Your Name

Instructor Name

Course Number

Date

Green Engineering

# Concept

Green engineering is the process of designing products and processes through the application of technologically and financially feasible principles in order to attempt one or more goals (Lozano et al.). Its prime purpose is to:

1. Reduce the amount of pollution that is generated as a by-product of construction, or in the operation of an industrial facility.
2. Reduction in the rate of human exposure to potential hazards. This also includes a reduction in toxicity.
3. Improve the use of energy and material in the lifecycle of the product.

Green engineering is diverse in its nature and the right application can overarch the framework of all design principles at hand.

# Principles

According to the American Chemical Society, there are nine guiding principles that hold importance in terms of green engineering. They are (“12 Principles of Green Engineering”):

1. **Inherent Rather Than Circumstantial** – the designers behind a project need to ensure that the materials and the energy being utilized are inherently nonhazardous.
2. **Prevention Instead of Treatment** – Waste prevention is much better than cleaning up following the formation of waste.
3. **Design for Separation** – The operations of separation and purification should be designed in a manner that minimizes energy consumption and the materials used.
4. **Maximize Efficiency** – Processes, Products, as well as systems, are to be designed in a manner that maximizes space, energy and the mass and time efficiently.
5. **Output-Pulled Versus Input-Pushed** – Processes, Products, as well as systems should be output-oriented as opposed to input-pushed.
6. **Conserve Complexity** – The complexity and the embedded entropy of the system must be seen as an investment while making choices with regard to reuse, recycle, or beneficial disposition.
7. **Durability Rather Than Immortality** – The Target product made should be durable as opposed to being immortal in terms of design.
8. **Meet Need, Minimize Excess** – one size fit all solutions would be considered a design flaw. Customize to the needs of the project.
9. **Minimize Material Diversity** – Minimize material diversity in products that have many components to promote value retention and disassembly.
10. **Integrate Material and Energy Flows** – Processes, Products, as well as systems are to be designed in a manner that includes connectivity and integration with the energy sources available.
11. **Design for Commercial "Afterlife"** – Processes, Products, as well as systems, are to be designed in a manner that they continue to perform well in the commercial "afterlife."
12. **Renewable Rather Than Depleting** – Renewable material and energy inputs should be used, rather than depleting.

# Benefits

Green engineering is an ideal way to reduce the detrimental impacts of innovation, that often accompanies engineering products. It aims to use products in a more efficient and cost-effective manner, especially when compared to the alternatives. Thus, here is a look at a few ways through which green technology can be extremely beneficial (Lagas).

## Reduce Energy-Related Costs

From energy-efficient light sources, where you can adjust the lighting levels on the basis of your choices. This enables you to utilize energy in an efficient manner, and also cut down on expenses. Using solar and wind energy, along with changing the type of packaging used by vendors to pack products can also be an excellent means to reduce energy-related costs using green engineering.

## Attract New Customers and Increase Sales

In the present age, going green and introducing sustainable practices in your company only makes you more marketable. It shows your customers that you are willing to make improvements in your infrastructure that would help the environment, which in turn strengthens your reputation.

## Societal Impact

Use of green technology will not only help you reduce costs and improve your reputation as a company, but it will also enable to take actions that can make a real difference to society. It will help you reduce your carbon footprint while also decrease the level of toxin emission from our environment. Ultimately, green engineering will help future generations live a quality life in a better world

# Constraints

The constraints of using green engineering are the fact that it requires designers to be conscious of the environmental impacts of their products, despite the alternative being cost-effective (Thurston and Srinivasan). In order to minimize the impacts in terms of design, and other similar elements, it is essential that the designer expands his toolset and improve his knowledge with regard to product design concepts, manufacturing systems, alternative materials, and analytic methods. This has the possibility of overwhelming the designer, but by using mathematical decision models the constraints associated with the use of green engineering can be reduced.

# Examples

It is important to consider the fact that green engineering is trying to make significant efforts in order to reduce the industrial impact on the environment. In the modern world, there is an immense need to incorporate sustainable construction to minimize environmental destruction. For this particular, there are various methods that should be used (Kibert). One of these methods includes reducing energy consumption by using renewable and recyclable resources. Sustainable construction is essential in the modern world as it reduce the emission of carbon into the atmosphere. It is important to consider the fact that the construction industry is accountable for 40 percent of carbon dioxide’s emission along with 36 percent energy usage. Traditional methods of constructions are emitting a major amount of carbon dioxide that is the basic reason behind global warming and climate change. Sustainable construction can reduce environmental degradation. Lower operating costs of sustainable construction makes it a feasible choice for organizations. It is obvious that first-time installation and incorporation of such strategy can be costly for an organization. However, an organization can easily get benefit from its long-term low operating costs. Global emerging spending is relatively higher in case of traditional construction methods. Utilizing sustainable construction can potentially save more than 410 billion dollars in a year. Consequently, organizations need to accept and adopt the concept of sustainable construction to make a significant change in terms of environmental degradation and cost-saving.

Works Cited

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