



QUALITY ASSURANCE OF CUP PACKAGING FOR FOOD AND BEVERAGE APPLICATIONS

*By Vince Paulauskas, Technical Service Manager, Winpak
December 2002*

There are numerous tests and checks that a processor/packager must perform on a regular basis during production to ensure that the finished product produced meets the expectations of the end customer. The final responsibility for quality finished goods is solely that of the processor/packager. Ensuring that ongoing quality checks of the proper type and frequency are carried out is the processor's most important responsibility.

This paper highlights some of the general checks that experience reveals are critical to good quality production. It also specifically details some of the test procedures currently utilized and recommended by Winpak for plastic cup packaging sealed with heat sealable membrane lids. Processor management should determine which checks and what check frequencies are important to them and their final customers. It may also be determined through experience with certain products that additional testing above and beyond these basic guidelines is necessary.

An excellent reference for further detailed information is the FDA/CFSAN Bacteriological Analytical Manual Online, Chapter 22C "Examination of Containers for Integrity" authored by George Arndt (NFPA).

GENERAL QUALITY CHARACTERISTICS TO MONITOR

Processors/packagers should develop a quality control program that monitors and controls important quality characteristics. This section outlines some of the general quality characteristics processors should monitor when producing food and dairy products.

The Product

Some or all of the following product characteristics should be monitored:

- ✓ Viscosity
- ✓ Color
- ✓ Fat content
- ✓ Taste
- ✓ Feathering
- ✓ Smell
- ✓ Feel
- ✓ pH
- ✓ Processing
- ✓ Process and fill temperature
- ✓ Other characteristics

The Packaging

Some or all of the following packaging characteristics should be monitored.

- ✓ Compatibility of the packaging with the product (correct combination of cup and lid materials for the product being packaged)
- ✓ Correct cup size
- ✓ Correct lid material for the cup
- ✓ Correct artwork and weight declaration on the lid
- ✓ Other characteristics

Filled and Sealed Packages

Some or all of the following checks should be performed during and after the product is filled and sealed into the package. Note that assurance of filled package integrity is a 4 step process, which includes vigilance by a trained filling machine operator as packages are discharged, frequent squeeze and roll checks of the filled and sealed package, peel tests, and vacuum tests of the filled and sealed packages. Some of the tests outlined in this section are further detailed later in this document.

- ✓ Visual inspection
- ✓ Squeeze and roll check
- ✓ Peel test
- ✓ Vacuum test
- ✓ Fill weight check
- ✓ Microbiological tests/ Incubation
- ✓ Shelf life checks
- ✓ Correct date code checks if utilized
- ✓ Other checks as necessary

Secondary Packaging

Secondary packaging is the box, bag, carton, sleeve, pallet, or other means used to pack and distribute the filled and sealed packages to the market. Normally filled and sealed packages are then also packed into some other type of shipping carton for final distribution. Some or all of the following secondary packaging characteristics should be monitored.

- ✓ Correct secondary package for the product
- ✓ The secondary package is formed properly and not damaged
- ✓ The correct amount of individual packages is packed into the secondary package carton, box, sleeve, etc.
- ✓ The correct product label is used on the secondary package
- ✓ The correct date code information for the product is used
- ✓ The secondary package is sealed or closed properly

- ✓ The pallet (if used) is in acceptable condition
- ✓ The pallet configuration is correct for the product (if used)
- ✓ The load of product is correctly secured onto the pallet
- ✓ Other characteristics associated with the secondary packaging

SPECIFIC TEST PROCEDURES

Collecting Samples

Specific sampling frequencies should be determined by the processor as necessary to ensure the filled and sealed packages meet all required quality standards. The procedures that follow are general tests that Winpak recommends be performed to ensure package integrity. Since finished package quality is solely the responsibility of the processor/packager, each processor/ packager should determine which, how, and when specific test procedures will be performed.

When it is necessary to collect filled and sealed samples for testing, perform the following steps.

1. Allow the filling machine to stabilize (the machine should be making good packages for at least 1 minute or more, for fill weight checks sometimes up to 10 minutes is required dependent upon the product and the degree of aeration in the process).
2. Stop the machine.
3. Remove the required number of packages from each lane of the machine. (Winpak recommends each lane of the filling machine be sampled.)
4. After the samples have been collected the machine may be restarted.

Visual Inspection

Perform visual inspections as per the sampling plan at the frequencies established by processor management. Use the following procedure as a guideline in establishing plant procedures.

1. Visually inspect the package to ensure the lid is centered properly on the container.
2. Visually inspect the package to ensure that the package is not physically damaged.
3. Visually inspect the package to ensure there is no product on the outside of the container or lid.
4. If anything is out of the ordinary, make necessary corrections and repeat the checks.
5. If the check is ok, continue with production and recheck at intervals established by plant procedure.

Fill Weight Check

Perform fill weight checks as follows at intervals established by the quality assurance policy established by processor management.

1. Weigh each of the samples and verify that the weight is within the established specifications.
2. If the weight is out of specifications, adjust the fill as necessary.
3. Resample and recheck the weight several times after making adjustments.
4. If the check is ok, continue with production and recheck at intervals established by plant policy.

Note: Most fillers used to fill Winpak products are of a volumetric type and cannot make corrections for a nonhomogeneous product. In other words, if a product has nonuniform chunks and particulates in it, the filled volume will be accurate, but the filled weight can vary

from package to package because of the nonuniform distribution of the particulates or chunks.

Squeeze and Roll Test

Perform squeeze and roll tests as follows at intervals established by the quality assurance policy established by processor management:

1. Allow the lids to cool.
2. Place each package between the thumb and index finger and/or middle finger. Gently but firmly squeeze the package to apply slight pressure on the package lid so that the lid bulges slightly. Roll the package back and forth between the thumb and fingers and look for leakage at the package seal.
3. If any leakage is observed or the lid sealing pattern is not uniform, investigate and correct the problem.
4. After making any necessary corrections, resample and repeat the test.
5. If the test is ok, continue with production and recheck at intervals established by plant policy.

Peel Check

Perform peel checks as follows at intervals determined by the quality assurance policy established by processor management.

1. Slowly and carefully remove the lid from the sample packages paying close attention to the peel resistance and uniformity of removal. There should be no observed seal gaps or open areas. Lid material should not exhibit blistering, delamination, or tearing as it is removed. No lid material other than perhaps some sealant should remain on the lip of the cup. The seal areas as seen on the lid should be a uniformly wide band with no gaps, narrow areas or spottiness. No damage to the cup lip should be observed.

2. If any of these conditions are present, investigate and correct the problem.

3. After making any necessary corrections, resample and repeat the check.

4. If the test is ok, continue with production and recheck at intervals established by plant policy.

Vacuum Test

Although this test is utilized in many types of packaging applications, it has been modified and adapted for the specifics relative to the creamer and portion controlled industries, where a producer requires real time assurance that package and seal integrity are sufficient to meet distribution demands. (The test was originally developed to ensure that coffee creamers would survive airline distribution, which is roughly 8 inches of vacuum; the difference from sea level to airline cruising altitude.)

Because of the processor's need for a quick turnaround on test results, the vacuum levels and test duration are necessarily severe. Minimal failures of packages at this test level is not cause for alarm, but results should be evaluated, corrections made and tests should be rerun. A vacuum failure rate of less than 1/2 of 1% of packages tested is commonly used and is a good general guideline for acceptance criteria on this test.

It is best practice to test all samples from a single complete rotation of the filler being tested. This is commonly done on creamer equipment. (For example, three 400 count boxes on a WTL16 creamer filling machine.) This gives a very good indication of the overall condition of the filling equipment. From a practical standpoint this becomes more difficult with larger format packaging, although it is still recommended.

Vacuum tests should be performed as follows at intervals determined by the quality assurance policy established by processor management.

The following equipment is required to perform vacuum test:

- ✓ Bell jar (glass or plastic) with tight fitting lid that is large enough to hold the required amount of samples to be tested
- ✓ Grease for the bell jar gasket
- ✓ Vacuum pump or generator
- ✓ Vacuum gauge
- ✓ Regulator
- ✓ Relief valve
- ✓ Timer or stopwatch

1. Inspect and clean the walls of the vacuum container. The inside walls should be completely clean and dry.

2. Place the filled and sealed samples into the bell jar.

3. Seal the bell jar.

4. Turn on the vacuum pump and adjust the vacuum to a level of 12" Hg of vacuum (50% safety factor over airline cabin pressure).

5. Turn on the timer and hold the packages at this level of vacuum for 2 minutes.

6. Remove the samples and inspect the bell jar to ensure it is still clean and dry.

7. If there is evidence of leakage, perform squeeze and roll checks and peel checks on the vacuum tested packages in an effort to determine the extent and cause of the leakage.

8. Correct the causes of the leakage.

9. After making any necessary corrections, resample and repeat the test.

10. If the test is ok, continue with production and recheck at intervals established by plant policy.

Incubation Testing

This type of testing is commonly performed to ensure that bacteriological levels in the product are within safe and acceptable limits, and to verify that products will not spoil within their code date period. This test is performed by raising temperature to a predetermined setpoint and holding the product at that temperature for a specified period of time. After incubation the product is inspected and tested for bacteriological levels and product spoilage. Since there is such a wide variety of products and test methods for them, along with test parameters, further detail as to test methods and parameters is omitted.

It is important to note, however, that when the temperature of a filled package is raised, two important things happen. Internal pressure is generated in the package and, in some cases, the sealant media on the lidstock material is softened and weakened. This has caused some false results and alarm in the past. 90° F is considered the upper limit of extended testing temperature with several current cup and lid combinations. If incubation testing is planned, consult with a Winpak representative on the specific testing parameters.

SUMMARY

In conclusion, specific quality testing questions or issues should be brought to the attention of a Winpak technical representative. There is such a wide variety of products, packaging, and filling equipment in use today, that it is impossible to cover all areas in a paper of this abbreviated length.

For further information please contact:

**Winpak Portion Packaging, Inc.
828A Newtown-Yardley Road, Suite 101
Newtown PA 18940-1785
info@wpp.winpak.com**