 1985. Controlled atmosphere storage of spotted shrimp (*Pandalus platyceros*). *J. Food Protect.* 48, 709-711.

characteristics of stale fish.[4] Generally the Gram-negative bacteria are more sensitive to CO_2 inhibition than Gram-positive, with pseudomonas being among the most sensitive and clostridia the most resistant.[5]

However, retail packs of fillets or similar products, too high a proportion of CO_2 in the gas mixture can induce pack collapse, excessive drip and may cause bleaching. Other gases, N_2 and O_2, are included as diluents to prevent these effects. O_2 is preferentially excluded from oily fish in MA packs so as to inhibit oxidative rancidity. **Moreover, the concentration of CO_2 above 25% in the atmosphere may cause brown discolorations of the red fish flesh due to oxidation myoglobin to metmyoglobin at low partial pressure of oxygen.[6]** A gas/product ration of 3:1 is commonly recommended. Any reductions in this ration can result in an impaired shelf-life extension.

The extent to which the shelf-life of the product can be extended by MAP will depend on the species, fat content, initial bacterial load, gas mixture, type of packaging material and, especially important, the temperature of storage. **The inhibitory activity of CO_2 increases with the decreasing of incubation and storage temperatures as well as the decreasing of pH into the acid range.[7]** Determination of the shelf life of a particular product should be by a suitably qualified person such as a food technologies or microbiologist. Since fish can be contaminated with *Clostridium botulinum* type E great care has to be exercised when determining the shelf life. **Storage of fish in an oxygen free atmosphere increases possibility of development of *Clostridium botulinum*, if the raw material is not completely free from these anaerobes. Fish packed in such an atmosphere should not be kept in a temperature higher than 3 °C, below which *Clostridium botulinum* type E does not develop. Moreover the packaging should be made of the material of low permeability of water vapor and gases (e.g. O_2-barrier and CO_2-barrier).[8]** ~~Although it is generally accepted that *Clostridium botulinum* does not grow at temperatures below +3°C Other factors, e.g. salt content or pH etc. can also have an inhibitory effect~~. Thus when determining the shelf life of MAP fresh fish it is advisable to do challenge tests on the product which accurately reflect the product conditions and storage and distribution environment. It is very important to note that the inclusion of O_2 does not preclude the growth of *Clostridium botulinum* type E and temperature control throughout the shelf life of the product is very important. In many

---

[4] Sikorski Z.E., 2004. *Ryby i bezkręgowce morskie. Pozyskiwanie, właściwości i przetwarzanie*. Rozdz. 7.WNT, Warszawa, s. 169.

[5] Jay J.M., Loessner M.J., Golden D.A. 2005. *Modern Food Microbiology*. Seventh Edition. Chap. 14. Food Science Text Series. Springer. NY, USA, p. 354.

[6] Sikorski Z.E., 2004. *Ryby i bezkręgowce morskie. Pozyskiwanie, właściwości i przetwarzanie*. Rozdz. 7. WNT, Warszawa, s. 169.

[7] 1. Jay J.M., Loessner M.J., Golden D.A. 2005. *Modern Food Microbiology*. Seventh Edition. Chap. 14. Food Science Text Series. Springer. NY, USA, p. 354.
2. Dalgaard P., Munoz L.G., Mejholm O. 1998. Specific inhibition of *Photobacterium phosphoreum* extends the self-life of modified-atmosphere-packaged cod fillets. *J. Food Protect*. 61, pp. 1191-1194.
3. Adams M.R., Moss M.O. 1995. *Food Microbiology*, Chap. 4. Cambridge, England: Royal Society of Chemistry.

[8] 1. Sikorski Z.E., 2004. *Ryby i bezkręgowce morskie. Pozyskiwanie, właściwości i przetwarzanie*. Rozdz. 7. WNT, Warszawa, s. 169.
2. Cai P., Harrison M.A. Huang Y.-W., Silva J.L. 1997. Toxin production by *Clostridium botulinum* type E in packaged channel catfish. *J. Food Protect*. 60, 1358-1363

circumstances it is considered undesirable to use ice to cool these packs and therefore mechanical refrigeration methods are preferred.

APPENDIX IV

Frozen Surimi

1.1.1 Moisture

2 The unit of the Pre-dry weight in the denominator should be expressed in [g]. The moisture parameter should be multiplied by 100 in order to express it as a percentage.

$$\text{Moisture (\%)} = \frac{\text{Pre}-\text{dry weight (g)} - \text{after}-\text{dry weight (g)}}{\text{Pre}-\text{dry weight (g)}} \text{ x } 100$$

1.1.3 Objectionable Matter

The term "objectionable matter" as used in this item shall mean skin, small bone, **pin bone, scales** and any objectionable matter other than fish meat.

The quantity of objectionable matter depends on grade of the surimi and should not exceed 14 pieces/10g of sample.

Rationale: According to practice of fish processors.

1.2.1 Gel Strength and Deformability

1.2.1.1 Puncture Test

A. Comminution

Sample ~~volume~~ **weight** necessary for surimi paste preparation depends on the capacity of mixing instrument used.

There are two more methods, which might be used in determination of surimi quality:

1.2.1.3 Stress Relaxation Test of Cooked Surimi Gel

In the stress relaxation test surimi gels are exposed to fixed deformation. The 25-mm diameter and 10-mm long surimi gels are compressed to 30% deformation at a cross-head speed of 1 mm/s with a 50 mm diameter flat cylinder probe using the TAXT2 Texture Analyzer. The gels are held for 2 min at 30% of their height. The stress relaxation data are analyzed by the stress relaxation method proposed by Peleg and the asymptotic moduli of surimi (a measure of gel solidity) are then determined from the modified version of Peleg's model.[9]

[9] 1. Varith J., Barbosa-Canovas G.V., Swanson B. 2000. The influence of texture on functional properties of high hydrostatic pressure surimi gels. /In:/ Innovations in Food Processing. Chap. 9.Ed. G. W. Gould and G.V. Barbosa-Canovas. CRC Press LLC, USA.
2. Careche M., Baroso M., 2009. Instrumental texture measurement. /In:/ Fishery Products: Quality, Safety and Authenticity.Chap. 9. Ed. H. Rehbeni and,J. Oehlenschlager. Blackwell Publishing, Oxford, UK.

1.2.1.4 Texture Profile Analysis of Cooked Surimi Gel

Instrumental TPA is the perfect complement sensory tests, allows you to get reliable information about the texture of products and / or raw materials, completely independent of the actual psychophysical condition and / or preferences of persons engaged in the analysis.

Texture Profile Analysis (TPA) has been widely use in determination of surimi quality as well. There are many scientific articles describing using this test in the area of surimi production. TPA test is performed with the TAXT2 Texture Analyzer with a 50-mm of diameter cylinder probe. The 25-mm diameter and 10-mm long surimi gels are compressed twice up to 25% of its original height (75% of compression) in reciprocating motion and a cross-head speed of compression is set at 1 mm/s. The textural attributes of hardness, cohesiveness, springiness, gumminess, chewiness and resilience were then calculated from the curve force-time.[10]

2. Secondary Quality Attributes

2.1 Raw Surimi Tests

2.1.4 Crude Fat Content

"S" in the denominator of the calculation of crude fat content should be expressed as weight of the sample taken (g), not quantity of the sample taken (g).

2.2 Cooked Surimi Tests

2.2.1.1 Water-added Surimi gel:

A. *Comminution*

Sample ~~volume~~ **weight** necessary for surimi paste preparation depends on the capacity of mixing instrument used.

2.2.2.2 Expressible Moisture

The calculations of the **expressible water** and **water holding capacity** should be multiplied by 100 in order to express them as a percentage.

The other way to determine the Water Holding Capacity of the surimi gels is the WHC Test. About 2 g of scrap surimi gel are spread on a filter paper and then backed up with two pieces of the same filter papers. The filter papers are folded twice and centrifuged at 2.500 rpm for 15 min. The water holding capacity is calculated with the following equation:

$$\mathbf{WHC\ (\%)} = \frac{\mathrm{IWC} - \mathrm{WL}}{\mathrm{IWC}}\, \mathrm{x}\ 100$$

IWC – initial water content (obtained from the percentage of moisture content multiplied by the weight of the sample taken)

WL – water loss[11]

---

[10] 1. Park J.W., Yoon W.B., Kim B.Y. 2014. Surimi Paste Preparation, Gel Analysys, and Rheology. /In:/ Surimi and Surimi Seafood, Third Edition Ed. J. W. Park. CRC Press. Taylor & Francis Group. Boca Raton, US.
2.Varith J., Barbosa-Canovas G.V., Swanson B. 2000. The influence of texture on functional properties of high hydrostatic pressure surimi gels. /In:/ Innovations in Food Processing. Chap. 9.Ed. G. W. Gould and G.V. Barbosa-Canovas. CRC Press LLC, USA.
3.Anwar C., Tsao C.-Y., Hsiao H.-I. 2013. EFFECT OF CRYOPROTECTANTS ON THE QUALITY OF SURIMI DURING STORAGE AT -20OC. Annals. Food Science and Technolog, Vol. 14, Issue 2., 199-205.
4. and other

[11] 1. Varith J., Barbosa-Canovas G.V., Swanson B. 2000. The influence of texture on functional properties of high hydrostatic pressure surimi gels. /In:/ Innovations in Food Processing. Chap. 9. Ed. G. W. Gould and G.V. Barbosa-Canovas. CRC Press LLC, USA.

Summation
First grade surimi should meet the following requirements (see table below).

Rationale: According to the manufacturer's practice the quality of surimi is graded on the basis of the physical and visual conditions of raw surimi and its gel forming ability.

Tab. Raw Material Analysis

PARAMETER		LIMIT	METHOD
Gel strength (g*cm)		100 - 700 (depending on grade)	texture analyzer
pH		6.8-7.3	pH-meter
Moisture (%)		75 ± 2	moisture balance
Impurity (scoring)		up 5 (depending on grade)	counting on the black&white plate
Cold water fish	**L* (Whiteness)**	> 68 (depending on grade)	colorimeter
	b* (Yellowness)	> 4 (depending on grade)	
	Descriptive	White to light grey	Organoleptic
Tropical fish	**L* (Whiteness)**	> 68 (depending on grade)	colorimeter
	b* (Yellowness)	> 5 (depending on grade)	
	Descriptive	Light yellow to yellow	Organoleptic
Smell		Natural / Fresh	Organoleptic

2. Hajidoun H.A., Jafarpour A. 2013. The Influence of Chitosan on Textural Properties of Common Carp (Cyprinus Carpio) Surimi. J Food Process Technol 2013, 4:5.