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Editorial

Sustainable Manufacturing: A Step for Mindful Consumption and Circular Economy

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Sustainable manufacturing is the demand of time. Due to limited availability of natural resources, there is constant demand to reduce consumption [1]. Manufacturers are seeing the carbon footprint associated with the process. Mass manufacturing has given rise to newer techniques of manufacturing which are highly advanced techniques and the energy consumption of such processes is very high. For example CNC (Computer and Numerically controlled) machining centers consumes a lot of energy [2] and are associated with enhanced carbon footprints.

Researchers are constantly working towards newer ways to promote green processes such as green and sustainable manufacturing. It is a manufacturing process which is designed keeping in mind the aspects of environment and its factors. There are various factors such as cutting fluids/lubricants, machining technique, cutting tool, work piece type, cutting conditions etc. that plays a crucial role in the amount of pollution caused by the manufacturing process [3, 4].

Researchers are emphasizing on usage of vegetable oil as cutting lubricant/ fluid in order to cause less pollution, and releasing less poisonous vapors to surroundings which are dangerous to machine operator as well as the environment. Also the advanced cutting tools which are used to perform cutting operations are generating less power, lesser forces and hence enhanced power consumption. Examples of advanced coating are Titanium Nitride, Titanium Carbide, Tungsten Carbide etc.

The other factor in the sustainable manufacturing is the Industry 4.0 concept, which is slowly moving to Industry 5.0 concept. In this concept, various CNC manufacturing machines and methods are integrated with computer and the concept is termed as intelligent manufacturing. The Industry 4.0 concept has revolutionized the product variant market. Taking example of car industry, previously lesser number of variables or car models were available [5]. But now a days, there are lot many options in the market for the customer to choose. Even the cost of cars is getting less and less with each passing day. And the quality is improving. People are experimenting beyond 6 σ(six sigma) concept. This is basically helping customer to get a variety of products. However it is also encouraging consumerism. And people are buying products due to enhance their status [9], in a way it is promoting mindless or less mindful consumption [8]. This again will lead to wastage of resources [10].

The concept of sustainable manufacturing has given rise to integration of various machine learning technologies as Artificial Neural Network, Genetic Algorithm, Particle swarm Optimization, Ant Colony Optimization etc. These all techniques basically helped in making the overall process of manufacturing more efficient [6, 7].

Also a newer area is emerging by the name of Remanufacturing. It means the defective products instead of being thrown straight forwardly in the garbage bins are remanufactured. It has it's own customers. Even people having less purchasing power are buying second hand and remanufactured products. The concept of reuse is well integrated in Indian culture. People believed in sharing their old clothes, left food, old furniture, old books, etc. with the needy ones. This has encouraged reuse and hence a step towards sustainable manufacturing.

The sustainable manufacturing is aided by other sustainable practices as sustainable supply chain, shared inventory hub, Just in Time technology etc. The Japanese concept of Kaizen or the practice of continuous improvement has given rise to continuous development in the arena of sustainable manufacturing [11]. A lot of emphasis is being given to product design stage, which actually eliminates the rejection cost. The production people are being involved in the design process and hence the functionality of product is also retained. The concept of design for sustainability is attaining significance these days. This all helps in economical production. The capital thus saved can be directed towards development of other industries. Even the manufacturing which was earlier pure man based, has moved to machine based involving generation of computer based programs, analyzing big data, cloud data storage, Internet of Things, machine Learning techniques, JIT inventory, and has given rise to concept of circular economy.

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