PEF Water Purifier

Sketch Model Review

Red-B
Product Concept

- **Purpose:**
  - Water Purification with Pulsed Electric Fields (PEF)

- **Key Features:**
  - Scaled-down PEF technology
  - Fast & Effective
  - Human-Powered

- **Users:**
  - Hikers
  - Campers

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PEF Treatment

Pores form in the cell membrane due to exposure to an external electric field.

Cell Content

Cell Membrane

Electric Field
Critical Question

Can we scale down the technology?
- Can we reach the required voltage?
- How much energy does it take?
- Can this be human powered?
Scaling Down & Human Powered

**Simplified Model:**

**Physical Parameters:**

- $C = 350 \, \text{F}$
- $V_c = 2.7 \, \text{V}$
- $R = 0.1 \, \Omega$
- $B = B_0 \sin(\omega t)$
- $\Omega = 1 \, \text{Hz}$
- $N = 120 \, \text{Turns}$
- $L = 2 \, \text{cm}$
- $A = \pi (1 \, \text{cm})^2$
Scaling Down & Human Powered

\[
0 = \frac{Q}{C} + IR + \frac{LdI}{dt}
\]

\[
0 = \frac{Q}{C} + \frac{RdQ}{dt} + \frac{Ll}{\mu_0 N} \times \frac{dB}{dt}
\]

\[
Q(t) = A\cos(\omega t) + B\sin(\omega t)
\]

\[
\Delta Q = \int_0^t \left| \frac{dQ}{dt} \right| dt'
\]

Reaching \( Q_{\text{max}} \):

\[
Q_{\text{max}} = V_c C
\]

\[
t = 0.542 \text{ hr}
\]

with \( \omega = 1 \text{ Hz} \)
Demonstration

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Camera Circuitry

[Diagram of camera circuitry with labeled components: First Transformer, Secondary Coil, Rectifier Diode, Neon Indicator Light, Second Transformer, Flash Tube, Main Capacitor, Oscillator Transistor, Charge Switch, Feedback Coil, 1.5 V Battery, Trigger (connected to shutter), Trigger Plate, Key with icons for transformer, resistor, capacitor, battery, diode, transistor, switch, inductor.]

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Result

Sketch Model Review

Red-B
Customer Needs

- Clean Water
- Portable Device
  - Lightweight
  - Fast & Effective
  - Rechargeable
Competition
Market

~9M

~$850M
Market

Key Competitors:

$100-150

$100-400

Total Addressable Market:

$100 * 9M = $90M
Questions?

MagneGlasses

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