ATLAS SUN SPOTS

TECHNICAL ARTICLES AND PRACTICAL INFORMATION ABOUT
TESTING WITH ATLAS WEATHER-OMETERS® AND FADE-OMETERS®

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TECH ARTICLE Major Redesign of Atlas' 6500/3500 Watt Xenon Burner

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James Huber, P.E. has a Bachelors Degree in Mechanical Engineering from Illinois Institute of Technology. He has been involved in engineering and R & D at Atlas Electric Devices for 16 years. He has been the Product Development Manager since 1979. He is active in ASTM, AATCC, ANSI and has been a delegate to the last two ISO, TC-38, Colorfastness of Textiles, meetings.

Atlas first introduced the 6500 Watt Xenon burner for use in the Weather-Ometer® in 1974[1]. Since then, there have been numerous modifications aimed at improving the burners' performance without modifying the spectral energy distribution. These modifications were not usually obvious. Typically they involved the metallurgical composition of the electrodes, subtle variations in electrode configuration, minor changes in the sealing technology and variations in the quartz envelope. In spite of regular preproduction testing these changes did not always give the intended results. More recently high rates of early failure in the lamps caused Atlas to begin a major development project to totally reevaluate and redesign the 6500 Watt Xenon burner.

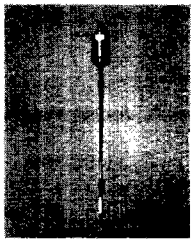


Fig. 1 New Lamp

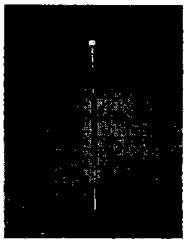


Fig. 2 Old Lamp

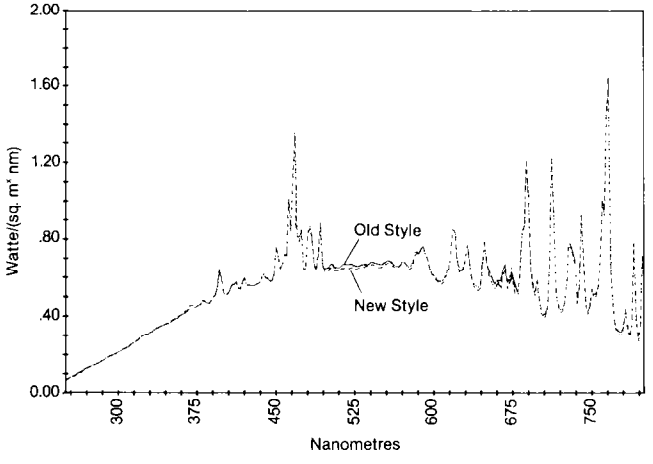


Fig. 3 SPD New & Old Style SPD (Spectral Power Distribution)

The design goal was to develop a highly reliable burner that was physically, electrically and optically interchangeable with the old burner. Extensive preproduction evaluation and over six months of field testing in selected market areas indicate that the new Atlas 6500/3500 Watt burner has these high reliability and performance characteristics.

Spectral Output

It was vitally important that the new and old burner designs give the same Spectral Power Distribution (SPD). Figure 3 shows the SPD from typical old and new styles. Both burners were operated at .35 W/m² at 340 nm using quartz inner and outer filters. Although the quartz filter combination is infrequently used in product testing programs, it allows us to make spectroradiometric measurements of the lamp without filter influence down to 250 nm. This is the lower limit of our quartz iodine reference lamp used to calibrate our Gamma Model C3-D Spectroradiometer. As you can see, the two traces are virtually identical.

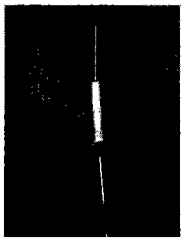


Fig. 4 New Burner Tip Close Up (Showing Flex)

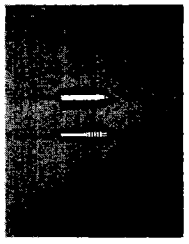


Fig. 5 New & Old Burner Sockets

Modifications

The new and old burners are visibly different. (Figure 1 and 2) The first, and most obvious difference is the method of sealing the ends of the quartz envelope. The old construction used seals against a molybednum foil. The new burners use rod seal technology with the quartz envelope sealing against solid tungsten. Thus, it is the tungsten rod, not the quartz tube that carries any mechanical stress to the electrode. These mechanical stresses increase with the square of the length of the quartz tube. The xenon burner is just one component in the complete Atlas lamp assembly. There are numerous assembly tolerances that build up in the system and misalignment may occur. When not properly aligned in the lamp housing, the burner may be subjected to bending stress. The new design is much more forgiving of mis-alignment. Figure 4 shows a close-up of the new flexible burner tip. The tip will allow for misalignment in the lamp assembly. This effectively removes bending stress from the burner.

The electrode material has also been changed. The new material will emit electrons more easily (has a lower work function) which increases the burners efficiency. This also reduces the rate of darkening around the electrode which causes gradual deterioration of irradiance levels.

[1] J.E. Norton, Atlas SunSpots, Vol. 3, Issue 8

TECH ARTICLE (continued)

Interchangeability

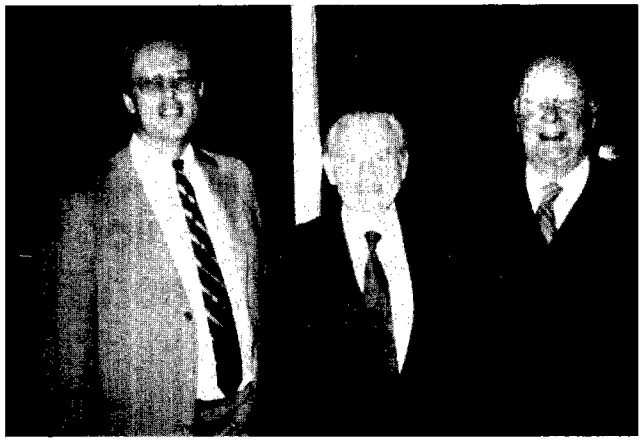
A major design criteria was that the new and old burners had to be interchangeable. With one minor exception this was accomplished. The new lamp fits in the same hardware with the same inner and outer filters. It will operate with the same power supply and does not require any modifications.

The one exception to direct interchangeability was discovered during our field testing. We found that the new flexible burner tip could bypass the mouth of the standard stainless steel burner socket and be inserted between the interior of the filter housing and the socket. This improper connection causes electrical arcing which damages both the tip and the socket. In the meantime a new style of socket had been identified and tested. (Figure 4) The new gold plated socket gives better electrical connection and corrosion resistance plus, less force is required when inserting the burner tip. More importantly, the larger outside diameter prevents the burner tip from misalignment and causing the problem connection described above. A new replacement socket will automatically be provided with all Atlas new style 6500/3500 Watt lamps as they are purchased. It is important that all the old style sockets be removed from your filter housing and be discarded.

Reliability

The field trials with the new style burner indicate that it is much more reliable. Infant failures (50 hours or less) have been virtually eliminated. In warranty failures (1200 hours or less) are running at rates significantly below the 10% industry norms for gas discharge lamps of this type. Early indications of useful life are also very encouraging with reports typically exceeding 1500 hours. The best of these exceed 2500 hours with some regularity. Needless to say Atlas is extremely pleased with these results. The new Atlas 6500/3500 Watt xenon burner is a state of the art lamp that has met or exceeded all of the design criteria of our development program.

Bert Alport Retires



Bert Alport with Bill Lane and John Lane

On January 1 of this year, Bertram J. Alport retired from his position of Vice President, Engineering. Bert started with Atlas in November, 1945, as an engineer. He had just completed service in the U.S. Navy as Lieutenant Commander.

Prior to his military service, Bert graduated from the University of Illinois with degrees in Electronics, and Mechanical Engineering. With his wife, Claire, he produced a family of two daughters, to which two grandchildren have been added.

For the last several years, Bert has had the Product Development, Production Engineering and Technical Service groups reporting to him. But most Atlas users know Bert as that friendly, helpful voice on the other end of the phone. The guy that gets you out of trouble when you are having a problem with your Atlas equipment. From complex electronic bugs to a simple blown fuse, he has given us the answers. From his fan club both here and around the world, we wish Bert the very best.

New

The new 6500 watt xenon arc burner tube announced in this issue's technical article has a *new warranty.* Tests of this new xenon burner (used in Atlas 3500 watt and 6500 watt xenon arc instruments) have been so successful that the standard Atlas xenon warranty of 1000 hours life will be increased by 20% for this new xenon burner tube. If the new design burner tube fails to ignite at any time within 1200 hours of actual use or within two years from date of shipment, then Atlas, or our authorized representative, will replace the burner with a new 6500 watt burner charging only for the actual time the original burner was in use. Further, if the failure to ignite occurs within the first 100 hours of use, Atlas will replace the burner at no charge to you. We will even pay the shipping charges.

The actual life of the new design xenon burner is expected to be well in excess of the warranted life, but it will depend upon your test parameters. Field reports on this new burner tube have indicated a useful life in many instances exceeding 2000 hours. Operating factors such as irradiance level, test temperature, and arc on/arc off cycling may be expected to have an effect on the useful life of individual burner tubes. Complete details on the new warranty will be found on the warranty record card that accompaines each burner tube. For additional information on the new design 6500 watt xenon burner, or any Atlas product, contact your local Atlas representative.

AtlaSpeaks

Atlas School on Weathering . . . A Success

Atlas is pleased to announce that the first Atlas School for Natural and Accelerated Weathering (ASNAW) was held, as announced in the last issue of Sun Spots, January 28-30 at the Doral Country Club in Miami. The forty-two ASNAW attendees representing over half a dozen industries and four countries learned about the theories and practices needed to achieve materials durability through weathering test methods. The ASNAW faculty gave presentations covering their areas of expertise. These topics included the effect of light on materials, factors of accelerated weathering, Programmed Environmental Testing, standards, measurement techniques. The attendees were given a full tour of our South Florida Test Service station in Miami. Not presented as a self-interest seminar. ASNAW was received as an answer to a long perceived need for an organized forum in which those of us involved in natural and environmental weathering could share information and discuss problems concerning materials durability. At the suggestion of our attendees and those who were unable to attend, Atlas will be running the second ASNAW school in mid-September. If you are interested in attending ASNAW II or would like further information, please contact Ms. Gigi Lane, Atlas, Marketing. Atlas would like to thank all of those who attended ASNAW for contributing to our successful first venture.

Q/A THE QUESTION AND ANSWER SERIES

Q **What improvements have been made with the CS-5 Xenon Lamp Cooling System that provide better xenon lamp operation and protection?**

A Over the years, changes to the CS-5 xenon lamp cooling system have been made which will give additional protection to the xenon arc lamp. A few of the easiest to install and which provide the most protection are as follows:

1. **In-Line Filter** To prevent any foreign materials from entering the pressure switch, flow switch or pump, a small in-line filter is available for installation in the CS-5 cooling system. This device consists of a small stainless steel strainer in an easily disassembled plastic body. Once installed, it will trap any particles that can impair the integrity of the CS-5 system.

   The filter may be ordered as follows:

   20-9062-00 In-Line Filter Kit for the CS-5 Cooling System

   When ordering the filter kit, please include the model and the serial number of the instrument to ensure that the proper kit will be sent.

   The flow switch and the in-line filter are components which, in addition to the existing devices, such as the high temperature cutoff thermostat, are designed to protect the xenon lamp and its associated cooling system. These devices, however, can work at peak efficiency only when properly maintained. Filters must be checked and cleaned at recommended intervals; thermostats must be properly set; and the water in the CS-5 tank must be kept at the proper level to assure proper system operation. This can be done only through the diligence of the conscientious operator, who represents the best safety feature.

2. **Flow Switch:** The flow switch was first used in the "C" Series Weather-Ometers® and Fade-Ometers® (Ci35, Ci65, Ci65/DMC and Ci65/XW). The flow switch is in the xenon lamp deionized or distilled cooling water return line. The switch insures that sufficient water is flowing through the xenon lamp assembly before the igniter is allowed to apply the ignition voltage. If the Weather-Ometer® or Fade-Ometer® is in the Operate mode with the xenon lamp turned on and the flow of water through this switch is restricted, the xenon lamp is immediately turned off; and the instrument goes into the Equalizing Cycle mode.

   Older CS-5 xenon lamp cooling systems had a pressure switch instead of the flow switch. However, the pressure switch did not protect the xenon lamp in the case of a restriction in the flow of the lamp cooling water. This could allow the xenon lamp burner to overheat and thus fail. The flow switch, on the other hand, is very sensitive to the water flow, and would immediately turn off the xenon lamp should any restriction in the flow occur.

   The flow switch assembly is easily installed on the CS-5 system in most of the older Weather-Ometers® and Fade-Ometers® at a reasonable cost. The flow switch assembly, which includes the in-line filter, may be ordered as follows:

   20-9063-00 Flow Switch and In-Line Filter Kit for the CS-5 System

   To Assure that the proper parts are supplied, please include the model and serial number of the instrument.

Q **What is the proper setting of the high temperature cutoff thermostat used on my xenon lamp cooling system if condensation forms on the xenon lamp?**

A There are two adjustable thermostats on the CS-5 cooling system. One is used to control the actual cooling water temperature while the other (which has a manual reset) is a high temperature safety cutoff.

For most tests, the cooling water thermostat is set for 42 °C. The safety cutoff thermostat is then set at 52 °C so that it is adjusted 10 °C higher than the cooling water thermostat. Normally, there is a 10 °C difference between the settings of the two thermostats.

There are some high humidity tests that cause excessive condensation on the outer filter of the xenon lamp assembly. In this situation, the setting of each thermostat may be increased until the condensation on the xenon lamp outer filter is minimized.

However, running the xenon lamp at higher temperatures may contribute to a shortened lamp life. In any case, a setting of 65 °C on the cooling water thermostat and 75 °C on the high temperature safety cutoff thermostat should NOT be exceeded.

Changing Standards

New Standards

D4364-84	Practice for Performing Accelerated Outdoor Weathering of Plastics Using Concentrated Natural Sunlight
G84-84	Practice for Measurements of Time of Wetness on Surface Exposed to Wetting Conditions as in Atmoshperic Corrosion Testing
G85-84	Practice for Modified Salt Spray (Fog) Testing
E971-83	Practice for Calculation of the Photometric Transmittance to Solar Radiation
E972-83	Test Method for Solar Photometric Transmittance of Sheet Materials Using Sunlight

Revision of Standards

C488-83	Practice for Conducting Exterior Exposure Tests of Finishes for Thermal Insulation. Under jurisdiction of Committee C-16 on Thermal Insulation.
D4303-84	Test Method for Relative Lightfastness of Pigments Used in Artists Paints.

South Florida Test Service INC.
A Subsidiary of Atlas Electric Devices Co.

Laurence Bond has joined the staff at the Wittmann Arizona site. Larry brings with him seventeen years of experience from DSET Laboratories, Inc., where he was a specialist in real-time and accelerated weathering. His last position with that company was supervisor of physical properties. He will have responsibilities at the South Florida Test Service Wittman and Miami sites in areas of research and special projects.

SUNopsis ABSTRACTS OF CURRENT LITERATURE

Accoustic Emission and the Performance of Paint Films. Part I: Effect of Chemical Structure on Acoustic Emission for Freshly Prepared Epoxy Clear Coatings, Bahra, M.S., Strivens, T.A. and Williams-Wynn, D.E.A., JOCCA, Vol. 67, No. 5, May (1984).

A series of clear epoxy coatings, in which the backbone chemical structure had been systematically varied were submitted to various physical tests as well as to different types of environmental and corrosion tests in order to evaluate and understand their anticorrosive performance. Acoustical emission was found to be a very sensitive indicator of the effects of chemical structure variation on the mechanical properties of freshly prepared coatings. Subsequent papers in this series will describe the results of acoustic emission testing applied to the same coatings after their exposure to accelerated weathering and salt spray testing environments.

Acoustic Emission and the Performance of Paint Films. Part II: the Effect of Environmental Exposure on Acoustic Emission from Unpigmented Epoxy Coatings on Steel, Bahara, M.S., Strivens, T.A. and Williams-Wynn, D.E.A., JOCCA, Vol. 67, No. 6, pp. 143-148, JUNE (1984).

In the first paper of this series a description was given of the acoustic emission technique and of the results obtained with this technique, when it was applied to freshly prepared crosslinked unpigmented epoxy coatings applied to aluminium foil.

While the mechanical conditions of test were not identical, it was found that the acoustic emission data were very sensitive to variations in chemical structure in the films, more so than either dynamic mechanical analysis or hardness testing.

Noteworthy was the profound effect of moisture on both the acoustic emission data and the mechanical properties of some of the epoxy coating compositions.

Accelerated, Real-Time Aging For 4 Construction Adhesives, River, Bryan H., Adhesives Age, Vol. 27, No. 2, pp. 16-21, February (1984).

In 1969, the Forest Products Laboratory initiated a long-term test fence exposure of 17 construction and panel adhesives.

Analysis of the data by the rate process method resulted in estimates of the bonded joints useful life. In the present study additional specimens prepared at the same time were placed in outdoor exposure and in continuous wet and continuous dry exposures at normal service temperatures. Estimates of service life based on 11 years of service exposure provide an opportunity to evaluate applicability of estimates of service life from accelerated aging exposure.

Rate process analysis of accelerated aging data can be a powerful tool for evaluating durability. The analysis is not always simple and straightforward. Service life estimates from rate process analysis of accelerated aging data agreed with estimates from service exposures in three of four adhesives tested.

Organosilanes as Adhesion Promoters for Organic Coatings. Part 5: Various Coatings, Walker, P., JOCCA, Vol. 67, No. 5, pp. 126-131, May (1984).

Organosilanes of the vinyl and methacrylate functional type have been examined as adhesion promoters for modified alkyd and acrylic paints. Torque shear and direct pull off adhesion tests have shown that some improvements in initial bond strength to degreased aluminium and mild steel can be obtained when the silanes are used as pretreatments. The major improvements in bond strength are noted after exposure to high humidity or water immersion tests.

AtlaShows

1. Quality Expo
   April 16-19
   O'Hare Expo Center
   Chicago, Illinois
2. ACHEMA
   June 9-14
   Atlas/SFTS BV
   Frankfurt, West Germany
3. National Plastics Exposition
   June 17-21
   McCormick Place
   Chicago, Illinois
4. Rubber Expo (CSI only)
   October 1-3
   Cleveland Convention Center
   Cleveland, Ohio
5. AATCC Conference & Exhibition
   October 6-10
   Queen Elizabeth Hotel
   Montreal, Quebec
6. 1985 Paint Industries Show
   October 7-9
   Cervantes Convention Center
   St. Louis, Missouri
7. IFAI
   October 30-November 2
   Fairmont Hotel
   New Orleans, Louisiana

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