ATLAS
MATERIAL TESTING SOLUTIONS

SunSpots

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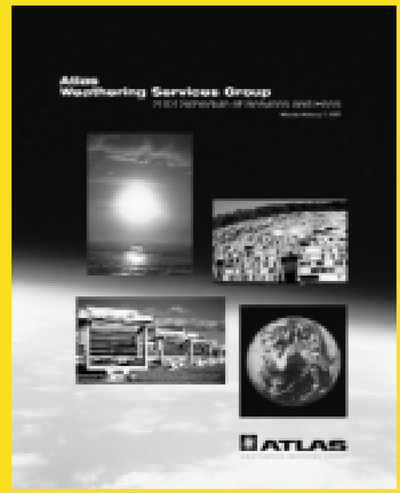

New AWSG Fee Schedule now available

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Shedding Some Numbers on Light

by Kurt P. Scott
Atlas Material Testing Technology
General Manager, Laboratories and Calibration Services

This article is loosely adapted from "Playing the Numbers: An Intercomparison of Radiant Exposure Among Lamps and Daylight," co-authored by two former colleagues, John Scott and the late Ray Kinmonth, from whom I had my very first lessons on the fundamentals of weathering.

Organic materials housed in a cooled vacuum would experience virtually no change over great periods of time. On the other hand, we know only too well that matter may be catastrophically destroyed in an instant; that is, in no apparent lapse of time. I make these simple observations that may result from extreme conditions to make the point that is perhaps obvious: that one has to account for much more than the passage of time when considering any form of material degradation, including that caused by weathering.

Therefore, the popular question "How much time must I expose my material in a laboratory weathering device to match its performance after one year's Florida exposure?" implicitly asks a great deal more than is sometimes realized.

The inability to absolutely characterize the dynamic conditions of light, moisture, temperature, and atmospheric pollutants of a specimen's microclimate for the duration of its exposure presents the greatest obstacle to definitively answering *the question.*

However, advances in the manipulation, control, and measurement of light, known to be the most important stress factor of the weathering phenomenon, give one a starting point from which to make comparisons between laboratory and natural exposures [1].

In this paper I will discuss and compare various laboratory light sources and sunlight. I will show how the various means of quantifying light may be used in the comparisons.

Because materials tend to be spectrally selective in absorption and hence in their weathering degradation process, it is the spectral makeup of a light source that has particular significance [2]. Therefore, finer wavelength increments of measurement (spectral) will generally

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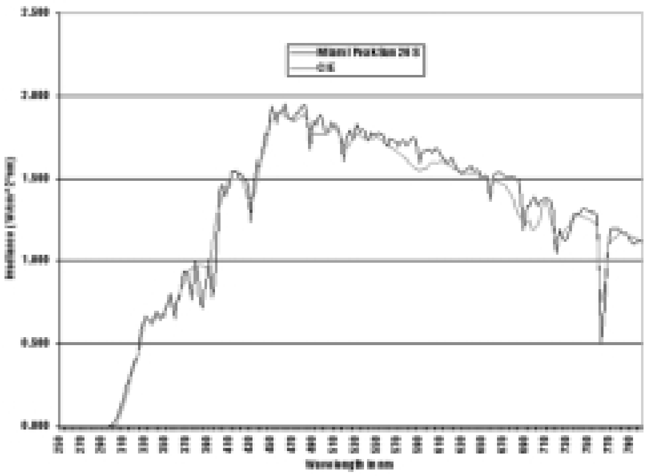

Figure 1: CIE vs. Atlas Peak Optimum Sunlight

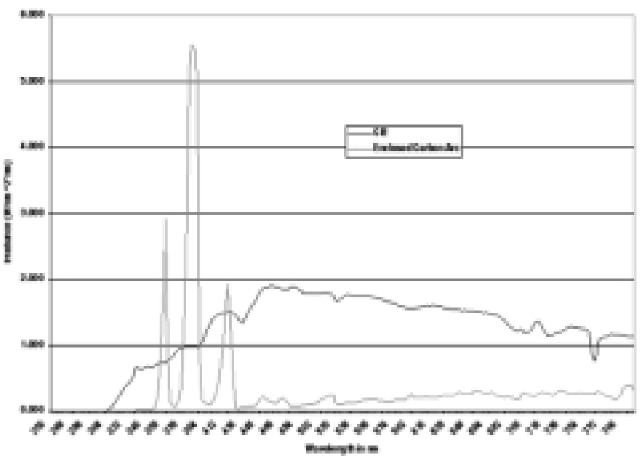

Figure 2: Enclosed Carbon vs. CIE 85

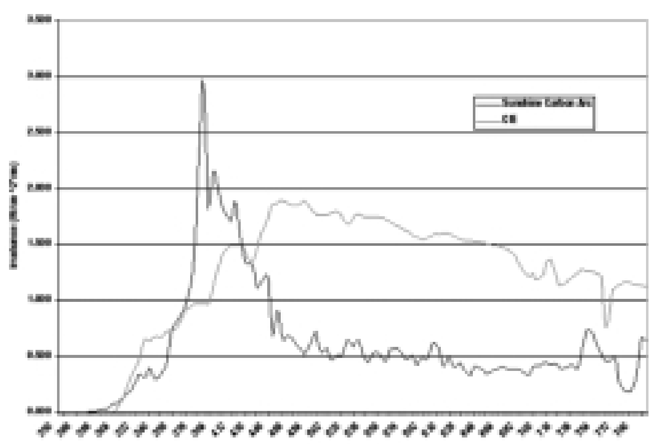

Figure 3: Sunshine Carbon vs. CIE 85, Table 4

facilitate more accurate and meaningful comparisons between various light sources.

To begin, the spectral power distribution (SPD) graphs of the common light sources used in weathering tests are shown, each compared to sunlight. The fluorescent sources are grouped together on one graph. Sunlight reference used throughout is the one represented in the Commission Internationale De L'Eclairage (CIE), Publication 85, Table #4 which is commonly used in international weathering standards as a daylight reference [3]. One of the sunlight curves measured by Atlas and typically used in its corporate technical publications is "benchmarked" against the CIE Table #4 curve in Figure 1. The apparent minor variations are primarily due to differences in measurement resolution.

Comparison of Different Light Sources

It is obvious from the graphs, the light sources that match sunlight well and, for that matter, those that do not. In cases where the spectra are vastly different, it may be a dubious, if not potentially misleading exercise to make comparisons based on broad wavelength bands of energy, since important differences may be obfuscated. However, this information is presented as a service to those who frequently request it. It is offered with a repetition of the important caveats and disclaimers stated by Scott and Kinmonth [4] (page 4).

Often, those wanting the capability to make comparisons between light sources are in some way involved in the modernization of weathering testing practices — from Carbon and Fluorescent technologies to Xenon and Metal Halide, for example — and wish to make rough comparisons between the past and present.

For the various light sources being compared, Table 1 (page 5) summarizes integrated values over 20nm bandwidths in the ultraviolet (280–400nm) and for 400–800nm, the visible to near infrared range.

The hourly radiant dosage for each of the light sources and their respective times to reach 275 MJ/m^2, the average annual total ultraviolet (290–385nm) in South Florida are shown in Table 2 (page 6). Scott and Kinmonth referred to the term in the far right column as the intensification factor and correctly pointed out that, were it not for the critical importance of spectral makeup, this could be considered an acceleration factor. Unfortunately, it is not quite that simple.

Basing comparative exposure to a specific dosage of total UV radiation is a step ahead of tests

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AtlasSpeaks

Technische Akademie
April 5–6, 2001
Wuppertal, Germany

Dr. Jörg Boxhammer, ATLAS Material Testing Technology, will present "Sample Surface Temperatures and Temperature Measurement Techniques on Sample Level During Accelerated Irradiation/Weathering in Instruments."

On April 9–11, 2001, at an event organized by the UNESCO Associated Centre for Macromolecules & Materials in collaboration with the Macromolecular Society of South Africa/Stellenbosch, Dr. Jörg Boxhammer will give a lecture titled "Early Recognition of Oxidative Degradation in Polymers by Chemiluminescence."

Technische Akademie
May 15, 2001
Wuppertal,Germany

Dr. Jörg Boxhammer will present "Determination of the Aging Behavior of Plastics and Coatings by Means of Natural Weathering and Simulated Weathering in Instruments."

SPE Polyolefin 3 Tech Conference
February 25–28
Houston, Texas

Matt McGreer, General Manager, Client Education, Atlas Material Testing Solutions, will present a paper titled "The Effect of Various Light Sources on the Degradation of Polymers — A Fundamental Approach." The paper was written by Matt McGreer and Kurt P. Scott, General Manager, Laboratories and Calibration Services, Atlas Material Testing Solutions.

Cleveland & Pittsburgh Societies for Coatings Technology 44th Annual Technical Symposium — Waterborne Coatings: Sink or Swim 2001
May 17–18
Cleveland, Ohio

Matt McGreer will present a paper titled "Differences in Spectral Power Distributions of Artificial Weathering Devices."

AtlasShows

2001

MAQUITEX
February 15–18
Oporto, Portugal

PROMA
February 27–March 2
Bilbao, Spain

SAE
March 5–8
Booth #701, Cobo Hall
Detroit, Michigan

SALON du LABORATOIRE - INTERCHIMIE - MESUCORA
March 13–16
Paris, France

Adhesive and Sealant Conference
March 18–21
Orlando, Florida

EuroCoating
April 3–5
Nuremberg, Germany

Overfladedage
April 3–5
Odense, Denmark

ATME-I
April 23–27
Palmetto Expo Center
Greenville, South Carolina

ANTEC 2001
May 7–10
Booth #507, Dallas Convention Center
Dallas, Texas

TEST 2001
May 8–10
Nuremberg Exhibition Center
Nuremberg, Germany

VIM 2001
May 15–17
Nancy, France

TECNO TMA/TEXTIL
May 26–30
Bologna, Italy

GRAFITALIA
June 12–17
Milano, Italy

Intl. Exhibition Poznan
June 18–21
Poznan, Poland

Chemistry 2001
September 10–14
Moscow, Russia

43rd Intl. Engineering Fair
September 24–28
Brno, Czech Republic

Plastics USA
October 2–4
Chicago, Illinois

MAC
October 2–6
Milano, Italy

Flanders Textile Valley
October 4–6
Kortrijk, Belgium

TIB
October 8–13
Bucarest, Romania

Plast 2001
October 18–21
Biylekduzü, Turkey

AATCC
October 21–24
Palmetto Expo Center
Greenville, South Carolina

K'2001
October 25–November 1
Düsseldorf, Germany

FSCT ICE 2001
November 3–7
Georgia World Congress Center
Atlanta, Georgia

Kemodijana
November 15–17
Helsinki, Finland

Context 2001
November
Mumbai, India

EXPOTRONICA
November
Barcelona, Spain

Textech 2001
December
Chandigarh, India

Light, from page 2

Caveat:

No guarantee should be implied that identical specimens receiving the same total radiant exposure from different sources or from repeated exposure of the same source will exhibit identical changes of properties for one, or more of the following reasons:

1. Materials are selectively sensitive to the wavelength distribution of energy. A specific material may behave differently when exposed to sources that have different spectral power distribution, as shown in the previous spectral power distribution graphs.

2. Photochemical reactions are temperature sensitive. The temperatures materials experience on exposure to natural conditions are, of course, dependent on nature, and will vary from hour to hour, day to day, and season to season. Most laboratory exposures define a set temperature for black panel or chamber temperature, with a tolerance of just a few degrees. Because of this, rates of degradation may differ between the two exposures.

3. The effect of moisture (in any phase) may cause physical or chemical degradation during exposure. The moisture delivery in a laboratory exposure may simulate natural conditions very well, but the duration of condensation, the frequency of wetting, changes in humidity, and exposure to pollutants such as acid rain must be considered as additional variables in the weathering processes of natural and laboratory exposure tests.

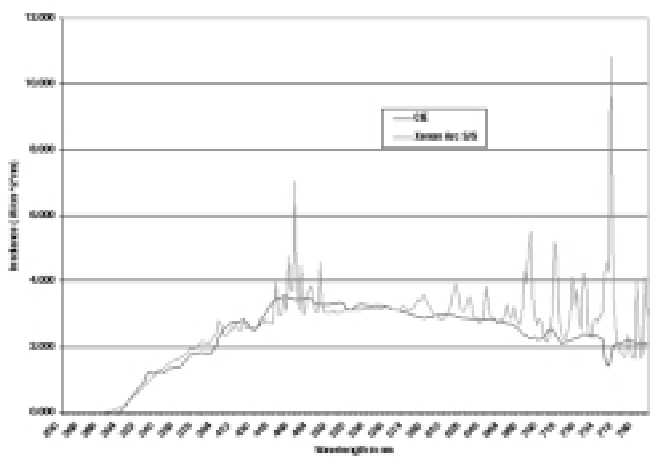

Figure 4: Xenon with S/S Filters vs. CIE 85, Table 4

Figure 5: Metal Halide vs. CIE 85, Table 4

based solely on time of exposure. However, when the relative energy at each wavelength for various radiation sources is different, the reaction of any material during exposure to these various sources will also differ. Shorter wavelengths of radiation contain more energy. Therefore, it is likely that exposure to radiation sources containing more short wavelength UV (UVB) will affect the stability to a greater or different extent than the longer wavelengths (UVA). So even though the dosage of, for example, a fluorescent exposure and natural daylight, may be the same when measured with a broad band radiometer, results may not be exactly the same. It will be much easier to interpret the results of any exposure test if one understands the "quality" of the radiation source, when compared to natural daylight, coupled with knowledge of the spectral sensitivity of the material.

Various Ways of Measuring and Specifying the Same Light Source

Just as there are various means of comparing different light sources, there are also different ways to measure, compare, and specify similar sources.

Historically, weathering standards written for the US, and to a lesser extent, Japanese markets, specified light control and dosage requirements, at a specific wavelength (narrow band), usually in the ultraviolet, while in Europe the practice was to do so over a wider wavelength range (broad band). In the current global market, the lines of distinction between markets are fading fast. Today, it is very likely that a US manufacturer of textiles will become the supplier of automotive trim to a German auto manufacturer building cars only a few miles from its South Carolina facility, for example. This supplier must therefore be able to test its materials to the heretofore unfamiliar German specifications.

The problem is usually not as daunting as it may first appear. The textile

Table 1

Light Source	Irradiance Integral — W/m² 280–300	300–320	320–340	340–360	360–380	380–400	300–400	400–800
CIE 85	0	3.05	11.44	14.20	18.03	21.20	67.90	600.72
Xenon S/S	0.29	2.98	8.30	13.24	16.79	20.33	61.64	508.97
Xenon B/SL	0.01	1.07	6.98	14.49	19.50	23.84	65.88	558.76
Metal Halide	1.06	6.62	10.04	18.56	23.83	22.36	81.43	592.57
Enclosed Carbon	0	0.05	0.24	15.67	18.22	50.85	85.01	95.14
XW Sunshine Carbon	0.59	2.80	6.65	10.16	22.84	45.08	87.53	242.33
UVA 340	0.06	3.02	11.25	12.92	7.84	2.67	37.72	3.56
UVB 351	0.03	1.07	9.96	22.50	13.84	3.10	50.48	3.53
UVB 313nm	10.38	22.04	10.70	2.80	1.32	0.21	37.10	4.32

All of the light sources were measured at the sample plane in Atlas instruments.

manufacturers' current instruments can usually be adapted to run the German specifications by using relatively simple conversions, an example of which follows.

First, a few useful radiometric terms:

Irradiance is the incident **radiant flux** over a given area (or, simply, the light falling on a specific area of a surface), typically expressed in units of W/m². [5]

Radiant exposure or **Irradiation** is the radiant energy incident over a specific area for a given period of time. Units are (W/m²)* time (seconds). Or (W• s)/m². Since by definition, a Joule = W• s, we may substitute as such in the above:

Radiant Dosage (Joule) = Irradiance (W/m²) • Time (seconds)

It is typical to relate narrow band radiant dosages in kilojoules, and exposure periods in hours rather than in seconds. Therefore, we must refine the above equation.

Hours • 3600 = seconds. Therefore, Joules = W/m • 3600 hr • (sec/hr). .....(1)

To convert to kilojoules, we must divide both sides by 1000, yielding the familiar equation:

kJ/m² = W/m² • 3.6 • hr (sec/hr) ....(2).

Note: The (sec/hr) term, though technically correct, is usually ignored since it appears not to figure into the arithmetic calculation, but its significance will be seen when all the units are factored.

Continued on next page

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How to use the equations (1) or (2)

Simplest form: Given any two of the three variables — radiant exposure (kJ/m^2), time (hrs), or irradiance (W/m^2) — the third variable can be calculated following simple algebraic steps.

For example,

One wishes to determine how many hours it will take to achieve 1000 kJ/(m^2•nm) (@ 340nm), while controlling the irradiance level in the Weather-Ometer® at 0.55 W/(m^2•nm) (@ 340nm),

Returning to the basic equation (1), in order to reconcile units.

For the sake of clarity, units of irradiance and radiant dosage will be shown as per m^2 rather than the technical correct per (m^2•nm).

$1000\ kJ/(m^2) = 0.55\ W/(m^2) \bullet Time(hr) \bullet 3{,}600(sec/hr)$

$Time(hr) = 1000\ kJ/m^2 \div (3{,}600\ sec/hr \bullet 0.55\ W/m^2)$

Recalling, Joules = W • s.
$\therefore Time = 1000\ k(W \bullet s)/m^2 \div (3{,}600\ sec/hr \bullet 0.55\ W/m^2)$

Applying the basic rules of arithmetic:
$Time\ (hr) = 1000\ k(W \bullet s)/m^2 \bullet m^2/W \bullet hr/s \div (3{,}600 \bullet 0.55) = 505.05\ hrs.$

Of course, this time relates only to "light hours" since no radiation occurs during dark periods of the test. Total test time may be determined by adjusting this value by the ratio of light-dark hours during the test.

Second example:

A scenario that may well face the South Carolina supplier of interior trim to the German automotive transplant.

Radiant dosage and irradiance requirements of a German test to qualify trim material are given in broad band units, and the tester needs to determine if and how current instrumentation may be operated to accomplish the test.

Test specifications:
Radiant Dosage: 200 MJ/m^2 (300–400nm)
Irradiance: 45 W/m^2 (300–400nm)

Spectral power distribution (SPD) table or curve is defined in the test standard, rather than the more familiar specification of xenon lamp filters.

Assume the current instrument is equipped with irradiance control and monitoring at 340nm, and radiant dosage is directly accumulated in kJ/(m^2 • nm)

Questions to be answered are:

1) What current xenon lamp filters meet the specified SPD?
2) What is the 340nm equivalence of the broad band (300–400nm) irradiance value specified?
3) What is the 340nm radiant dosage that is equivalent to 200 MJ/m^2(300–400) for the specified SPD?

At this point it becomes necessary to either consult the current weathering instrument's technical literature or the instrument manufacturer for answers to the above questions.

For the sake of this example we will assume the following answers have been provided.

1) Type S inner and outer filters meet the SPD requirement.
2) An irradiance level of 0.42 W/m^2 (@ 340nm) is equivalent to 45 W/m^2 (300–400 nm).
3) 1866.67 kJ/(m^2 •nm) @340nm is equivalent to 200 MJ/m^2 (300–400nm).

It now becomes a simple arithmetic calculation to determine the light hours required to complete this test. Substituting in equation (2).

1866.67 kJ(m^2•nm) @340nm = 0.42 W(m^2 •nm)@340nm • 3.6 • hr. = 1234.56 hours

An alternative to the approach outlined above would be to make minor hardware modifications (replacing the interference filter in the irradiance control system of the Weather-Ometer®, for example) to enable the instrument to directly meet the irradiance measurement and control criteria of the test specifications. Either way, direct comparisons between xenon exposures can be made regardless of whether the test specifications are related in narrow band or broad band terms and units.

References

[1 & 2] Searle, N. D., "Effect of light Source Emission on Durability Testing" Accelerated and Outdoor Durability Testing of Organic Materials, ASTM STP 1202, Warren D. Ketola and Douglas Grossman, Eds., American Society of Testing and Materials, Philadelphia, 1994

[3] Commision Internationale De L'Eclairage Publication Number CIE 85, Ist Edition 1989

[4] Kimonth, R. A. and Scott, J.L., "Playing the Numbers Game," Atlas *Sun Spots,* Spring, 1984

[5] McGraw–Hill Dictionary of Scientific and Technical terms, Fifth Edition.

Table 2

Time to Produce Total Annual Ultraviolet Radiant Dosage of 275 MJ/m^2

Annual average at AWSG, Miami, based on several years' data

Light Source	Hourly TUV Exposure kJ/m^2	Exposure Time, h. (rounded to nearest 10 hour)	Intensification Factor H_S/h_{TUV}
CIE 85 Table #4 & Peak Optimum Sunlight	189.1	1450	3.0
Average Optimum Sunlight, 26° South	92.8	2960	1.5
Xenon S/S @0.55 W/m^2 @340nm	169.4	1620	2.7
Xenon B/SL @1.40 W/m^2 @420nm	176.4	1554	2.8
Metal Halide @1020 W/m^2, Total Irradiance	235.5	1170	3.7
Enclosed Carbon	241.0	1140	3.8
XW Sunshine Carbon	211.2	1300	3.4
UVA 340	130.6	2100	2.1
UVB 351	176.2	1560	2.8
UVB 313nm	152.6	1800	2.4

Notes:

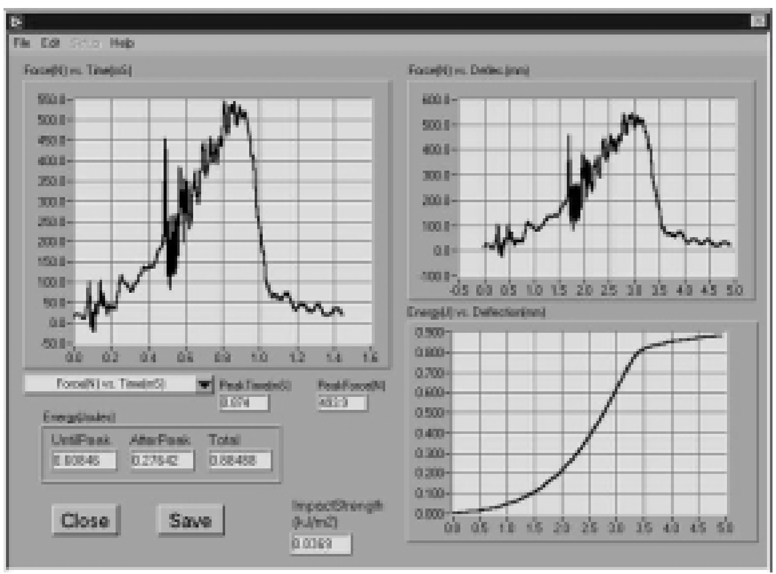
1) *If one assumes that annual TUV at AWSG, Miami is accumulated over an average of 12 hours per day, 365 days per year, the total hours of accumulation is 4380.*
2) *Typically, laboratory sources can be operated at various levels of irradiance. The numbers in this table relate to a specific nominal irradiance. Consult Atlas for the operating ranges of specific instruments of interest.*
3) *Irradiance for the various light sources was integrated over the effective range of the sunlight measuring instrument, 295–385nm. Kinmonth may have used 300–400nm for artificial sources, thereby accounting for some of the differences between these numbers and his.*

Atlas Test Instruments Group

New Instrumented Pendulum Impact System for Testing Plastics

The Polymer Evaluation Products Division has introduced a new instrumented impact testing option for the API **Advanced Pendulum Impact** tester. This system is used for characterizing the dynamic impact properties of plastic materials according to ISO 179-2 (*Determination of Charpy Impact Properties — Part 2: Instrumented Impact Test*). An Izod impact option is also available.

The **ASPEN**™ (**A**cquisition **S**ystem for instrumented **Pen**dulum impact) system for the API automatically measures, collects, and displays the "instantaneous" force in the contact zone of the high-speed impact event, typically 0.2~20 milliseconds in duration. The impact event is *directly* measured by incorporating a high-resolution piezoelectric strain gauge transducer into the impactor head. This information is necessary for a detailed analysis of the dynamic impact performance of plastic materials.

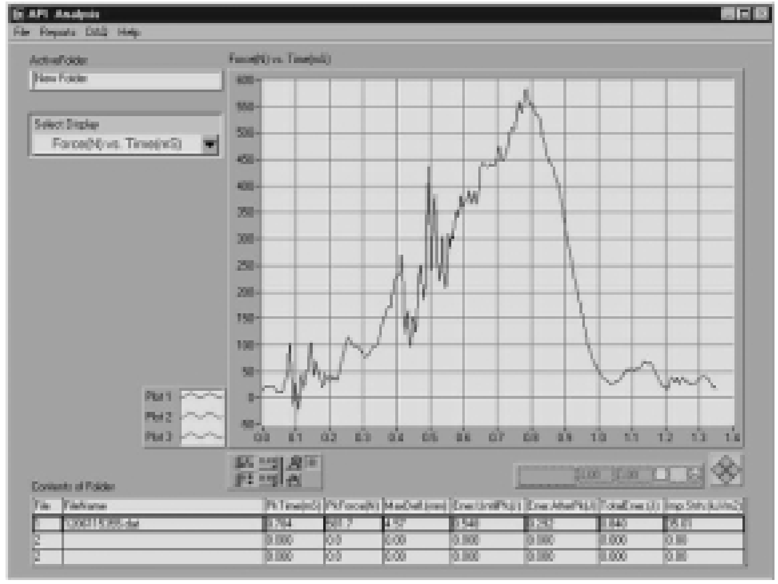


ASPENsoft Impact Raw Data Capture

The "traditional" Charpy/Izod tests (ASTM D256 & D6110, ISO 179-1, ISO 180, et al) of the standard API measures material impact strength by determining the differential in pendulum potential energy before and after impact to determine the absorbed energy, but does not provide any real-time information such as the force-versus-time behavior of the material. For example, the "instantaneous" maximum, or peak, force can exceed the nominal integrated value of the traditional measurement by a factor of 30–40 fold. This peak force can be very important in understanding the true performance of the specimen material.

Designed to exceed the requirements of existing and draft standards, ASPEN can perform both Izod and Charpy tests on notched or un-notched specimens with an initial pendulum striking energy of up to 50 Joules. A high frequency (500 kHz) PC data acquisition system and Windows/National Instruments LabView-based **ASPENsoft** software package ensures the capture of rapid changes of impact force in the range of 0–4500N. Results can be digitally analyzed and graphically displayed or transferred to other software such as Microsoft Excel for customized analysis.

The ASPEN accessory consists of instrumented Charpy and/or Izod pendulums and additional hardware components, interface electronics, a personal computer, and ASPENsoft. The instrumented ASPEN system is added to a standard API instrument equipped with or without components for "traditional" ASTM/ISO Izod/Charpy testing. ASPEN will also allow API options such as the clamping-force measuring Izod specimen vise or cryogenic low-temperature cold box option to be used, resulting in a very flexible and customizable system, which can be easily converted between traditional and instrumented testing.



ASPENsoft Data Analysis

Advantages of the ASPEN System:

- Uses an innovative piezoelectric transducer design with a high natural frequency and high-resolution data acquisition system (500 kHz). This provides both high sensitivity and linearity of the force measurement system, resulting in the ability to accurately record rapid increases, drops (in the case of brittle materials), or oscillations of the impact force.
- The high stiffness and strength of the piezoelectric force transducer and impactor design (approaching the rigidity of comparably proportioned solid steel) allows loss-less direct force measurement since the transducer is mounted in line with the force being measured. High accuracy is obtained, as the transducer response is virtually independent of the point of the force application, making it suitable for all specimen dimensions.
- Transducer does not require temperature compensation as do many commonly used strain gage sensors.
- System instantly displays results of measurement on computer screen without file manipulation.
- Software simultaneously provides for the display and analysis of data from single or multiple specimens (for comparison).
- Operator may zoom in on any part of the data curve, selectively define the section of the curve for mathematical analysis, and customize the data display scale.
- Modular design of the system offers simplicity of hardware installation, verification of functionality, and start-up.

Instrumented Charpy Pendulum

For more information, please check the corresponding box on the reply card or contact Allen Zielnik at (773) 327-4520.

RAITECH
PARTNER OF ATLAS TEXTILE TEST PRODUCTS

New Textile Products Hit the Market

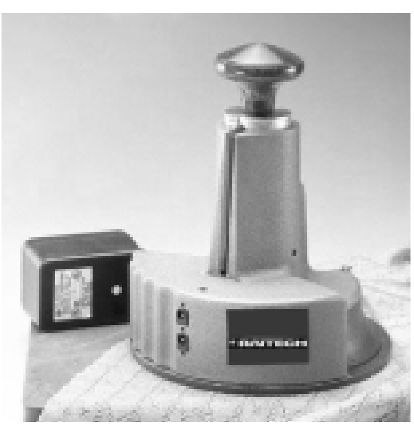
Raitech's QuickCalc™

Raitech, Partner of Atlas Textile Test Products, has expanded its product line with several new, quick solutions for today's textile testing needs. Together with the Quickwash Plus shrinkage testing system, these new products expand their line of time- and cost-saving products for the worldwide textile market.

The **QuickTemp™** temperature control system works with traditional home washing machines to control temperatures and provide water temperature accuracy and consistency required by AATCC and other test methods. Accurate water temperature can be difficult to achieve because of the variability of today's washing machines and seasonal changes in water temperature. Microprocessor-controlled QuickTemp units use sensors directly in the water bath to keep temperatures within
1 degree of variance. Alternative products currently available were not designed to control tolerances closer than +/- 10 degrees. The **QuickTemp Plus™** is a multi-port system that is capable of controlling up to *eight* washing machines. Both models feature user-programmable controls, separate wash and rinse cycles, and operator selected temperatures. The QuickTemp and QuickTemp Plus are wall-mounted units that require very little space.

Raitech's QuickTemp™

The **QuickDry™** and **QuickDry Plus™** systems help textile companies cut the drying cycle for specimens during testing. The QuickDry system produces dried specimens in 7 to 10 minutes; the enhanced QuickDry Plus has an added spinning capability to reduce drying to 3 to 5 minutes. The instruments use tumbling action and warm air circulation to dry specimens without distortion — a frequent problem in centrifuge/oven drying. The resulting specimens are smooth and easier to measure. Multiple chambers keep colors separate so specimens are not subject to the color changes caused by traditional dryer technologies.



Raitech's QuickCircle™

The **QuickCalc™** electronic scale is an ideal solution for determining fabric yield. When used with **QuickCircle™**, it converts the weight of your specimens to g/m^2 or oz/yd^2. In addition, QuickCalc features ratio analysis for blended materials. It is easy to use and has a large LCD screen and protective transparent dust cover. The QuickCalc is the quick, automatic way to calculate yield. Use QuickCircle to cut standard 100-cm^2 round specimens easily. QuickCircle produces precise specimens simply by pressing a button, eliminating strain on the operator. The blade spins, cutting an equal pressure incision throughout the circumference.

For more information on these products and other Atlas Textile Test Products, please call (773) 327-4520 or visit our web sites at **www.atlas-mts.com** or **www.raitech.com**.

AtlasCommitment to Growth

Client Education Goes Global

The Client Education Division, under the leadership of Matt McGreer, was founded in 1998. Since then it has experienced an almost explosive extension and successful development.

Increasing demand for training in Europe has led to the expansion of Client Education activities around the world by creating an additional CED group at the ATLAS Material Testing Technology BV site in Linsengericht-Altenhasslau (L.A.), Germany.

The head of this new group will be Bruno Bentjerodt, who was previously responsible for running the International Sales group in L.A.. With his experience and knowledge of sales representatives, customers, languages, and cultures, he is a logical choice to fill this position.

The first steps in building this new division have already been taken. Preparations for the first trainings are underway. The main products and services will be as in the US:

- a Fundamentals of Weathering Course,
- the Weather-Ometer® and XENOTEST workshops,
- and Technical Conferences for Accelerated Ageing and Evaluation

Specific seminars and inhouse trainings are also planned. The main activities will be in Europe, the Middle East, and India. The first events for which the schedules have already been fixed are:

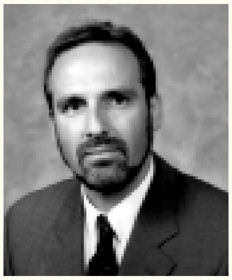
The Netherlands:	Weather-Ometer® workshops
	March 26–27 (in Dutch)
	June 4–5 (in English)
	June 11–12 (in German)
France:	Fundamentals of Weathering
	September–October 2001
Middle East:	Seminar in the UAE at the University of Sharjah
	Second half of 2001
India:	Automotive seminar
	Late 2001

For more information about Client Education, please contact Bruno Bentjerodt at 011-496-051707-134 or visit our web site at **www.atlas-mts.com**.

ATLAS MTT BV Makes Organizational Changes

ATLAS MTT BV is pleased to announce an organizational change within the ATLAS Material Testing Technology organization.

Effective January 1, 2001, Mr. Giorgio Chiandetti will become General Manager of Sales in addition to his position as General Manager of the Switzerland Business Unit. In his new position, he will be responsible for the total sales and technical services organization for Europe, the Middle East, India, and Africa. He will work out of his Swiss office.



Mr. Giorgio Chiandetti

Kudos to Coatings Award Winner

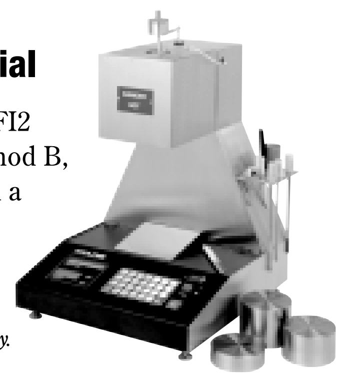
Dr. David Bauer

Atlas would like to recognize Dr. David Bauer, Senior Staff Technical Specialist, Material Science Department, Ford Motor Company, for receiving the Roy W. Tess Award in Coatings. The award is presented annually by the American Chemical Society's Division of Polymeric Materials: Science and Engineering (PMSE) for outstanding contributions to coatings science and technology.

Dr. Bauer is known for his work in the areas of mechanisms and kinetics of cure, network structure in high-solids coatings, flow control and coating rheology, polymer photodegradation and stabilization, plastics characterizations, and coating service life predictions. He has authored over 100 technical papers on coatings and plastics and is a member of the review boards of the *Journal of Coatings Technology* and *Polymeric Degradation and Stability.*

Atlas congratulates Dr. Bauer on his tremendous achievement.

MFI2s Available from Stock with 30-Day No-Risk Trial

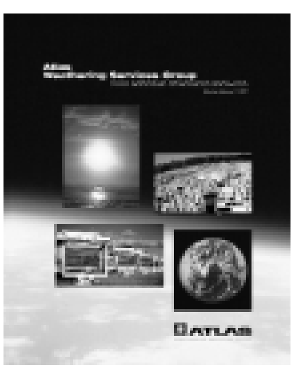


The MFI2 is now available from stock. Call today to order the MFI2 Melt Flow Indexer (for ASTM D 1238/ ISO 1133 Standard Method B, with or without weight lift option) for shipment within one week and a 30-day no-risk trial!*

Contact Craig Hazzard at (773) 327-4520 ext. 234 for more information or to order.

**Some restrictions may apply.*

Atlas Weathering Services Group



Announcing the 2001 Fee Schedule

The Atlas Weathering Services Group is pleased to announce the availability of its 2001 Fee Schedule. Prices are effective as of February 1. To obtain a copy of the Fee Schedule, please contact your local sales representative or a Client Services Representative at (800) 255-DSET.

AtlasCommitment to Education

2001 Client Education Courses and Dates

The Fundamentals of Weathering

The Fundamentals of Weathering seminars introduce the basics of how various factors in weather and climate affect materials durability and teach participants how to properly test a material's durability resistance to these factors.

This introductory course is designed for anyone with minimal knowledge of weathering who is involved in the design, evaluation, selling, or purchase of materials or products that may be affected by exposure to heat, light, and moisture. Topics include natural and accelerated outdoor testing techniques and artificial laboratory weathering techniques.

Students will leave the class with insight into the weathering industry and the ability to set up their own weathering tests.

Weather-Ometer® Workshop

These comprehensive one- and two-day courses feature hands-on instruction with Weather-Ometers and cover installation procedures and requirements, a brief history of accelerated testing, operating systems, calibrations, routine maintenance, and trouble-shooting techniques.

The Weather-Ometer workshops are designed for equipment operators, quality assurance and control personnel, laboratory technicians, and anyone else responsible for equipment operation, maintenance, and calibration. Workshops are available for Ci35, Ci65, Ci4000, and Ci5000 Weather-Ometers.

Atlas School for Natural and Accelerated Weathering

The Atlas School for Natural and Accelerated Weathering (ASNAW) is an advanced-level symposium that presents the theories and practices needed to achieve materials durability through the use of weathering test methods. Subjects include an overview of weathering — natural and accelerated — the effect of light on materials, correlation studies, statistical design of an experiment, evaluation techniques, and the role of international test standards. The October ASNAW will focus specifically on the automotive industry. For more information, contact Theresa Shultz at (773) 327-4520.

2001

Fundamentals of Weathering I

May 23
Albany, NY

June 18
Milwaukee, WI

June 21
Parsippany, NJ

September 13
Seattle, WA

September 18
Pointe-Claire, Quebec, Canada

September 24
Dubuque, IA

September 26
Evansville, IN

September 27
Dublin, OH

October 1
Baltimore, MD

October 3
Arlington, TX

October 30
Raleigh, NC

Fundamentals of Weathering II

May 24
Albany, NY

June 22
Parsippany, NJ

Ci4000/Ci5000 Weather-Ometer Workshop

February 28

May 7

November 14

Ci35/Ci65 Weather-Ometer Workshop
(2-day course)

March 1–2

May 8–9

November 15–16

Advanced Weather-Ometer Workshop

May 10

Atlas School for Natural and Accelerated Weathering (ASNAW)

May 2–4
Miami, FL

October 24–26
Phoenix, AZ (ASNAW-Automotive)

Case Study: Failure of an Industrial Weathering Test

The Purpose of Weathering Testing

A Weather-Ometer® is a specially designed instrument that simulates natural weathering testing conditions conducted under an accelerated time frame. Weathering testing of industrial materials is performed to evaluate the ability of materials to withstand long-term effects of weather. Test results are needed by manufacturers to ensure that all materials purchased pass specified industry quality requirements.

Silica Contamination of Treated Water in a Manufacturing Plant

An auto parts maker subjected samples of coated rubber to accelerated weathering testing in an Atlas Weather-Ometer. The rubber — to be used eventually as a seal around car windows — was run through an SAE J 1960 cycle wet and dry, at 225 KJ/m^2. For 8–12 weeks, 24 hours a day, the sample was sprayed with water and subjected to high temperatures, high humidity, and sunlight. White spots found on the rubber indicated that the test had failed.

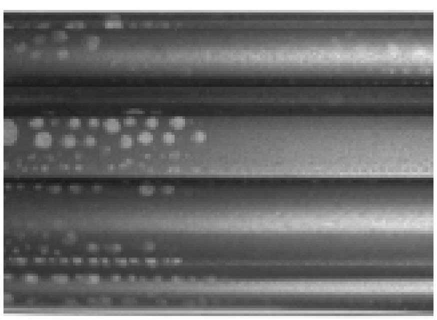


Photo of coated rubber sample after weathering testing in an Atlas Weather-Ometer®.

White spots on the sample indicate that the test failed.

Why the Test Failed

A sample 1/8" x 1/8" was cut from the white spot and another small sample was cut from the area having no white spots. Each sample was mounted for surface analysis by Scanning Electron Microscopy/Energy Dispersive X-ray Spectroscopy (SEM/EDS). Following established procedure, the laboratory performed the analysis in the Environmental Scanning Electron Microscope (ESEM).

Examination of the white spot showed the presence of carbon, oxygen, and, most of all, silica. The sample having no white spots contained mostly carbon with traces of oxygen and other elements. The analyses proved that the cause of the failed weathering test was silica, a contaminant commonly found in water (see Figure 1 on next page).

In this weathering test instance, "good-quality water" was indicated by a green light on the SDI water system. However, most SDI water purification systems are not designed to remove silica, so the water quality indicators would not identify silica as a contaminant. In general, SDI systems produce variable water quality, typically caused by regeneration, re-use, and ultimate degradation of ion exchange resin. As a result, contaminants such as silica are released into the water.

Conclusion

The auto parts company learned that contaminants in the water feeding the Weather-Ometer can adversely affect test outcomes. The solution was to find a water purification system that could produce consistently ultrapure, silica-free water, so they purchased a Milli-RX™ 75 water purification system from Millipore. Milli-RX systems combine reverse osmosis (RO), and Elix® technology to ensure the effective removal of silica from the feedwater. Elix technology, Millipore's unique and patented electrodeionization (EDI) process, ensures efficient energy use and lowered operating costs.

For more information about water purification, please contact Keith Goggin at (781) 533-2357 or keith_goggin@millipore.com. For Millipore Technical Service, call 1-800-MILLIPORE (645-5476) or visit **www.millipore.com/H2O**.

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Author Keith Goggin is Technical and Sales Training Specialist at Millipore Corporation, Lab Water Division.

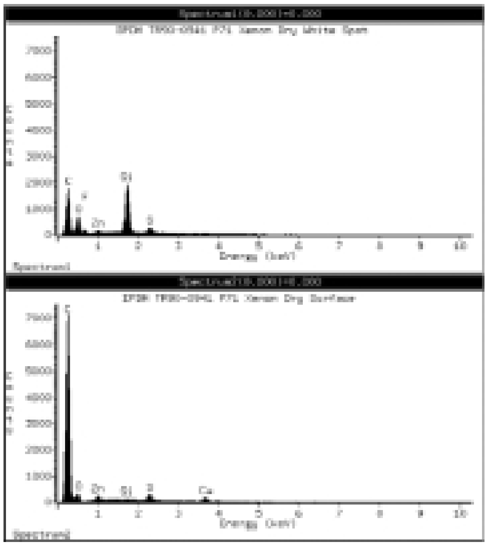

Figure 1

Spectrum 1 (0.000) = 0.000
Spectrum 2 (0.000) = 0.000

Figure 1 shows analyses of rubber samples following failed weathering testing. White spots on the sample indicate that the test failed. The test sample was mounted for surface analysis. Spectrum 1 shows data obtained from a sample of the white spot on the rubber sample and indicates that a predominance of the contaminant silica was present in the white spot. Spectrum 2 data shows the absence of silica, which correlates with the absence of any white spots on this sample.

VIEEW™ System Accepted Worldwide

Atlas is pleased to announce that VIEEW™ Digital Image Analysis System has been accepted and purchased by major automotive manufacturers in the United States and Europe, including Ford Motor Company (Daimler Chrysler and BMW). One initial application of the VIEEW system is the evaluation of automotive exterior paint surface defects. Until now, no objective instrumental methodology has been available for this type of evaluation. Atlas plans to launch VIEEW into the Asian market in the coming months.

VIEEW will be displayed at SAE 2001, Booth #701, March 5–8. VIEEW allows laboratory personnel to analyze surface structures quickly, precisely, and with reproducibility. Its combination of state-of-the-art optical imaging system and intelligent image analysis software that incorporates image database and report generator makes it an indispensable tool for the objective inspection of surface defects.

For more information regarding the VIEEW system, please check the corresponding box on the reply card or for inquiries in the Americas and Asia contact Fred Lee, Product Manager, Analytical Division, at (773) 327-4520 or flee@atlas-mts.com. For inquiries in Europe contact Cees van Teylingen, Product Manager, Analytical Division, at +49-6051-707-140 or cvt@atlasmtt.de.

Coming Next Issue:

New reference Solar Spectrum Power Distributions proposed for Miami and Phoenix

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