Transforming industries with green alternatives

SDGs and ESG / By Nikhil Sawhney / March 31, 2023

Climate change is one of the central problems caused due to global industrialisation and economic growth. Manufacturing, one of the sectors in India that is expanding substantially, has a significant impact on both economic and sustainability issues as it is a dominant contributor of greenhouse gases (GHG) and other pollutants. The key question is whether manufacturing companies can pursue industrial expansion while simultaneously remaining conscious of how production negatively impacts the environment.

Green and sustainable manufacturing will be essential to accomplishing India's ambitious development goals, which include lowering carbon dioxide (CO_2) emissions in half by 2030. The process of green manufacturing holds the key to achieving long-term sustainability and defending the earth from new dangers posed by climate change. To reduce the industrial influence on climate change and other environmental issues, green manufacturing focuses on altering business and production methods as well as stakeholders' mindsets. Through practical means, manufacturers can promote sustainable practices within their production facilities, throughout the supply chain, and among their consumer base.

environmental advantages. Sustainable manufacturing is the production of manufactured goods using economically viable procedures that reduce their harmful effects on the environment while preserving energy and other resources. Additionally, safer production practices improve worker, community, and product safety. In order to boost growth and worldwide competitiveness, an increasing number of businesses are addressing "sustainability" as a crucial goal in their strategy and daily operations. The small group of people who historically identified as "green" has expanded significantly, and this movement now encompasses numerous well-known manufacturing ıpanies in a wide range of commercial sectors.

ı Can Businesses Incorporate Renewable Energy?

ɐn manufacturing lowers waste, encourages safe production, and lessens its impact on the ronment by using green energy sources like non-fossil or renewable energy. They can create market eco-friendly goods or implement production techniques that minimise waste, ssions, and pollution while putting an emphasis on recycling and reusing.

g renewable energy is one of the most effective strategies to construct a more sustainable environment. There are several renewable energy sources, including sunlight, wind, rain, tides, waves, and geothermal heat. Fossil fuels have been crucial to running the biggest factories in the world for more than a century. While a radical shift won't occur overnight, electrification is on the rise, and according to the most recent Global Energy Perspective, renewable energy sources could supply more than half of the world's electricity by 2035—and in the majority of regions, at a lower cost than through the use of fossil fuels.

Sustainable Approaches Currently Employed in the Sector

The manufacturing facilities of the future have the potential to lead to verifiable sustainability outcomes as well as decreased costs by reducing waste and water usage, modifying energy loads, cutting heating requirements, and embracing carbon-neutral manufacturing. And a crucial component of the energy transition is green hydrogen. This has the potential to fundamentally alter India's energy security, as the country now imports about 53% of its gas and 85% of its oil. The country is considering mandating the purchase of green hydrogen by oil refineries and fertiliser factories in order to promote clean fuels. Green hydrogen is created by electrolysing water to separate it into hydrogen and oxygen using a machine fuelled by renewable energy sources like solar and wind.

Carbon capture, utilisation, and storage (CCUS) is another key technique for reducing emissions that can be used across the energy system. Carbon dioxide (CO_2) from fuel combustion or industrial processes is captured via CCUS technology, transported by ship or pipeline, and then either used as a resource to produce useful goods or services or permanently stored underground in

becomes almost emission-free, provided that the carbon capture facility is powered by clean electricity.

The Joule-Brayton cycle and the Rankine cycle, two examples of existing thermodynamic power cycles, normally run on air or water, respectively. However, the focus has shifted to the use of different working fluids as a means of achieving better cycle thermal efficiency and resolving some of the technical issues associated with current cycles. The Supercritical Carbon Dioxide (sCO2) Technology programme seeks to create highly effective and less expensive indirectly heated power es that outperform advanced ultra-supercritical steam and serve as the technological ıdation for directly heated power cycles based on more sophisticated fossil energy conversion ems. The direct-fired cycle produces a high-purity stream of carbon dioxide that is ready for sumption, reuse, or storage, which can facilitate carbon capture. Advancements in sCO2 ınologies can lead to significant progress in meeting the national climate and energy goals.

de range of energy conversion and storage technologies will be needed to meet the need for ure, reliable, clean, and sustainable energy. In addition to the application of technologies to ease overall energy efficiencies, such as waste-heat recovery, and the continued use of fossil fuels, this is likely to involve the production of nuclear power, concentrated solar power plants, and the use of blue and green hydrogen, eventually with carbon capture and storage. Thus, it is likely that thermodynamic power cycles will continue to play a crucial role in future energy networks.

(This article is authored by Nikhil Sawhney, Vice Chairman and Managing Director of Triveni Turbines)

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