Appliance Efficiency Test Procedures

Legislation passed in 1975 and amended in 1987 and 1988 requires DOE to develop standard test procedures to measure accurately the energy consumption and efficiency of 12 categories of major household appliances. Since the testing and labeling program began, the average energy efficiency of new major appliances has increased significantly. As consumers reject less efficient models with higher operating costs, manufacturers are producing new designs that are up to 50% more energy efficient than older models. Four national trade and professional associations representing manufacturers of major appliances have adopted the DOE appliance test procedures in their own industry guidelines and product certification programs.

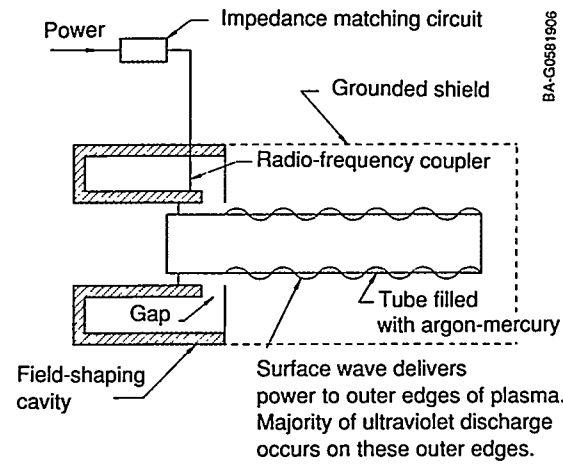
Solid-State Ballast for Fluorescent Lighting

Although the theoretical output limit for a luminous light source is more than 350 lumens per watt, standard fluorescent lamps generate less than 70 lumens per watt. This inefficiency in standard lighting stimulated DOE to initiate a research program to improve the performance of fluorescent lamps.

The program initially focused on the potential of solid-state ballasts to power fluorescent lamps at higher frequencies. Working with two small contractors, DOE developed and tested prototypes of solid-state ballasts that improved lighting efficiency by 25%. As a result of DOE-sponsored demonstrations of the benefits of solid-state ballasts in several office buildings, several major lighting manufacturers were convinced to adopt this energy-saving technology in their product lines. Today, more than 2 million solid-state ballasts are being used in U.S. buildings, saving more than 200 million kilowatt hours of electricity annually. Solid-state ballasts, currently installed in fewer than 3% of fluorescent fixtures in the United States, are expected to achieve a 50% market penetration by 1995.

Surface Wave Lamp

In 1980, DOE began a program directed at improving the efficiency of converting electrical energy to useful light. DOE research indicated that fluorescent lamp efficiency was limited by self-absorption of ultraviolet radiation within the lamp's plasma and by the efficiency of the lamp's phosphor in converting ultraviolet radiation into visible light. Several techniques to improve efficacy, including exciting fluorescent lamps using very high (gigahertz) frequencies, were explored. Unlike lower frequency lamp excitation, which concentrates ultraviolet radiation generation in the fluorescent lamp's center, very high frequency excitation using surface waves creates greater ultraviolet generation close to the lamp's outer walls. Test results of surface wave lamps revealed a 40% efficiency improvement over conventional fluorescent lamps. When fully developed, this concept is expected to reduce by 50% the electrical energy requirements for fluorescent lighting and to improve lamp life to more than 40,000 hours.



Surface wave lamps promise a 50% reduction in energy use and more than 40,000 hours of lamp life.

Low-Emissivity Window Coating

In response to the energy crises of the early and mid-1970s, DOE initiated a research program to identify innovative energy-saving technologies that could be applied to commercial and residential buildings. As part of this program, scientists determined long-wave infrared radiation through windows to be a major source of energy loss in buildings. Low-emissivity (low-E) glass coatings were known to reduce this problem, yet the window and glass industries were unable to commit sufficient research resources to solve numerous technological problems connected with these coatings.