

Product Report



A medical device for cheaper and more accessible diabetes tests in developing countries

Title: D+ - A medical device for cheaper and more accessible diabetes tests in developing countries

Master's Thesis
Industrial Design | Department of Architecture, Design and Media Technology
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Synopsis

This Master's Thesis focuses on diabetes in developing countries. The project is based upon qualitative data collected during field studies at clinics and hospitals in Senegal and Gambia, West Africa, and the overall vision is to design a medical device for cheaper and more accessible diabetes tests and monitorings of blood glucose levels in developing countries. The product developed in the project incorporates a newly developed electrochemical measuring method that ensures a significantly lower price for each test while not being dependent on expensive extra supplies that clinics in developing countries do not have access to.



IN SUB-SAHARAN AFRICA
MANY PEOPLE
DIE FROM
DIABETES
BECAUSE THEY WERE
NEVER DIAGNOSED

If treated correctly, people can live a good life with diabetes without complications. In sub-Saharan Africa, however, 81% of people with diabetes are not diagnosed, and many people die from diabetes related complications without ever being tested for diabetes, and people dying premature puts extra pressure on both families and societies.

D+ is a new medical device for diabetes tests focusing on this specific problem. The product is developed with the agenda of making monitorings of blood glucose levels cheaper and more accessible in developing countries and targets a growing market in need of action - now.

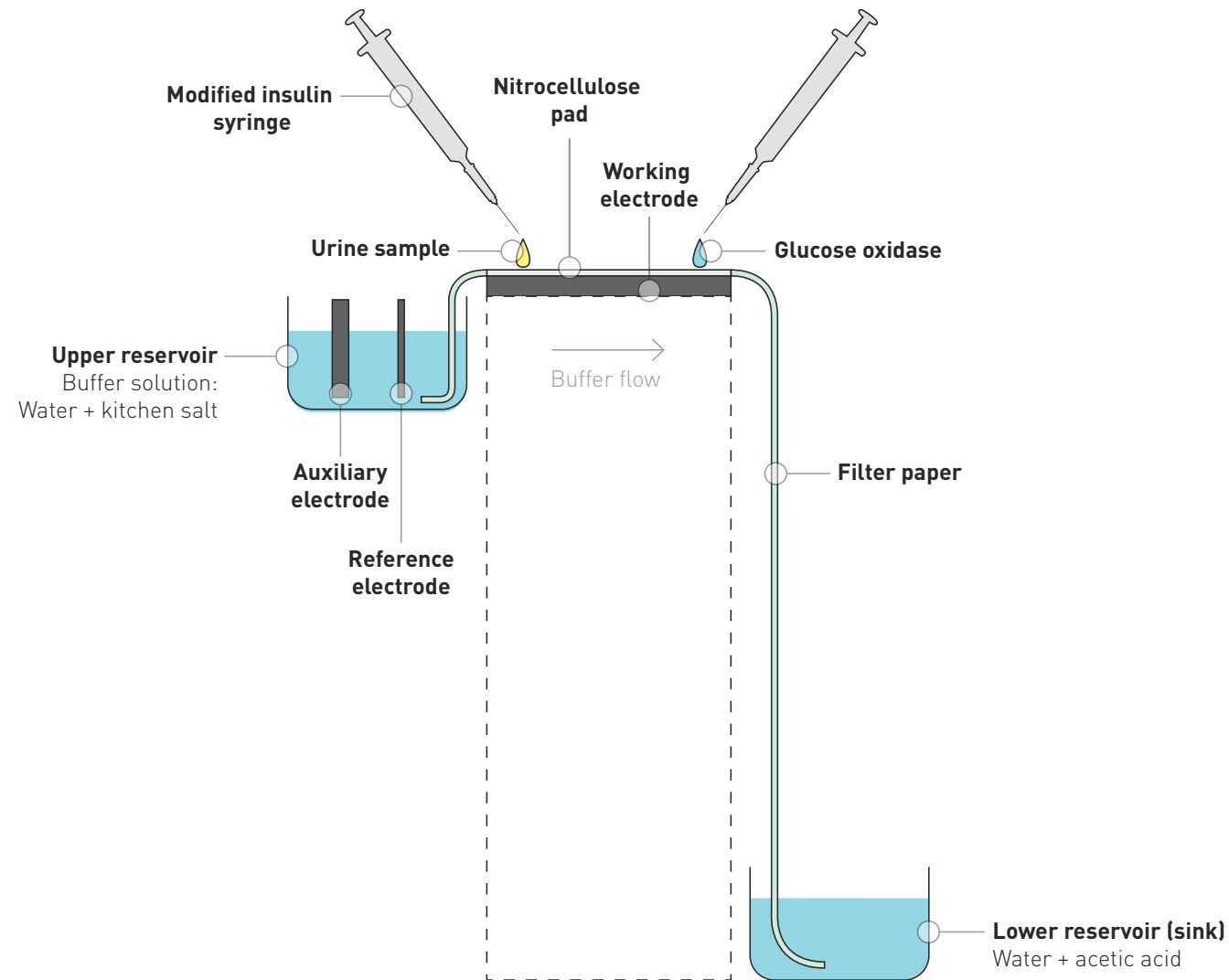


CHEAP AND ACCESSIBLE **DIABETES** TESTS FOR DEVELOPING COUNTRIES

D⁺ is a medical device to use for diabetes tests. The product is designed specifically for clinics in developing countries and is the first product using a newly developed electro-chemical analysis method for measuring glucose levels in urine.

The uniqueness of this product consists of its very low cost measuring method that does not use disposable test strips like regular blood glucose meters. The test strips are very expensive and difficult to get for clinics in developing countries causing a limited access to life-saving measurements, and D⁺ is designed to solve this problem.

When configured, the system can run 50 tests. The cost is the same whether you run one or 50 tests on one configuration which makes D⁺ the only product for monitoring diabetes that becomes cheaper and cheaper the more it is used. This gives D⁺ a unique market position as there is a big focus on making testing for diabetes more accessible in developing countries.



MEASURING METHOD

- A SHORT INTRODUCTION

The electrochemical measuring method is based on a gravity driven flow through filter paper between two reservoirs. The electrochemical system needs to be configured for every 50 test or after 10 days of use in order to inhibit microbial growth.

One configuration requires:

- 2 filter paper strips
- 1 nitrocellulose pad
- 0.9 µl glucose oxidase (cheap enzyme)
- Tap water
- ½ teaspoon of kitchen salt
- A few drops of acetic acid

Thereby, the system is based on cheap materials that are easier to get access to and is about

How does it work?

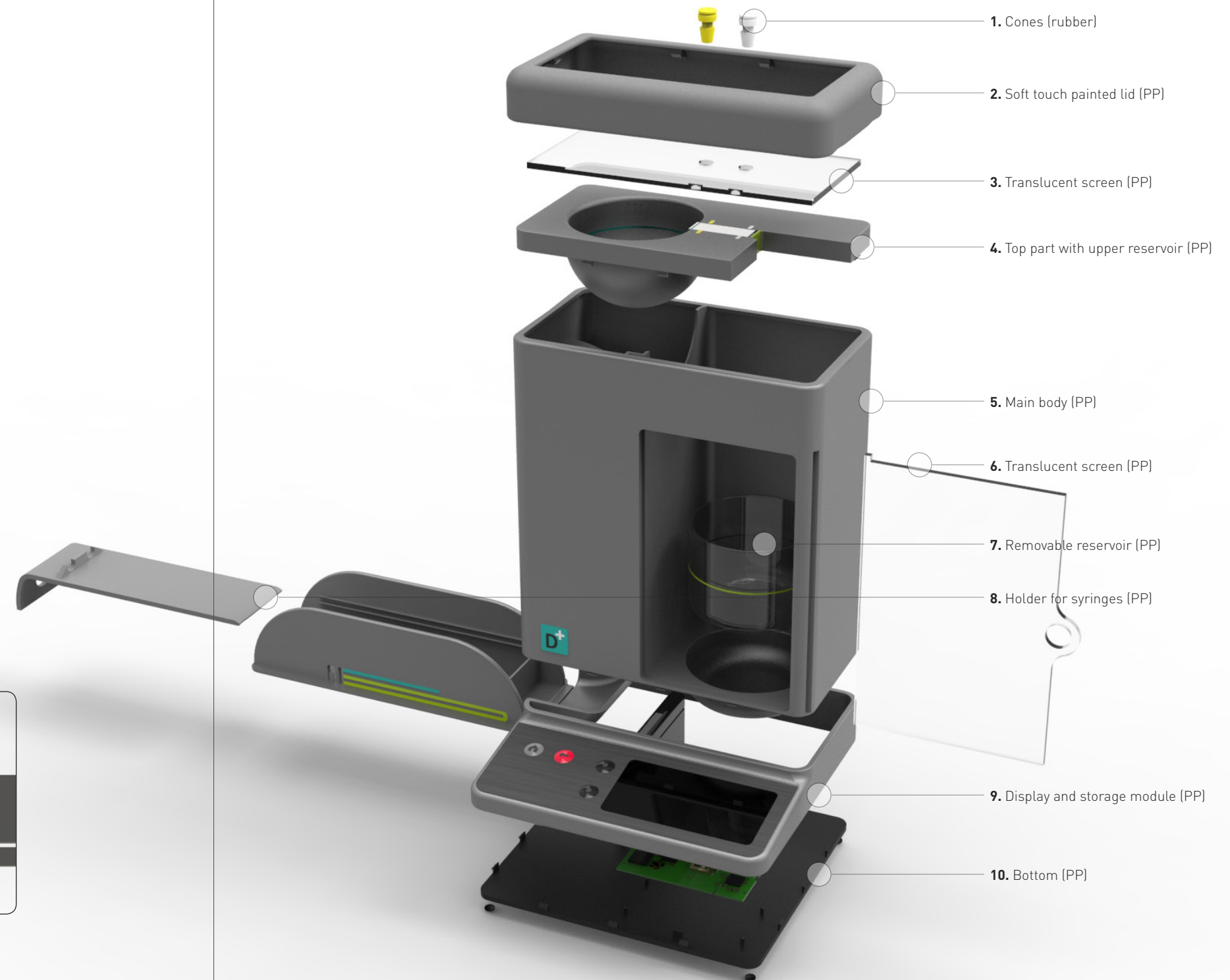
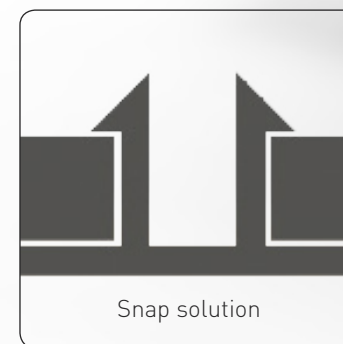
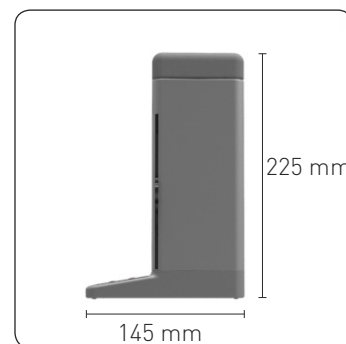
The urine sample is applied to the nitrocellulose pad on top of a working electrode using a modified low cost insulin syringe, and the gravity-driven flow leads the urine towards the lower reservoir. When in contact with the glucose oxidase the glucose in the urine oxidises on the working electrode, and the oxidation can be measured as a difference in the electric current determining the glucose levels in the urine (and thereby in the blood).



DESIGNED FOR LOW COST MANUFACTURING AND ASSEMBLY

D⁺ is designed to keep cost for production as low as possible in order to be a profitable investment ensuring a quick return of investment and in order to be within financial reach of clinics in developing countries.

This is achieved through a small number of parts combined with snap solutions for quick assembling without the need of screws or spare parts.





DESIGNED TO FIT INTO A NON-STERILE LAB ENVIRONMENT

D+ is designed to fit perfectly into messy and dusty lab environments in developing countries. The product's vital, inner parts are protected from dirt and dust behind protecting, transparent screens, and the supplies needed for operating the product are kept in an integrated storage module.

At the same time, the product's use of colour codes are inspired by communication forms seen at clinics in Africa, and the choice of colour for the product itself is chosen to camouflage dust and dirt on the product.



If the lower reservoir disappears or breaks it can be replaced by a cut Coca Cola can

