6430X Vex IQ Omnipod Teardown The Next Generation

Our team chose an insulin pump (Omnipod) to teardown because my older brother has Type-1 Diabetes. All year, we have been doing our IQ STEM project on this subject. We hypothesized that robotics can help people with Type-1 Diabetes live normal lives. Unfortunately, we proved our hypothesis is wrong. Although it helps, it is not perfect because an insulin pump does not give you an automatic delivery of insulin, and does not supply ANY sugar (glucagon). Every Type-1 Diabetic has a struggle to find the perfect balance of insulin and sugar every second of every day. They do this by pricking their finger to test their blood, doing a lot of math calculations, and sometimes even eating when they do not want to. Compared to people without Diabetes, Type-1's have a LOT to think about!

My brother uses a One Touch Ping Insulin Pump, called "Beethoven," priced at about \$7,000. But, we chose to break apart an Omnipod, a disposable Insulin Pump that is worn for three days and has a cost of about \$30. This pump is worn directly on the body as seen in the pictures below.

Unfortunately, there were no TI parts in the Omnipod. But it was very intriguing. A Smartphone is used by the Diabetic to talk to the Omnipod. There are three batteries that run the pump. An antennae is used to connect to the phone, which tells the computer chip what to do. The chip then notifies the motors and sensors to do what the user asked. There is a crystal, that acts like a clock to help tell the computer chip when to do things. The hot memory wire controls a small part that moves a lever, pushing insulin out of the reservoir and into the Diabetic's body.

We, as the next generation of engineers, can improve insulin pumps and other devices that can help Type-1 Diabetics. We can do this by having sensors constantly checking blood sugar levels and telling the pump directly what to give and how much- either insulin or sugar (glucagon). This would make the life of a Type-1 Diabetic safer, happier, and more carefree. Recently, the Minimed 630G pump was made. It does constantly monitor your blood sugar and will prevent insulin from going into the users body if numbers go too low. However, it does not automatically give you insulin if blood sugars go too high. Right now, there are no pumps available that will administer insulin automatically or that will provide sugar (glucagon).



My older brother has Type-1 Diabetes and uses a one-touch ping insulin pump.



Our Team won the STEM Award!



Our STEM project described what happens to a diabetic when their blood sugar moves around.



This is what the Omnipod comes in. It is packaged with a needle and syringe.



This is what the Omnipod looks like when it is removed from it's package.



Once the adhesive is removed, you can see all of the parts inside.



Underneath the adhesive is a backplate, which when removed gives us access to the control board and pump.

Dis-assembled, we see the backplate, control board, pump and batteries, and cover and speaker.

Hot Wire Motor



Batteries

Motor Gears

> Insulin Reservoir

Top-Side Mechanical Components

Motor Encoder

Motor Gears

Insulin Reservoir



Needle Inserter

Bottom-Side Mechanical Components



Electrical Components

Motor Encoder



Electrical Components



Passive Components – Resistors, Capacitors and Inductors