RESEARCH ON A NOVEL SUSTAINABLE, SOLAR-HYBRID LIGHTING SYSTEM FORTHE INTERIOR OF UNDERGROUND CITIES AND/OR BUNKERS

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Objectives:

• Design and study of primary fiber optic bundles. This objective is to perform the optical design of the primary bundle of optical fibers and develop their gluing, polishing, and jacketing processes.

• Design and construction of the HUB of fiber optic cable interconnections. This objective is to create the HUB of interconnections using specialized software to determine the coupling efficiency according to the type of components.

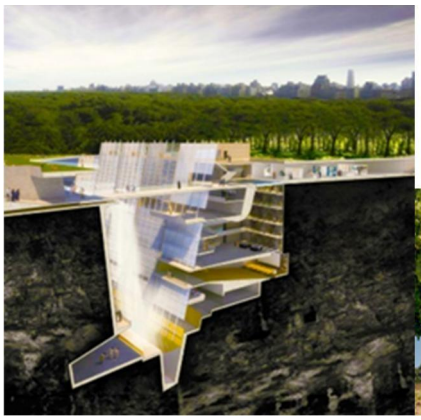
• Design and construction of projection luminaires and hybrid luminaires. The final purpose is to perform the optical design and fabrication of the solar projection luminaire (receptor/diffuser/cabinet) and enable the hybrid luminaire through the integration of an LED lighting system with monitoring/control to regulate its lighting intensity.

Status:

This project is the result of a series of research works that have been looking for a solution to improve the environment and the energy theme, and that revolves around generating scientific knowledge in this area. All these initiatives have consisted of exploring how specific optical fiber arrangements can be innovated/renovated to build hybrid lighting systems that will be installed and provide illumination services to indoor buildings. All these works have led to the development of a scientific methodology system with a theoretical and experimental section. In this new version, all the previous results have been added and are joined to the project with new tendencies that are currently known as industry 4.0 technology, which includes the use of the internet (IoT), big data, and access to the computation cloud; the latter is used to manage large quantities of data and everything that represents sustainable energy with photonic devices.

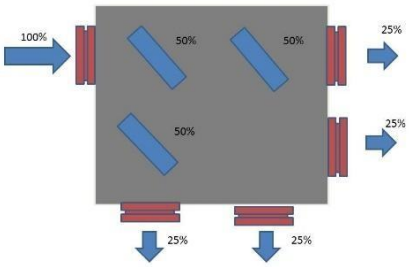
Problem areas and project description:

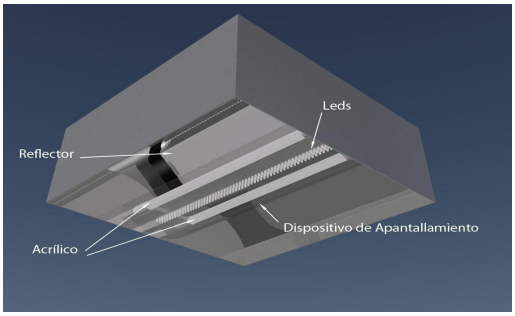
The increasing energy consumption by humans and its adverse effects on the environment have led to the development of alternative energy sources for both electrical power generation and lighting systems. Some reports estimate that traditional lighting systems consume about 15% of the total electricity consumed in urban environments. Therefore, there is a growing interest in using sustainable alternatives to save energy related to lighting. In this sense, the abundant solar radiation incident in northeastern Mexico due to its latitude and atmospheric conditions is of interest for lighting applications based on radiant energy collection. A new sustainable solar lighting system is proposed given this advantage




Preliminary results

In 2012, a workgroup was formed with students and teachers to generate scientific research and apply it to active hybrid topics. Academically one of the rising research lines of the academic body enrolled like CA-276-UANL-consolidated, and that nowadays is the photonics one. In a reasonable time frame, it will change to energy and photonics. A hybrid lighting system form has been proposed in arrangement with optic fibers and LEDs strips. In all this process, the following projects have been obtained chronologically to conform to the infrastructure in the energy lab: **INFRA-CONACyT-2O12-#187906**, **PAICYT2012-UANL program,** and **CATEDRA-CONACyT-#177. I**n 2019, our research group was also benefited by endorsing two more PAICYT-UANLprojects. The resources and the activities of the mentioned projects help us in continuing to get better results are we expected.





Papers & patents.

(1) R Selvas-Aguilar, et al, “Seccionamiento transversal para extracción de luz de una guía de onda”, patente MX/A/2015/003755. (Registered on May 2019).

(3) P Viera-Gonzalez, et al., “Radiant flux analysis of a system based in imaging Fresnel lens and plastic optical fiber with fiber lenses, Research in computing science 131(1), 2017.

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Hits: The energy crisis that awaits us will make projects of this nature be considered. This is because solar energy is free, and the way to relocate the energy to our lighting service will help with the problems that are yet to come."