Whitford’s Secret Weapon

We believe that the best new business tool is Research and Development

What we can do today to explore ever deeper into the problems of our customers and what our products can do to solve them, will lead to better business tomorrow — for our customers as well as for us.

This philosophy has led to Whitford’s surprisingly extensive testing program. Our test procedures are designed to examine different dimensions of coating performance, since each facet of a given product that can be examined offers another opportunity to improve the product.

Whitford performs more than 100 different tests to determine characteristics that include film thickness, completeness of film cure, gloss, opacity, hardness, adhesion, flexibility, impact, drawability, abrasion, mar resistance, coefficient of friction, resistance to chemicals, etc. Because we believe that research and development are good for everybody’s business, we make our test procedures and even the designs of our proprietary testing equipment available to anyone who requests them.

We believe that the more we can do to improve the quality of coatings in general, the more the consumer will benefit — and the faster and larger the entire market will grow.

We have listed some of the key Test Methods and a brief description of each on the pages that follow. If you would like a full description of a particular Test Method, please let us know.

Whitford’s Quality Cooperative Program

Quality is getting more and more important and, at the same time, more difficult to control as manufacturing and marketing re often separated by continents. That’s why Whitford created the Quality Cooperative Program (QCP).

The QCP help maintain the highest quality in the application of coatings. This helps the cookware, bakeware and appliance manufacturers, coaters, importers, retailers — and the ultimate consumer (not to mention Whitford),

See more information on this program at the back of this book.
# Test Methods

## Section One: Test Methods for BOTH Cookware and Bakeware

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Test Methods and their Scope

Section One: Test Methods for BOTH Cookware and Bakeware

Measurement of Dry Film Thickness Using an Electronic Gauge
Whitford Test Method 114A
This procedure is used to measure the dry film thickness of coatings applied to magnetic or non-magnetic metal substrates using a magnetic induction or eddy current type electronic gauge, respectively.

Evaluation of Completeness of Cure by Solvent Rub Test
Whitford Test Method 115A
This procedure is to be used to determine the degree of cure of a baked film by the paint film’s resistance to a specified solvent.

Adhesion by Crosshatch/Tape Pull
Whitford Test Method 132C
This procedure is to be used to determine the adhesion of a coating to its substrate by trying to remove the coating with adhesive tape.

Adhesion by Crosshatch/Tape Pull with Boiling Water
Whitford Test Method 132D
This procedure measures the adhesion of coatings to a substrate by the crosshatch adhesion method in combination with exposure to boiling water. This method is an extension of Whitford Test Method 132C

Rotary Scotch-Brite Abrasion Resistance Test
Whitford Test Method 135B
The Rotary Scotch-Brite Abrasion Resistance Test measures the resistance of coatings to abrasion by a rotating Scotch-Brite pad. The test is used frequently to evaluate coatings for cookware because it is simple, reproducible and provides an abraded area large enough to allow subsequent release test measurements, i.e., food release tests. The test is a measure of the useful life of coatings that have been subjected to scouring and other similar forms of damage.

Reciprocating Abrasion Tester
Whitford Test Method 135C
This test measures the resistance of coatings to abrasion by a reciprocating Scotch-Brite™ pad. The test subjects coating abrasion in a back and forth motion. The test is a measure of the useful life of coatings that have been subjected to scouring and other similar forms of damage caused by cleaning. TM135C is specific to a test apparatus built by Whitford; however, it is applicable to similar test methods such as the one described in British Standard 7069-1988.

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**Scratch Resistance by Pneumatic Scratch Tester**  
**Whitford Test Method 137D**

Scratch resistance is one measure of the damage resistance of coatings. Scratch resistance depends upon the hardness, film integrity and adhesion of the coating. These properties also depend upon the type of substrate, substrate preparation, film thickness and other product variables.

The pneumatic tester is a simple device for comparing the resistance of coatings to scratching by a ball-point pen tip. The pen is fixed to a piston, and a force is applied to the piston by air pressure. Changing the air pressure varies the force. The pen is pushed against and drawn across the coated surface. The scratch resistance is determined by the force (air pressure) needed to cause the pen tip to penetrate and remove the coating over the length of the scratch.

**Evaluation of the Detergent Resistance of Coatings**  
**Whitford Test Method 150A**

This method is used to measure the resistance of coatings to prolonged exposure to detergents.

**Test Methods and their Scope**

**Section Two: Test Methods for Cookware ONLY**

**Wear Resistance by the Ball Penetration Test**  
**Whitford Test Method 137B**

This test method describes a procedure for determining the wear resistance of coatings by subjecting them to abrasion and pressure as supplied by a standard hardness ball moving in a circular track on the surface of the coating. The objective is to determine the length of time required for the ball to cut through the coating and expose the substrate using a known pressure, speed of motion and length of track. This time is a measure of the durability of the coating and its resistance to gouging by metal utensils.

**Mechanical Scratch (Gyrograph)**  
**Whitford Test Method 137C**

Coatings for cookware are susceptible to abuse and damage by scratching and cutting with metal utensils. Resistance to this kind of damage is often measured by a so-called “Tiger Paw” test. In this test, a device equipped with ball-point pen tips is used manually to stir food cooking in a piece of coated cookware. The pen points simulate damage by metal utensils, and provide a convenient renewable test implement. However, the “Tiger Paw” test is long in duration, difficult to control and subjective to rate.
Whitford Test Method 137C describes a procedure and equipment that inflicts similar abuse on coatings, but is reproducible, objective and quick. A weighted ball-point pen tip affixed to a balance arm is placed on the coated surface that is revolving on a turntable. At the same time, the balance arm oscillates from side to side by means of a revolving cam. Constant speed DC motors drive the turntable and cam. Variable DC power supplies control the speed of the turntable and cam. The amplitude of oscillation is controlled by the degree of eccentricity in the cam. The weight is variable. By adjusting the speeds of the motors and the amplitude, various scratch patterns may be obtained. These can be adjusted to cover a small or large surface area.

To simulate further the conditions encountered by coatings for nonstick cookware, the test piece (panel or pan) is covered with hot oil. The temperature of the oil is maintained with IR heat lamps and is monitored with a thermometer or thermocouple.

**Salt Water Immersion Corrosion Test**  
**Whitford Test Method 165A**

Coatings for cookware are subjected to foods that may penetrate and attack the substrate. Salty foods or acidic foods containing high salt content are extremely corrosive. Some substrates are also very reactive and will show blistering or white corrosion spots in the coating when exposed to salty and/or acid foods. The procedure provides a standardized method for evaluating the susceptibility to attack by corrosive foods of various coating/substrate/substrate preparation combinations. It requires a coated utensil (preferably a saucepan with tight fitting lid) for accurate evaluation of the entire combination.

**Acidic Corrosion Test**  
**Whitford Test Method 165B**

Coatings for cookware are subjected to foods that may penetrate the coating and attack the substrate. Acidic foods are extremely corrosive. Some substrates are also very reactive and will show blistering or white corrosion spots in the coating when exposed to acid foods. The procedure provides a standardized method for evaluating the susceptibility to attack by acidic, corrosive foods of various combinations of coating, substrate and substrate preparation. It requires a coated utensil (preferably a sauce pan with tight fitting lid) for accurate evaluation of the entire combination.

**Boiling Salt Water Test**  
**Whitford Test Method 165C**

Coatings for saucepans are exposed to wet heat and steam for long periods of time. In addition, it is common for saucepans to be used to heat water containing salt. This test method describes a procedure for evaluating the resistance of coatings to long-term cyclical exposure to boiling salt water and steam.
Salt Water/Starch Corrosion Test  
**Whitford Test Method 165D**

Coatings for saucepans are exposed to wet heat and steam for long periods of time. In addition, it is common for saucepans to be used to cook high starch content foods, such as pasta or noodles, in salted water. This test method describes a procedure for evaluating the corrosion resistance of coatings in salt water and the release of starch from the coatings.

Standard Cooking Test  
**Whitford Test Method 199A**

This procedure outlines a method for evaluating the stain resistance and retention of release properties of coatings for cookware. The procedure requires the cyclical introduction of various foodstuffs to simulate the conditions encountered in the typical use of a fry pan. The intention is to accelerate these conditions and to rate the effect of the conditions on the critical properties of the coating.

Determination of Nonstick Properties by Dry Egg Release  
**Whitford Test Method 199B**

This procedure is used as a quick method of determining the ability of food to be released from a nonstick coating for cookware. When used with care, this test may be used as an on-line control test to measure the consistency of production. The test is somewhat subjective and dependent upon the equipment used and the technique of the tester.

Accelerated Cooking Test for Woks  
**Whitford Test Method 199C**

This procedure outlines a method for conducting accelerated cooking tests for nonstick-coated wok style cooking utensils.
Test Methods and their Scope

Section Three: Test Methods for Bakeware ONLY

Knife Scratch Adhesion
Whitford Test Method 132A
This procedure is used to determine the adhesion of a coating to its substrate by observing the resistance of the coating to a knife scratch. Because this is a subjective test, it is recommended that the rating be made relative to a control. Experienced testers, however, may use this test for evaluating single samples.

Release Test for Coatings for Bakeware
Whitford Test Method 198A
This test method describes a standard procedure for evaluating the release of coatings for bakeware.

Cooking/Roasting Test for Bakeware Coatings
Whitford Test Method 198B
This test method outlines a procedure for evaluating the resistance of coatings for bakeware to hot fats and greases.