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Eco-efficiency model implemented in Higher Education institutions; case study for Politécnico Colombo Andino in Bogotá D.C., Colombia

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Abstract

This article presents the results of the design and implementation of the model of Eco-efficiency experimentally applied in the Politécnico Colombo Andino institution, with the aim to reduce operational costs, beside promoting the care for the environment, using methods of environmental awareness and the use of technologies that improve the ergonomic, cultural and environmental conditions; departing from the identification and the study of the environmental impacts that represented a risk for the community and to the internal activities that see affected by the evil functioning of the Politécnico Colombo Andino.

Keywords: Eco-efficiency, experimental model, environmental awareness, warning impacts, recycling.

INTRODUCTION

In Latin America, the application of the Eco-efficiency strategy has been enthusiastic, although limited and specific, in many cases motivated by transnational corporations. However, it has been useful to promote better environmental management and promote associativity in the industry, including small and medium enterprises.

Aware of the importance that the environmental issue has acquired to economic, political and institutional level in recent years, of the existence of regulatory measures, added value and competitiveness in the institutional sector and especially in education sector, which aims to involve the environmental dimension as a key factor of sustainable development. The following project aims to implement the basic principles of Eco-efficiency at the Politécnico Colombo Andino (higher education institution), reduce operating costs and create environmental awareness in students, teachers and administrative staff, to act in a friendly way with the environment.

For the purposes of the start-up of the Eco-efficiency project, secondary information was initially collected using consumption data in water, energy and cleaning services as a basis, through the payment receipts for each period invoiced in order to know the average consumption; In the same way, an electrical plan was drawn up in order to identify the optimal lighting system, which will be adapted to the current electrical circuit, in addition to this, the load tables that determined the real consumption of the facilities were created, and finally a characterization of the solid waste produced.

CONTENT

Eco-efficiency

"Goods with competitive prices and services that meet human needs and provide quality of life, while progressively reducing the environmental impacts of goods and the intensity of use of resources, through the analysis of the life cycle of a product or service "- World Business Council for Sustainable Development (WBCSD).

Eco-efficiency Principles

One of the ways in which a process of advancing of the countries towards sustainable development is to adopt the Eco-efficiency approach, a term originated in the 1990s as a consequence of growing concern for the environment. Doing something Eco-efficient includes the following:Environmental Protection

- ✓ Sustainable economic development

Sustainable development seeks to promote in organizations the ability to discover the added value of their activities and define innovation strategies that incorporate environmental and social requirements. Under this approach, the company seeks to minimize the amount of resources used while maximizing the creation of economic, social and environmental value and meeting the needs and requirements of its stakeholders as shown in Figure 1. [1]

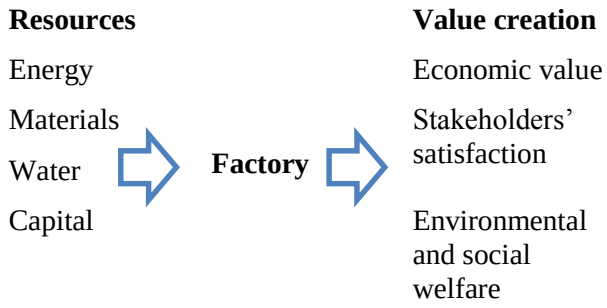


Figure 1. Sustainable development scheme

Source. CEGESTI (2006)

Eco-efficiency education is aimed at internalising the issues related to water management, solid waste, the issue of adaptation to global climate change, the improvement of air and soil quality, as well as efficient use of energy, the management and value of biodiversity, in the educational and management processes of educational institutions, in order to

achieve in students the development of competencies that promote sustainable development and the reduction of environmental impacts of institutions educative in their environment, expressed in attitudes, behaviors and practices with healthy lifestyles and harmonious with the environment. [2]

An environmental education campaign focused on Eco-efficiency is structured as follows:

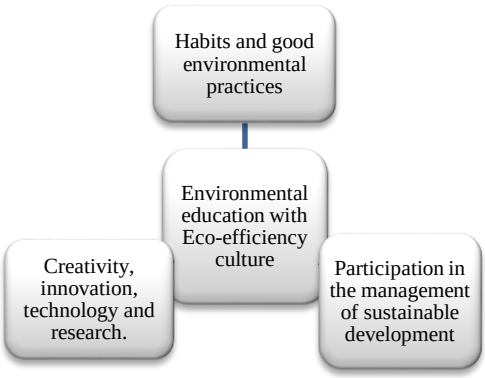


Figure 2. Environmental education with Eco-efficiency culture

Source. http://www.minam.gob.pe/

According to Leal (2005), the essential elements of Eco-efficiency are:

- ✓ Reduce the quality of materials and / or resources used in products and services.
- ✓ Reduce energy consumption in products and services.
- ✓ Reduce the pollution and dispersion of waste between water, air and soil.
- ✓ Increase the capacity of products to be recycled
- ✓ Maximize the sustainable use of natural resources.
- ✓ Increase the durability of the materials used.
- ✓ Increase the useful life of products and services.

METHODOLOGY

Phase I: Design and collection of information

Eco-efficiency project begins with the identification of factors that intervene negatively in working and educational conditions, in addition to generating a high degree of environmental contamination; after determining each one of the impacts, we proceed to the research and analysis of Eco-efficiency techniques that promote greater productivity and quality, optimizing the use of resources. The collection of information determined four (4) factors with deficiencies: water, energy, recycling and environmental awareness.

From the Eco-efficient development it is intended that the educational community achieve the highest standards of quality in education, promoting values and lifestyles, which generate greater productivity for the Politécnico Colombo Andino, through good management of natural resources and leaving one side the waste of water, energy, among others.

Phase II: Execution

In the research 100% of the educational community is taken into account. After the collection of information, the Dual Master valves and Push type keys were installed for the students' restrooms, a proposal designed for a savings program and efficient water use; the system that was installed to increase the energy saving was the connection of motion sensors and programmable sensors for classrooms and restrooms of Politécnico Colombo Andino, starting from the lifting of plans and load charts to know the wiring, locations , and real consumption; the environmental awareness proposal consisted of holding a day of awareness and environmental education explaining to students the pillars of Eco-efficiency and in turn raising awareness in the educational community to properly use recycling bins.

Phase III: Analysis techniques

For the analysis techniques, the information estimated in the environmental impact matrix will be compared against the records monitored through receipts; to establish the definitive decrease in emissions and economic savings associated.

Phase IV: tentative analytical index of the project

Through the environmental evaluation of the Politécnico Colombo Andino, the impacts caused during the institute's own activities are identified and evaluated, based on the integrated analysis of characteristics and attributes of the environmental components. The results obtained from this allow us to determine the management measures for environmental problems and the optimization in processes specific to the educational activity, in order to reduce limitations in the normal operation of the institution. Taking into account their limitations, environmental management measures are proposed for each of the analyzed components that require changes or improvements.

RESULTS

Water

The installation of Corona's Dual Master system for toilets generates a saving of 1.5 to 2 liters per liquid discharge. [3]

The change of traditional keys by Push type keys generates a saving per person of 2.32 liters per day.

Figure 3. Dual Master Valve

Source. https://www.corona.co/tu-solucion/productos/valvulas

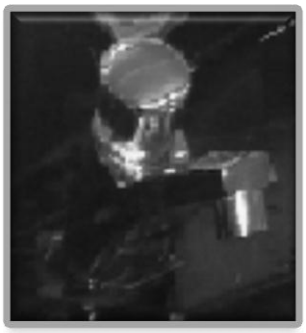


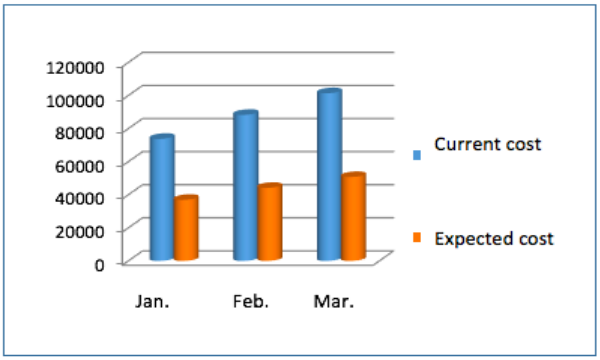
Figure 4. Faucets in students' restroom

Source. Authors

Illumination

Motion sensors turn off the lights when the place is empty and can save up to 20% of the energy. [4]

The programmable sensors located in classrooms generate a potential energy saving - lighting of 30%, taking into account that 15% corresponds to the use of daylight.



Graph 1. Actual cost vs. expected cost

Source. Authors

Radiation

Black Google would save 750 megawatts - hour per year.

Figure 5. Black Google Presentation

Source. Authors

CONCLUSIONS

Addressing Eco-efficiency as a sustainable and sustainable way of providing adequate and responsible use of the resources obtained from the environment, we understand the great importance of implementing measures that minimize the effects and environmental changes caused by our daily activities, promoting the saving of resources that they are mostly non-renewable and define the future of life for the next generations. [5] [6] [7]

It is observed after the work done in the institute the benefit of using the tools that technology provide us to improve the living conditions and comfort of the human being, a sustainable way to adapt the environment where we are.

The saving of energy through the use of sensors allows us to make efficient use of this, only when we require it, avoiding consuming energy in classrooms or spaces that are empty for several hours.

The decrease by discharge in the use of toilets of water sent to the waste conduits to large-scale represents a significant and very important figure of this vital resource for life and that it is very difficult to recover, if not almost impossible; the decrease in consumption of this resource is one of the ways we have to improve life expectancy in the future.

The recycling of reusable products is of great significance for the industry and for the environment, since not only do we obtain new raw materials to be processed, but we also reduce the load of landfills and sanitary landfills that collapse every day, including leachates which generate great damage to entire populations living in the vicinity of these places. In addition to them we save raw material in the production of products and natural resources for the preparation of the same as is the case of paper, plastic glass, among others.

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