

The Circular Economy Imperative



In a major decision, the 2020 Tokyo Olympics authorities have decided that the medals to be given to winners in the games will be made from 50000 tons of electronic-waste produced in Japan.

Johnson Controls, USA, has designed a battery that is 99 percent recyclable, which for a product so chemically complex and hazardous is of enormous importance.

Highly deficient in precious-metal resource India, which produces a whopping 2 million tons of e-wastes annually - is at the cusp of mobilizing its recycling strategy. The world seemingly has realized the true need of circular economy!

The rapidly emerging Indian economy will continue to compel geologists, technocrats, economists, manufacturers, service-providers and policy-makers to explore superior options to face the challenge of growing material consumption and depleting natural resources. The increasing consumption demand for material is primarily due to increased population and prosperity; demographic changes; lifestyle transformations; and intervention of disruptive technologies. The result is increased volatility in product prices and ecological imbalance, affecting societies adversely. Scarcity of material is a concern but the good news is that the Circular Economy approach can serve as a powerful solution.

Circular economy seeks to eliminate all kind of wastes in market. Here waste does not refer to traditionally what is termed as junk/trash, but refers to underutilization of products. Waste is classified as – (i) Waste of resources - where material/energy cannot be regenerated, eg, fuel; (ii) Waste of capacities - where assets are hardly or not fully utilized, eg, poor utilization of family-owned cars; (iii) Waste of life-cycles - accelerated development of new-products, processes and business-models resulting in difficult-to-serve demand peaks, eg, iPhones; and (iv) Waste of embedded-value - precious-metals/energy get lost in waste-streams, eg, Gold, Palladium in e-waste.

The widely used linear business-model of ‘mine-refine-shape-assemble-use-discard’ ends up in waste generation. As the Indian economy aims to be a \$5 trillion economy, demand for material will significantly strain the manufacturing supply-chain in the linear model.

India expects to double its consumption of metallic resources by 2030. India's per capita consumption of stainless steel has touched a new peak of 2.5 kgs in 2019 (ISSDA report). The per capita consumption of Aluminum in India is just 2.5 kgs vis-à-vis 24 kgs in China. Consumption of Copper is likely to double in next five years. The consumption of anti-corrosion metal Zinc is only 0.6 kgs vis-à-vis world average of 2 kgs. India is the largest consumer of Gold in the world, mostly imported. For such a growing consumption and widening production-consumption gap, material recyclability and improved natural-resource productivity can provide a sustainable relief.

The concept of recycling/reuse is not new in Asia. The practice of younger siblings wearing clothes or shoes worn by elders has been common. The second-hand garments, furniture, utensils and vehicle markets, though unstructured, are common in India. This phenomenon is replacing the linear model by the circular model of ‘mine-refine-shape-assemble-use-collect-reprocess-reuse’ with a ten ‘R’ approach as its backbone.

The first ‘R’ attempts to reduce material consumption by using reliable products with longer life, eg, unlike the use-and-throw shaving-razors. Also additive-manufacturing and 3-D printing in new-product development (R&D) and in manufacturing of spare-parts of aircrafts can lead to practically no waste generation. In the re-market route, the discarded products are resold and utilized in an alternate market in different avatars, eg, Cars24; OLX in the used automotive market. Large volume of defective products is discarded even when a repair-intervention can provide a longer life, eg, Kitchenware. The repair route is appropriate here. In the refill



route, the product under breakdown due to End-of-Life (EoL) of one of its parts may get a new lease of life if the defective part is replaced with a new EoL part. Refurbishing or remanufacturing is another business route. For instance, machine tools, home-appliances, etc, are refurbished to its near original state of performance. Remanufactured car-engines can be 30-50% less expensive, with original quality standards, with reduced lead-times. The retro-fitment route upgrades (CNC conversions/improved features) existing machine tools, which is a growing industry today. In the reuse of parts route, discarded products get their parts having residual EoL stripped-off, to be used in another product, eg, electronic goods. The reuse of high-value metals route extracts the high-value metals like Gold, Palladium, Iridium from e-wastes to be used in other



applications. In the Reprocess scrap route, instead of discarding engineered products like motors, batteries and canisters, metals like steel, copper, lead can be recovered efficiently via scrap-melting route. It will save material-waste and embedded energy. Finally, the rental route is a product-as-a-service business model providing tangible goods as a service. In place of purchasing a product, provide a shared-platform for multiple end-usage. For instance, UK based Hydrogen Fuel Cell car manufacturer – Riversimple behaves as a lessor rather than a manufacturer by charging a rental, covering maintenance, fuel and insurance from its customers. Instead of selling robots for spot-welding to car manufacturers, robot manufacturers can not only build, own and operate robots but also sell the client what it really wants and needs - World-class weld-spots, thereby maximizing utility and life of robots and delivering more reliable cars. The Ten 'R' approach can accelerate the circular economy drive but not without associated barriers and challenges.

One of the first barriers being the inferior positioning of remanufacturing business with OEMs. Creating a sense of urgency and awareness of its larger benefits and introducing material circular in schools/colleges can trigger the change.

The challenge in handling the probabilistic reverse-logistics for collection of discarded products in terms of varying quantum, quality and frequency is genuine. It induces volatility in business. Low collection-efficiency of products after EoL is a big challenge. To facilitate collection, ownership will have to move upstream in the supply chain. Rental/shared-platform related approach can majorly eliminate issues of collection.

Lack of strong product-design based reverse supply-chain is leading to a challenge in improving collection of EoL products. Smart designs, taxing virgin-material application and moving towards zero-landfills may be the way out. The current less privileged informal sector MSME engaged with repair and maintenance of products will have a critical role to play for the effectiveness of the approach. Higher degree of transparency of ownership coupled with access to smartphones and internet; reducing costs of sensors and RFID etc. are facilitating mapping of physical systems digitally to track EoL of products.

Lack of incentive for product-return in today's disposable society with 'cash-rich' and 'time-poor' consumer needs revisiting. In circular business-models the shift from volume-driven to product-longevity driven sale, keeping the product alive and relevant for extended period will be a challenge. Rapid awareness creation of the key-drivers to circularity to the young population is the order of the day. The current customer and producer/seller interaction does not facilitate the circularity approach. It will have to transform from a transactional to relationship/collaborative oriented process, improving targeted flow of EoL products in the value-stream. A quick implementation of a comprehensive circular economy policy by the government has become inevitable, as the Indian government finalizes the legal framework for effective looping of material in automotive sector and National Resource Efficiency Policy.

In summary, the author envisages a Version-2 of the Swachh Bharat initiative, encompassing material circularity. The initiative will continue giving rise to new ideas to improve material circularity through smart-designs; green reverse-logistics; innovative remarketing strategies; improved recovery technologies; new remanufacturing/retrofitting industries; renewed stakeholder-collaborations; and new platforms for product as a service. The future of material consumptions would rest of the five Core-beliefs defined by Hammer and Somers- Think Lean, Think Limits, Think Profit per hour, Think Holistic and Think circular.

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