KLS martin GROUP

Elevating surgical sustainability

The advantage of reusable devices in healthcare

Together with our customers, we are committed to innovating reliable and trendsetting energy-based surgical solutions. Every day, we passionately work on developing products and services that assist in optimizing clinical results which contribute to the well-being of the patient.

Abstract

With the increasing social emphasis on environmental conservation, the need for action also extends into the healthcare sector. However, the effective reduction of waste in the medical industry has yet to reach the desired level. A major challenge in this regard is the widespread use of disposable products, comprising the bulk of medical devices and contributing significantly to waste generation. Regulatory bodies, hospital systems, and consumers are urging for more sustainable solutions, intensifying the pressure to instigate tangible actions.

Opting for a more sustainable direction involves integrating more reusable devices. Nevertheless, ensuring the unquestionable safety standards of medical products remains a top priority. A life cycle assessment comparing single-use and reusable devices for vessel sealing shows the benefits of adopting a reusable approach in surgical procedures. The findings indicate that conducting 50 surgeries with one reusable device instead of 50 disposable devices, decreases the total carbon footprint by 36%.

Laying the foundation: Understanding sustainability

In contemporary discourse, sustainability unfolds across three dimensions: social, economic, and ecological. Each of these dimensions emerges in various ways within healthcare and medical technology.[1]
Social sustainability focuses on the value and influence of actions in relation to society, particularly in the context of working conditions along the entire value chain. KLS Martin Group is dedicated to advancing this aspect of sustainability by engaging in research collaborations and supporting various associations and projects aimed at promoting medical progress, training clinical staff, and enhancing the quality of life for patients.[2]
Economic sustainability, achieved through strategic initiatives, aims to ensure long-term financial stability.[3] This includes preserving jobs and fostering moderate growth to sustain an organization's continued existence. This emphasis on sustainability is directly linked to management systems, ensuring the long-term stability and resilience of the company.
Environmental sustainability is already an integral part of daily discussions in several industries. The focus lies on key issues such as energy consumption, greenhouse gas emissions, waste avoidance, reduced resource consumption, and recycling.[4] The use of disposable products is prevalent in the healthcare sector. They make up the majority of medical devices and contribute significantly to waste generation.[5] Reducing the use of disposable items, therefore, offers the potential to reduce the environmental footprint of medical practices significantly.[6] KLS Martin Group is leveraging this potential by developing reusable instruments within its vessel sealing portfolio, thereby strengthening its commitment to environmental sustainability. The evaluation of this form of sustainability is particularly important in the context of comparing reusable and disposable products. To conduct a thorough assessment of sustainability, it is essential to analyze the entire product life cycle, as illustrated in Figure 1.

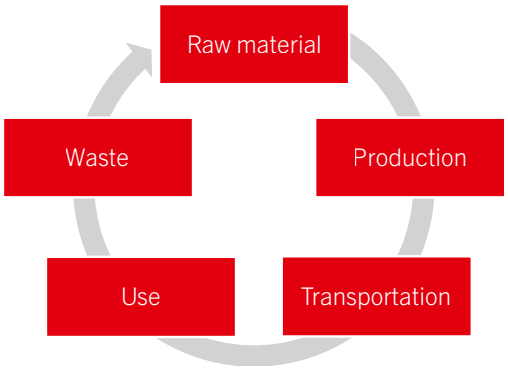

Figure 1: Product Life Cycle

Evaluating sustainability

Evaluating the sustainability of products or systems is a complex endeavor, demanding sophisticated analyses. An internationally recognized method is the implementation of life cycle assessments (LCAs). Such analyses are carried out in accordance with the International Organization for Standardization (ISO) 14040:2006, which defines the technical and documentary requirements for LCAs.[7] Building on this, ISO 14044:2006 deals with the requirements and guidelines for life cycle assessments.[8] Compliance with the standards enables a meaningful conclusion to be drawn from the analysis. LCA is a modeling tool for quantifying the environmental impact of products and processes over their entire life cycle. It involves encompassing both upstream elements like suppliers and downstream processes such as waste management linked to each life cycle stage.[9]
The basic structure divides the assessment into four phases, as shown in Figure 2, which must be covered in every compliant study.[10]

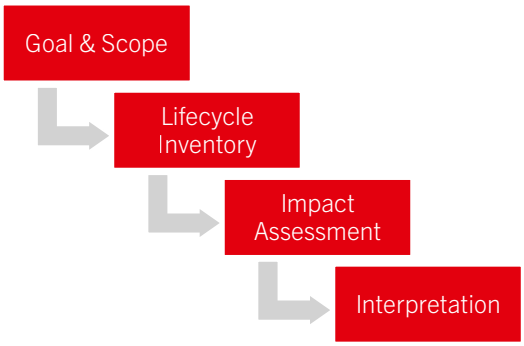

Figure 2: LCA Phases

Figure 3: KLS Martin, marClamp® Cut IQ

The first phase defines the study's goal and scope, identifying what should be measured or excluded from the analysis.
The second phase centers on creating a lifecycle inventory, where all necessary data is collected, encompassing environmental inputs and outputs associated with the product's lifecycle.
In the third phase, the impact assessment takes place, wherein previously collected and quantified data are translated into effects on the environment.
In conclusion, the fourth step involves interpreting the results, providing clarification on how the evaluated products compare to each other.

Exploring contrasts: dispose vs. reuse

The assessment focused on instruments designed for combined vessel sealing and cutting in open surgeries to facilitate a specific comparison. The marClamp® Cut IQ, 18 cm (Figure 3), chosen as the representative device for its 50-time reusability, was compared to a conventional disposable product of a similar design. Derived from the number of possible reuses, the functional unit for the comparison was established as 50 use cycles, impacting the environmental footprint across each phase of the product life cycle.

Aligned with the defined functional unit, the production requirement necessitated the manufacturing of 50 disposable devices, whereas one reusable device sufficed. During the production phase, the examined single-use devices generate 36.2 kg CO_2-eq, constituting the predominant portion of the environmental impact throughout their entire product life cycle. In contrast, the reusable marClamp® Cut IQ only causes 1.2 kg CO_2-eq during this phase.
Contrasting results were obtained in the use phase, where the marClamp® Cut IQ necessitates reprocessing through cleaning, disinfection, and sterilization before each surgery. Alongside energy and water consumption, the upstream production of the necessary personal protective equipment (PPE) is also taken into account. This results in an additional environmental impact of 30.67 kg CO_2-eq over the product life cycle of the marClamp® Cut IQ.
During the waste phase, not only must the reusable device be disposed of, but also the personal protective equipment (PPE) used during each reprocessing. Consequently, the waste phase contributes 2.33 kg CO_2-eq to the total emissions of the marClamp® Cut IQ life cycle. Nevertheless, this impact is relatively insignificant compared to the analyzed single-use devices. This is due to the disposal of 50 devices and packaging, generating 15.74 kg CO_2-eq.

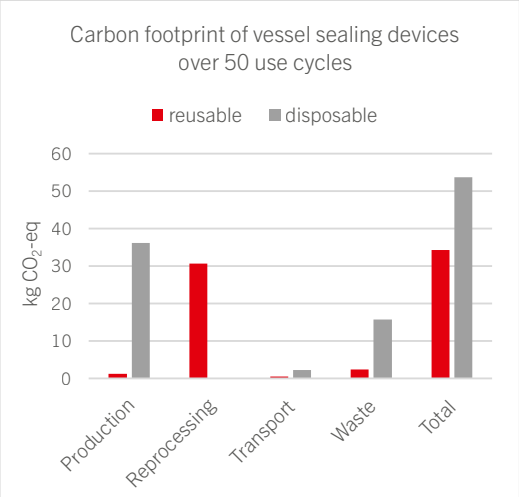

Figure 3: Impact of individual product life cycle phfases

Overall, the life cycle of disposable vessel sealing devices yields an environmental impact of 53.68 kg CO_2-eq, contrasting with the significantly lower 34.27 kg CO_2-eq generated by the reusable device. The substitution of 50 disposables with one marClamp® Cut IQ consequently reduces environmental impact by a total of 36%.

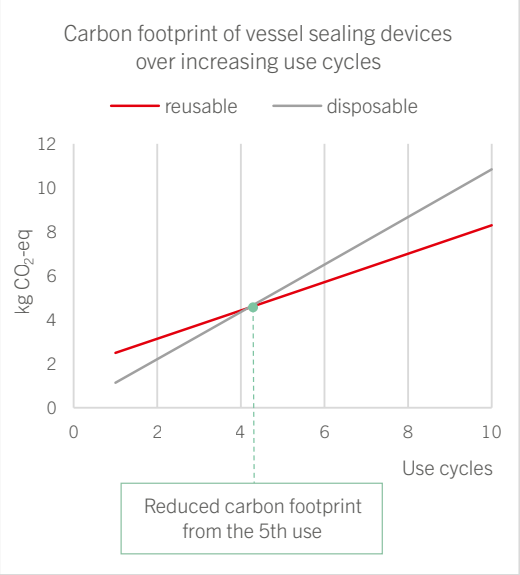

Figure 5: Impact over increasing use cycles

Considering the carbon footprint over increasing use cycles shows that the marClamp® Cut IQ outperforms the environmental performance of comparable disposable products from the fifth use onwards. The CO_2 reduction increases progressively with each use cycle, ranging from 7% at the fifth to 23% at the 10th and 36% at the 50th.

Charting a greener course

KLS Martin Group strategically incorporates sustainability into the early stages of product life cycle planning by designing reusable vessel sealing instruments. This approach facilitates the integration of the social concern for conscientious waste management within the professional healthcare sector. The proactive commitment to enhancing sustainability demonstrates that environmental responsibility does not have to compromise patient safety. Despite the additional inputs required during device reprocessing in the use phase, it yields a significant 36% reduction in the carbon footprint across the entire product life cycle by the 50th use. This is primarily due to reduced emissions in the production phase and the waste avoidance.

To fully unleash the potential of the marClamp® Cut IQ, it's highly recommended to complete at least 50 use cycles to take advantage of its reusability benefits. Emissions can already be reduced from the 5th use, with the advantages increasing substantially with each additional use.

The examined marClamp® Cut IQ serves as a demonstrating example, highlighting the advantages of the company's reusable vessel sealing portfolio. Its performance exemplifies the company's dedication to sustainability but also sets the stage for environmentally conscious advancements in medical technology.

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KLS Martin Group

KLS Martin Australia Pty Ltd.
Sydney · Australia
Tel. +61 2 9439 5316
australia@klsmartin.com

KLS Martin do Brasil Ltda.
São Paulo · Brazil
Tel. +55 11 3554 2299
brazil@klsmartin.com

KLS Martin Medical (Shanghai) International Trading Co., Ltd
Shanghai · China
Tel. +86 21 5820 6251
info@klsmartin.com

KLS Martin India Pvt Ltd.
Chennai · India
Tel. +91 44 66 442 300
india@klsmartin.com

KLS Martin Italia S.r.l.
Milan · Italy
Tel. +39 039 605 67 31
info@klsmartin.com

KLS Martin Japan K.K.
Tokyo · Japan
Tel. +81 3 3814 1431
info@klsmartin.com

KLS Martin SE Asia Sdn. Bhd.
Penang · Malaysia
Tel. +604 261 7060
malaysia@klsmartin.com

KLS Martin de México, S.A. de C.V.
Mexico City · Mexico
Tel. +52 55 7572 0944
mexico@klsmartin.com

KLS Martin Nederland B.V.
Huizen · Netherlands
Tel. +31 35 523 45 38
infonl@klsmartin.com

KLS Martin SE & Co. KG
Moscow · Russia
Tel. +7 499 792 76 19
russia@klsmartin.com

KLS Martin Taiwan Ltd.
Taipei · Taiwan
Tel. +886 2 2325 3169
taiwan@klsmartin.com

KLS Martin SE & Co. KG
Dubai · United Arab Emirates
Tel. +971 4 454 16 55
middleeast@klsmartin.com

KLS Martin UK Ltd.
Reading · United Kingdom
Tel. +44 118 467 1500
info.uk@klsmartin.com

KLS Martin LP
Jacksonville · Florida, USA
Tel. +1 904 641 77 46
usa@klsmartin.com

KLS Martin SE Asia Sdn. Bhd.
Hanoi · Vietnam
Tel. +49 7461 706-0
vietnam@klsmartin.com

KLS Martin SE & Co. KG
A company of the KLS Martin Group
KLS Martin Platz 1 · 78532 Tuttlingen · Germany
PO Box 60 · 78501 Tuttlingen · Germany
Tel. +49 7461 706-0 · Fax +49 7461 706-193
info@klsmartin.com · www.klsmartin.com