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**MECHANICAL ENGINEERING**

**ENG384 SHORT TEST**

You have been invited by the current president of Nigeria, General Muhammadu Buhari to make an argument for the optimization of engineering resources in the country. As an aspiring Engineer, briefly discuss your view on this and make viable recommendations that will facilitate timely completion of engineering projects within the allocated budget without jeopardizing economic and legal regulations of Nigeria.

**ANSWER**

In today’s industrial age, where manufacturing processes are highly crucial and a synonym of development and growth, the need to use resources effectively and efficiently has become necessary. The continuous growth of industries has led to development of highly efficient or leaner processes which focus on minimum wastage and maximum utilization of the available resources through various technologies developed overtime. The use of robots and automating the processes in order to eliminate human error and increase efficiency has been adopted by almost every industry today which has further been facilitated by the Internet of Things (I0T) in developing smarter processes.

In order to execute resource optimization and make sure that it is continuously being carried out, energy audits and water audits can be done which track the energy needs of an organization and track the water consumption by the organization respectively. The audits not only provide feedback about the status of optimization within the organization, but also help in tracking the development in this area and accordingly set targets. Even though these audits are a bit time consuming but they are highly necessary as they help the organization stay aligned with their set targets.

Optimization of resource usage not only decreases the amount of waste generated, but also leads to greater profits and creates opportunities for recycling and reusing the wasted resources. In a lot of cases, resource optimization leads to a reduction in carbon footprint which is vital due to the currently degrading environmental conditions. Since India agreed to ratify the second commitment period (2013-2020) of the 1997 Kyoto Protocol for the reduction of Greenhouse Gases and thus reduce the carbon footprint, the need for cutting emissions and correspondingly minimizing waste through resource optimization has gained more importance. The rising trend of green technologies has facilitated in optimization as well as cutting down on energy usage and reducing emissions.

There are few steps I’ll like to recommend to help with resource optimization, which are;

**Step 1: Define the objective to reflect organizational mission and strategy**

The resource optimization model must reflect not only the well-defined, often narrow departmental objectives but also the objectives that are most important to the organization as a whole. There also needs to be an understanding of how activities will support these objectives, and how success or failure will be measured.

**Step 2. Get executive buy-in and foster accountability**

It’s not enough for executives to agree on the goals, business rules and constraints, and decisions that will be made. Putting the “best” choice for each decision variable into action requires accountability and commitment from implementers and executives.

**Step 3: Define the conceptual resource optimization model**

To define the model, you first need to determine what input data is available. The cleaner and more accurate the data, the better. The more historical depth and relevance, the better. Next, identify variables that can actually be changed and decisions that can realistically be made in this organization within the given time frame.

**Step 4. Formulate the resource optimization model**

This step is the translation of your conceptual model into an analytic model with more rigor and detail, represented in mathematical terms. In this step you begin to formally code the key elements of the optimization model – objective, constraints and decision variables. There is no single “right” way to use mathematical expressions to represent the elements of a decision problem. Every formulation represents a compromise because no mathematical representation can reflect every detail of a real-world scenario. Good modelling balances realism and workability.

**Step 5. Implement and update the model**

Test the optimization model for suitability. Training and experience will help you to choose the best model. It’s important to understand how well the model works in the real world and to incorporate the knowledge from previous versions of the model into future ones.

Analytical models must be validated and continually updated. Best practices for resource optimization are tied to.