

# Current trend in sustainable manufacturing system environmental sciences essay

[Business](#), [Manufacturing](#)



Material and energy resources direction includes the proper choice, installing and managerial of it in fabricating will give impact on the production procedure, energy ingestion and even cut down the pollution. Manufacturer nonsubjective towards sustainable fabrication is maximise the production while minimise the use of stuff and energy resources because the monetary value of the stuff and energy had increased due to consuming of stuffs and non-renewable resources ( Leahu S. , 2012 ) . The demand for merchandise that non environmental friendly should besides be minimize. Stakeholders plays of import function as going external forces for the manufacturer or maker towards bring forthing or utilizing merchandise or stuff which require less energy to bring forth ( Leahu S. , 2012 ) . Factors contribute the consciousness of stakeholders to pull off the fabrication efficiency is the pollution particularly, the planetary heating and besides the addition monetary value of the resources ( Bunse K. , Sachs J. , and Vodicka M. , 2010 ; Ramani K. et Al, 2010 ) . Resources are defined as natural stuffs, energy resources and all operating supplies. Three methods to better the decrease of stuff and energy resources is discussed which are the resource efficiency direction, merchandise design and the value concatenation optimisation.

Energy is a cardinal factor in economic development and in supplying critical services that improve quality of life where required for run intoing all of the basic demands such as nutrient and wellness, agribusiness, instruction, information, and other substructure services ( Kamaruzzaman et. Al, 2011 ) . Therefore, there have possible menaces of energy deficits, planetary heating, and clime alterations pose to society explicate why energy policies worldwide progressively concentrate on developing renewable energy

( Shun-Chung and Li-Hsing, 2011 ) . Besides, utilizing the renewable energy resources can cut down the struggles among states sing energy militias, cut down the pollution and cut down energy related to illness and deceases ( Richa et al. , 2010 ) . There have assorted types of energy resources such as biomass energy, biodiesel energy, hydropower, solar energy, weave energy and etc. These energy resources are considered as renewable and hence, sustainable over comparatively long term. Each of the renewable energy resources is briefly explain in the undermentioned subdivision.

### **Integrated product-process-machine fabrication**

Manufacturers are responsible on the sum of resources consumed for production of merchandise. The duty non merely on the maker, the authorities besides play of import function by utilizing the economic instruments. The policy wedges under economic instruments is controlled by the authorities. Economic instruments operate by bear downing monetary value for the usage of environmental resources likewise to environmental revenue enhancement. This activity improves is decrease of resource usage to merchandise end product promote consumer to exchange from resource inducement merchandises to less resource inducements merchandises. However, maker played more of import function by bettering the resource efficiency is one method to cut down the resource ingestion.

### **Resource Efficiency Manufacturing**

Efficiency in fabrication is measured via the sum of energy ingestion ; the benefits and cost nest eggs ( Bunse K. , Sachs J. , and Vodicka M. , 2010 ) .

Resources efficiency is the decrease of natural stuffs, energy and all

operating supplies because these factors are interrelated and strongly interlinked. Manufacturing procedure and efficiency, merchandise design and value concatenation optimisation are three standards that give impact on fabrication efficiency.

## **Manufacturing Process and Efficiency**

The efficiency can be improved in many countries in organisation because each section plays of import functions and affected the procedure in organisation. Thin fabrication is one construct that can better efficiency status where the organisation organizes every individual subdivision in the production by extinguishing the waste in order to bring forth merchandise good. The wastes are from human, infinite, tools or equipment, engineering, and technology clip in developing new merchandises ( Deros et al, 2011 ) . Two big leagues ' countries are focus to better the resource efficiency which is the public-service corporation optimisation and value technology and stuffs be aftering methodological analysis ( Sheng T. L. , Shiuh T. J. , and Ling L. C, n. d. ) . Under public-service corporation optimisation, command the H<sub>2</sub>O evaporated and H<sub>2</sub>O discharge in chilling tower is one manner of energy and waste optimisation. Upgrading the warming, air outing and chilling systems can well take down the public-service corporation cost such as planetary energy direction multi-variable nonlinear system theoretical account ( Lv H. , Duan P. , Yao Q. , Li H. , and Yang X. , 2012 ) . Electrical system efficiency direction needs to be considered to obtain planetary electrical energy ingestion decrease. The first phase design of electric motors must dwell of a few standards which achieve the criterion and

besides in good public presentation in footings of environmental sustainability. The standards must be standard to forestall inefficiency during production. Example, the EROD ( Energy decrease oriented design ) platform, which composed of several interrelated systems and tools. The EROD platform can pull off different functionalities in the procedure design which eventually to the full use the electric motors and aid cut down the energy use ( Favi C. , Germani M. , Marconi M. , and Mengoni M. , 2012 ) . Third on the H<sub>2</sub>O preservation by put ining new water-reduction equipment such as installed the closed-loop systems that enable H<sub>2</sub>O to be recycled ( Jasinowski J. J. , n. d. ; Sheng T. L. , Shiu T. J. , and Ling L. C, n. d. ) . The value technology and stuff planning methodological analysis besides aid in bettering the fabrication efficiency. Materials System Applications and Products ( MSAP ) works by place the spreads between the stuff planning algorithm and existent stuff use. Then, model the relationship of machine use and waste coevals. This theoretical account will demo the decrease of waste coevals and betterment in methodological analysis from the first planning. The theoretical account able to propose the optimum processing and transporting paths and at the same clip meets the criterion of sustainable design ( Lv H. , Duan P. , Yao Q. , Li H. , and Yang X. , 2012 ) .

## **Merchandise Design**

Sustainability and merchandise design correlated as the early design determination give impact on the sustainability. Early design determination besides consequence the full merchandise 's life rhythm including the supply concatenation ( transit and logistic ) . Design forenvironmentand Eco-design

tools are discussed as parts of invention in the whole value concatenation merchandise ( Ramani K. et Al, 2010 ) . Design for environment. Example of design and sustainability is design for environment ( DFE ) and life rhythm appraisal ( LCA ) . Design for environment considered the consequence of the design procedure processs towards environment and the design constituent is design towards sustainability ( Ramani K. et Al, 2010 ; Rosen M. A. and Kishawy H. A. , 2012 ) . The procedure must keep the merchandise quality, the monetary value offer and the public presentation of the procedure and besides the merchandise. Design applied scientist is hired to plan a merchandise and procedure which eco-design. Eco-design is an attack of planing a merchandise or procedure with particular consideration on the consequence to the environment during the full life rhythm. Therefore, we need eco-design tools to guarantee that our design run into the specification that the procedure is environmental friendly or can cut down the pollution.

One of the eco-design tools called life rhythm appraisal ( LCA ) . LCA is used to analyse the all stages of merchandise life to see the environmental public presentation of procedures and systems. LCA consist of for stairss get downing with the end and range definition, analysis of the stock list appraisal on the impact and informations reading. LCA measured the energy and resources ingestion. ISO 14040: 2006 explained about the LCA ; the rules and the model. Figure Thirty shows the stairs for placing environmental impact in LCA.

## Value Chain Optimization

Value concatenation procedure is the complicated path in fabrication or organisation for resource efficiency. However, good planned concatenation direction will honor a batch to the environment and economic nest eggs. The value concatenation optimisation is examined the primary energy needed of the pre-production resources, the nursery gas emanation as CO<sub>2</sub> equivalent, the direction of the material resources and besides all the energetic resources. This encourage the overall procedure efficiency and sustainability. The model of value-based public presentation covered the investing, operation and fiscal.

Global heating, lifting energy monetary values, and clients ' increasing ecological consciousness have pushed energy efficient fabrication to the top of the docket among authorities and fabrication companies. Governments and companies are both endeavoring to place the most effectual steps to increase energy efficiency in fabrication procedures. Katharina et Al. ( 2010 ) stated that, the fabrication industry, with its 31 % of primary energy usage and 36 % of C dioxide ( CO<sub>2</sub> ) emanations, is one of the chief consumers of energy every bit good as one of the largest emitters of CO<sub>2</sub>. The European Commission ( EC ) estimates that an energy salvaging possible for the fabrication sector of 25 % could be realized by steps such as implementing energy efficient motors, fans and lightings ( EC, 2006b ) .

Katharina et Al. ( 2010 ) once more explained that from the fabricating companies ' point of position, there are three of import drivers to present energy efficiency betterments. The first manner is by raising the energy

monetary values. Rising monetary value for oil and gas monetary values every bit good as other fossil fuels like coal due to scarceness of the specific resources leads to the minimisation of energy ingestion and more of import for fabricating companies. ) . Resource monetary values can be expected to lift continuously in coming old ages ( Berger, 2009 ) due to lifting energy monetary values and the associated rise production costs for steel, chemicals, etc. , doing an addition in other buying costs every bit good. Other than that, energy efficiency betterment can be introduced by new environmental ordinances with their associated costs for CO<sub>2</sub> emanations. As the fabrication sector is responsible for about one tierce of planetary CO<sub>2</sub> emanations, different policy enterprises and market-oriented ordinances like revenue enhancements, subsidies, tradable emanation licenses, and green certifications were introduced in several states. Companies that improve their energy efficiency and accordingly their C footmark can better their place to face challenges and costs ensuing from current and future CO<sub>2</sub> ordinances. Apart from that, altering buying behaviour among the clients with respect to 'green ' and energy efficient merchandises and services besides can be an alternate in presenting the energy efficiency betterment. Companies and end users regard energy efficiency in the usage stage of a merchandise as an of import standard for their buying determinations. Though consumers might non yet pay attending to energy efficiency in the production stage, energy efficient fabrication can be a major factor to cut down the entire environmental impact of a merchandise. As energy efficient fabrication can hold a important impact on the environmental public presentation of a merchandise, it can go a important driver for fight. The



above mentioned drivers make energy efficiency an of import pillar lending to all three facets ( ternary underside line ) that are considered in sustainable fabrication models ( see Fig. # ) .

Examples in the literature and in the universe of pattern show that although the fabrication sector has made uninterrupted betterment in energy efficiency, economically good energy efficiency potency is non yet exploited. Few documents identified the grounds why the executions of energy efficiency betterment steps are really low among the companies and they are:

Decisions based on payback periods alternatively of involvement rate computations Low capital, a low precedence given to energy efficiency by the direction deficiency of information or `` difficult-to-measure constituents " of energy investings ( such as dealing or monitoring costs )

Several surveies have besides identified a low position of energy direction as a barrier to energy efficiency. Energy direction can be good for industrial companies for economic, environmental or social grounds. The criterions ISO 50001 and EN 16001 specify some of import demands for direction systems such as the scene of marks and aims and the measuring of energy ingestion. The Implementation of an energy direction can be an alternate to cut down energy ingestion and the related CO2 emanations. Within the model of energy direction the integrating of energy efficiency into production direction is one of import lever to heighten production systems towards energy efficiency as it may be the footing for successfully implementing energy

efficiency betterment steps. The term 'management' can be defined as "the maps of planning, forming, and commanding the transmutation procedure and its public-service corporation in supplying a good or service to clients". Some research workers define 'energy direction' as using "to resources every bit good as to the supply, transition and use of energy. Basically it involves monitoring, mensurating, entering, analysing, critically analyzing, commanding and airting energy and stuff flows through systems so that least power is expended to accomplish worthwhile purposes". In Katharina et Al. (2010) paper, they defined 'energy direction in production' as including control, monitoring, and betterment activities for energy efficiency. Energy efficiency public presentation has to be considered at the same time with other of import public presentation countries of industrial companies, such as cost, flexibleness, bringing clip, and quality.

The first measure for measuring and implementing betterment steps is mensurating and commanding the energy efficiency in production procedures. The determinations can be made with relevant information on impacts of energy public presentation ensuing from production planning and concern determinations, by set uping production information systems towards energy efficiency. The mensurating system can be done by utilizing Key Performance Indicators (KPI). The development and application of energy efficiency indexes depend on the intent for which they will be applied. Other than that, is to utilize the benchmarking system to mensurate the energy efficiency during the production procedure. However, benchmarking for energy efficiency indexes may be implemented for specific industry

sectors and on state degrees, but for works and procedure degree merely few indexes for benchmarking exist.

Energy efficiency monitoring, benchmarks, and audits are of import for energy direction, as they enable determination shapers to place betterment chances and to maintain path of the effects of their determinations on energy usage. Monitoring and analysis of the energy ingestion of machines and support and fabrication procedures is a measure towards increasing energy efficiency. Insufficient monitoring may ensue in companies non being cognizant of their possible for profitable energy investings.

Furthermore, direction system criterions taking at increasing the environmental public presentation and the energy efficiency of a company by bettering the organisation processes exist. This standardisation increases the transparence of companies ' procedures and stakeholders can more easy measure the committednes of a company for bettering its environmental public presentation. Apart from that, this criterion besides provides a model for energy-saving activities and counsel for practical actions for energy director can be found.

## **Biomass Energy**

Biomass energy refers to the energy of biological system such as wood and waste that shops sunlight in the signifier of chemical energy ( Sunday, 2012 ) . The chief usage of this biomass energy in developing states including Malaysia is every bit firewood for cookery and warming. Because of Malaysia is a tropical state that has first-class conditions so that it can guarantee the

good in turning status of high biomass energy resources. Therefore, in Malaysia, the Nation Energy Policy has established the importance of Renewable Energy beginnings and highlighted the focal point on the renewable and environmental preservation. Nowadays, states more interested in the turning in biomass energy that will lead to the decrease of poorness in developing states, increase the sustainable energy supply and cut down the emanation of C dioxide. ( Ying et al. , 2011 ) Biomass is one of the oldest and simplest manner to utilizing the energy by burning procedure to bring forth the electricity and heat ( Amine, 2011 ) . Therefore, biomass is considered to be one of the chief renewable energy resources of the hereafter due to its big potency for economic viability and assorted societal and environmental benefits.

## **Solar Energy**

Solar energy is the most promising of the renewable energy beginnings in position of its evident illimitable potency. The Sun radiates its energy at the rate of about  $3.8 \times 10^{23}$  kilowatts per second. Most of this energy is transmitted radially as electromagnetic radiation which comes to about 1.5kW/m<sup>2</sup> at the boundary of the ambience. After tracking the ambience, a square meter of the Earth 's surface can have every bit much as 1 kilowatt of solar power, averaging to about 0.5 over all hours of daytime ( Sunday, 2012 ) . In malice of high potency, solar energy engineering are non now widely used, except for flat-plate solar aggregators for domestic hot H<sub>2</sub>O production in the coastal parts. ( Kamil, 2002 ) . In Malaysia, the most solar

power are used for domestic degree merely such as hot H<sub>2</sub>O system, H<sub>2</sub>O pumping and drying of agricultural green goods ( Tick et al. , 2010 ) .

## **Wind energy**

Wind power is the transition of air current energy into more utile signifiers, normally electricity utilizing air current turbines. Harmonizing to Betz 's jurisprudence, wind turbine can take advantage of up to 60 % of the power of the air current. Nevertheless, in pattern, their efficiency is about 40 % for rather high air current velocities. The remainder of the energy denseness of the air current non gettable is exergy loss. This exergy loss appears chiefly as heat ( Arif, 2008 ) . The use of this energy is still in the early phase because of the deficiency of fiscal option. However, in Malaysia, air current energy transition is a serious consideration that the potency of this energy is depends on the handiness of air current resource that varies with location. Therefore to develop the undertaking of air current energy, the natural air current at the site shall understand clearly ( Tick et al. , 2010 ) . The air current sector showed impressive growing rates in the twelvemonth 2009 possibly due to an addition in consciousness of the importance of air current energy and its economic, societal and environmental benefits ( Kamaruzzaman et al. , 2011 ) .

## **Hydro power**

Hydropower is the lone renewable energy engineering that is commercially feasible on a big graduated table in Malaysia. Furthermore, hydropower dikes can and hold made of import and important parts to human development which is a renewable energy beginning and produces negligible

sums of nursery gases. In long term, it shops big sums of electricity at low cost and it can be adjusted to run into consumer demand. Furthermore, hydro dikes are multipurpose and are built chiefly for social-economic development like irrigation, H<sub>2</sub>O supply, inundation control, electric power and betterment of pilotage ( Ong et al. , 2011 ) . Hydroelectricity contributes about 2. 8 % ( 2000 MW ) of Malaysia 's entire electricity demands and supplying 6 % of universe energy supply. Tenaga Nasional Berhad operates three hydroelectric strategies in Peninsular which are Sungai Perak, Terengganu and Cameron Highland with an installed generating capacity of 1911 MW ( Tick et al. , 2010 ) . Presently, the biggest hydropower undertaking in Malaysia and largest dike in South-east is the on-going Bakun hydropower undertaking holding a capacity of 2400 MW, located at Sarawak and it is emission free which has no impact on planetary heating. This Bakun hydropower will function the electricity to the peninsular of Malaysia through the undersea cables that will be ready on 2015 for first stage overseas telegrams and 2017 for the 2nd stage ( Shafie et al. 2011 ) .