

MATERIAL SCIENCE IN MENSTRUAL HEALTH & HYGIENE

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INTRODUCTION

- Issues to Address
 - Cost/accessibility of culturally appropriate and sustainable menstrual health products.
 - Ability to dispose of the pads in a safe and healthy way
- Purpose
 - Develop a biodegradable menstrual pad that is affordable and effective through the use of superabsorbent polymers.
- Plan
 - Take the tested prototypes to a small village in Botswana, Africa to establish a menstrual hygiene program. This program will focus on educating young girls as well as providing them with the necessary supplies to develop healthy menstrual habits.

FUNCTIONAL COMPONENTS

1. Cotton topsheet (UNITIKA model UO305/A25)
2. TENCEL™ cotton fibers with embedded SuperAbsorbent Polymer (Zeba™)
3. Compostable garbage bag (Glad®)

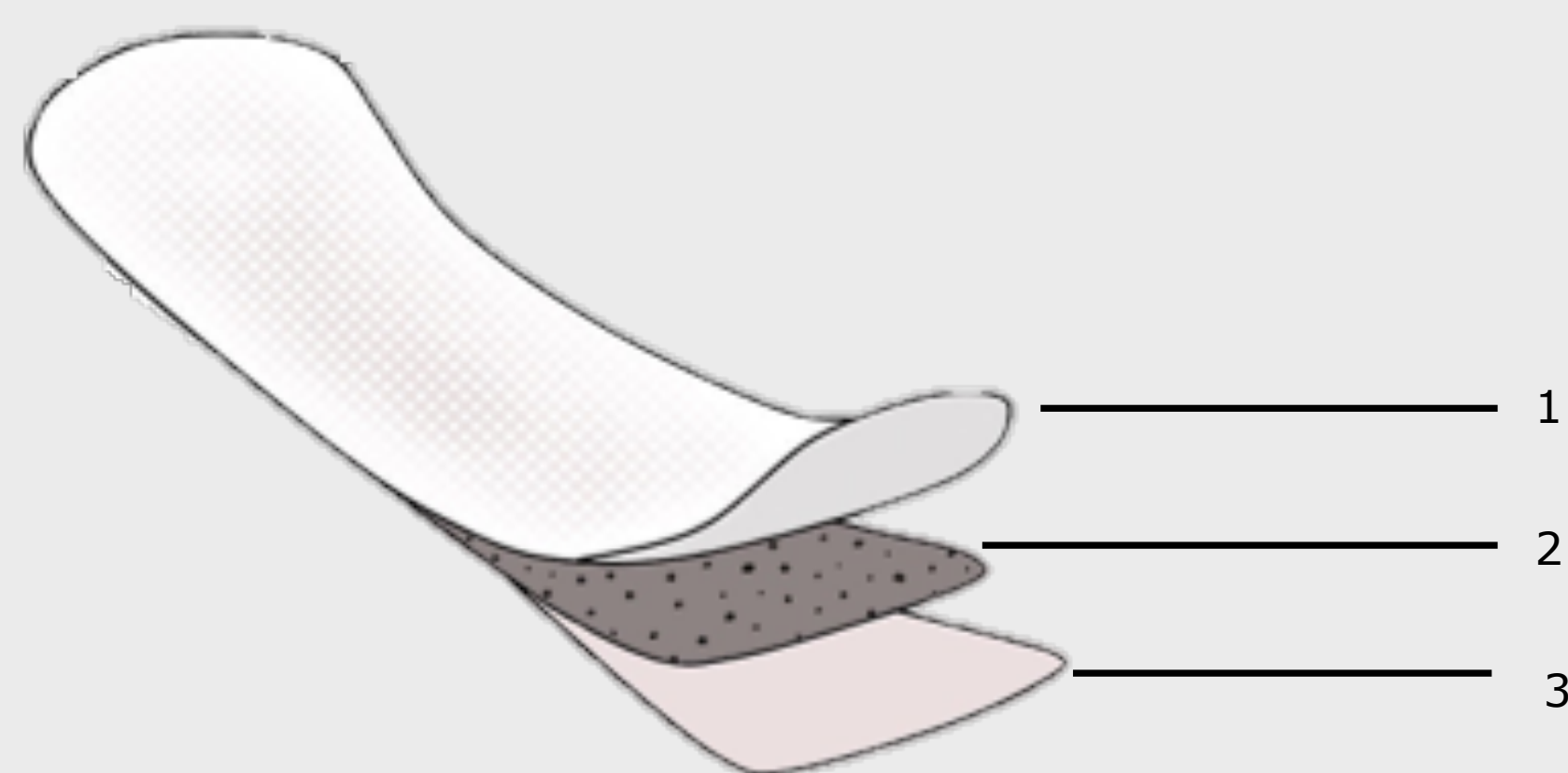
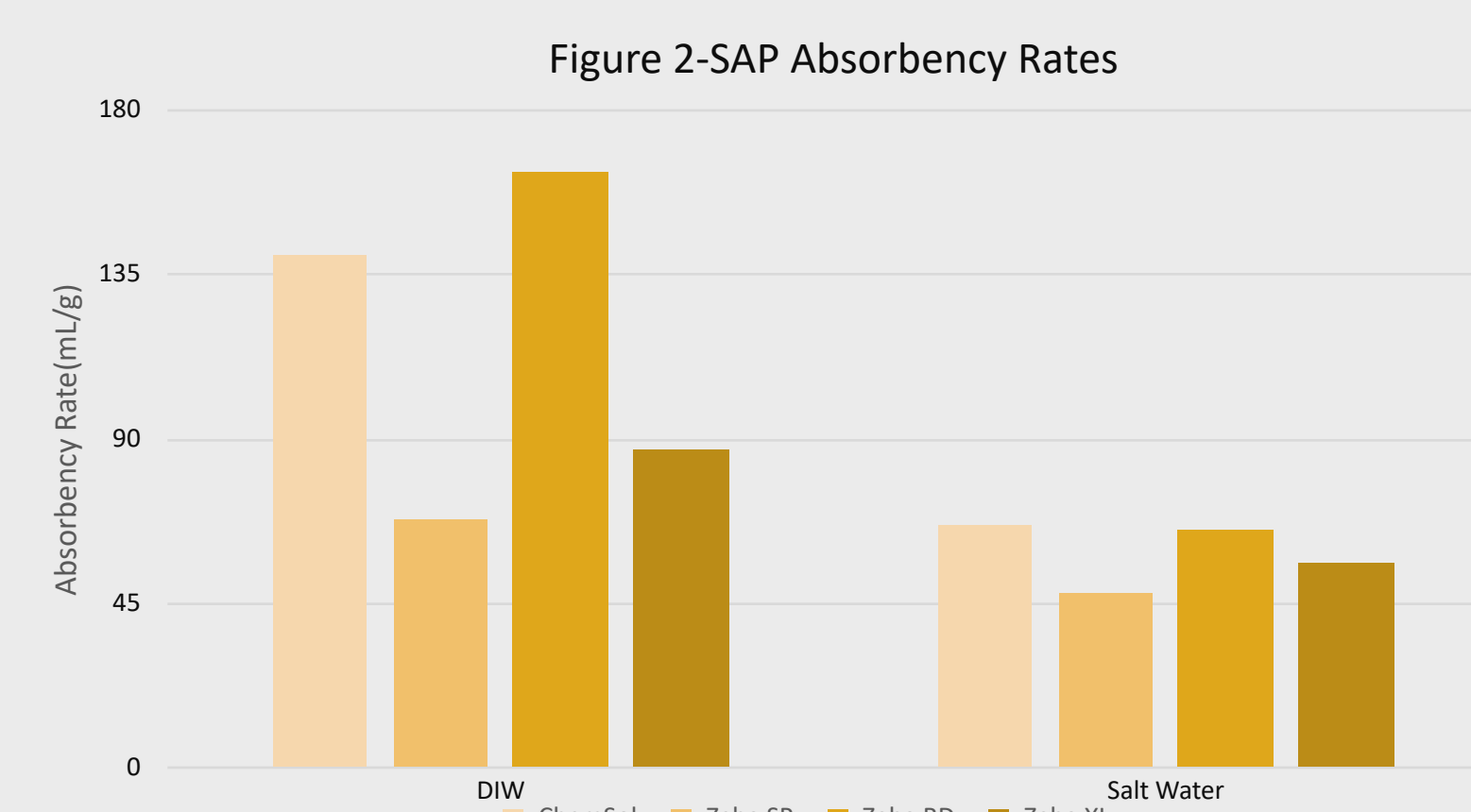


Figure 1-Menstrual Pad Schematic



PERFORMANCE TESTING

- Absorbency tests-SAP, cotton top sheets
 - We have used absorbency tests on SAP and PLA top sheets.
 - For the SAP, we added water until the sample reached a saturation point and then analyzed the absorbance rates in mL/g.
 - Figure 2 shows Zeba(biodegradable) absorption rates in comparison with Chemsol, a non-biodegradable SAP with strong absorption.
 - For the PLA top sheets, we held the sheets taut over a petri dish and dispersed 3 ml on the top of the sheet. We measure how much water was absorbed and took quantitative observations on the feel of the sheet.
- Prototype tests
 - We made menstrual pad prototypes made up of PLA top sheets, an SAP composite, and compostable plastic sheets(adhesive not used in these prototypes as this design was made to test the absorbance of our product).
 - We tested the prototypes through absorbency tests and wetback tests.
 - The absorbency test involved adding 2 ml of water and rotating the pad, repeatedly, until the pad dripped to see how much the pad could hold.
 - The wetback test involved adding water and letting the pad sit, then weighing a filter paper before and after placing it on the wet pad with a weight on top of the paper, to find how much water was on the surface of the pad/not absorbed.



ACKNOWLEDGMENTS

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FUTURE PROTOTYPE WORK

- Finalizing what products we want to continue forwards with
- Prototypes are going to be tested to four performance parameters, from the European Disposables and Nonwovens Association
 - Strikethrough-how fast a pad absorbs liquid
 - Absorbency-how much liquid a pad can hold
 - Wetback-how wet a pad feels to the skin
 - Adhesion-how well a pad stays in place when stuck to an undergarment
- We will conduct detailed testing along these standards using 1wt% saltwater and animal blood.
- We are also looking into the idea of a biodegradable foam for the core, or hemp/bamboo material for the middle layer

MANUFACTURING

- Approximately 1500 pads will be needed for this study.
- We are currently designing dies to shape the pads on solid works, first 3D printed prototypes, then built out of aluminum with a CNC mill once we have a final design.
- We will attach the aluminum dies to a manual press to seal the contents within the pad.

COMPOSTABILITY

- All materials we plan on using have met the standards to be described as biodegradable and compostable.
- For successful compost, one needs air, moisture, green matter and nitrogen, and heat, all of which are readily available in Botswana. The native grass and cow manure works well as green matter.
- Depending on the depth of the compost(12-16 inches), worms can also help to break down organic material.
- Composting, with proper education, can provide both a viable and discreet way for young women to dispose of their menstrual pads in both homes and community centers in Muanatlala.
- HIV is prevalent in the community and should be taken into consideration.
- HIV becomes inactive after leaving its host and being exposed to temperatures above 25 degrees Celsius(a healthy compost pile ranges from 57-71 degrees Celsius). While the environment damages the virus almost immediately, it still takes a week to fully die and no longer be infectious.

FUTURE WORK IN MAUNATLALA, BOTSWANA

- Maunatlala is a rural community in Botswana, with about 5,000 residents.
- Dr. Sunil Khanna is working in a participatory and empowering partnership with the community to better understand the people and their health care needs.
- Menstruation is highly stigmatized within the community.
- 80% of women surveyed(15-45years) said that commercial pads are either unavailable or unaffordable.
- Approximately 30% of the girls in school miss school monthly because of lack of availability of menstrual health products.
- While supplying these women with menstrual pads, we would also provide them with a 2-hour workshop to teach them how to use and dispose of the products.
- After the study is completed, we will hold focus groups and structured discussions to assess the viability of the pad and improvements that could be made.

