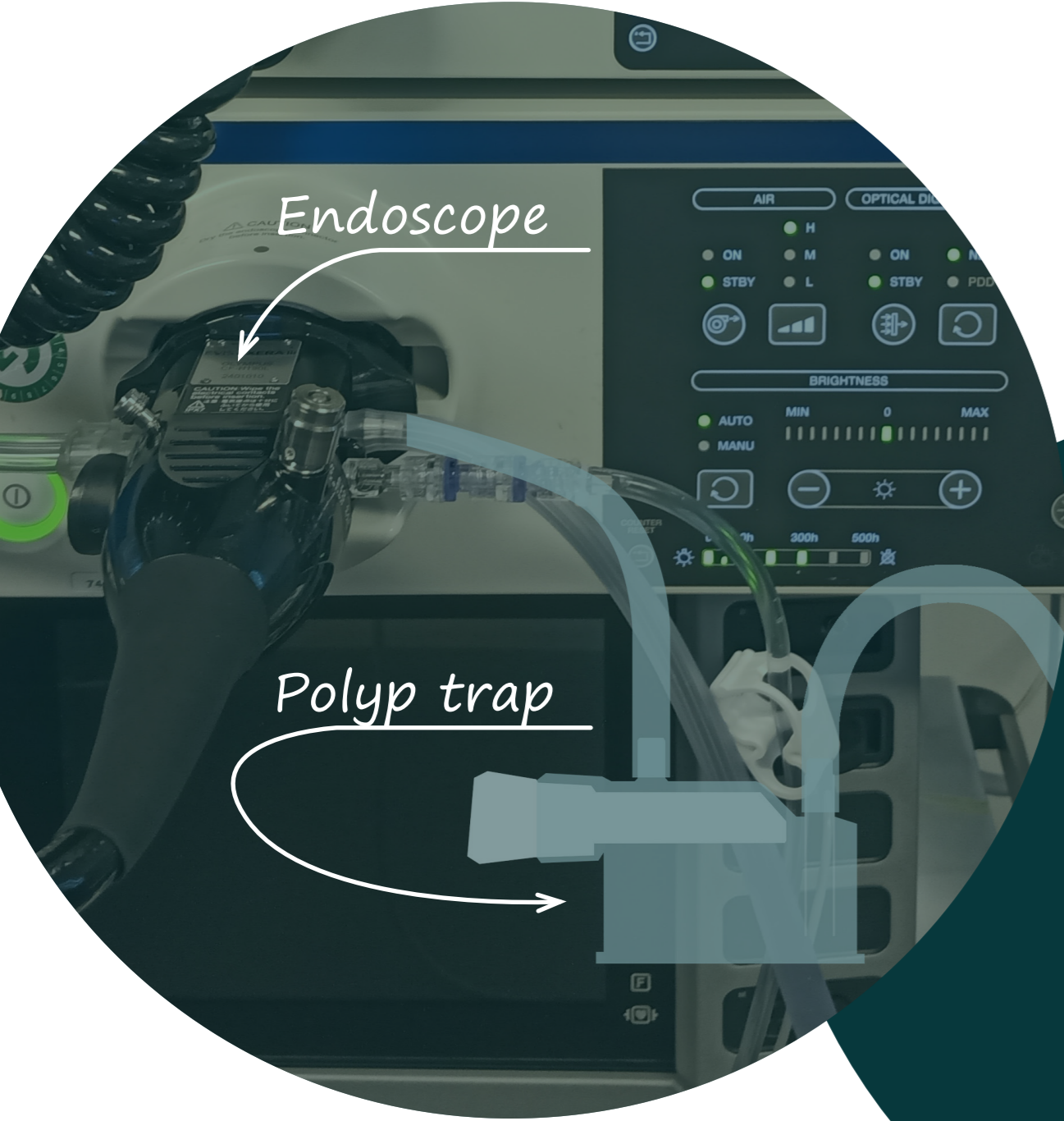


Sustainable Endoscopy

Redesigning the Polyp Trap

1. The Context: Endoscopy

Endoscopy is a minimally invasive kind of surgery. The surgeon uses an **endoscope**, a medical instrument with a long flexible tube, equipped with a camera, lights, a water and air channel and an **instrument channel**. The endoscope is inserted into the body and used to inspect internal organs. Endoscopic instruments can be inserted through the instrument channel to perform small operations.



2. The Problem: Sustainability

Endoscopy is a department with a high environmental footprint, relative to the hospital. Three main factors contributing to this, are **material extraction**, **waste generation** and **carbon footprint**. A potential cause for these factors is the frequent use of **single-use devices (SUD)**, combined with a relatively high procedure rate.

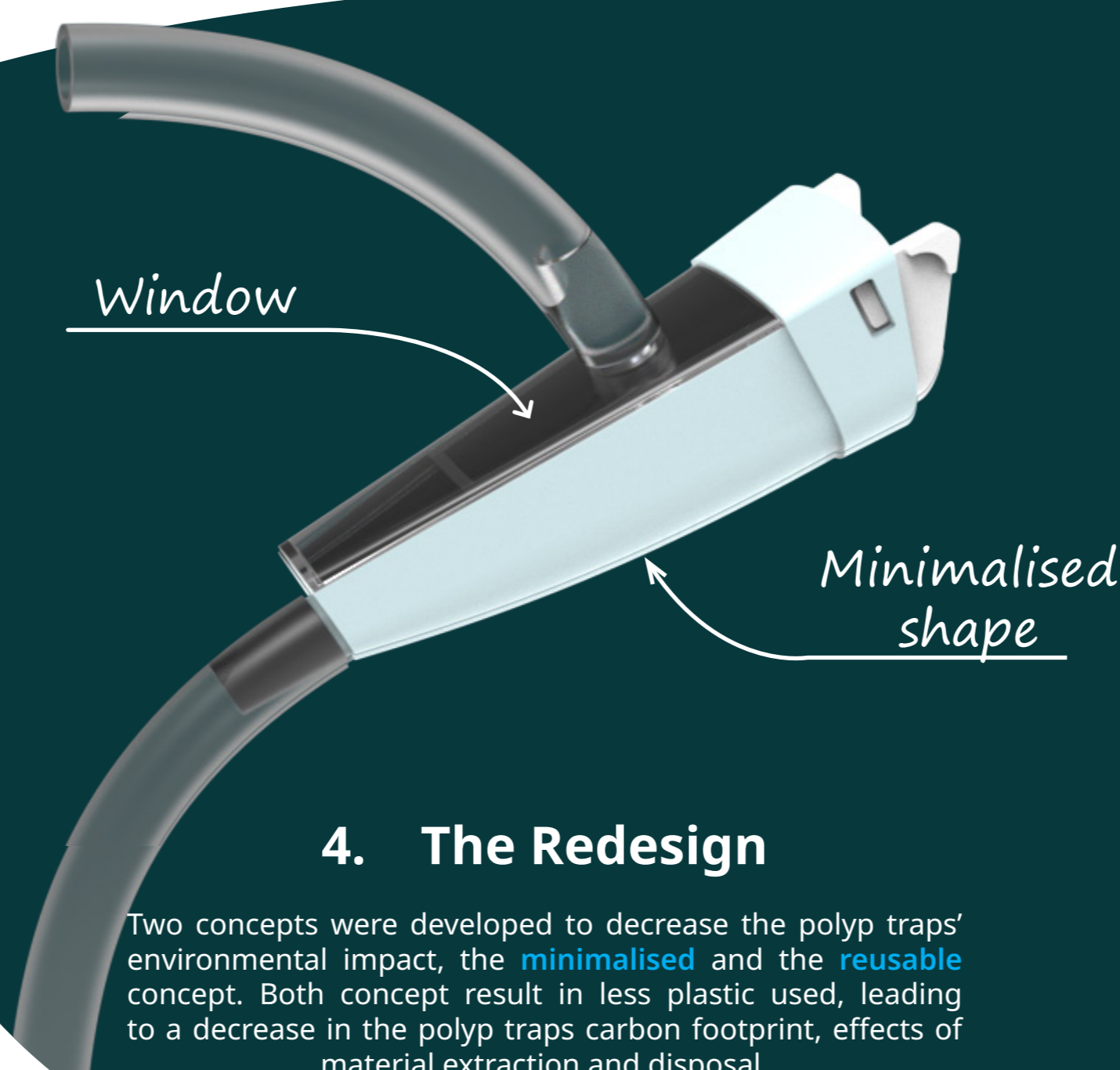
Medical SUD are used for one use cycle. This use cycle can be **a single time**, a single operation, or a fixed period of time such as **24 hours**. After this, they are disposed of and become **hospital-specific waste (HSW)**. According to EU regulations, HSW must be **incinerated** to prevent the **spread of infections**. The Polyp Trap is bound to this rule.



3. The product: Polyp trap

During an endoscopy, the surgeon sometimes removes **polyps**. A polyp is an anomalous tissue growth, positioned on a mucous membrane. As some polyps evolve into cancerous tumours when left to grow, they are removed out of precaution. This procedure is called a **polypectomy**.

During a polypectomy, the polyp is removed with an instrument inserted through the instrument channel of the endoscope. The instrument channel is also used to transport tissue and bodily fluids out of the body through the **irrigation system** and into the **wastewater bag**. A polyp trap is connected to the endoscope to interrupt this flow and catch any polyps moving from the tip of the endoscope towards the irrigation system. It has two **drawers**, containing a sieve that catches polyp tissue. A nurse checks through the container if the polyp has entered the drawer, and then removes the drawer and replaces it with a second drawer. The surgeon then continues the procedure. The nurse transports the polyp from the first drawer to a cup containing preserving fluid. This cup is sent to the laboratory where a pathologist will examine it.



4. The Redesign

Two concepts were developed to decrease the polyp traps' environmental impact, the **minimalised** and the **reusable** concept. Both concept result in less plastic used, leading to a decrease in the polyp traps carbon footprint, effects of material extraction and disposal.

5. Minimalised concept

Concept 1 is a **minimalised** version of the current polyp trap. It has a different shape, that enables a smaller size, without any loss of function. The new shape also allows the polyp trap to hang **diagonally**, reducing the **length of tube** required. Additionally, the drawers are rounded, to provide sufficient surface for the sieve, yet use less material. Lastly, the minimalised concept has a **window** rather than a completely transparent exterior. This decreases its carbon footprint, as transparent plastics with sufficient stiffness generally have a relatively high carbon footprint compared to opaque plastics. Container and drawer of the minimalised concept are made from Polyhydroxyalkanoate (PHA), a bio-based and biodegradable plastic.

Current polyp trap

Daily waste production of one endoscopy suite

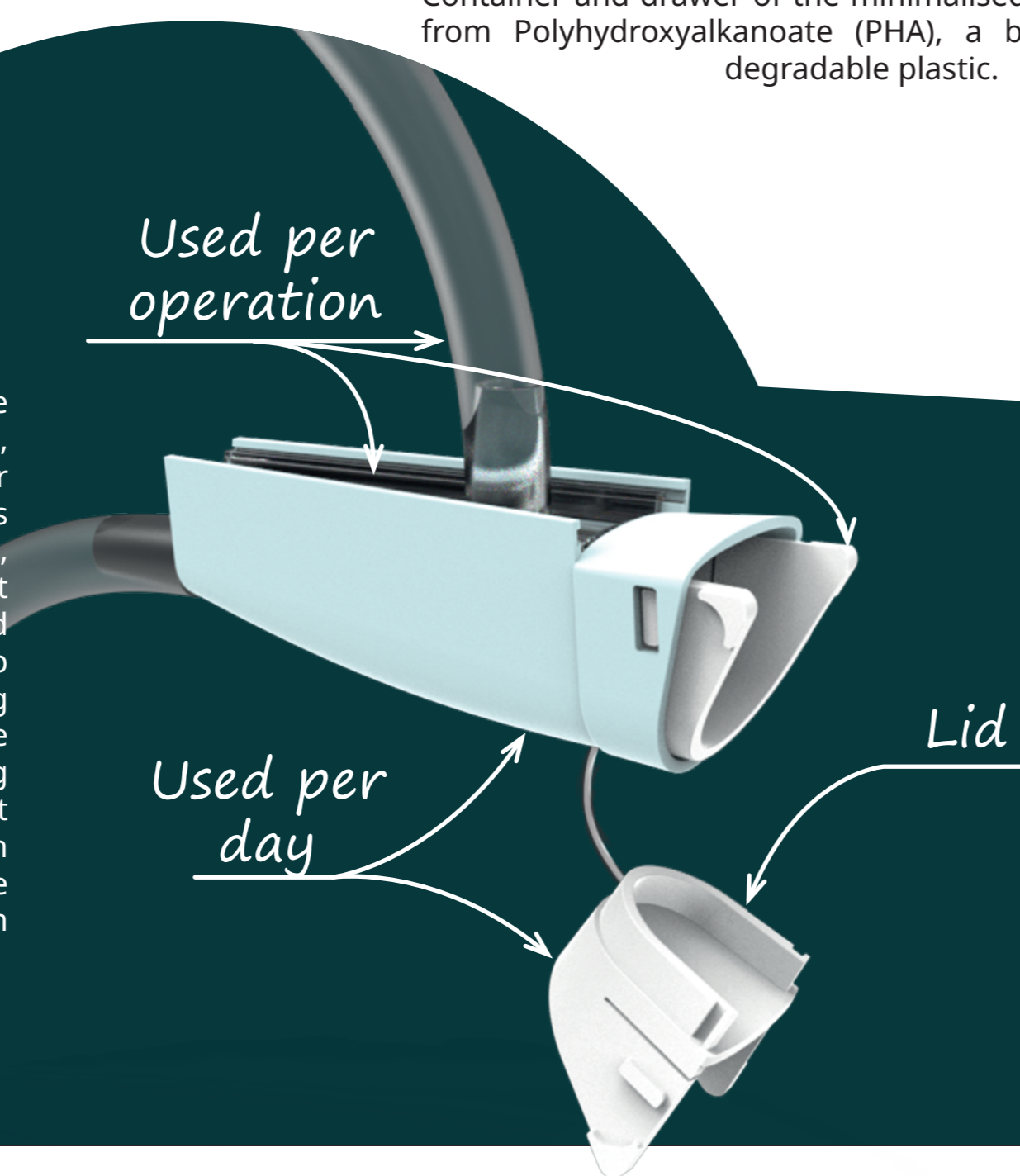
Minimalised polyp trap

Reusable polyp trap



6. Reusable concept

Concept 2 is a more visionary approach to the redesign. It is a more radical change in function, resulting in significantly less used material per polypectomy. However, it also creates new risks concerning possible tissue contamination. Therefore, extensive tests would be required before this concept could be implemented. Its **window**, **drawers** and **tube** are used for **one patient**. This prevents polyp tissue from a previous patient from contaminating that of the next patient, possibly resulting in false results. The container is used **per day**, prolonging the parts' lifetime. It has a **lid** to close the product without using a drawer. This way, the polyp trap can be flushed with water in between endoscopies. The entire polyp trap, except for the tube, is made from PHA.



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Integrated Product Design

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