Perma-lite LED Collar

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Overview

- LED collar on cattle to increase visibility
- High visibility to decrease road accidents with livestock
- Easier to identify livestock at night
- Features
  - Solar powered to last through the night
  - Waterproof
  - Printed circuit board
  - 3 year lifespan
  - Zero maintenance!

Feasibility

- Power
  - 2 AAA batteries → charge rate 10-16 mA depending on angle of sun
  - 3 hyper-orange LEDs draw 50 mA
    - A pulsing duty cycle of 10% averaging 5 mA
    - If we charge at 10 mA and discharge at 5 mA, then we will have a safety factor of 2
- Life
  - 800 mA-hours with life of greater than 500 cycles

Cost

Quantity	Item	Cost/Item	**Total Cost**
1	3V Solar Panel	1.68	**1.68**
3	Hyper Orange LED	0.42	**1.26**
2	AAA Batteries	0.83	**1.66**
1	AAA Battery Holder	0.29	**0.29**
1	2N2222 transistor	0.27	**0.27**
1	1N4001 diode	0.02	**0.02**
1	photo detector	0.45	**0.45**
1	circuit board	0.90	**0.90**
6ft	hook-up wire	0.04	**0.24**
1	24k resistor	0.04	**0.04**
Total			**$6.81**

Durability

- Force requirements: cow head is 1/5 of total weight (~200lb)
  - Needs to withstand force of 900N
- Options for protecting solar panels

	Low Iron Tempered Glass	RTV Resin Coating
+	*Allows 91% transmittance *Sturdy *Reflective	*High transparency *UV stable and moisture resistant *Durable and radiation resistant *Thin film module protection
-	*Adds additional volume *Can be too rigid	*Additional labor in applying coat *Achieving smooth coating
$$	$0.17 per panel ($143 / (36*96) in^2 sheet→ $.0414 / in^2→ 17 cents / 4 in x1 in sheet	$0.15 per panel Varies depending on type of resin used

Market

- Target Entry Market: Free Ranging Cattle, Calving Cows, Bulls
- Total Cattle in US – 90.065 Million
  - Organic cattle – 65,000 in the US
  - Non-organic cattle – 90 million in the US
  - 20% of Cow Population are Calving
  - 1 Bull/25 Cows
- Potential: Assume $15/collar on every cattle in America →

  $(15-7)x90MM = **$720 million**
- Predicted: Assume $15/collar, 50% of organic customers, 2% of non-organic customers →

  (2%x90MM+50%x65,000)x(8) = **$15 million**
- OR: Assume farmers use this for their calving cows and bulls→

  (20%x90MM+1/25x90MM)x(8) = **$180 million**
- Secondary Markets: Household pets, other livestock, fence posts, highways, etc.

Additional Concerns

- Convincing farmers to integrate collars into their cattle herds
- Finding methods of containing free-ranging cows to be fitted for collar
- Testing how long a collar will last on a 1 ton cow
- Finding behavioral effects on herded animals
- Seeing if market can be expanded to other animals such as pets