

General Meeting of Performance BIB

Nîmes, France

25 to 27 November 2007

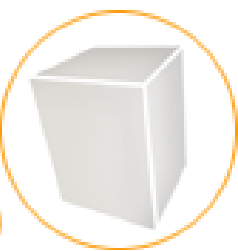


Session : Monday 26 november 2007 at 16:00
Standardisation of Test Methods

Title : Recommendations for the
international standardization of
test methods for boxes, taps, films,
bags and wine

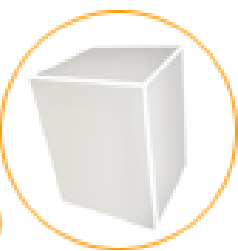
Speakers : Tony Hoare (Rapak, UK),
Philip Bailey (Corby Bottlers, UK)
Eric Olsen, Amcor, Denmark

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Introduction

- We extracted from the document listing Principles and Key parameters of what we felt were definable elements.
- Gathered established test specification and collated this presentation as a interim stage for film, tap, bags, wine and filling.
- On - going developments of test methods some of which have already been talked about will be included as a separate element as any new processes will need to be proved across a range of conditions.
- There are many variations on a theme as a result of the global nature of the application but we have tried to take a representative view where variations occur.



Introduction

- Eric from Amcor will discuss parameters related to Films
- I will then cover taps with Phil From Corby Bottlers discussing wine and filling.
- To complete the presentation I will then cover bags
- Due to time constraints and the magnitude of the subject we will only briefly discuss each parameter it is intended that a Draft document will be issued early next year for further discussion before a final document is issued.
- As new technology and methods are developed changes may occur to the recommendations so this is very much a snapshot of where we are now.

WINE
SEM
2007



Permeability



- The following permeability parameters are important related to films for BIB

- Oxygen Permeability - unit $\text{cm}^3/\text{m}^2/\text{day}/\text{atm}$

Measurement of permeation of oxygen. The figure is the amount expressed in cm^3 permeating 1 m^2 film during one day and with a partial pressure difference one 1 atm (at normally 23°C , 50% RH – other conditions might be used)

- (Carbon Dioxide (CO_2) permeability)

Similarly to oxygen permeability

- Water Vapour Transmission Rate (WVTR)
unit $\text{g}/\text{m}^2/\text{day}$

Measurement of the amount of water vapour(g) permeating 1 m^2 film during one day. Normally measured with 90 % RH at 38°C but other RH and temperatures can be used.



Oxygen Permeability



- The following permeability parameters are important related to films for BIB
 - Oxygen (from the outside into the product)
 - Carbon dioxide (for some few products), however the CO₂ barrier is always 3-5 times the O₂ barrier





Water Vapour Transmission Rate

- The WVTR is not that relevant for the BIB, but helps characterizing the material

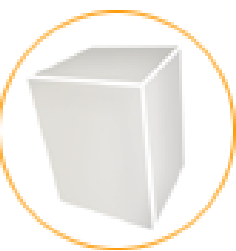




Flex Resistance

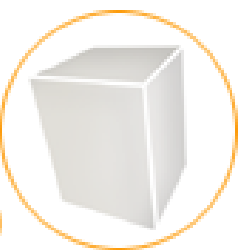


- It is important that the material has a certain flex resistance. When filled with wine the material will in the carton during transportation be exposed to a lot of vibration which might lead to small flex crack. This is especially evident when the carton volume is specifically higher than the wine volume. The most used test equipment being used is Gelbo Flex. In this test a material is formed into a cylinder and then exposed to rotating and compression a number of times.
- After this treatment which can be from 5 to several hundred rotations the test specimen can be used to be examined for flexcrack holes or for change in barrier properties



Flex Resistance

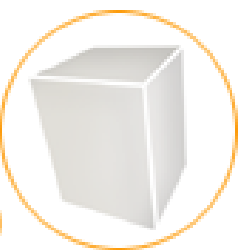




Ageing performance



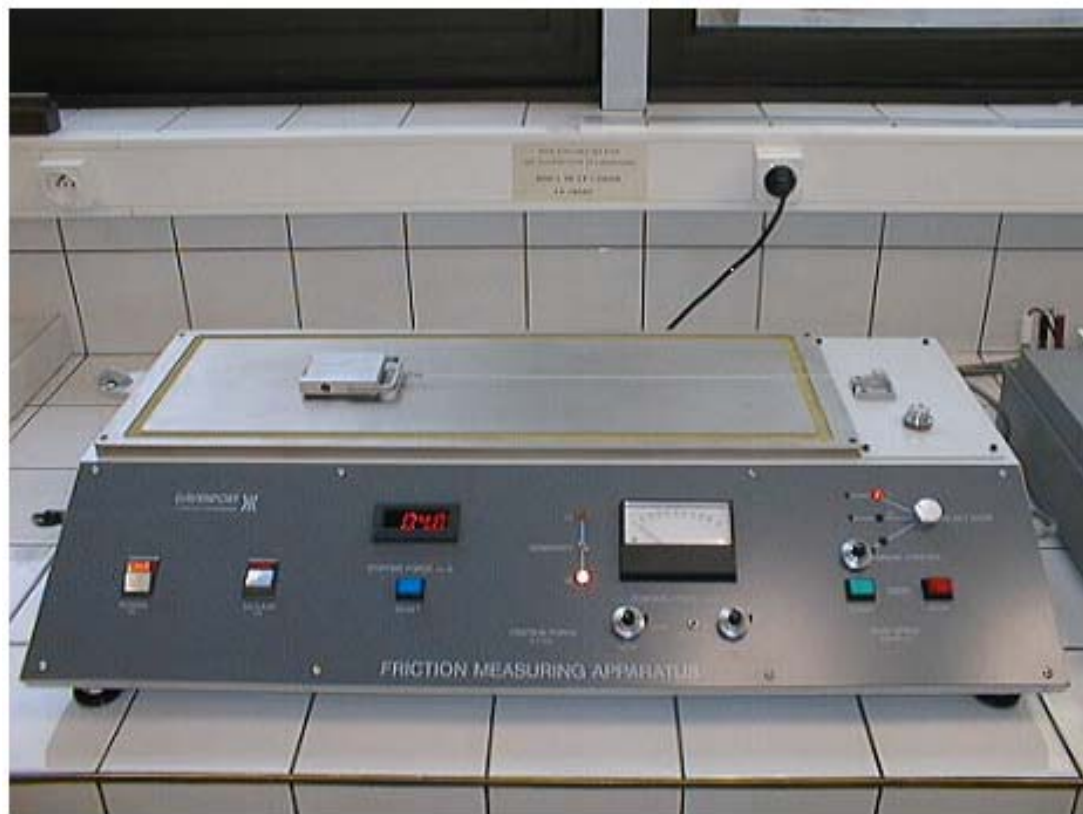
- This is an area which is very difficult to conclude from
- The aim is to estimate the shelflife of the film (or the wine) based on accelerated tests. Most measurements are about measuring the change in physical properties after exposing to heat for a certain period of time (e.g. 10 - 30 days at 40 °C)



Coefficient of Friction CoF



- CoF is important for moving the BIB into the filling machine (or the pouch making) and also to insert the filled pouch into the carton.





Tensile

- Tensile strength and Elongation at break are parameters which will characterize the packaging film material.
- The units being used is in N/mm^2 or $\text{N}/15 \text{ mm width}$ and %



Bond Strength



- However bond strength is a very important test parameter which is important for not only laminates but also co extruded material
- The material is not better than the weakest point
- The unit being used is normally N/15 mm

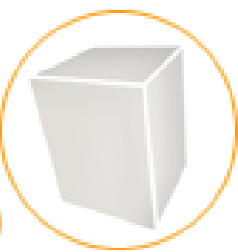




Seal Strength

- A very important factor for packaging material is the ability to seal – to make a pouch
- Seal conditions (temperature, time pressure) are important to agree upon
- Seal strength is measured in N/15 mm

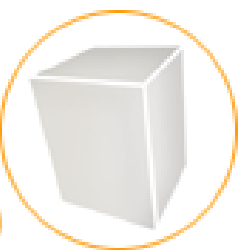




Puncture resistance



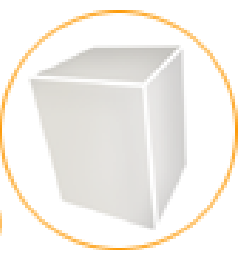
- There are different methods available to measure the puncture resistance
- The difference is related to the needle being used – especially the tip being round or as point – and the size of the needles



Food contact regulation

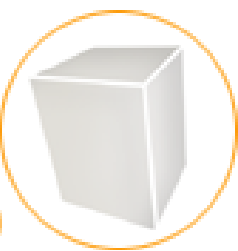


- ★ 1 Framework Regulation 1935/2004/EC
- ★ 2 Plastic Directive 2002/72/EC
- ★ 3 GMP
- ★ 4 Other Specific Measures
- ★ 5 Resolutions & Guidelines
- ★ 6 National provisions



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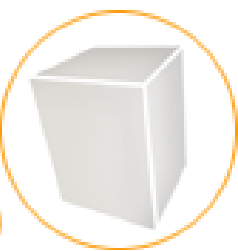
Taps and Glands



Taps



Parameter	Test Procedure	Conditions	Units
Dimensions	<p>SQC Package is used and dimensions taken once per shift.</p> <p>Smart scope system (numeric control machines) tested every 2 hours body and gland from each injection mould</p>	<p>Room conditions (22°C)</p> <p>Critical dimensions for external tap barrel and internal spout diameters</p>	
Aging performance	<p>Recommended usage by the bag manufacturer is within 12 months and must not exceed 2 years from date of manufacture</p>		
Temperature conditions	Storage of taps and glands	Customers storage area	Must be over 4°C and less than 50°C

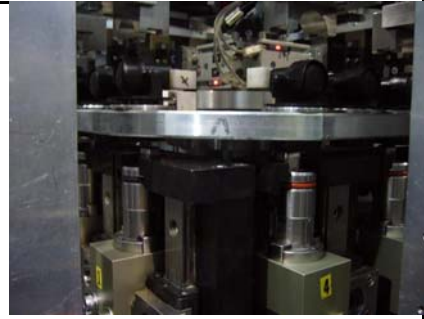


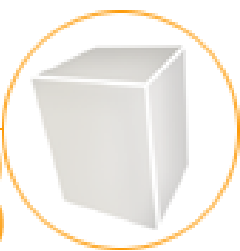
Taps

Parameter	Test Procedure	Conditions	Units
Mechanical Resistance of valve	<p>Button force, delatch force and button actuation force</p> <p><i>Cyclical test of using (open and close for 500 times)</i></p> <p><i>Period test of keeping tap open in connector for 24 hours and then closing it</i></p>	<p>Samples taken from every tool, every shift and force recorded in Newtons</p> <p><i>Tightness in Bars of pressure after open and close test.</i></p>	
Barrier	<p>Systec Model M8001 or similar O2 permeation test (measured according to ASTM D3985-81 standard)</p> <p>Before opening tap and after opening and closing 10 times</p>	<p>24-hour period, 21% oxygen rate, 50% relative humidity at 23°C</p> <p>Test with tap Wet or Dry</p>	



Taps

Parameter	Test Procedure	Conditions	Units
Tap Gland Fit –force test	Dimensional data taken on both tap and gland to ensure fit. <i>In House push through force</i>	Room Temperature (22°C) <i>10 taps and 10 glands each day –</i>	<i>force (Kg) required to insert and remove tap into and from spout.</i>
Tightness – tap interfaces	Valve interfaces tested 100% on the assembly machines Number of taps (in %) which remain tight at a pressure of 0.4 bar without having ever opened the valve mechanism	Room Temperature (22°C) 7.5 Psi with leak rate below 0.5 cc/min <i>Each tap is tested at 0.4Bar</i>	
Tap/gland interface integrity	Number of tap/gland interfaced (in %) which remain tight at a pressure of 0.7 bar. The tap is totally sealed off so that only the air through the interface is measured.		



Taps

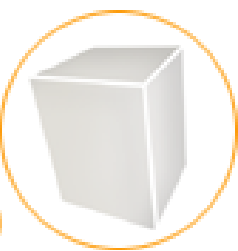
Parameter	Test Procedure	Conditions	Units
Stress Crack testing	Stress crack testing. Elevated temp 40C in Suffactant solution	Room Temperature (22°C) and accelerated/elevated conditions for stress crack tests	Stress crack tests done to maintain specifications. Measured over various time periods and conditions
Migration	European Directive 82/711/EEC, 85/572/EEC. Procedure 2002/72/EC <i>D.M. 22/07/1998 n°338 Art 1 GU n°288 30/09/1998</i> + <i>D.M. 26/04/1993 n° 220 GU n.162 13/07/1999</i>	Distilled water and 10% alcohol. <i>Acetic acid 3% W/V in water Ethanol 10% W/V in Water Olive Oil</i> <i>Temperature: 40°C Contact Time: 10 Days</i>	Sample Testing done every year – minimum 12 tap gland combinations <i>10 taps +10 glands per year</i>



Wine/Filling Parameters


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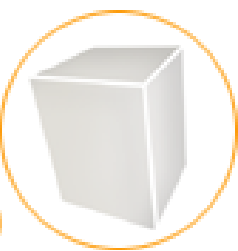




Wine





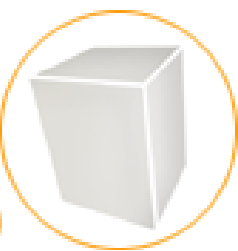
Parameter	Test Procedure	Conditions	Units
<p>Bulk wine prior to filling.</p> <p>Preservative level in the wine relative to BiB</p>	<p>Ascorbic, Sorbic acid levels</p> <p>SO2 Determination Aspiration-European reference method</p> <p>Ripper & Foss</p> <p>Skalar segmented flow analyser Ripper Method-target 50mg/L Iodide – iodate</p>	<p>Chemical analysis</p> <p>Test blend and bottling tank Arrival – storage – packaging International regulation apply for Tot. SO2:</p>	<p>mg/l</p> <p>mg/l</p> 



Wine



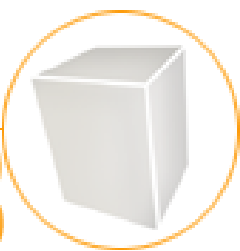
Parameter	Test Procedure	Conditions	Units
O2 Levels	Inolab, Oxilevel 2 Hach Fluorescence DO meter Orbisphere, Note: method has a marked influence on the result.	<2 <1ppm Test bag start <3ppm Sampling points throughout entire flow – mainly packaged wine	mg/l (ppm) 
CO2 Levels	Carbon Dioxide meter- Corning Wine Scan	<800 at ambient Temp Pre packaging	mg/l (ppm) 
Microbiology	Examples: Membrane Filtration 0.45µm membrane filter on WLN media plates. Tomato agar, 3 days incubation Millipore 55 plus monitors Spreading on agars, 4 days, yeast, bacteria, mould	Incubation for 3-5 days at 25-27C on WLN (At filling) 5 days incubation at 26°C Filter beginning and end of run sample and incubate 27-30°C for 48 hours.	Colony / 250ml CFU's



Wine

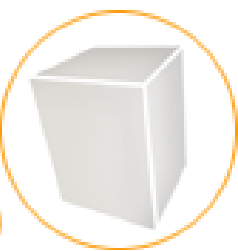


Parameter	Test Procedure	Conditions	Units
General Wine Analysis	<p>pH – meter</p> <p>Sugar level,,reducing sugar,</p> <p>Acidity both Total & Volatile</p> <p>Alcohol, distillation or alternative such as Refractive index, IR.</p> <p>FSO₂, TSO₂, Stability protein & cold . conductivity, or chill test.</p> <p>DO</p> <p>filterability test, colour measurement- phototometer</p> <p>Wine Scan</p> <p>Sensory evaluation</p>	<p>Felhings solution</p> <p>Prior to bottling and Alcohol, DO on finished product</p> <p>Arrival</p> <p>Storage</p> <p>Pre-packaging</p> <p>Filled product</p> <p>Molecular SO₂?</p>	<p>Affects so2 stability</p> <p>g/l reducing sugar</p> <p>Industry standards</p> <p>International legislation.</p>



Filling

Parameter	Test Procedure	Conditions	Units
Level of final filtration	Certified by the manufacturer. Recommendation to integrity test prior to use, by pressure decay or equivalent method.	<i>Specified in the contract-designed to produce stable product.</i>	Typically 0.45 micron membrane filtration on filling
Temp/Humidity	Temperature	High temperatures will accelerate the aging process	Degree C
Leakers	Observation of Leakage	Identification of cause	Rate per 10,000 bags
SO2 Levels	Aspiration-European reference method Ripper & Foss Skalar segmented flow analyser Ripper Method-target 50mg/L Iodide – iodate	During shelf-life under ambient conditions. International regulation apply for Tot. SO2:	mg/l in Pack

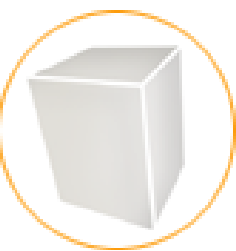


Filling



Parameter	Test Procedure	Conditions	Units
Air volume in the bag (parameter 77)	Measurement of cone volume	It is recommended that the % O2 be measured to indicate the risk to the wine. (See also D.O)	5 cm or better for 3L.
Fill Volume control	Weighing or volume measurement.	Traceable to national standards & to meet legal requirements.	Litres
O2 Levels	Inolab, Oxilevel 2 Hach Fluorescence DO meter Orbisphere, TPO Method for Oxygen? O2 ingress in pack- for material evaluation?	Test bag start <3ppm	mg/l (ppm)

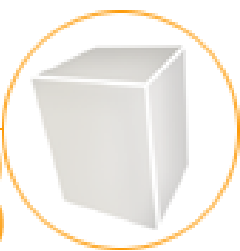
DO should be measured at several stages prior to filling and as soon as possible after filling.



Bag Parameters

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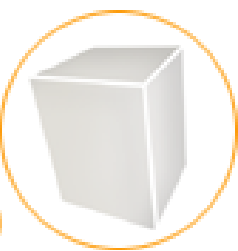




Bags





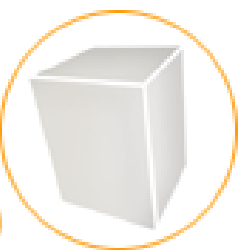
Parameter	Test Procedure	Conditions	Units
Storage temperature and humidity	Should be allowed to acclimatize to filling Hall conditions prior to fill.	Max 40C Min 0C	°C & RH
Recommended shelf life of empty bags	Bag supplier should be consulted for any period over recommendation	In Original Packaging and recommended storage conditions 18 months	
Dimensions	Measurement internal between seals and to centre point of spout.	23-25°C	mm
Tolerances	<u>+3</u> <u>+5</u>	23-25°C	mm
Traceability system	Each Bag coded	Should allow full trace back to raw material usage	Individual bag definition
Orientation of tap	Hold bag with tap/gland at bottom & facing so 12-o'clock is vertically up.		Clock handle position



Bags



Parameter	Test Procedure	Conditions/Units	
Seal Testing cont	Air Pressure Hold	Actual Pressure at Failure psi/bar	
	Burst Test	Type failure/air pressure psi/bar	
Dynamic Test:- Drop Test	Drop Height and format of drop	20-25 °C	% pass

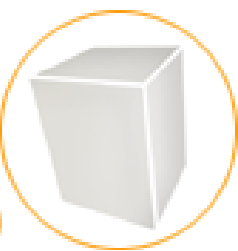


Bags



Parameter	Test Procedure	Conditions	Units
Barrier (See Film)	Oxtram F1927-98	23°C at 75% RH 23°C at 50% RH	cc /m ² /24h
Resistance to vibrations during transport	Gelbo Comparative Testing Transit Test With Filled bags	<i>ASTM F392</i> <i>Replicate Road Usage</i>	Number of Pinholes Leakers identified
Microbiological hygiene of empty bags	Spreading on agars, 4 days, yeast, bacteria, mould	Incubation for 3-5 days at 25-27C on WLN	Number of Colonies identified per bag
Hygiene in Manufacture	Biological analysis by count of bacteria Bags Manufactured to BRC or equivalent	37 °C	Number of Colonies identified
Contamination avoidance	Ppb of contaminate		

Barrier Measurements described above are taken on the raw material not the complete bags (because of variability in criteria)



Bags



Parameter	Test Procedure	Conditions	Units
Environmental impact	Under Discussion		Kj of energy or kg of carbon dioxide equivalent units, per litre of packaging
Migration	UNE-EN 1186-1 Analyses to show Due Diligence External testing to 2002/72/EU latest amendments	40°C Laboratory standards	mg/dm ²

We recommend that O₂ permeation should be expressed in cc/m²/24 h at 21 % oxygen and at 75% RH and 23°C , but other values can also be provided for relevant measurements But conditions of test must be stated on any documentation