



WHITE PAPER

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# Sustainability in the Medical Device Industry

FutureBridge

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## **The Medical device industry is a slow adopter of Effective Sustainability programs**

...delaying further was out of choice despite adoption complexities like recycling of infectious materials and getting regulatory approval for even small change in design, business drivers like lightweight of plastics; the higher cost involved in sourcing alternate materials and getting regulatory approvals for these materials and change in design; and negative consumer perception about reusable medical devices/material.

The financial benefits against the sustainability initiatives play a key to their adoption, in addition to driving positive environmental impact. Sustainability programs for the healthcare industry have moved ahead of just environment (recyclability) to other factors such as economy, health outcomes, quality, stakeholders, and society. Annual savings of 8.6 Million USD is estimated from utilizing reprocessed single-use devices alone.

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# Introduction

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In recent years, the world is getting increasingly concerned about the increase in carbon footprints which is one of the major reasons for climate change, acid rains, ozone depletion, and many other environmental hazards to name a few. The solution as mooted by most of the governments, experts & industry players is to move towards sustainable development. This has given rise to a megatrend – Sustainability. Sustainability focuses on maintaining the balance between current needs and an uncompromised future. The concept revolves around three major pillars: economic or profit, environmental or planet, and social or people. According to the UN World Commission on Environment and Development, “Sustainable development is the development that meets the needs of the present without compromising the ability of future generations to meet their own needs”.

## **The healthcare industry lagged adoption of sustainability concepts...**

.... as compared to other industries globally. About 3–8% of national greenhouse gas emissions are estimated to be contributed by healthcare facilities in developed countries<sup>1</sup>. American hospitals produce 5.9 million tons of medical waste every year<sup>2</sup>. This waste primarily contains the consumable medical devices. The single-use medical products end up in landfills negatively impacting the environment. Despite these burning issues, the healthcare and Medtech industry adopted these programs very late. Some of the reasons for the late adoption of sustainability programs are safety concerns, difficulty in altering established processes like thorough sterilizations of reusable devices using eco-friendly chemicals, negative perception about reusable consumables, and healthcare cost benefits of using harmful materials like plastic.

## **It has become an obligation for the industry to embrace sustainability**

Sustainability has a significant impact on the entire healthcare value chain and therefore regulators have set expectations from the industry and have put a great amount of moral pressure to adopt greener alternatives for patient care. In addition, societal & consumer pressure, encouragement of the government, growing interest within the medical device industry, and willingness of the other stakeholders to extend support the healthcare sector has prioritized its efforts towards its obligations for the environment and overall sustainability.

## **Few are the early adopters within the industry but these are not enough**

Many organizations have proactively implemented sustainability initiatives through robust programs. A few big players like Baxter, Stryker, and Abbott have already implemented it at various stages of its product value chain. These players are thriving with innovative approaches to design and optimize processes for achieving sustainability in the healthcare sector. Still, the industry lacks greater participation mainly due to factors like cost surges & negative consumer perception for recyclable/reusable medical devices.

## **Collaboration is a must for sustainability goals in the healthcare space**

Medical device developers are responsible for designing eco-friendly products and they are collaborating with the suppliers to opt for greener alternatives to materials used in manufacturing medical devices. Healthcare facilities such as hospitals have been influenced by the wave of sustainability and prioritizing it in their architectural designs, operations, and purchase of medical necessities. Integrating sustainability into the healthcare industry can be achieved through a range of activities: recycling and waste reduction, development of greener architecture designs, and preference for less toxic alternatives, efficient energy management, and supply chain optimization.

# **Current state and future possibilities lead to environment protection through reuse and recyclability**

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## **Baby steps should turn to giant steps**

Currently, considering the healthcare sector as a whole, many institutions and organizations have started taking initiatives directed toward sustainability. However, the medical device sector, one of the important sub-sector of the healthcare sector is looked at in isolation, very few have started moving towards sustainability. There are a variety of reasons which justify its lower adoption in the medical devices industry. Despite these challenges, most companies have started their journey towards sustainable solutions. But they usually begin by analyzing the most measurable & logical aspects of their operations i.e. energy consumption, waste recycling, and usage of renewable energy. But that is like a drop in the ocean when compared to the impact of the end-products that they manufacture. Hence sustainable product design is required to make a significant impact. (*Refer Exhibit 1*)



## EXHIBIT 1: Reasons for Lower Adoption of Sustainability in Medical Device Industry

### Different priorities

Currently safety and usability is the top priority for most of the medical device companies followed by affordability and it clearly outweighs their emphasis on sustainability

### Risk assessment process not encompassing environmental impact

The current risk assessment processes of most of the organizations do not take environmental impact into consideration or lay very little emphasis on it

### End-user perception

End-users or patients in the medical device industry hold a negative perception of recyclable medical device products as they have always seen it as something that is disposable and not re-used.

Hence changing this perception will also play a pivotal role if these companies have to be successful in achieving their sustainability goals

### Increase in cost

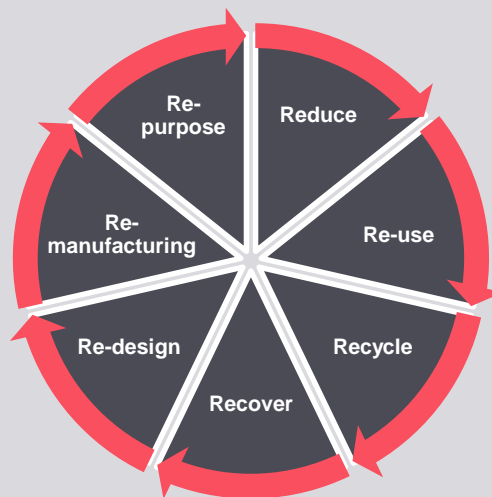
Sustainability initiatives can spur the cost of the end-product which can result in increased pressure from government & payers who are always reluctant to any increase in the final price of a medical device product.

This can impact the reimbursement or approval of medical device products.

Source: FutureBridge analysis

Keeping sustainable product design as an ultimate goal, the approach taken by the medical device industry is not wrong. Howsoever small impact, any initiative taken towards reducing the environmental impact is always welcome by the society at large and it would help the companies in the longer run. Having said that, a lot can be done by medical device companies to achieve their sustainability goals. The first step is to analyze the value chain and identify the areas in which companies can take up sustainability initiatives.

## EXHIBIT 2: Ways to Achieve Sustainability

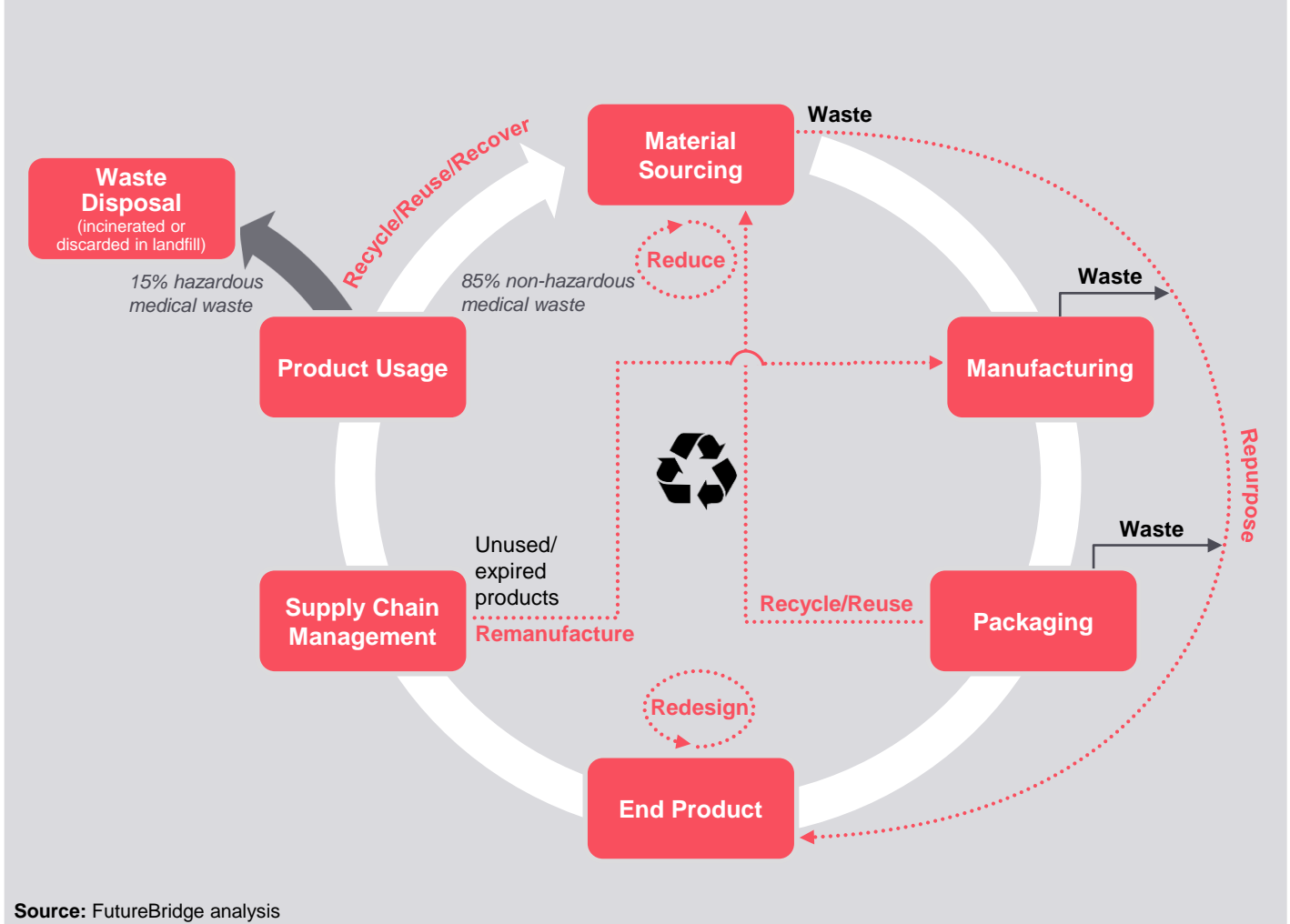


Source: FutureBridge analysis

### Different initiatives are required at each level of the value chain

The value chain of the sustainable medical device industry is concerned with identifying the environmental impact of a given product or process at each stage. The value chain allows the engineer to make a quantitative comparison of a product's life stages to determine the environmental benefit and ultimately monitor the long-term effect of changes in the product lifecycle.

**EXHIBIT 3: Applicability of Sustainable Initiatives across the Medical Device Value Chain**



There are a variety of steps/initiatives that can be taken at each stage of the value chain. Each company/organization needs to analyze its value chain to identify the solutions that can be implemented which best suits the company's interest alongside achieving its sustainability goals.

## Engineering designs have evolved as the major priority in the Medtech industry

- Sustainability in infrastructure design is the easiest of all and should be the priority while embarking upon the journey of sustainability. Most of the companies who have started their journey have begun by tweaking their engineering designs.
- High energy consumption by air conditioners can be replaced by less energy cooling systems
- Consumption of energy by overhead lamps can be replaced by installing skylights on the roof
- Recycling of water should be adopted, which would be helpful in water availability for toilet flushing and external irrigation
- Rainwater harvesting should be embraced
- Electricity consumption can be replaced by renewable energy sources such as wind, solar power, and hydroelectricity
- Sewage treatment plant helps in energy production and waste reduction

***Example:** Baxter's facility in Sao Paulo, Brazil, installed a ceramic roof that reduces solar heat gain and decreases building heating and cooling losses. This improvement saves an estimated 84,600kWh of energy a year<sup>3</sup>.*

## Raw material sourcing and Manufacturing should lead to minimum emission

The manufacturing system generates a lot of waste while producing a great number of resources. Therefore, medical device manufacturing industries must implement sustainable manufacturing that generates less harmful materials and fewer carbon footprints.

To enhance and optimize the existing processes, it is important to develop new processes that use less harmful materials and generate fewer emissions which can be considered as green processes.

- Companies can ensure the raw materials sourced from different vendors are bio-based/biodegradable materials which would help embark upon sustainability right from the beginning of the product life cycle.
  - Sustainable raw materials extracted from natural, renewable resources (such as trees and plants) are an alternative to non-degradable materials.
  - Plastic raw material can be replaced with plant-based raw materials OR bio-plastics such as maize stalks bio-PET, bio-PE, and bio-based nylons.

- Alternatively, products should be designed with easy disassembly, which helps in the process of repair, reuse, repurpose, and remanufacture
- The product should be flexible, which allows environmental improvements, like materials substitution, while retaining competitiveness.
- Increased product customization would make flexibility increasingly important.
- Laser brings environmental advantages by reducing emissions during manufacturing processes while extending the tool life because of its non-contact nature.
- CNC milling manufacturing process can be replaced by Direct Metal Deposition (DMD) as its less environment burdensome, moreover, this manufacturing process is better for simple moulds with a low solid-to-cavity volume ratio.
- Reduction in energy consumption in a machine tool can be done through the use of a kinetic energy recovery system (KERS) similar to regenerative breaks used in automobiles.
- Reduction in the cost of machining tools can be enhanced by using cutting fluids which extends the machine tool life.
- Bio-based fluids such as vegetable oils are bio-degradable and renewable. Furthermore, they also perform better in terms of prolonged tool life, better chip breaking, and lower tool wear, and lower cutting forces. Bio-based fluids perform better in terms of prolonged tool life, better chip breaking, and lower tool wear, and lower cutting forces.
- Usage of less environmental toxic chemicals for sterilization and other purposes
- 3D printing can significantly reduce waste during the R&D stages of development, whereas most other manufacturing methods are subtractive and generating a lot of waste.

**Example:** American start-up Lia recently produced the world's first flushable pregnancy test made up of natural plant fibers as toilet paper. It works in the same way as a traditional OTC pregnancy test<sup>4</sup>.

### **The packing material and packaging method should be eco-friendly**

Sustainable packaging is the development and usage of packaging materials that are either bio-based or biodegradable. It can limit the usage of single-use plastics that can take over 400 years to biodegrade.

- Sustainable packaging should provide strength and durability in relatively light weights for medical device packaging, thus allowing heavy delicate parts to be protected, using less material.



- Sustainable packaging should prevent microbial infiltration with a wide range of sterilization techniques that helps in preventing damage or contamination to medical devices/ drugs during transportation and storage.
- Plant-based raw materials or bioplastics such as maize stalks or sugar beets, bio-PET, bio-PE can be used as an alternative to plastics.
- The end product should be an inert material that should not leach harmful compounds into groundwater.

**Example:**

- *Abbot started a pilot program last year that replaced a larger single-use box with a smaller one that is reusable, recyclable, and made from 100-per cent organic-based materials for shipment of some physician samples that require refrigeration<sup>5</sup>.*
- *Origin is a healthcare packaging solutions designer which offers a range of packaging solutions for making tablet packaging, dropper bottles, and ready-to-use vials out of polyethylene (PE) and polyethylene terephthalate (PET), as these materials are easily recyclable<sup>6</sup>.*

## **Effective distribution and green supply chain would be a key to success**

Smart distribution and competent transportation are key to sustainability. The effective & green distribution network is the one that ensures sustainability right from manufacturing to the final distribution of a product.

- Choose a packaging partner that can perform complete activities from design to tool building under one roof. This would ensure no or minimum transportation of intermediate products and hence reduction in energy and carbon footprints.
- Choose a packaging partner that has several global locations, offers a regional manufacturing facility to reduce the necessary transport distance. Which ultimately benefits the original equipment manufacturer (OEM) and the environment.
- Reduce the number of distribution centers and introduce more deliveries direct to customers avoiding unnecessary journeys.
- Selecting the right locations for distribution centers, to allow efficient transportation from factories to customers.
- Switching from road journeys to rail and sea freight known as intermodal transport can help in reductions in CO<sub>2</sub> emissions and cost.
- Alternative fuels to cut carbon dioxide emissions
- Well-specialized software to increase supply chain productivity.

**Example:** Baxter also collaborated with an office supply company in the US to change its minimum order requirement from \$35 to \$50, resulting in a reduced number of office supply shipments. This change saves approximately 4.3 metric tons of carbon dioxide-equivalent emissions and 2,100 corrugated boxes annually<sup>7</sup>.

In addition to the above-mentioned solutions, many more can be implemented by leveraging advanced technologies. However, a lot depends on the company priorities, life stage, financial aspirations, and market situation such as return on investment (ROI), cost & competition.

Sustainability should be viewed as Created Shared Value (CSV) activity rather than a burden of Corporate Social Responsibility (CSR) activity. And when it is a CSV activity, obviously it cannot be devoid of challenges.

## Barriers to Go Green

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There are several hurdles when it comes to the adoption of sustainability or going green in the medical device industry.

### **Cost sensitivity of the Medtech industry is very high**

One of the major barriers to sustainability in the healthcare sector is its perception of being costly. Rather the focus must be on the true value derived from sustainable ideas. The investment in sustainability may be justifiable when analyzed based on the return on such an investment. Many cost-effective and energy-saving strategies can be applied in the healthcare facilities, including hospitals and medical device manufacturing companies like the incorporation of natural light in facility design, passive energy-saving techniques, motorized blinds, and alternative energy solutions (such as geothermal energy, fuel cell technology, and variable refrigerant flow systems for appropriate areas)<sup>8</sup>.

### **Disposability and recyclability of contaminated material invites huge risk**

Plastic has offered huge benefits to the healthcare industry by providing lighter, cost-effective devices and packaging. Despite these benefits, plastics pose a severe threat to the environment. Recycling these plastics waste is a bigger challenge. Healthcare facilities must be trained on proper waste disposal.

The increase in fear against blood-borne pathogens like HIV has fuelled the growth of single-use devices in the medical industry. Its widespread usage ranges from a simple syringe to complicated surgical devices. With many benefits of disposable devices, there are obvious drawbacks attached as we look at the complete product

devices, there are obvious drawbacks attached as we look at the complete product life cycle. Many virgin materials go into disposables and these materials are often discarded after a single use. The challenge is to work within this disposable device business model to increase sustainability and reduce costs, while still safeguarding the pillars of sustainability. Smart choices about materials, packaging and distribution can result in modifying the sustainability of the existing architecture of the medical device.

For instance, Syreen (Cambridge Consultants) is a novel pre-filled syringe that has been designed with the concept of sustainability, as well as patient safety and support, in mind. Made from amorphous sustainable polymer plastic, cyclic olefin polymer (COP), rather than glass, the design acts as both the primary drug container for injection and the secondary packaging.

### **Packaging in plastic is practiced due to product safety, lightweight, and low cost**

The medical products are packaged in plastic containers that often end up in landfills after the removal of the medical products. Instead of packing the products in a plastic container, one can choose sustainable packaging materials to make the environment plastic-free, greener and safer.

For instance, EcoVue, a US-based company is manufacturing water-based ultrasound gel that is supplied in simple packets rather than in the usual plastic bottles. The use of these packets prevents 1.5 million plastic bottles from being disposed of in landfills each year (as per company claim).

### **Lengthy product development cycle discourages replacement with eco-friendly products**

The prospect of sustainable medical device design is referred to as another design restriction due to highly regulated space. The possibility of legal accountability and lengthy product development cycles has also slowed the acceptance of sustainable practices in the medical device industry. Sustainability can be inculcated from the start of device design to avoid reiterations. Multiple product life cycle analysis tools are available in the market including software programs such as Eco-it and Simapro, and environmental impact analysis tools like Eco-Indicator 99 for promoting rapid, eco-friendly device designing.

### **Lack of harmonized regulations has created confusion**

There are several regulations for minimizing waste or eliminating hazardous substances from consumer products. The regulations are Waste Electrical and Electronic Equipment (WEEE); Restriction on Hazardous Substances (RoHS); Registration, Evaluation, and Authorization of Chemicals (REACH); and Energy

Using Products (EuP) regulations. Most medical devices are exempted from these regulations. A worldwide (or nationwide) harmonized environmental regulation for medical devices is needed for companies to understand the importance of sustainability and inculcate in their device designs.

## Conclusion

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Attaining sustainability in a cost & quality-sensitive industry like medical devices is a challenge but not impossible. Many medical device companies move towards sustainable development in their respective capabilities. Companies like Stryker have implemented Stryker's Sustainability Solutions (SSS) which is the leading provider of reprocessing and remanufacturing services for single-use medical devices whereas Johnson & Johnson Medical Devices Companies (JJMDC) recently launched a new sustainability capacity tool to address the environmental impact of health systems and reduce costs through incorporating sustainability practices<sup>9,10</sup>. The need of the hour is that the industry leaders should come together and deliberate on the possibilities of implementation of such initiatives by overcoming the challenges. But it will never be a one-way journey. Equal support is required to be extended by the other stakeholders like government, payers & end-users i.e. providers & patients. Though a few payers have already started taking initiatives that would inspire the industry towards environment-friendly products. For instance, Kaiser Permanente has started the Environmentally Preferable Purchasing (EPP) Program that uses a variety of sourcing strategies, business forums, and disclosure mechanisms to uncover and capture opportunities throughout our supply chain that benefit the environment and human health<sup>11</sup>. Together it can be made possible otherwise medical device industry will end up being a laggard as compared to other industries when it comes to sustainability and call for wrath from the general population & environmentalists even if they are not playing their respective roles in helping the industry to successfully achieve their sustainability goals.

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