ATLAS MATERIAL TESTING SOLUTIONS
AMETEK MEASUREMENT & CALIBRATION TECHNOLOGIES

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SunSpots®

Fall 2014

Determination and Validation of the Spectral Power Distribution (SPD) of Artificial Weathering Instruments

By Matthew McGreer, Product Manager,
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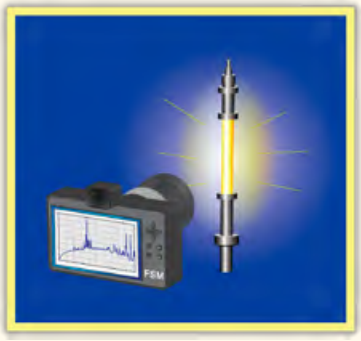
Atlas Material Testing Technology LLC



Automatically controlled irradiance (Ci) laboratory weathering instruments were first introduced in 1970. The technology has since become universally used. Today, virtually all weathering test standards specify irradiance levels, and all major manufacturers of weathering instruments currently offer instruments that feature a version of irradiance control.

Until now, controlled irradiance devices have been limited to maintaining and providing irradiance data at, or about, a single wavelength or wavelength range. With the introduction of Atlas Material Testing Technology's proprietary on-board, real-time Full Spectrum Monitoring (FSM) system, the complete spectral power distribution (SPD) of the light source can now be displayed. This article will discuss the features, benefits, and capabilities of this system which was introduced to the market this year.

History and Evolution of Light in Weathering Tests

It is universally accepted that light (especially UV) is the most important aspect of natural and simulated weathering tests. Numerous excellent studies of light's importance to material degradation can be found in industry literature.

The first, fairly crude, laboratory weathering tests employed carbon-arc lamps as the solar simulator. Instruments using xenon arc light sources, which are inherently superior solar simulators, eventually replaced such devices.

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Atlas to Co-Host Asia Solar Energy Durability Conference
Pages 8–9

In This Issue

Atlas' 2015 Client Education calendar of events is currently being established. To view course dates as they become available, please visit www.atlasmtt.com/courses.

Keep Your Team Up to Date!

Fundamentals of Weathering I			
	November 4, 2014	Oldenburg, Germany	Presented in German
	November 5, 2014	Gorinchem, Netherlands	Presented in Dutch
	November 6, 2014	Paris, France	Presented in French
	April 22, 2015	Mount Prospect, IL, USA	Presented in English
	July 22, 2015	Mount Prospect, IL, USA	Presented in English
	October 7, 2015	Mount Prospect, IL, USA	Presented in English
Fundamentals of Weathering II			
	November 5, 2014	Oldenburg, Germany	Presented in German
	November 6, 2014	Gorinchem, Netherlands	Presented in English
	November 7, 2014	Paris, France	Presented in French
	April 23, 2015	Mount Prospect, IL, USA	Presented in English
	July 23, 2015	Mount Prospect, IL, USA	Presented in English
	October 8, 2015	Mount Prospect, IL, USA	Presented in English
Weather-Ometer® Workshop			
	November 6–7, 2014	Linsengericht, Germany	Presented in German
	April 21, 2015	Mount Prospect, IL, USA	Presented in English
	July 21, 2015	Mount Prospect, IL, USA	Presented in English
	October 6, 2015	Mount Prospect, IL, USA	Presented in English
Atlas/CEI Asia Solar Energy Durability Conference			
	November 19–20, 2014	Shanghai, China	Presented simultaneously in English and Chinese

Atlas Material Testing Technology Relocates Corporate Offices

After almost 60 years in a once-industrial, now mainly residential area on the near north side of Chicago, Atlas Material Testing Technology has moved. As of September 2014, Atlas' new corporate headquarters is at 1500 Bishop Court in northwest suburban Mount Prospect, Illinois.

Atlas' new home at 1500 Bishop Court, Mount Prospect, IL

"Atlas is proud to have been an established part of Chicago's north side community of Ravenswood for close to six decades," said Atlas Vice President of Global Operations Louis Bacigalupo. "Our new facility in Mount Prospect, however, provides us with contemporary offices, an efficient manufacturing layout, and a location that is closer to major transportation and distribution channels, allowing us to better serve our increasingly global customer base."

For more information, contact Atlas at atlas.info@ametek.com. ■

ATLAS • SHOWS

FoodTech
October 28, 2014
Herning, Denmark
Hall J, Booth #J7396

Plastimagen 2014
November 18–21, 2014
Mexico City, Mexico
EQUIPOS Y SERVICIOS WESTEK
Booth #602

Wind Turbine Blade Manufacture 2014
December 1–3, 2014
Düsseldorf, Germany

SIAT Expo 2015
January 21–24, 2015
Pune, India

NPE 2015
March 23–27, 2015
Orlando, FL USA
Booth #S18018

in-cosmetics 2015
April 14–16, 2015
Barcelona, Spain
Booth #6T53

European Coatings Show
April 21–23, 2015
Nürnberg, Germany
Booth #5-344

PLAST
May 5–9, 2015
Milan, Italy

Asia Coatings Congress
May 12–13, 2015
Ho Chi Minh City, Vietnam
Booth #27

Asia Pacific Coatings Show 2015
September 8–9, 2015
Kuala Lumpur, Malaysia
Booth #J06

ITMA 2015
November 12–19, 2015
Milan, Italy

Visit Atlas' booth at these shows to learn about the latest weathering developments and how we can help advance your testing program.

For a complete list of Atlas shows, visit http://atlas-mts.com/news-events/trade-shows/

ATLAS • SPEAKS

Swiss Association for Environmental Simulation SVU, Switzerland Conference on Environmental Influences on Products

October 31, 2014
Hotel Arte
Olten, Switzerland

"Controlled Accelerated Laboratory Weathering – Methods and Results"

Presenters:
Dr. Artur Schönlein, Atlas Material Testing Technology GmbH, and Mr. Walter Rauth, Bayer MaterialScience AG

Atlas/CEI Asia Solar Energy Durability Conference

November 19–20, 2014
Courtyard Marriott Shanghai Puxi Hotel
Shanghai, China

"Long Term Weather Resistance and Testing Methodologies for Solar Energy Materials and Products"

Presenter:
Mr. Allen Zielnik, Atlas Material Testing Technology LLC

Seminar on Measuring and Testing on Painted Surfaces

November 20, 2014
Technical Academy Wuppertal (TAW)
Altdorf/Nuremburg, Germany

Presentations:

- "Weathering"
- "Automated Digital Image Analysis"
- "Controlled Accelerated Laboratory Weathering – Methods and Test Results"

Presenter:
Dr. Artur Schönlein, Atlas Material Testing Technology GmbH

European Coatings Congress

April 21, 2015
Nürnburg Convention Centre
Nürnburg, Germany

"Coating Surface Temperature During Artificial Weathering-Significance for Lifetime Prediction"

Presenters:
Dr. Florian Feil and Dr. Artur Schönlein, Atlas Material Testing Technology GmbH

Spectral Power Distribution, from page 1

LS-200 spectroradiometer mounted on Ci chamber rack

As with other light sources, the output of a xenon arc will vary with electrical input power, the stability of its enclosure, and surrounding optical filters. The filters will generally tend to degrade or solarize with use. The combination of these variables will adversely affect the quality and quantity of light that impinges upon test specimens. The controlled-irradiance feature is designed to automatically hold the output constant at one wavelength or wavelength range throughout a test, especially in the ultraviolet range, thereby mitigating the negative impact of variable light on test results. Measurements have shown that in some commercial xenon arc devices, the UV can drop up to 25% during the expected life of the lamp/filters.

However, controlled irradiance technology, which, in theory, is very similar regardless of the supplier, is not without some notable weaknesses. First, it provides information only at the single wavelength (or wavelength range) for which it is configured. Second, the systems have little or no flexibility. For the most part, the user is restricted to controlling and monitoring a test at the wavelength that has been pre-selected and which may only be changed to another single wavelength (range) by hardware reconfigurations, often requiring complex recalibration. Further, the common wavelengths available for control are limited to 340 nm, 420 nm, or wideband (300-400 nm). Other wavelength ranges, such as the full UV-visible or lux, are offered only as expensive, customized solutions.

Full Spectrum Monitoring (FSM)

The introduction of the Full Spectrum Monitoring (FSM) system is the first major innovation for fully integrated light control in laboratory weathering instruments in 30 years. It is meant to address the weaknesses associated with standard controlled irradiance, as well as provide researchers the critical spectral data now being demanded by progressive weathering methodologies and approaches. Within the past two years, Atlas introduced the LS-200 spectroradiometer, which is an independent device specifically designed to monitor full spectrum in the Ci Series Weather-Ometers. While this was a positive first step toward our goal of full spectrum monitoring, the LS-200 can only be used periodically and the test must be interrupted for measurement.

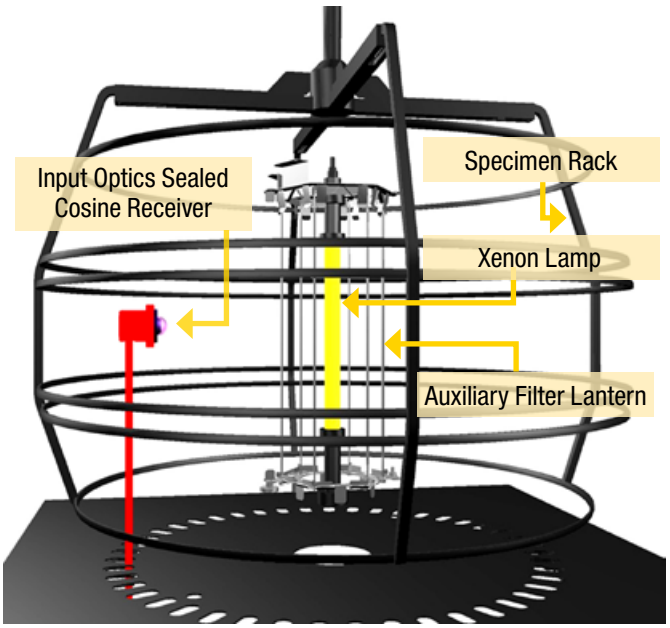

Figure 1: Graphical display of the Ci Series chamber interior. The CCD array spectroradiometer is mounted outside the test chamber.

In contrast with current technology, which controls and/or monitors fixed, single, discrete portions of the xenon spectrum, the FSM system permits control of any single user-selected wavelength, or any user-selected wavelength range, while monitoring and collecting data at all other wavelengths in the 250-800 nm range. The many implications of this capability are discussed later.

The system, which is fully integrated in an Atlas Weather-Ometer®, is meant to be used on a full-time basis. As such, it is designed to be robust and to withstand inherently hostile environments in and around laboratory weathering instruments.

Detailed specifications are proprietary, but, in general, the FSM system is comprised of a CCD array spectroradiometer with one nanometer resolution over a range of 250-800 nm, including order-sorting filters to ensure appropriate stray light rejection. Figure 1 shows the mounting of the input optics in the weathering chamber. The input optics system incorporates a sealed robust cosine receiver and patented quartz diffuser. The user interface manages the system with customized software for system calibration, configuration, and data management.

FSM Capabilities

User-Selected Monitoring Points

Current instruments are limited to controlling irradiance at a predetermined wavelength, or a wavelength range that is likely not to coincide with a test material's critical wavelength(s). Critical wavelengths are those at which a material demonstrates heightened sensitivity to light. In addition, a lamp undergoing temporal changes not captured by a single-wavelength-monitoring system will compound the problem. This has implications for repeatability and reproducibility. For example, replication of current tests that monitor and integrate irradiance data at non-critical wavelengths will indicate that the tests are identical. However, assuming there are changes to the lamp (there always are — small and gradual, for the most part) at the critical wavelengths not "seen" by current instrumentation, true radiant dosage replication, where it matters most, is not accomplished. The flexibility of the FSM system allows unprecedented utilization of activation spectra data, to monitor tests at material-specific critical wavelengths to determine the consistency of tests. As the irradiance changes at these selected wavelengths, the user can adjust the irradiance at the control point to decrease variability. Future product enhancements will provide automatic control at the user-selected wavelengths.

It should be made clear that the selection of a control wavelength coincident with a material's critical wavelength does not limit testing to a single type of material. While it is only possible to control at a single wavelength or range, since the full spectrum is available, data may be monitored and accrued at up to three other wavelength(s). In addition to the user-selected points, the common 340 nm, 420 nm, and 300-400 nm wavelengths will also be monitored. The standard functionality of the Weather-Ometer® will control irradiance at one of these points.

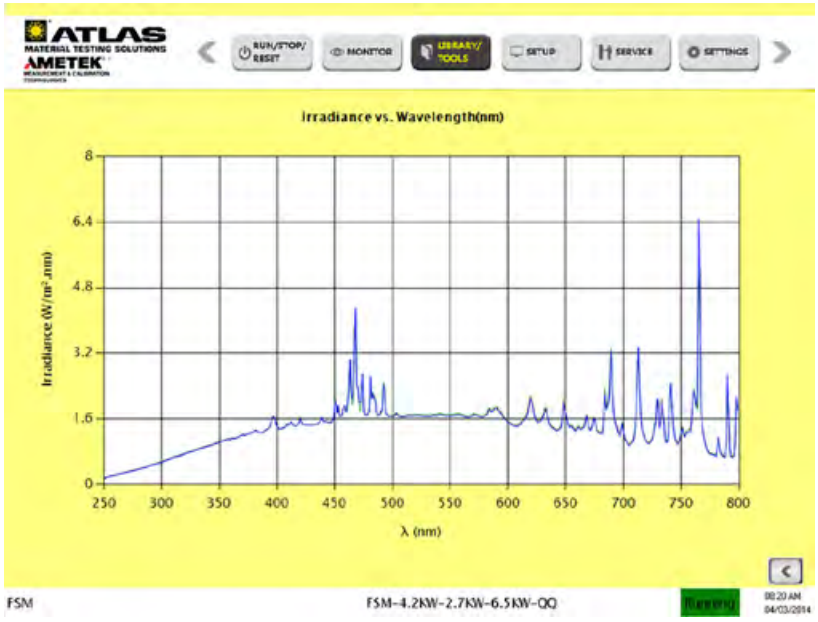

Figure 2: Ci Series user interface showing real-time spectral power distribution with the Full Spectrum Monitoring (FSM) system.

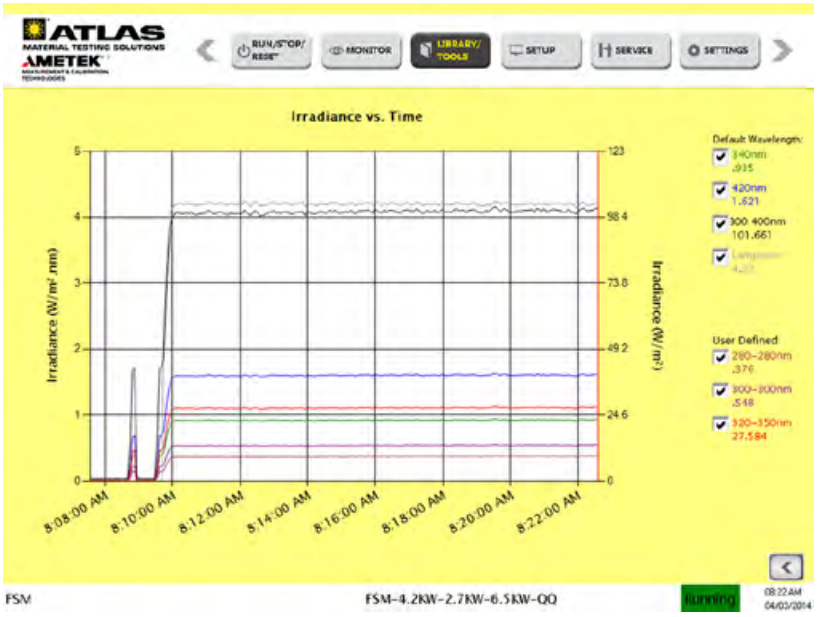

Figure 3: Screen shot showing trends of standard control wavelengths as well as monitoring of user-defined wavelength ranges.

Photometric Monitoring

In the photo imaging industry, lightfastness tests are required to maintain specified lux values, which, for current instrumentation, means customization of the controlled irradiance system. By contrast, systems with FSM could, through its software, automatically produce the lux value by convolution of its spectral irradiance measurements and the known photometric, "standard observer" weighting curve.

Continued on next page

Spectral Power Distribution, from previous page

Performance-Based Specifications

The trend in recent years toward performance-based weathering test specifications has meant the elimination of any technical information or features relating to a specific instrument. The more traditional "hardware-based" standards specifically name by manufacturer's nomenclature the type of xenon filters required for the desired results of the test.

By contrast, performance-based standards show allowable irradiance ranges, in spectral bands, as indicated in the example below, taken from *SAE J2412, Accelerated Exposure of Automotive Interior Trim Components Using a Controlled Irradiance Xenon Apparatus.*

Except for a few laboratories that may occasionally measure their instrument's SPD, there is currently no fully integrated means of verifying and demonstrating to an auditor or customer, for example, that the requirements are met. Only the LS-200, as referenced previously, could accomplish this. Since the LS-200 can only be used periodically, the user would not know the precise time in which a lamp system went "out of spec."

The FSM is capable of generating tables of irradiance to ensure beginning (of test) and ongoing compliance to performance-based requirements. The user may configure the table's wavelength bands as he or she sees fit — to be consistent with that in a given specification, for example. Another future product enhancement will be the inclusion of the common SPD tables from weathering test methods, for fully automated reporting of compliance.

Table 1: Spectral Power Distribution Requirements for SAE J2412, Daylight Filters

Irradiance in W/m² for Xenon-Arcs with Daylight Filters Normalized to Exactly 0.55 W/m² at 340 nm

Bandpass	Mean	Std. Deviation	Minimum	Maximum	Lower 95% Conf. Limit	Upper 95% Conf. Limit
250-260	0.00	0.00	0.00	0.00	0.00	0.00
261-270	0.00	0.00	0.00	0.00	0.00	0.00
271-280	0.00	0.00	0.00	0.01	0.00	0.00
281-290	0.02	0.02	0.00	0.11	0.00	0.06
291-300	0.19	0.10	0.03	0.55	0.00	0.38
301-310	0.77	0.21	0.32	1.46	0.35	1.18
311-320	1.91	0.21	1.31	2.68	1.49	2.33
321-330	3.39	0.13	2.96	3.97	3.12	3.65
331-340	4.92	0.06	4.68	5.11	4.80	5.03
341-350	6.24	0.09	5.80	6.40	6.06	6.43
351-360	7.40	0.22	6.66	7.82	6.97	7.84
361-370	8.58	0.41	7.56	9.82	7.76	9.39
371-380	9.25	0.60	8.09	11.36	8.04	10.45
381-390	9.92	0.89	8.39	13.71	8.15	11.69
391-400	11.88	1.44	9.64	18.57	8.99	14.76
300-400	64.31	3.57	57.79	78.96	57.16	71.45

Optical Filter Aging

The fact that each filter set has a unique UV transmittance is used to identify each filter set to the user — thereby eliminating or significantly reducing the potentially disastrous use of incorrect filters. Utilizing their own knowledge and experience, individual users may choose their own "end of useful life" criteria based on sample sensitivity or tolerance for confidence level in the test result.

Summary

The Full Spectrum Monitoring system for laboratory instruments represents a significant step forward for the management of light — the most critical component of photo-degradation. It can be a tool to serve leading-edge researchers as they endeavor to refine service life prediction calculations. The FSM feature can also benefit everyday users wishing to realize more repeatable and reproducible tests, or to demonstrate compliance with performance-based test methods. ■

For more information on the Atlas FSM system, visit

http://atlasmtt.com/fsm

ASTM Honors Atlas Partner

One of Atlas' partners has been recognized by the standards organization ASTM International.

In late 2013, Kevin Smith, president of Auto Technology, with whom we partner for our corrosion testing equipment, was presented with ASTM's Award of Merit. Kevin is the current secretary of ASTM Committee G01 on Corrosion of Metals and has been project leader for the revision of ASTM B117, the world's most widely used corrosion test standard.

The Award of Merit was established in 1949 by the ASTM International Board of Directors and is the highest society award granted to an individual member for distinguished service and outstanding participation in ASTM International committee activities. Recipients also receive the honorary title of Fellow. ■

Kevin Smith receives the ASTM Award of Merit from Mary McKiel, former chair of the ASTM International Board of Directors.

CLIENT EDUCATION ATLAS

Atlas and CEI to Host Asia Solar Energy Durability Conference

November 19–20, 2014, Shanghai, China

Even as the solar market has become more mature, it continues to grow at impressive rates. With solar system life expectancies of 20, 25, and even 30 years, appropriate accelerated testing of long-term durability is crucial, and accurate weathering testing has never been more important to product development, quality control, and certification testing. In addition, more emphasis is being placed on "solar bankability" and how it is impacted by product durability and reliability.

In response, Atlas Material Testing Technology and China National Electric Apparatus Research Institute Co., Ltd. (CEI) are hosting a two-day conference for the global weathering and solar energy community. The Atlas/CEI Asia Solar Energy Durability Conference is your chance to hear from global technical leaders in the solar energy industry on the latest developments in:

- Environmental durability research and testing
- Materials performance
- Advancements in service life testing and estimation
- Certification and testing programs for PV modules, materials, components, and systems
- New enhanced PV "Qualification Plus" test methods and their impact on IEC

Presenters

» **Dr. Nicolas Bogdanski,** TÜV Rheinland Energy and Environment
Analytical Methods to Analyze Ageing of PV Modules on Module Level

» **Dr. Leo Feng,** China National Electric Apparatus Research Institute Co., Ltd. (CEI)
Study on the Service Performance and Micro-Temperature of Crystalline Silicon Module in Typical Climate Site

» **Dr. Xiaohong Gu,** National Institute of Standards & Technology (NIST)
Chemical and Mechanical Depth Profiling of PV Backsheets During UV Exposure

» **Dr. Peter Hacke,** National Renewable Energy Laboratory (NREL)
PID Measurement, Factors, and Prediction

» **Dr. Qiang Han,** VDE Global Services (Shanghai) Co., Ltd.
What is a Good PV Module?

» **Mr. Liang Ji,** Underwriters Laboratories Inc. (UL)
Updates on IEC PV Standard Development

» **Dr. Michael Köhl,** Fraunhofer Institute for Solar Energy Systems ISE
Ultra-Violet Radiation Testing of PV Modules and Components

- **Dr. Hyun Jin Koo,** FITI Testing and Research Institute
  Accelerating Long Term Materials Durability Testing Using 10-Sun Level High Irradiance Weather-Ometer®
- **Dr. Cristos Monokroussos,** TÜV Rheinland (Shanghai) Co., Ltd.
  Implications on Performance Rating of High Efficiency PV
- **Dr. Ralph Romero,** Black & Veatch
  Observations on PV Module Quality Management
- **Professor Hui Shen,** ShunDe SYSU Institute for Solar Energy
  Solar Cell Technology Analysis and Development Trend Assessment
- **Dr. Carolin Ulbrich,** Forschungszentrum Jülich GmbH
  Direct Analysis and Transition to STC of the Current Voltage Curves of Outdoor Degrading Modules
- **Mr. Hung-Sen Wu,** Industrial Technology Research Institute (ITRI)
  Indoor Acceleration Program for Snail Track Effect on Silicon Solar Modules
- **Mr. Allen Zielnik,** Atlas Material Testing Technology LLC
  Long-Term Weather Resistance and Testing Methodologies for Solar Energy Materials and Products

Who Should Attend

- Solar industry managers faced with product longevity issues
- Reliability engineers interested in enhancing the longevity of their products
- Financial managers interested in warranty considerations and return-on-investment calculations in their business models
- PV R&D staff interested in new materials and systems applications
- PV executives interested in understanding long-term issues surrounding their product marketplace
- QA personnel responsible for solar energy product durability
- Staff from companies supplying the solar industry

Event Sponsors:

TÜVRheinland®
Precisely Right.

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WWW.TESTPV.COM

Language

The conference will be held simultaneously in Chinese and English.

Location and Accommodations

Courtyard Marriott Shanghai Puxi
338 Heng Feng Road
Shanghai, 200070 China
Phone: +86-21-2215-3888

Registration Information

For registration information, visit **http://atlasmtt.com/solarconference2014**

Atlas Expands Its Worldwide Exposure Network Locations and Services

New High-Altitude Site in Loveland, Colorado

Atlas now offers more than 20 test sites around the world for clients to better understand the global performance of materials durability. One of the latest additions is in Loveland, Colorado.

As of July 2014, AWSG now offers traditional outdoor exposure testing at this high-altitude location. This pristine site has a slightly higher elevated radiation as well as seasonal changes that have actinic effects, causing the natural accelerated weathering of materials.

AWSG is pleased to announce this expansion of offerings in Loveland with our partner Pearl Laboratories. AWSG and Pearl Laboratories have been providing customers with joint solar testing capabilities since our partnership began in 2013.

Site Details: Loveland, Colorado

Latitude:	40° 25' North
Longitude:	104° 59' West
Elevation:	1519 meters
Average Temperature:	10.5°C
Average Relative Humidity:	54%
Total Rain:	544 mm
Total Radiant Exposure:	5,509 MJ/m²

New Desert Test Site in Turpan, China

Atlas Material Testing Technology, LLC has partnered with the China National Electric Apparatus Research Institute Co., Ltd. (CEI) to offer desert exposure testing at CEI's outdoor facility in Turpan, China. The Turpan site is located approximately 150 km (93 mi) southeast of Ürümqi in a mountain basin, on the northern side of the Turpan Depression.

This new test site offers direct and under-glass exposures, IP/DP and full-vehicle exposures, as well as evaluation services. In addition, the Turpan site has a fully operational weather station that collects temperature, humidity, rainfall, radiation, wind speed, and wind direction data measurements.

Site Details: Turpan, China

Latitude:	42° 56' North
Longitude:	89° 12' East
Elevation:	61.5 meters
Average Temperature:	17.4°C
Average Relative Humidity:	27.9%
Total Rain:	16.4 mm
Total Radiant Exposure:	5,513 MJ/m²

Sanary-sur-Mer Site Becomes CSTB-Compliant

Atlas Weathering Services Group is excited to announce that its Sanary-sur-Mer site is Centre Scientifique et Technique du Bâtiment (CSTB)-compliant. In France, CSTB is the leader for assessing the viability of building materials.

Located in Southeastern France, Atlas' Sanary-sur-Mer outdoor test site features a typical Mediterranean climate. With 3000 hours of sunlight per year, an elevation of 110 m (361 ft), average wet time of 2700 hours, and a proximity to the Mediterranean Sea of only 4 km (2.5 mi), the site is ideal for meeting CSTB requirements.

The Sanary-sur-Mer site is another sign of Atlas' commitment to the architectural materials industry, which also includes collaborative efforts with organizations such as the American Architectural Manufacturers Association (AAMA).

Site Details: Sanary-sur-Mer, France

Latitude:	43° 08' North
Longitude:	5° 49' East
Elevation:	110 meters
Average Temperature:	13°C
Average Relative Humidity:	64%
Total Rain:	700 mm
Total Radiant Exposure:	5,500 MJ/m^2

As the testing demands at the Sanary-sur-Mer site have quickly grown, Atlas has added Rachida Hajaji to its support staff to assist clients with their testing needs. For more information about the capabilities and features of this site, contact Rachida at rachida.hajaji@ametek.com. ■

The Atlas Worldwide Exposure Network consists of over 20 sites around the world in multiple climates.

For detailed information about the various sites, visit www.atlasmtt.com/outdoortesting.

To request a quotation for outdoor exposure testing at any of our global sites, contact John Wonders at +1-623-465-7356 x101 or john.wonders@ametek.com

Performing MIL-STD-810G, Method 505.5, Solar Radiation (Sunshine), Procedure II – Steady State Test Using Atlas Ci Series Weather-Ometer® and SUNTEST® XXL+

Ensuring that products are protected against the harmful effects of solar radiation is important for most industries. However, these concerns are particularly prevalent in the military sector. In modern combat arenas where military units are deployed, conditions are extreme and severe. Dry, arid environments such as the desert, as well as areas of extreme heat and humidity, are typical theaters of operation. Ensuring that materials are able to withstand these environments is not only critical for military hardware performance, but most important, for the safety of military personnel.

Test method *MIL-STD-810G, Method 505.5, Solar Radiation (Sunshine), Procedure II – Steady State Test* was developed by the U.S. military to help assess the actinic, or photodegradation, effects on materials and products deployed by the U.S. military services. Procedure II can also be used to simulate the UV effect of solar radiation at different locations. Additionally, the standard is utilized by participating NATO countries for similar applications.

Although the conditions are not specifically stated, they can be derived from the standard using the tailoring process described in *MIL-STD-810G, Part 1.* This process allows the user to determine suitable conditions to meet the intent of the standard using available test equipment.

Using the tailoring process, Atlas recommends the following conditions to meet the requirements of the standard:

Atlas Ci Series Weather-Ometer® Settings

- Recommended Atlas filters: Right Light Inner / CIRA on Quartz Outer
- Irradiance control set point: 0.68 W/(m^2 nm) @ 340 nm, 69 W/m^2 @ 300–400 nm
- Test Cycle: 20 Hours of Light, 4 Hours of Dark per 24-Hour Cycle
- Recommended exposure length: 56 24-Hour cycles or longer for materials continuously exposed outdoors (1344 Total Hours)
- Chamber Temperature: Cycle A1 (Worldwide Deployment – Hot Dry) - 49 ± 2 °C; Cycle A2 (Basic Hot) - 43 ± 2 °C, Both Light and Dark Cycles
- Black Panel/Standard Temperature: Not specified – Adjust set point as needed to facilitate control of specified chamber temperature
- Relative Humidity: Control not specified or required

Atlas SUNTEST® XXL+ Settings

- Recommended Atlas filters: Coated Quartz with Daylight Filters
- Irradiance control set point: 0.59 W/(m^2 nm) @ 340 nm, 67 W/m^2 @ 300–400 nm
- Test Cycle: 20 Hours of Light, 4 Hours of Dark per 24-Hour Cycle
- Recommended Exposure Length: 56 24-Hour cycles or longer for materials continuously exposed outdoors (1344 Total Hours)

- Chamber Temperature: Cycle A1 (Worldwide Deployment – Hot Dry) - 49 ± 2 °C; Cycle A2 (Basic Hot) - 43 ± 2 °C, Both Light and Dark Cycles
- Black Panel Temperature: Not specified – Adjust set point as needed to facilitate control of specified chamber temperature
- Relative Humidity: Control not specified or required

Minor deviations to the test method are allowed, as long as they are documented in the test report. Reporting requirements found in *MIL-STD-810G, Part 1* and in *Method 505.5* must be observed to comply with the requirements of the standard.

For additional details regarding the application of the tailoring process for spectral power distribution compliance data, or any other questions regarding the use of Atlas equipment for this test method, consult your local Atlas sales representative.

AATCC Announces New Blue Wool Availability

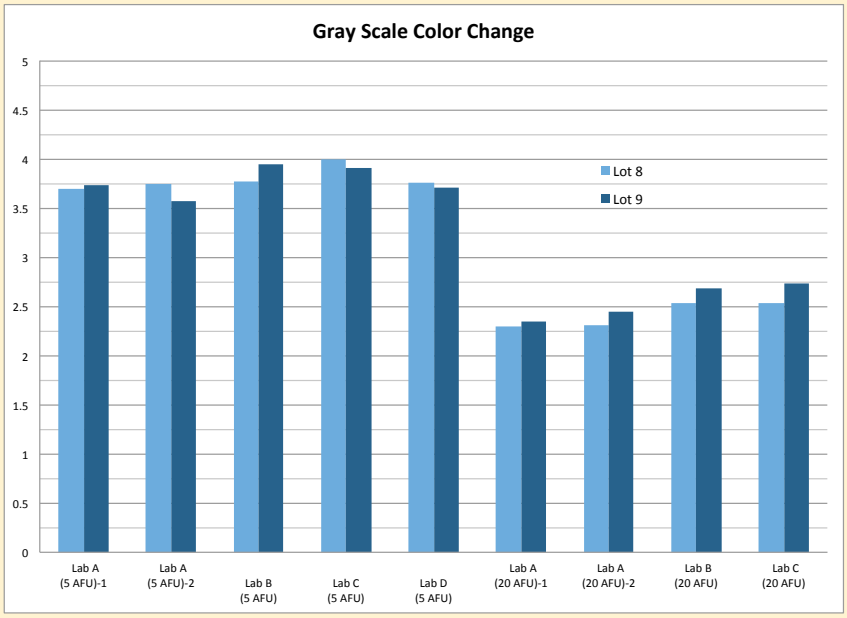
The American Association of Textiles Chemists and Colorists (AATCC) has announced the introduction of a new lot of L2 blue wool fabrics, labeled Lot 9. The availability of blue wool has been a hot topic over the last few years as inventory has continued to decline.

AATCC has been working for the last several years to develop a new lot of L2 blue wools. The new L2, Lot 9 fabrics were tested using AATCC TM16.3, Colorfastness to Light: Xenon-Arc for 5 and 20 AFU's at three AATCC member labs, and the results were favorable.

AATCC has announced that L2, Lot 9 will be distributed as soon as all of the Lot 8 material has been purchased. Limits on the amount of L2 that can be purchased will be lifted. There is no more inventory of the L4 blue wool, although there are future plans for development.

Many of our clients have used both L2 and L4 for AFU's of 5 and 20, respectively. The L2 can be used in place of L4 for 20 AFU's due to the linearity of fade of the L2.

L2 blue wools can be purchased from Atlas by contacting Customer Service at +1-773-327-4520 or email atlas.info@ametek.com.



Data courtesy of AATCC

ATLAS MATERIAL TESTING SOLUTIONS

AMETEK® MEASUREMENT & CALIBRATION TECHNOLOGIES

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