

## Local Disinfectant Refinery

This year, our school, Herzog Branco-Weiss, became the first school in Israel that is a part of the Global-schools network that focuses on the SDG's. Over the past few months we were introduced with and researched about the UN 17 Sustainable Development Goals (SDG). We learned about a variety of difficulties and challenges around the world, which affect millions and millions of people, and wanted to try and make a difference.

As part of a school all night "ISDG" - Hackathon, we came up with an idea of how to approach a medical issue in Zambia, answering the UN third SDG. We are delighted to present to you our project.

Our initiative deals with disinfestation and can save thousands of people every year. As a result of adverse sanitary conditions and the inability to properly disinfect medical equipment or hands, even the most minor medical procedures, such as injections, can result in death.

About 10% of all childbirths in Zambia end in death.

Since there's a difficulty to transfer disinfectants from one place to the other, there is a need to produce ethanol for medical needs at the medical center itself.

We came up with the general idea during a biology class in which we were exposed to a special gel that was developed in Israel. That gel serves as a substrate for growing different plants, which gave us the idea to grow sugarcane inside the gel and produce ethanol from it. The idea about the importance of disinfectant came from a story we were told about Hungarian gynecologist, Ignaz Zelmawis, from the 19th century. Zelmawis worked in Vienna, researching how he can dramatically take down women's death rates after birth, by using lemon and chlor to disinfect the doctors' hands. How a simple idea can be the difference between life and death. We thought about how the process of producing any disinfectant could be optimized and adapted to hospital conditions in Zambia so that the disinfectant (ethanol in this case) can be produced at the hospital itself, eliminating the need to transfer it from the cities to the hospitals.

We started researching the matter, coming up with a 3-stage-program that will result in a 96% pure ethanol.

While we did our research, Andrew from Uganda, an educator that read about our idea in the Global-schools online platform, contacted us.

Andrew is interested to help us through the research process as a concerned and involved citizen living in Africa, in a country whose conditions are similar to Zambia. With Andrew's help, we are making research on how much it would cost to produce such a system locally. Furthermore, Andrew is directing us on how to teach the locals how to produce ethanol. In addition, Andrew raised the point that in light of the system's low price, such a life-saving system can be built in every village center.

We also found out how to optimize each of the steps in the process.

The first step is the sugarcane growth phase. The sugarcane is grown on top the hospital's roof, so there is no space or height limitation, and it is exposed to direct sunlight. Combining the soil substrate with the gel will fertilize the sugarcane and will double the crops. The gel, which was developed in Israel, incorporates many essential minerals into the plant, and therefore, provides a better base for the crops.

This process takes several months, but at the end of the first few months of production, there will be enough sugarcane to produce 3-5 liters of ethanol every day.

The second step in the process is fermenting the sugarcane. This process is done inside a vacuum chamber.

We took the sugarcane that we grew, grinded it and added yeast. The yeast breaks down the glucose into the elements that make it (ethanol among them).

This process takes about 12 hours. The vacuum compartment can be built from local materials that the industry in Zambia or Uganda will provide us with, such as glass, various metals, and plastics. The container itself is made out of glass and the suction hose is made out of plastic. By using local materials the provincial industry is getting involved and more job opportunities and financial changes are being offered.

The third stage is the distillation of fermented sugar cane. Here, we can also use materials that can be found in Zambia, such as various metals, glass, and plastic. The system is very simple and built from a heating test tube connected to a condensation tube and a collection test on the other side.

We put the fermented sugarcane inside the heating test and boil the solution. Ethanol's boiling point is lower than the boiling point of water and methanol, and so the ethanol will evaporate first and enter the condensation tube. In the condensation tube, the ethanol gas will return to liquid and will be collected in the collection tube. This process takes about 4 hours. To

involve the local industry, we can make all the pieces, such as various stands and tripods in Zambia. After the whole process, we got a commercial amount of 96% pure ethanol.

The importance of ethanol in hospitals is enormous.

A simple solution like this is an essential thing in the 21st century, and it is hard to believe that even though we live in the modern age, despite the tremendous technological advancement we have gained over the years, nobody yet has done something for Africa.

It is hard to believe that every day people die due to a lack of disinfectants, which are common in every western hospital.

Today, even though the Western world significantly reduced the death toll due to infections, many African countries don't have the aims or technology to deal with this epidemic. Here, we come into the picture. Our idea is applicable and requires not more than three members to learn how to produce ethanol. According to the studies, such a facility would result in a drastic 90% reduction in infections related deaths.

The estimated cost of one system in Israel is 3,000 NIS, which is an affordable price. Assembling the system is very simple, and with the right guidance, various medical teams will be able to pass on their knowledge and build entire systems in just a few hours. Such a system can revolutionize medicine in Africa, and the beauty of it is its simplicity. Zambia's industry allows us to produce thousands of such kits, and maybe even export them to other countries.

In conclusion, according to our estimations, the initiative will help to reduce the death toll due to infections by 90%.

Moreover, the project will strengthen the relationship between Zambia and Israel as well as the Zambian industry, by using local materials in addition to Israeli technology. Our solution is both simple and applicable, with minimal maintenance requirements, which makes it even more attractive.

The initiative is a simple example of how many lives can be saved by combining existing technologies and products with contemporary inventions.

With the cooperation between Israel and Zambia, numerous lives can be saved.

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