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SunSpots

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VIEEW™

A Quantum Leap in the Advancement of Surface Defect Evaluation

by Fred Lee, Product Specialist, Analytical Instruments Division, and Cees Van Teylingen, Product Manager, Analytical Instruments Division

Introduction

The human eye is an unparalleled organ that allows us, in one moment, to count the stars in the sky and in the next, the spots on a ladybug clinging to our fingertip. Yet the eye is not without serious limitations in its perception of the physical world. Despite these limitations, we have grown to depend on its capabilities in the evaluation of surface defects in a wide variety of manufactured materials.

The human eye, coupled with the subjective judgment of a material inspector, determine the surface quality levels that are acceptable in raw materials and finished goods. And where visual perception is lacking in acuity, or conscious judgment is incapable of quantifying a large number of physical surface defects, pictorial references are employed for general comparison to allow a classification of the severity of a sample's defects. This technique has admirably compensated for our visual limitations, but it has come at the cost of questionable repeatability and, with its inherent subjectivity, includes the perceptual and psychological biases of the observer.

While this methodology has sufficed throughout the history of industrialization, revolutionary advances in photographic, video imaging, and computer technology have originated precision tools for minimizing subjective, human influences and for automating inspection procedures, the repetitiveness and labor intensity of which can also diminish human performance through fatigue. The **Atlas VIEEW™ Digital Image Analyzer** is a leading-edge integration of these modern technologies. It is capable of capturing digital images of samples under various lighting schemes optimized for the sample surface, of digitally processing the images to highlight and enhance surface defects, and of measuring and counting defects such that each sample is defined by a comprehensive statistical profile. This process may also be applied to graded reference

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The Atlas VIEEW™ Digital Image Analyzer

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AtlasCommitment to Growth

Atlas Opens New Business Unit in India

Atlas Electric Devices Company, USA and RICH. SEIFERT & Co., Ahrensburg, Germany have been present in India for several decades. Both companies were originally represented in India through the official agent THE SCIENTIFIC INSTRUMENTS COMPANY LIMITED, (SICO) Allahabad. SICO started its operation in 1911 and expanded it in 1998 with 18 branch offices and 350 employees all over India. It represented more than 50 different foreign manufacturers worldwide. The Industrial Division (NDTD) within SICO handled sales of Atlas and SEIFERT products.

ATLAS and SEIFERT join forces in India

In June 1998, RICH. SEIFERT & Co., Germany decided to start its own subsidiary office in India after financial crises at SICO led to a downward trend in business. ATLAS Material Testing Technology BV — a European subsidiary of ATLAS — also had plans to start its own operation in India in the near future. Based on input from members of the Industrial Division at SICO, Atlas and SEIFERT started a joint venture operation in India which resulted in the company SEIFERT X-RAY & ATLAS MTT (INDIA) PRIVATE LIMITED, with the registered head office in Chennai, India.

The joint company was registered in October 1998 with just two employees and had expanded to 11 employees by January 1999, with most of the team members from the Industrial Division at SICO joining us. Today, Mr. C. S. RAVI, General Manager, runs the company. Branches at Mumbai and New Delhi have also opened. The company was formally inaugurated on 26 February 1999 by Dr. Klaus Schroeder, Consulate General of the German Embassy, Chennai, in the presence of both the Managing Directors along with the General Manager and Area Manager of the International Sales division of both SEIFERT and ATLAS MTT BV. Over 100 clients and members of the press attended the inaugural event.

Due to the support of the Atlas MTT and SEIFERT sales teams, the joint Indian venture was able to achieve a huge growth in business compared to the previous few years. The stock inventory of consumables and spares parts was increased to help clients get these parts in the local currency, which was very new to the Indian customers. Service issues were taken care of faster and more efficiently.

As of April 2000, the Indian office was extracted from the International Sales (PCI) departments and Independent Business Unit, respectively, and restructured to its new identity with the assistance of consultants from both SEIFERT and ATLAS.

In this new function as Business Unit India, SEIFERT & ATLAS will report to the General Management of ATLAS MTT BV, Netherlands.

SEIFERT & ATLAS, INDIA has plans to open a new office in Calcutta to serve clients in the eastern part of India. Chennai, Mumbai, and New Delhi now cater to the needs of the southern, western, and northern parts of India. ■

AtlasSpeaks

International Coatings Expo
October 16–17, 2000
Chicago, Illinois

Kelly Hardcastle, R & D Manager, Atlas Weathering Services Group, will present "Variables, Methods and Philosophies Considered in Coatings Durability" at the Durability of Coatings Technical Conference.

ISATA 2000
September 26, 2000
Dublin, Ireland

Larry Bond, Manager of Sales and Client Services, Atlas Weathering Services Group, will present a paper entitled "Choices in the Design of Outdoor Weathering Test for Automotive Interior Materials."

ONE YEAR FREE!

Buy any Atlas xenon weathering instrument, Suntest XLS/XLS+ or larger, and receive **one free year** (12 months) of static weathering for 24 specimens. Samples or specimens can be any size up to 305 x 305 cm (12 x 12 in). Clients are responsible for all shipping and handling fees to the test site. AWSG will pay the return shipping. No third party specimens will be accepted. Please contact your Atlas Sales Representative for your complimentary static exposure form.

* *Offer subject to change without notice. Evaluation services are not included but are available at the regular price.*

AtlasShows

2000

AATCC 2000
September 17–20
Booth #701 & 703
Benton Convention Center
Winston-Salem, North Carolina

International Exhibition Brno
September 18–22
Brno, Czech Republic

EUROCOAT
September 19–21
Torino, Italy

International Trade Show Plovdiv
September 25–30
Plovdiv, Bulgaria

Het Instrument Trade Show
October 9–13
Utrecht, The Netherlands

FSCT ICE 2000
October 16–20
Booth #1815
McCormick Place
Chicago, Illinois

Cloristic Congress and Exhibition
October 18–20
Pardubice, Czech Republic

VISION
October 18–20
Hall 8.0, Booth #109
Stuttgart, Germany

Interplastica
November 28–December 1
Moscow, Russia

Chemistry 2000
December 1–3
St. Petersburg, Russia

ITME
December 1–10
Mumbai, India

2001

PITTCON 2001
March 4–9
New Orleans, LA

SAE 2001
March 5–8
Cobo Hall
Detroit, Michigan

Adhesive and Sealant Conference
March 18–21
Orlando, Florida

European Coatings Show
April 3–5
Nuremberg, Germany

ATME-I 2001
April 23–27
Greenville, South Carolina

ANTEC 2001
May 7–10
Dallas, Texas

Test 2001
May 8–10
Nuremberg, Germany

Plastics USA
October 2–4
Chicago, Illinois

K'2001
October 25–November 1
Düsseldorf, Germany

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samples and stored on disk, ultimately allowing a classification of test samples by automatic, statistical comparison to the reference data. Thus, the basic, historical evaluation method is preserved but is automatically performed by precision optics and software analysis algorithms at the press of a button.

VIEEW allows unprecedented quantification and qualification of defects. Measurable characteristics include textural, spatial, and geometric attributes of defects, as well as their characterization in frequency domain. Such comprehensive sample data, and its easy retrieval and manipulation, provide a new and overdue level of precision in the evaluation of material surfaces.

Optical Imaging System — Hardware Considerations

The technique used to light a sample is of critical importance in optical imaging. Light source spectrum and angle of incidence on the sample surface are key factors in determining what can be optically detected and captured. In the VIEEW system, differing lighting methods are applied to achieve optimal illumination under two schemes: diffuse, chromatic (color) lighting for the detection of variations in tonal and chromatic contrast; and direct lighting to measure variations in geometric reflection (gloss) and its textural variation.

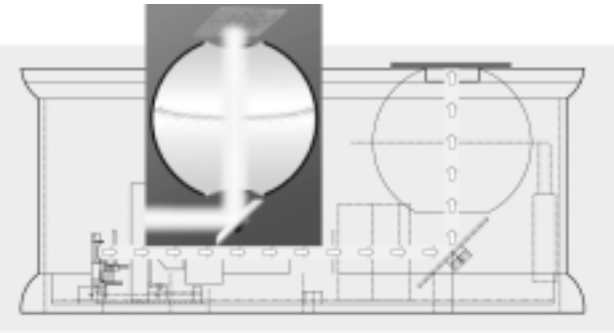

Figure 1: VIEEW diffuse illumination

VIEEW Diffuse Illumination

To accurately measure surface abnormalities resulting from chromaticity, or color difference, the sample should be illuminated by a diffuse chromatic source where each color component (red, green, and blue, or RGB) may be independently adjusted to maximize contrast on the sample surface. Optimal light diffusion is obtained by mounting the light source(s) inside an integrating sphere (a spherical cavity), the interior walls of which are treated with a high-reflectance coating to maximize reflection and scattering, as shown in Figure 1. Light-emitting diodes (LEDs) are suitable light sources for use inside the sphere for their output stability, reliability, and compact size.

VIEEW Direct Illumination

The most accurate measurement of the reflectance, or gloss, of a surface (which also reveals surface irregularities, such as scratches, chips, orange peel, etc.) is made when light strikes the sample normal to its plane at an incident angle of 0°. Light striking an optically smooth surface under these conditions will be reflected back at 0°, but light striking an uneven or textured surface will be reflected at angles other than zero and, in effect, will be lost to the detector of the digital camera which is viewing the sample at a 0° angle. See Figure 2. The result is that very smooth surfaces will appear as a uniform color (gray or white depending on the surface smoothness) and the irregularities will reveal themselves as significantly darker areas or, in the case of scratches, as distinctly dark lines. An example of this beneficial phenomenon is shown in Figure 3. It is important to note that the unaided human eye is incapable of perceiving an object or surface with an illumination incident angle of 0°, as it would require a light source emanating from the center of the ocular pupil.

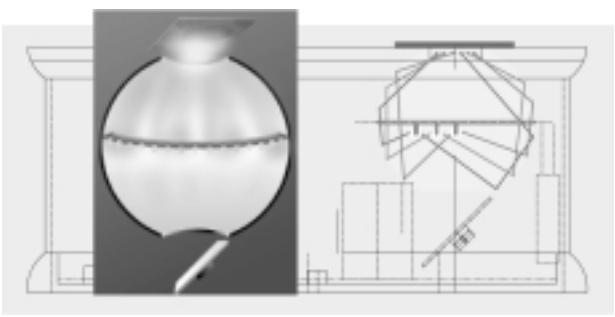

Figure 2: VIEEW direct illumination

Direct illumination further reveals its advantages with coated samples where degradation is limited primarily to a clear

top coat layer. In this sample topology, light is reflected only from the surface of the clear coating and not from the deeper pigmentation layer, which is of no interest when the defects are produced by marring, light abrasion, or chemical and environmental exposure — the effects of which are confined to the exterior layer.

Figure 3: Selective viewing of surface structure using VIEEW direct/diffuse illumination

The Atlas VIEEW system incorporates both of these illumination schemes, independently or in combination, to allow the most comprehensive detection of surface defects. It is not uncommon for samples to be photographed under both lighting techniques to allow evaluation of more than one type of degradation mechanism exhibited by the sample. Illumination conditions are computer-controlled and precisely repeatable since the final control-setting scheme may be named and saved as a setup file. This feature ensures reproducible evaluation conditions and repeatable results.

Optics and Image Capture

A precision digital-imaging system must also include optics capable of magnifying the sample surface without introducing astigmatism, spherical aberration, or chromatic irregularities. A high-quality, coated lens system with apochromatic correction is suitable for this task.

Additionally, the charge-coupled device, or CCD chip, used in the camera must be capable of detecting the sample image at a resolution that can reveal nearly microscopic abnormalities while accurately rendering surface tonal variations. The digital camera and optical lens assembly used in the VIEEW system provide unparalleled resolution and grayscale capturing accuracy.

Software Analysis of a Digital Image — Binary and Grayscale Images

In the computerized analysis of surface defects, two categories predominate: defect characterization and surface texture properties. The former category includes defect size, shape, and distribution while the latter entails a determination of the change in surface appearance (texture). Analysis software exploits two different image types to perform these characterizations and determinations: binary (or 2-bit black and white) images and grayscale images.

Binary Image Analysis

Processing the original 256-shade grayscale image with a thresholding filter that reduces the image to black and white pixels creates binary images. A variety of different thresholding techniques, either in spatial domain or in frequency domain, are used to determine the proper settings that allow the image to retain optimal defect information while eliminating those pixels of the unaffected areas. Additional processing steps may be employed to further refine the area of interest before or after the thresholding procedure. The analysis program then applies special measurement and analysis algorithms to the black-on-white defects of each sample and records defect quantities and their geometric parameters in an associated statistical file. Typical parameters used in this type of analysis are defect count, size, shape, area, orientation, boundary analysis, gravity center analysis, and Fourier shape analysis.

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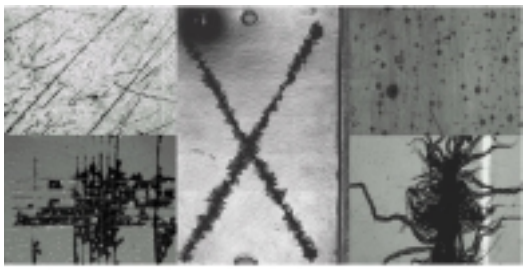


Weathering defects, corrosion defects, adhesion properties, processing defects

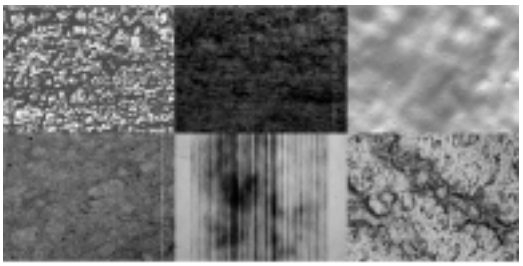
Figure 4: Various surface defects for binary image analysis

The spatial formations (distribution over the sample surface) of the defects are also important in some applications since spatial characteristics can be related to physical and mechanical properties of the sample as well as to material processing. Parameters used for spatial analysis are spatial distribution by quadrant, nearest-neighbor statistics, spatial variance, and spatial density based on random points.

Typical examples of binary image analysis in coatings applications are: corrosion (rust) analysis, delamination analysis, pitting or popping analysis, crack analysis, chipping analysis — impact resistance, etc. See Figure 4 for various surface defects for binary image analysis.

Grayscale Image Analysis

Grayscale images are used in their original grayscale form as acquired by the system. In some cases, image preprocessing may be applied equally to all the samples to highlight defect information. Sample images are then analyzed for surface texture and variations in shade that do not submit to geometrical definition. Since the original grayscale (or equally preprocessed) images are analyzed, this method provides objective results comparable to visual perception techniques. Sample illumination is the only variable, but the system allows it to be applied under precisely the same conditions to all samples, whether direct, diffuse, or both illumination techniques are used. This ensures absolute results within sample groupings and, in applications where reference samples and their analysis data are used for comparative classification, ensures the most objective accuracy in relative comparisons.



Surface texture, orange peel of coatings, marring, material processing texture

Figure 5: Various surface defects for gray image analysis

Typical parameters used in grayscale image analysis are: histogram, surface properties, surface fractal dimensioning, flow field measurement, gray level run length, surface texture uniformity, roughness, and numerous others. Grayscale image analysis is applicable in mar analysis, scratch analysis, discoloration, micro-texture analysis, pattern analysis, surface structure analysis, etc. See Figure 5 for various surface defects for gray image analysis.

Such capabilities as these are incorporated in the sophisticated analysis software program of the Atlas VIEEW system, as well as numerous other capabilities and features to enhance and simplify the defect analysis process. Since all setup and preprocessing parameters may be saved as retrievable files, analysis is reduced to repeatedly placing specimens on the VIEEW sample stage and clicking on a single screen icon.

Sample Classification

VIEEW allows a new and more accurate method for classifying samples according to the nature and severity of the surface degradation they incur since it reliably determines quantitative values to define such degradation, and these over a broader and more sophisticated range of deterioration mechanisms than with visual techniques. After the desired analyses have been performed, the pertinent characteristics of each sample are resolved to a data set that can be numerically compared to other samples or to the data of reference samples or pictorial

standards that have been captured and analyzed under the exact same conditions. Samples may then be graded or grouped according to the severity level with which they conform. This latter capability allows results obtained by the VIEEW system to smoothly dovetail with historical evaluation results gathered through traditional visual means. Rather than imposing a 90° turn in the progress of surface evaluation methodology, VIEEW should be envisioned as an innovative tool for opening a broader pathway toward the goal of accurate, objective, and repeatable characterization of surface defects.

Digital Data and Image Archiving

Since analysis results are resolved to a unique data set for each test sample, archiving and access to the results are greatly simplified and no longer entail the cumbersome, messy storage of massive quantities of tested materials. Digital images and analysis data may be stored on a computer hard disk or recorded on CD-ROM for long-term archiving. By easily transferring test data and images over the Internet to colleagues and clients, laboratory and research personnel no longer have to mail tested materials around the world. This promotes a new level of convenience and responsiveness in meeting customer requirements.

The ease with which an image of a sample may now be captured encourages the recording of sequential deterioration at intervals during an exposure test. This may help provide new insights into deterioration mechanisms and their onset points.

As an additional benefit to a network of VIEEW system users; illumination setup, image processing and analysis macro files may be shared among members to instantly duplicate evaluation conditions.

An Application Example

Analysis of Chipping Damage in a Multi-layer Coating System

Using a gravelometer, stone chips are ejected on to a group of coated samples. An image of each sample is captured and each instance of surface damage is measured according to shape, size, and other geometrical attributes to allow a rating of the samples. Additionally, the multi-layer structure of the coating must be analyzed to determine what layers have been affected in each damaging instance. Traditionally, this has been measured visually, but now VIEEW provides a more expedient and accurate instrumental solution. Through the use of a special enhancement algorithm coupled with sophisticated illumination options, a complete analysis can be obtained by analyzing images of the damage structures on each layer.

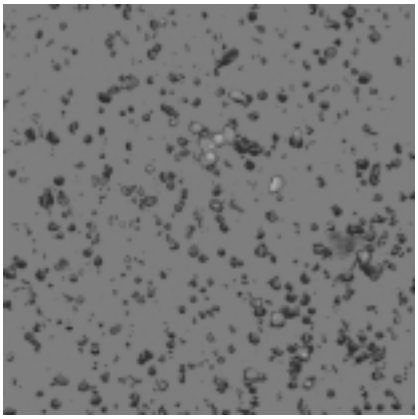


Figure 6: Chipping damage in a multi-layer coating system — captured with VIEEW

Step 1 — Image Capture

A sequential combination of direct and diffused illumination was used to reveal the chipping damage of each coating layer. The direct illumination reveals the damage on the top layer of clear coating. A spectrally optimized diffuse illumination then illuminates the subsequent layers so that each layer damage can be revealed with visible distinction. See Figure 6.

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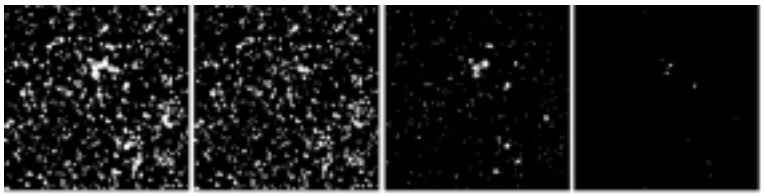

Layer 1: Clear coating | Layer 2: Pigment layer | Layer 3: Primer layer | Layer4: Metal substrate

Figure 7: Chipping damage — each layer revealed

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Step 2 — Image Processing (Enhancement)

The captured images, which already reveal the damage in each layer, can be further processed to digitally separate each layer of chipping damage in a black and white image format. See Figure 7.

Step 3 — Image Analysis

The damage shown as black pixels are measured and analyzed statistically. The calculated geometrical attributes can then be compared to an industry standard rating in order to yield a standard rating.

Layer	% Damage	No. of Defects	Mean Size – mm²	Size – Std. Dev.
1 (Clear Coat)	11.9	481	0.5	1.1
2 (Pigment Layer)	10.3	439	0.3	0.5
3 (Primer Layer)	1.5	85	0.2	0.4
4 (Metal Substrate)	0.1	8	0.2	0.2

Conclusion

Surface defect evaluation is a science to which modern digital imaging and computer analysis technology may be adapted to greatly enhance its accuracy, depth of application, and empirical repeatability, while minimizing or eliminating subjective human biases. The fruition of such a technological adaptation has been realized in the **Atlas VIEEW Digital Image Analyzer.** It provides acute accuracy and repeatability in the analysis of paint, plastics, coatings, and textiles surface defects. VIEEW is available today for revolutionizing the worldwide surface evaluation laboratories of tomorrow.

For more information regarding VIEEW, please check the corresponding box on the reply card. ■

A Short Ride to Work

Ken Riley, a dependable employee of DSET Laboratories responsible for washing mirrors on our 500 EMMAQUA machines, was asked to come into work on a Saturday to fill in for another employee who was on vacation. Ken readily agreed to work, even though he was having some car problems. (The site manager offered him a ride to and from work, but Ken said no, he would borrow or rent a car while his vehicle was being repaired).

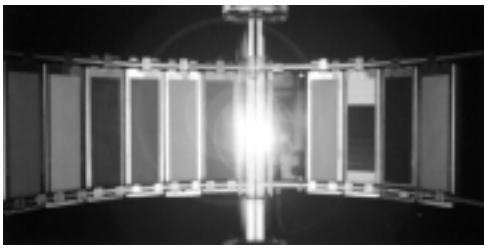
As it turned out, Ken was not able to obtain another car for his trip to work, nor did he call for a ride. Instead, Ken got on his bike at 4:00 a.m. Saturday morning and pedaled the 30 miles to work, arriving on time! He was offered a ride home on Saturday afternoon by coworker Perry Sartain, saving him the rigors of having to pedal another 30 miles. For the trouble, Ken offered Perry gas money, which was graciously refused.

This is a remarkable story of dedication and pride. Everyone at Atlas applauds Ken Riley and is proud to have him as a staff member.

Hats off to Ken! ■

Xenon Arc Lamp key to accuracy and repeatability

Atlas Weather-Ometer®/Fade-Ometer® Instruments* are valuable tools for producing repeatable and reliable accelerated weathering tests. The heart of each of these systems is the Xenon Arc Lamp source. The execution of each accelerated weathering test is based on either total irradiant exposure or elapsed time. Therefore, the irradiance produced by the Xenon Arc Lamp must be precisely known and controlled to ensure accuracy and repeatability. For the Weather-Ometer/Fade-Ometer to accurately measure the irradiance of the lamp being used for a test, the instrument's light-monitoring device must be recalibrated after approximately 200 hours of test time. The light monitor is calibrated using a **Xenon Arc Reference Lamp,** which is a specifically configured lamp to be used at a particular power level in a particular type of instrument. Hence, the Xenon Reference Lamp is critical to the proper calibration of the Weather-Ometer, and consequently, to the accuracy of tests it runs. This article will discuss the Xenon Arc Reference Lamp, its calibration at Atlas, its traceability to NIST, and how it should be used and cared for during its lifetime of use.



Atlas' Xenon Arc Lamp

Reference Lamp

A Xenon Arc Reference Lamp is comprised of a Xenon Arc Burner with Type S Borosilicate inner and outer filters. With this filter combination, the spectral power distribution of the lamp best correlates with the average spectral power distribution of sunlight at the earth's surface. Atlas serializes each component of the lamp, so that they are traceable to a specific manufacturing lot and production date. Each component is tested, appropriately stabilized, cleaned if necessary, and assembled. The lamp is then ready for calibration according to Atlas' ISO-9002 certified procedures in one of Atlas' calibration stations.

Lamp Calibration

The lamp calibration is done in situ — that is, in a chamber identical in geometry and construction material to the one in which it will be used. Calibration of the Reference Lamp is performed at the customer-specified wavelength(s) by direct comparison to two Working Standard Xenon Arc Lamps which themselves have NIST traceable calibrations. A Certificate of Calibration is then generated, stating the output of the Reference Lamp, the serial number of the Primary Working Standard Lamps, and the calibration procedure used. To ensure continued NIST traceability, the Reference Lamps must be recalibrated every 50 hours of use or every 2 years, whichever comes first.

Lamp Traceability

The Working Standard Xenon Arc Lamps are calibrated in a calibration station using a double grating scanning digital spectroradiometer. These calibration stations are very similar to production of the Weather-Ometer/Fade-Ometer, except they are specially maintained and controlled, per Atlas' ISO-9002 procedures. Each lamp is calibrated in multiple configurations

**Weather-Ometer and Fade-Ometer are registered trademarks of Atlas Electric Devices Co.*

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Xenon Arc Lamp, from previous page

and power levels, depending on its use. The digital spectroradiometer is calibrated directly against a NIST-calibrated standard of spectral irradiance.

Lamp Use

The Xenon Arc Reference Lamp is calibrated for use in a specific type of Atlas Fade-Ometer or Weather-Ometer at a specific power level only, as shown on its calibration certificate. The calibration takes into account the geometry of the specimen rack and the reflectance of the test chamber walls in the instrument for which the lamp is intended, and should be used only at the specified wattage. Use of the Reference Lamp in a different instrument from that which it was calibrated will result in an inaccurate calibration and incorrect test irradiance values. Also, all specimens and/or specimen holders must be removed from the specimen rack of the instrument prior to the calibration procedure in order to reproduce the conditions of the original calibration. If the specimen rack is not empty during the calibration process, the actual irradiance at the sample distance will likely be different from that stated on the lamp's calibration certificate.

Lamp Recalibration or Repair

Proper documentation will significantly expedite the recalibration process. Provide all the pertinent information necessary to recalibrate your Reference Lamp when returning it to Atlas. Do so by completing the recalibration form, available from the Customer Service Department. If the calibrated lamp is compromised in anyway, or in the unlikely event that its performance becomes questionable, return the lamp to Atlas for repair and recalibration by contacting Customer Service at (773) 327-4520. ■

Caring for Your Xenon Arc Lamp

The Xenon Arc Reference Lamp has a lifetime of approximately 2,000 hours if cared for properly. A few guidelines regarding care will help achieve the optimal performance of the lamp:

1) Do not disassemble the lamp. The Reference Lamp has been aligned and tested at the factory prior to shipment. If the lamp is disassembled, the relative positions of the components could change. Because of variations in the materials of the components (filters and burner), the output of the lamp will vary with changes in relative position. This will invalidate the irradiance results as listed on the calibration certificate. If a problem exists with the lamp assembly, return it immediately to the factory for repair and recalibration.

2) Never handle the Xenon burner tube or glass filters with bare hands. Skin oils deposit and burn into the glass. This can dramatically effect the performance of the lamp. Always wear cotton or rubber gloves when holding the lamp. If the glass has been in contact with skin, clean it immediately with an optical glass cleaner.

3) Clean and inspect the outer filter of the lamp assembly every 400 hours. Check for visible signs of water and skin oil deposits on the surface of the glass, which can inhibit light transmission through the outer filter. To clean, use a clean cotton cloth or cotton swab and alcohol or alcohol/acetone solution to wipe the glass. If the deposits cannot be removed or if other problems are found, return the lamp to the factory for repair and recalibration.

4) Maintain the Calibrated Lamp Log Card. In order to accurately track the amount of time the Reference Lamp has been used, the Log Card included with the lamp must be maintained. This will serve to alert the user when a recalibration is due. Also, failure to complete the Log Card may effect warranty coverage, as the use of the lamp cannot be verified without the Log Card.

5) Return the Reference Lamp to the factory for recalibration after 2 years or 50 hours of use. The irradiance output of a calibrated reference lamp, as shown on the Certificate of Calibration, is good for 2 years or 50 hours of use. To ensure the highest accuracy and optimal performance, return the lamp for recalibration within the specified time. The lamp will be inspected, cleaned, and recalibrated at Atlas and returned with new calibration results valid for another 2 years or 50 hours of use.

Atlas to Stage Workshop on Chemiluminescence in Germany

ATLAS Material Testing Technology invites you to a workshop about aspects of the chemiluminescence technique, as applied in the **Atlas CL400 ChemiLUME™ Analyzer,** October 19–20, 2000. Speakers from Atlas, as well as, guest speakers from various academies and plastics companies, including Clariant and Borealis, will present information on industrial experiences and state-of-the-art commercial instrumentation without neglecting the scientific point of view.

The major cause of degradation of most organic materials is oxidation. Almost every polymer needs to be protected during processing and in use with stabilizers. Severe environmental conditions such as elevated temperatures and UV light, as well as mechanical stresses can cause material degradation resulting in a reduction of material properties. Understanding the complex mechanisms of the degradation is essential for successfully utilizing materials; however, existing methods of analysis have often shown a lack of sensitivity.

Atlas' CL400 ChemiLUME™ Analyzer

The simplicity and extreme sensitivity of the chemiluminescence technique in detecting oxidation reactions at a very early stage and under actual conditions offers an interesting alternative for industrial applications.

The purpose of the October workshop is to present the latest developments in the application of the chemiluminescence technique for analysis of oxidative stability of polymeric materials and compounds, theoretical and practical aspects, state of the art commercial instrumentation, and industrial implementation examples.

As the workshop combines the scientific aspects as well as the practical aspects of the CL400 ChemiLUME and the technique of chemiluminescence, Atlas is looking forward to an interesting dialogue among the guest speakers and between the speakers and the participants.

The workshop is for anyone involved in the research and development of plastics but also addresses other disciplines where new and accelerated test methods for short-term determination of thermal and photooxidative stability of polymers and other organic materials are needed — for example, the pharmaceutical industry.

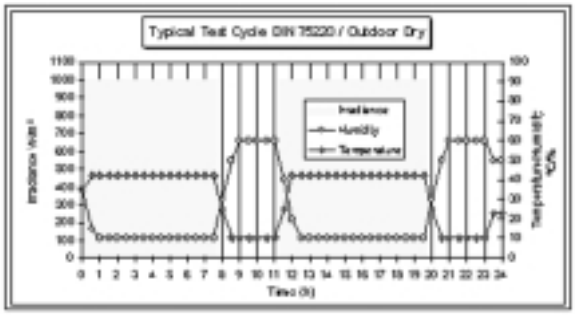
The workshop will be held in both German and English, and simultaneous interpretation will be available for all presentations at the Kunststoff-Zentrum in Leipzig, Germany. The tuition fee is DM 690,00 + VAT, which covers admission to the workshop, documentation, lunch and refreshments on both days, and one dinner. (Accommodations are not included.) Registration in advance is required, as the number of participants is limited to about 40. For further details, please contact Sandra Schmitt at phone: +49 6051-707-160, fax: +49 6051-707-161, or e-mail: **marketing@atlasmtt.de**.

Laboratory Testing Improves Material Performance Confidence Level and Reduces Risk

Automotive suppliers and OEMs are ever more reliant in the shipment and delivery of component-based assemblies and systems. Many tier-one suppliers are responsible for the design, development, manufacture, assembly, and delivery of completed components and assemblies (IPs, seats, Fascia/headlight, safety systems) or complete exterior and/or interior systems. The trend is toward the supplier having full product lifetime responsibility, from concept to warranty and beyond. Often product pricing reflects recall/warranty liability considerations. How can an automotive OEM or supplier improve the risk assessment associated with component and complete vehicle system performance?

One of the main reasons for testing is to develop a risk assessment. Often this entails making judgement decisions using whatever data may be available at the time. The judgement is often coupled with a confidence level. When dealing with component and full vehicle material performance (fading, dimensional stability, fit and finish, etc.), the ability to increase the confidence level, and thus reduce risk, is often directly related to time. Traditional component and full vehicle material performance tests performed outdoors simply take longer than the development cycle will allow.

To make high value decisions, it is useful to perform accelerated laboratory exposures on components and, in many cases, full vehicles. Reproducible, repeatable, and reliable laboratory exposure methods increase the confidence level that the automotive system in its final configuration will meet the needs and expectations of the end user. The user can make adjustments and fine tune the system in a time frame that allows effective price/performance/risk analysis.



With the use of **KHS technology,** testing of automotive and other component parts and complete vehicles and assemblies can be accomplished in a short time frame, typically 18 to 30 days. A common test specification for performing component and full size automotive tests is DIN-75-220, titled “Aging of Automotive Components in Solar Simulation Units.”

The DIN 75-220 specification covers interior and exterior material in component and full car configurations. The simulation includes static and cyclic test conditions that are used to provide stresses that occur in natural outdoor environments.

The greatest benefit is achieved when the complete vehicle is tested. The amount of data obtained from a single full vehicle test can be tremendous and a great benefit to the automotive OEM and automotive system supplier. This is due to high confidence that the component parts

will be subjected to similar stresses in end use.

If your company needs to improve the testing process for finished component and full vehicle systems and traditional outdoor tests simply take too long, perhaps bringing component and full car testing capability into the laboratory will provide the answers.

For more information on component and full vehicle testing, check the corresponding box on the reply card or visit the KHS web site at **www.KHSLIGHT.com** or contact:

KHS US Office
4114 North Ravenswood Avenue
Chicago, Illinois 60613, USA
Sally Stansbury
Phone: (773) 327-4520
Fax: (773) 327-4023

K.H. Steuernagel Lichttechnik GmbH
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64529 Mörfelden-Walldorf, Germany
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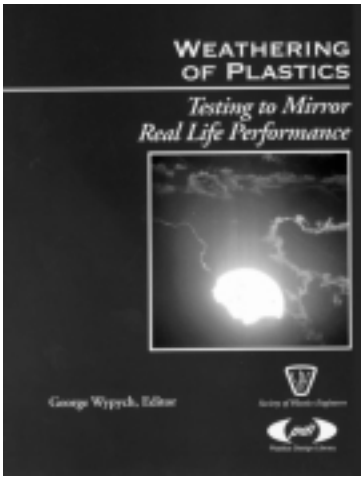
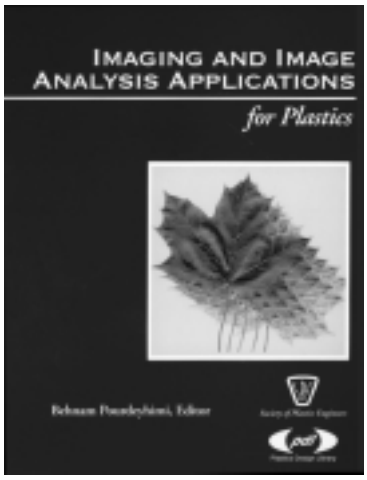
Fax: 011-49-6105-912881

Full vehicle testing

Component testing

Atlas Client Education Division Now Sells Books!





Effective immediately, Atlas is selling three important publications through its Client Education Division.

- *The Handbook of Material Weathering,* edited by Dr. George Wypych, is a step-by-step guide to material durability with expert advice on recent trends in effective testing. It is one of the most thorough works on material behavior during exposure to environmental conditions that is available today. This book should be on the desk of anyone involved with studying material durability, producing materials for outdoor use, photochemistry research, R & D of new materials, and quality control of manufactured products. Dr. Wypych is an expert in the field of material degradation with over 25 years of experience in the industry. The price of the book is $175.
- *Weathering of Plastics: Testing to Mirror Real Life Performance,* also edited by Dr. Wypych, is a compilation of papers and opinions of experts in materials degradation testing. The book illustrates the importance of certain parameters, such as UV radiation and temperature of specimens, on weathering studies. The book also provides information relating laboratory tests to outdoor exposure to create correlation studies. Anyone interested or involved in the plastics or polymer industry will benefit from this book. This book sells for $160.
- *Imaging and Image Analysis Applications for Plastics,* edited by Prof. Dr. Behnam Pourdeyhimi, is a collection of papers that discuss novel imaging techniques and image analysis methods currently in use to quantify the process or the material. The broad collection of applications gathered in the book illustrates material-process-property relationships for a wide variety of materials and processes. The cost of the book is $160.

For more information about these books or to purchase one, please contact Theresa Garcia, Client Education Coordinator, at phone: (773) 327-4520, fax: (773) 327-9731, or e-mail: tgarcia@atlas-mts.com. ■

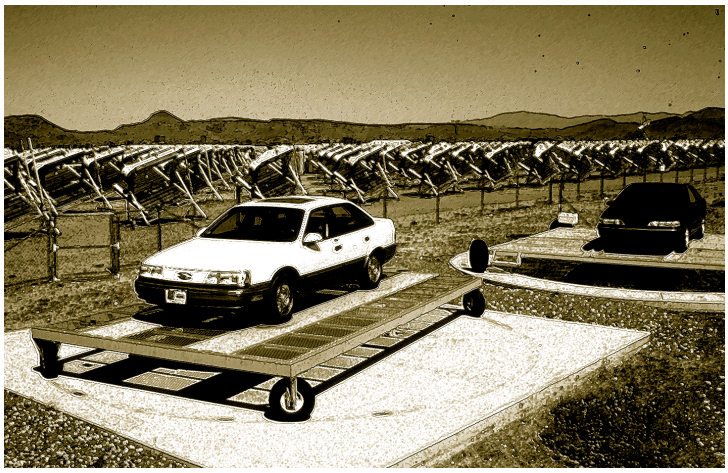
Guest Speakers Announced for ASNAW-Automotive 2000

ASNAW-Automotive 2000, an important symposium for the automotive industry on the subject of materials durability and weathering, will be held October 25–27. Guest speakers from PPG Industries, the American Plastics Council, and SC International will cover new testing and modeling techniques on automotive products, service life prediction, spectroradiometry studies, and advanced evaluation of materials. The speakers are experts in automotive durability testing for both interior and exterior applications. Several Atlas representatives will also be on hand to present important papers and research for the automotive industry.

Included in the program is a half-day tour of DSET Laboratories — part of the Atlas Weathering Services Group — an independent laboratory and outdoor testing site with over 1 million samples on exposure. This provides a hands-on look at test sample preparation and handling, exposure orientations, data acquisition, and interpretation of test results.

The course will be held at the Embassy Suites Hotel in Phoenix, Arizona. Course tuition is $1,295 and covers a welcoming reception, course materials, instruction, refreshments, and meals. All other costs are the responsibility of the attendee. Advanced registration is required. Call the Embassy Suites Hotel directly for room reservations at 1-800-527-7715 and be sure to mention the Atlas School for Natural and Accelerated Weathering.

For more information, please check the corresponding box on the reply card. Registration information is available by calling Theresa Garcia at (773) 327-4520 or by sending a fax to (773) 327-9731. On-line registration is available at **www.atlas-mts.com.**



Sun tracking carousel

Guest Speakers Include:

Dr. Dieter Kockott, Technical Consultant, ATLAS Material Testing Technology, will open the symposium with a presentation titled "An Overview of Weathering" that discusses common processes that contribute to the degradation of automotive materials.

Kelly Hardcastle, R & D Manager, Atlas Weathering Services Group, will present "Weathering Experimenter's Tool Box," which details insightful tips on how to get the most from your weathering tests.

Gene Zeurlat, President, SC International, will present recent data on solar radiation measurements.

George Coonley, K.H. Steurnagel Lichttechnik GmbH, will lecture on the latest technology in full vehicle testing and standard test methods used to simulate outdoor conditions for automobiles.

Bruce Cundiff, American Plastics Council, will speak about the future trends of plastics in automobiles.

Fred Lee, Product Specialist, Atlas Electric Devices Company, will introduce a new image analysis technique for automotive coatings.

Dr. Cliff Schoff, PPG Industries, will discuss ways in which PPG tests to reduce failures of materials used in real world automotive applications.

Harold Hilton, Product Specialist, Atlas Electric Devices Company, will present a paper titled "Past, Present, and Future of Corrosion Testing."

Coming Next Issue:

A correlation study between natural and accelerated weathering

Atlas Material Testing Solutions

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