TYPES OF LIGHTING LAMPS AND THEIR CHARACTERISTICS

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Abstract: This article discusses light and its different types, including natural, artificial, and special lighting. The International Lamp Coding System (ILCOS) provides a short form coding system for lamp efficacies and some types of lamps. Today's types of lighting lamps and their characteristics are highlighted. In addition, the article discusses the technical aspects of lighting, such as color temperature, brightness levels, and energy efficiency. Through this comprehensive analysis, the reader will gain a deeper understanding of the role of light in our daily lives and its impact on our well-being.

Key words: light output , wattage requirements, International Lamp Coding System (ILCOS), *incandescent lamps*, low-voltage tungsten halogen lamps, tubular fluorescent lamps, compact fluorescent lamps, induction lamps, high-pressure mercury lamps

A lamp is an energy converter. Although it may carry out secondary functions, its prime purpose is the transformation of electrical energy into visible electromagnetic radiation. There are many ways to create light. The standard method for creating general lighting is the conversion of electrical energy into light [1-5].

Although the development of technology has made it possible to produce a variety of lamps, the main factors affecting their development have been foreign market forces. For example, the production of filament lamps used at the beginning of this century was possible only after the availability of good vacuum pumps and tungsten wire drawing. However, it was the large-scale generation and distribution of electricity to meet the demand for electric lighting that determined the growth of the market. Electric lighting has many advantages over gas or oil-based lighting, such as steady light that requires little maintenance, and increased safety by avoiding open flames and local combustion products [6-11]. During the post-World War II recovery, the focus was on productivity. The fluorescent tube lamp became the dominant light source because it allowed factories and offices to be illuminated without shadows and relatively without heat, allowing for maximum use of space.

The light output and power requirements for a typical 1500 mm fluorescent tube lamp are listed in Table 1.

Table 1. Enhanced Light Output and Wattage Requirements for Some Typical 1500mm Fluorescent Tube Lamps

Rating (W)	Diameter (mm)	Gas fill	Light output (lumens)
80	38	argon	4,800
65	38	argon	4,900
58	25	krypton	5,100
50	25	argon	5,100 (high frequency gear)

By the 1970s oil prices rose and energy costs became a significant part of operating costs. Fluorescent lamps that produce the same amount of light with less electrical consumption were demanded by the market. Lamp design was refined in several ways. As the century closes there is a growing awareness of global environment issues. Better use of declining raw materials, recycling or safe disposal of products and the continuing concern over energy consumption (particularly energy generated from fossil fuels) are impacting on current lamp designs [12-18].

As a general rule the efficiency of a given type of lamp improves as the power rating increases, because most lamps have some fixed loss. However, different types of lamps have marked variation in efficiency. Lamps of the highest efficiency should be used, provided that the criteria of size, colour and lifetime are also met. Energy savings should not be at the expense of the visual comfort or the performance ability of the occupants. Some typical efficacies are given in table 2.

Table 2. Typical lamp efficacies

Lamp efficacies	
100 W filament lamp	14 lumens/watt
58 W fluorescent tube	89 lumens/watt
400 W high-pressure sodium	125 lumens/watt
131 W low-pressure sodium	198 lumens/watt

Main lamp types. Over the years, several nomenclature systems have been developed by national and international standards and registers.

In 1993, the International Electrotechnical Commission (IEC) published a new International Lamp Coding System (ILCOS) intended to replace existing national and regional coding systems. The International Lamp Coding System (ILCOS)

provides a standardized way to categorize different types of lamps based on their efficacy and other technical specifications. This system helps consumers and professionals make informed choices when selecting lighting options [19-22]. A list of some ILCOS short form codes for various lamps is given in table 3.

Table 3. International Lamp Coding System (ILCOS) short form coding system for some lamp types

Type (code)	Common ratings (watts)	Colour rendering	Colour temperature (K)	Life (hours)
Compact fluorescent lamps (FS)	5–55	good	2,700–5,000	5,000–10,000
High-pressure mercury lamps (QE)	80–750	fair	3,300–3,800	20,000
High-pressure sodium lamps (S-)	50–1,000	poor to good	2,000–2,500	6,000–24,000
Incandescent lamps (I)	5–500	good	2,700	1,000–3,000
Induction lamps (XF)	23–85	good	3,000–4,000	10,000–60,000
Low-pressure sodium lamps (LS)	26–180	monochromatic yellow colour	1,800	16,000
Low-voltage tungsten halogen lamps (HS)	12–100	good	3,000	2,000–5,000
Metal halide lamps (M-)	35–2,000	good to excellent	3,000–5,000	6,000–20,000
Tubular fluorescent lamps (FD)	4–100	fair to good	2,700–6,500	10,000–15,000
Tungsten halogen lamps (HS)	100–2,000	good	3,000	2,000–4,000

Incandescent lamps. These lamps use a tungsten filament in an inert gas or vacuum with a glass envelope. The inert gas suppresses tungsten evaporation and lessens the envelope blackening. There is a large variety of lamp shapes, which are largely decorative in appearance. Incandescent lamps are still popular for domestic lighting because of their low cost and compact size. However, for commercial and industrial lighting the low efficacy generates very high operating costs, so discharge

lamps are the normal choice. A 100 W lamp has a typical efficacy of 14 lumens/watt compared with 96 lumens/watt for a 36 W fluorescent lamp. Incandescent lamps are simple to dim by reducing the supply voltage, and are still used where dimming is a desired control feature.The tungsten filament is a compact light source, easily focused by reflectors or lenses. Incandescent lamps are useful for display lighting where directional control is needed [23-24].

Low-voltage tungsten halogen lamps.These were originally designed for slide and film projectors. At 12 V the filament for the same wattage as 230 V becomes smaller and thicker. This can be more efficiently focused, and the larger filament mass allows a higher operating temperature, increasing light output. The thick filament is more robust. These benefits were realized as being useful for the commercial display market, and even though it is necessary to have a step-down transformer, these lamps now dominate shop-window lighting.

Tubular fluorescent lamps. These are low pressure mercury lamps and are available as “hot cathode” and “cold cathode” versions. The former is the conventional fluorescent tube for offices and factories; “hot cathode” relates to the starting of the lamp by pre-heating the electrodes to create sufficient ionization of the gas and mercury vapour to establish the discharge. Cold cathode lamps are mainly used for signage and advertising.

Compact fluorescent lamps. The fluorescent tube is not a practical replacement for the incandescent lamp because of its linear shape. Small, narrow-bore tubes can be configured to approximately the same size as the incandescent lamp, but this imposes a much higher electrical loading on the phosphor material. The use of tri-phosphors is essential to achieve acceptable lamp life.

Induction lamps. Lamps using the principle of induction have recently appeared on the market. They are low-pressure mercury lamps with tri-phosphor coating and as light producers are similar to fluorescent lamps. The energy is transferred to the lamp by high-frequency radiation, at approximately 2.5 MHz from an antenna positioned centrally within the lamp. There is no physical connection between the lamp bulb and the coil. Without electrodes or other wire connections the construction of the discharge vessel is simpler and more durable. Lamp life is mainly determined by the reliability of the electronic components and the lumen maintenance of the phosphor coating.

High-pressure mercury lamps. High-pressure discharges are more compact and have higher electrical loads; therefore, they require quartz arc tubes to withstand the pressure and temperature. The arc tube is contained in an outer glass envelope with

a nitrogen or argon-nitrogen atmosphere to reduce oxidation and arcing. The bulb effectively filters the UV radiation from the arc tube.

References

1. Kholiddinov, I. K., Musinova, G. F., Yulchiev, M. E., Tuychiev, Z. Z., & Kholiddinova, M. M. (2020). Modeling of calculation of voltage unbalance factor using Simulink (Matlab). *The American Journal of Applied sciences*, *2*(10), 33-37.
2. Yulchiev, M. E., & Qodirov, A. A. O. (2020). Electricity Quality And Power Consumption In Low Power (0.4 Kv) Networks. *The American Journal of Engineering and Technology*, *2*(09), 159-165.
3. Yulchiev, M. E. (2023). POWER QUALITY IN THE LOW-VOLTAGE AIR NETWORK. *Spectrum Journal of Innovation, Reforms and Development*, *15*, 79-84.
4. Эралиев, А. Х., Юлчиев, М. Э., & Латипова, М. И. (2020). ЭКСПЕРИМЕНТАЛЬНЫЕ МЕТОДЫ И ОБЪЕМ ИСПЫТАНИЙ ТРАНСФОРМАТОРОВ ТОКА. *Universum: технические науки*, (12-5 (81)), 39-43.
5. Mash'albek, E. (2022). CONTENTS, PROBLEMS AND DIDACTICAL BASIS OF TEACHING THE SUBJECT" ELECTRIC NETWORKS AND SYSTEMS" IN THE ELECTRONIC EDUCATIONAL ENVIRONMENT. European International Journal of Multidisciplinary Research and Management Studies, 2(04), 341-349.
6. Yulchiyev, M. E., & Salokhiddinova, M. (2023). ORGANIZATION OF MULTI-STAGE ENHAT FOR MEDIUM AND LARGE POWER INDUSTRIES OR ENERGY SYSTEM. World scientific research journal, 20(1), 13-18.
7. Muslima, S. (2023). APPLICATION OF A HYBRID SYSTEM OF RENEWABLE ENERGY SOURCES IN THE SUPPLY OF ELECTRICITY THROUGH A MULTIFUNCTIONAL DEVICE. International journal of advanced research in education, technology and management, 2(10).
8. Zuhritdinov, A., & Xakimov, T. (2023). STUDY OF TEMPERATURE DEPENDENCE OF LINEAR EXPANSION COEFFICIENT OF SOLID BODIES. *International Bulletin of Applied Science and Technology*, *3*(5), 888-893.
9. Abbosbek Azizjon-o'g'li, A., & Nurillo Mo'ydinjon o'g, A. (2023). GORIZONTAL O 'QLI SHAMOL ENERGETIK QURILMALARINING ZAMONAVIY KONSTRUKSIYALARI.

10. Parpiev, O. B., & Egamov, D. A. (2021). Information on synchronous generators and motors. *Asian Journal of Multidimensional Research*, *10*(9), 441-445.

11. Atajonov M.O. Ashurova U.B. Algorithm for Adaptive Regulation of Parameters of Fuzzy-Models to Diagnose Dynamic Object. Technical science and innovation, Iss 8, Vol 2, 2021/2 peg. 234-240.

12. Розиков Ж.Ю, Холмирзаев Ж.Ю, & Абдуллаев М.Х. (2023). ОСНОВНЫЕ ПРОБЛЕМЫ ПЕРЕНОСА ИЗЛУЧЕНИЯ В АТМОСФЕРЕ. Fergana State University Conference, 48. Retrieved from https://conf.fdu.uz/index.php/conf/article/view/2298

13. Холмирзаев, Ж. Ю. (2022). ЗОНАЛЬНОЕ СТРОЕНИЕ КРИСТАЛЛОВ В ПРИБЛИЖЕНИИ МНОГОЗОННОЙ (КЕЙНА) МОДЕЛИ. Oriental Renaissance: Innovative, educational, natural and social sciences, 2(12), 748-753.

14. Qosimov Oybek Abdumannon o`g`li Dekhkanboyev Odilbek Rasuljon o`g`li Andijan Machine-Building Institute. (2023). ENERGY-SAVING CONTROL SCHEME OF ELECTRICAL CONTROL OF HORIZONTAL LAMINATING MACHINE. Zenodo. https://doi.org/10.5281/zenodo.10315865

15. Qosimov Oybek Abdumannon o`g`li Dekhkanboyev Odilbek Rasuljon o`g`li Andijan Machine-Building Institute. (2023). ENERGY-SAVING CONTROL SCHEME OF ELECTRICAL CONTROL OF HORIZONTAL LAMINATING MACHINE. Zenodo. https://doi.org/10.5281/zenodo.10315865

16. Olimov, L. O., & Yusupov, A. K. (2021). The Influence Of Semiconductor Leds On The Aquatic Environment And The Problems Of Developing Lighting Devices For Fish Industry Based On Them. *The American Journal of Applied Sciences*, *3*(02), 119-125.

17. Alijanov Donyorbek Dilshodovich Dean of the Faculty of Energetics of Andijan Machine-building Institute, & Islomov Doniyorbek Davronbekovich Phd student of Andijan Machine-building Institute. (2023). OPTOELECTRONIC SYSTEM FOR MONITORING OIL CONTENT IN PURIFIED WATER BASED ON THE ELEMENT OF DISTURBED TOTAL INTERNAL REFLECTION. Zenodo. https://doi.org/10.5281/zenodo.10315833

18. Olimov, L., & Anarboyev, I. (2023). IKKI STRUKTURALI POLIKRISTAL KREMNIYNING ELEKTROFIZIK XOSSALARI. *Namangan davlat universiteti Ilmiy axborotnomasi*, (8), 75-81.

19. Alijanov, D. D., & Axmadaliyev, U. A. (2021). APV Receiver In Automated Systems. *The American Journal of Applied sciences*, *3*(02), 78-83.

20. Abdulhamid o‘g‘li, T. N., & Sharipov, M. Z. (2023). ENERGY DEVELOPMENT PROCESSES IN UZBEKISTAN. *Science Promotion*, *1*(1), 177-179.

21. Olimjoniva, D., & Topvoldiyev, N. (2023). ANALYSIS OF HEAT STORAGE CAPACITY OF RESIDENTIAL BUILDINGS. *Interpretation and researches*, *1*(8).

22. Topvoldiyev, N. (2023). ANALYSIS OF HEAT STORAGE CAPACITY OF RESIDENTIAL BUILDINGS.

23. Shuhratbek o‘g‘li, M. Q., & Saydullo O‘ktamjon o‘g, S. (2023). OBTAINING SENSITIVE MATERIALS THAT SENSE LIGHT AND TEMPERATURE. *International journal of advanced research in education, technology and management*, *2*(12), 194-198.

24. Saydullo O‘ktamjon o‘g, S. (2023). IMPROVING THE ENERGY EFFICIENCY OF A SOLAR AIR HEATING COLLECTOR BY CONTROLLING AIR DRIVE FAN SPEED. *International journal of advanced research in education, technology and management*, *2*(12), 179-184.