

Waste Re-Engineering, Recycling of Products and Mineral Reclamation: A Need of the Hour for Future Sustainability

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With the progress of civilization there is an always exponential demand for raw material utilization to sustain the materialistic requirement of the human race. With passage of time man learnt to process raw materials to produce final products of desired size and shape as per utility to suffice the needs of life and daily activities. The process of conversion of the raw material to a finished product is always assisted with waste generation. Depending on the raw materials grade, process route entrusted for manufacturing and professional practice at the concerned industrial unit, waste generation also varies. With passage of time there is an ever-increasing thrust on demands for more materials for various applications leading to stress on raw materials, their supply and logistics support. Raw materials are either to be mined out from natural resources or sometimes need to be re-processed out from wastes. With demand of various materials for products, there is waste generation of multitude dimension in every front which itself is a challenge. Waste management thus becomes an uttermost importance since unscientific disposal of wastes creates lot of problems and stress on land. Generally, wastes are coming from any industrial and municipal activities are either solid, liquid and gaseous form. It is not necessary that wastes are all useless they also contain several important constituents for use. For example: Blast Furnace slag, Steel melting shop slag have utility in construction sector as well as for fertilizers. Process optimization in connection with waste generation is now becoming a strong trend since raw materials are not of unlimited supply. Natural resources are executing signs of constraints in various forms like interrupted supply, unavailability of proper grade leading to difficulty and stress on research development for product maturation with lean grade materials. Working with lean grade materials involves lots of more energy and process upgradation which cause waste generation. Without proper scientific approach of waste handling, landfill problem is becoming more acute along with environmental pollution, soil conditioning problem and others which possess further chain of critical challenges for sustainability of various human activities including availability of proper agricultural land and forest coverage. As per law of conservation of mass, materials are constant in the universe either created or destroyed maintaining an equilibrium. Disturbance of equilibrium may shift the balance in either direction which may cause catastrophic impact on sustainability. With more focus on green energy sector, alternative methods of energy generation are under need which also cause more shift on different material processing with exploitation on different natural resources. Wastes should be treated like another source for extraction materials for our needs since natural source may get exhausted just like in the case of hydrocarbon and coal reserves. Recycling of different items or wastes addition during any process already in practice is coming up with supports of proven research and development. It leads to reduction in raw material demand as well as saving of energy leading to reduction of energy consumption for product development. Any sort of energy generation is found to be directly linked with green house gas emission which could be reduced by such practice and adoption of new techniques. Directly it would also control excessive mining activities that is required from extraction of materials from earth sources. Mine reclamation is now days in practice after the mine got exhausted of the reserves for the required time period. Mine reclamation is noted to be useful to regenerate natural conditions like soil, vegetation and other factors which may help in distant future for sustainability and maintenance of ecological balance. Thus, in brief it could be noted with vital interest that waste re-engineering for better utility and source, recycling of products and mine reclamation is linked in a certain chain or cycle which actually reduce energy consumption,

green house gas emission, maintaining balance of optimum utilization of natural resources thus paving the pathway for better future and sustainable approach.

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