

A person wearing a lab coat with a name tag that says "Scott" and white gloves is looking through a microscope. The scene is set in a laboratory with a computer monitor in the background displaying a microscopic image. The entire image has a blue tint.

**Testing  
one...  
two...  
three...**

**Whitford and Alpha's secret to superior  
coatings for automotive sealing systems**

**Whitford**

*Manufacturers of the world's largest, most complete line of fluoropolymer coatings*

## Whitford's equipment and testing capabilities for the automotive industry

Continuous improvement of coatings is made possible by superior R&D — and the ability to test as one experiments and improves.

What follows is a list of some (but not all) of the testing equipment Whitford and Alpha maintain to help us stay ahead of the competition.

Type	Description	Manufacturer	Model #	Function
<b>Analytical Testing</b>	Rheometer*	TA Instruments	AR 2000	Flow and deformation of liquids under various shearing and oscillating conditions and at various temperatures.
	Thermal Viscometer*	TA Instruments	AR 2000	Modification to the above provides DMA capability to measure changes in polymer viscosity during curing.
	Gas Chromatograph*	SRI	8610C	Separation, identification, quantification of volatile components in complex mixtures.
	Drop Shape Analysis System*	Kruss	DSA 10	Determination of contact angles, surface or interfacial tension of liquids and calculation of surface free energy to evaluate wetting and release potentials.
	Karl Fisher Water Analyzer	Metrohm	701KF Titrino	Determination of water content.
	IR Spectrophotometer	Buck Scientific	M500	Identification of chemicals.
	Fourier Transform Infrared (FTIR) Spectrometer*	Thermo Nicolet	360 Avatar	Precision chemical identification; coupled to TGA and GC provides analysis of multi-component systems.
	Particle-Size Analyzer*	Horiba	LA-930	Determination of particle sizes from 0.02µ to 2,000µ.
	Thermogravimetric Analyzer (TGA)*	TA Instruments	Q50	Measurement of thermal stability of materials (decomposition, volatilization, oxidation).
	Differential Scanning Calorimeter (DSC)*	TA Instruments	DSCQ100	Measure of thermal characteristics of solid polymers, melting points, Tg, specific heats.
	Electronic Balance	A&D Co. Ltd.	ER-60A	Fine analytical weight measurements.
	Dynisco MFI Tester	Kayeness	D4001	Determination of melt viscosity of polymers.
<b>Noise Analysis</b>	Itch & Squeak Test Equipment*	MB Dynamics	N/A	Analysis of noise generated by surfaces rubbing together in random or sinusoidal vibrations either wet or dry in an anechoic chamber.
<b>Curing Equipment</b>	UV-Curing Equipment Production Prototype	Fusion UV	DRS 10/12	Cure UV coatings.
	Portable UV-Curing Equipment with IR Dryer*	Fusion UV	LC-6B-2	Cure UV coatings (at customer sites).
	IR Curing Equipment*	Proprietary	N/A	Provides IR radiant-energy curing.
	Curing Ovens: Gas and Electric	Various	N/A	Conventional convection curing of coatings.
	Oven Temperature Recorder	Datapaq	DPQ9000 6CH	Measurement of in-oven temperatures at customer sites.
	IR Temperature	Omega	OS542	Remote measurement of temperature.

\* Of significant importance to weatherstrip and similar applications

Type	Description	Manufacturer	Model #	Function
<b>Environmental Testing</b>	Stability Ovens	Various	N/A	Accelerated long-term testing of effects of heat on coated parts.
	Constant High-Temp. Bath	Magni Whirl	MW-11454A	Immersion tests.
	Humidity Chamber	Gebr. Liebisch	KS - 3005	Accelerated long-term testing of effects of high humidity on coated parts.
	Kesternich Cabinets (2)	Gebr. Liebisch	KS - 3005	Corrosion resistance, acid-rain simulation.
	Salt-Fog Cabinets (2)	Singleton	21	Corrosion resistance, salt-fog.
	Weatherometer - Xenon Arc*	Atlas	Ci4000	Sophisticated accelerated weathering.
	Weatherometer - Xenon Arc*	Q-Panel	Q Sun Xenon	Accelerated weathering.
	Accelerated Weathering	Q-Panel	QUV	UV-light resistance.
<b>Mechanical Testing</b>	Spark Tester	Electro-Technic	BD-40E	Detection of pinholes.
	Slip/Friction Tester	TMI	32-06-00-0005	Coefficient of friction, static and dynamic.
	Taber Abraser	Taber Industries	5130	Rubbing abrasion (includes "scuff" test).
	Inclined Plane	Whitford	N/A	Inclined angle for testing static coefficient of friction, friction on hard surfaces.
	Tensile Strength/Elongation Tester*	GCA/Precision	Scott-Cre/500	Measurement of tensile strength, elongation and observation of color change.
	Materials Tester*	Lloyd Instruments	LRX 233	Measurement of friction, elongation, freeze-release.
<b>Surface Analysis</b>	Diamond Saw - Isomet Low-Speed plus Ecomet II Polisher	Buehler Ltd.	11-1180-160	Cuts/polishes cross sections for optical measurement of film thickness; analysis of structure of applied coatings.
	Profilometer Surftest 402	Mitotoyo	178-821A	Testing of surface roughness.
	Profilometer, Portable	Federal	Pocket Surf III	Measures surface roughness.
	Dry-Film Resistivity	Pinion	SRM-110	Surface resistivity (ohms/square).
	Tristimulus Colorimeter	Byk Gardner	6800	Measurement of color.
	Color Spectrophotometer	X-Rite	SR-62	Measure/analyze color, predict optimal pigmentation, adjust color of batches.
	Video Microscopy System*	Various components	Nikon	Digital imaging of surfaces up to 300X.
	Stereo Microscope	Wild	M3C	Surface evaluation to 160X magnification.
	Scanning Electron Microscope*	Joel	JSM-T20	Enhanced digital imaging of surfaces up to 10,000X magnification.
<b>Substrate Prep.</b>	Corona Discharge*	Tantec	HV2000	Rubber pretreatment via electric discharge.
	Plasma Treater*	Enercon	Dyne-a-mite 3D	Rubber pretreatment via charged gas.
<b>Abrasion Testing</b>	AATCC Crock Tester*	Atlas	CM5	Measure resistance to solvents, abrasion.
	Reciprocating Abrasion Test, Glass Chisel*	Whitford	N/A	Measure abrasion resistance with variable loads, speeds and in different media.

\* Of significant importance to weatherstrip and similar applications

# Whitford's Test Matrix for flexible finishes

Working with customers, Whitford and Alpha have developed a matrix of tests performed on

all flexible finish systems during product development — and to assure continuing quality.

Test	Test Method and Description	Evaluation/Rating
Adhesion	ASTM D-3359. Five (5) tape pulls over cross-cut area.	No adhesion loss.
Toluene Double Rubs	Whitford Test 115A. Coat and let age for 24 hrs; test with cotton swab soaked in toluene.	Record # of rubs until film damaged.
Water Immersion	Whitford Test 153K. Immerse parts in water at 80°C/176°F for 96 hrs.	No delamination or damage to coating.
Humidity	Whitford Test 150M. Expose 7 days at 70°C/158°F, 90% relative humidity.	No blistering or loss of adhesion.
Crocking-dry	Ford WSB-M2D49A2. Rub with dry cloth using 900 gm load; 300 cycles on sponge, 500 cycles on dense.	No break in coating; minimum transfer to cloth (Rating #4).
Crocking-wet	Ford WSB-M2D49A2. Rub with wet cloth using 900 gm load; 300 cycles on sponge, 500 cycles on dense.	No break in coating; minimum transfer to cloth (Rating #4).
Crocking-Windex, Armorall & soapy water	Ford WSB-M2D49A2. Rub with cloth soaked with cleaning solutions using 900 gm load; 60 cycles on sponge & dense.	No break in coating; minimum transfer to cloth (Rating #4).
Glass Chisel (Honda & GM)	Abrade coating on dense substrate for 20,000 cycles using 1 kg load on 4 mm glass chisel.	No break in coating.
Glass Chisel, (Toyota & GM)	TSM 1708G. Abrade coating on dense substrate for 10,000 cycles using 3 kg load on 4 mm glass chisel.	No break in coating.
Glass Chisel (Muddy Water)	TSM 1708G. Abrade coating on dense substrate in abrasive slurry for 3,000 cycles using 3 kg load on 4 mm glass chisel.	Rating #3 minimum.
Coefficient of Friction	PSA D41. Record starting & moving force to pull 1.4 kg sled.	Static & Dynamic <0.5.
Cold Flex	DBL 5578.30. 180° bend after exposure to -40°C/104°F.	No cracks or loss of adhesion.
Freeze Release	Whitford Test 149K. Apply water mist and compress coated part and mating surface; expose 2 hrs at -40°C/104°F.	No ice sticking; record maximum force (N) to separate.
Noise Test	GM9842P Rev. A. All environmental & vibrational conditions.	<40dBA sound level.
Xenon Arc (Ford et al)	SAE J2412. 1225 kJ Interior conditions.	Delta E Color Change ≤ 3.0.
Xenon Arc (Ford et al)	SAE J2527. 2500 kJ Exterior conditions with water spray.	Delta E Color Change ≤ 3.0.

*Note: All the flash-point, draw-down, simple viscosity, moisture analyzers, cameras, pin-hole testers, spray equipment (hand, HVLP, electrostatic, pressure pot, airless) found in any reasonable coating development laboratory are available, but have not been included here.*

## How to contact Whitford

Whitford manufactures in 7 countries, has employees in 8 more and agents in an additional 25. To find the office nearest you, please visit our website: [www.whitfordww.com](http://www.whitfordww.com) or [alpha-coatings.com](http://alpha-coatings.com) or email us: [sales@whitfordww.com](mailto:sales@whitfordww.com) or [solutions@alpha-coatings.com](mailto:solutions@alpha-coatings.com).



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