Individuals with Type I diabetes need to maintain their blood sugar at a consistent level to maintain a healthy lifestyle. One of the ways they do that is with an insulin pump. However, most insulin pumps on the market are expensive. Even with health insurance, it can cost several hundreds of dollars to purchase an insulin pump. Our aim is to reduce the cost of an insulin pump by developing an assembly kit that can be customized by the user. The benefit is that any part that breaks can easily be replaced, without the cost of replacing the entire pump.

**Background**

- Customizable parts and case
- Programmable features
- Replace parts if they break
- Interactive and intuitive LCD screen and button control
- Sensors for accuracy/error

**Objective**

- Construct a model for less than $500
- Deliver the insulin within a margin of error of 1 unit of insulin
- Design an intuitive user interface for controllability
- Design a customizable system for user satisfaction

**Specifications**

<table>
<thead>
<tr>
<th>Metric</th>
<th>Units</th>
<th>Ideal Value</th>
<th>Margin</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safely and Accurately Deliver Medical Fluid</td>
<td>Units</td>
<td>± 5</td>
<td>± 1</td>
<td>± 0.87</td>
</tr>
<tr>
<td>Accuracy of Force Sensor</td>
<td>Grams</td>
<td>± 2</td>
<td>± 5</td>
<td>± 2.54</td>
</tr>
<tr>
<td>Reflective Sensor Able to Compute Error</td>
<td>Yes/No</td>
<td>Yes</td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Accuracy of Motor</td>
<td>Degree</td>
<td>± 1</td>
<td>± 5</td>
<td>± 1</td>
</tr>
<tr>
<td>Length of Battery Life</td>
<td>Hours</td>
<td>24</td>
<td>&gt; 6</td>
<td>6.2</td>
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<tr>
<td>Design Creates a Feeling of Control and Confidence</td>
<td>-</td>
<td>8&lt;0&lt;10</td>
<td>&gt; 6</td>
<td>8</td>
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<tr>
<td>Easy to Travel with and Non Obtrusive to Everyday Life</td>
<td>mm&lt;3</td>
<td>185,000</td>
<td>&lt;230,000</td>
<td>226,302</td>
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<tr>
<td>Price of Assembly Kit</td>
<td>$</td>
<td>$400</td>
<td>&lt; $550</td>
<td>$250</td>
</tr>
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</table>

**Design Features**

- Customizable parts and case
- Programmable features
- Replace parts if they break
- Interactive and intuitive LCD screen and button control
- Sensors for accuracy/error

**Testing Resulting**

- The Affordable Insulin Pump does safely and accurately deliver insulin to the customer to control their blood sugar. The Affordable Insulin Pump would only cost the customer $250, meeting the specification for affordability. However, the casing was too large and the battery dies too quickly. By customizing the LCD screen and microcontroller, the size would be reduced and would allow a smaller battery.

**Future Improvement**

- Improve battery life
- Make customized microcontroller
- Use less battery life
- Exactly what we need and nothing extra
- Reduce size
- Customizable silicone cover
- Water proofing
- Reduce damage if dropped

**Conclusion**

The Affordable Insulin Pump does safely and accurately deliver insulin to the customer to control their blood sugar. The Affordable Insulin Pump would only cost the customer $250, meeting the specification for affordability. However, the casing was too large and the battery dies too quickly. By customizing the LCD screen and microcontroller, the size would be reduced and would allow a smaller battery.