

# Production of Soy Electronic Screen Protectors

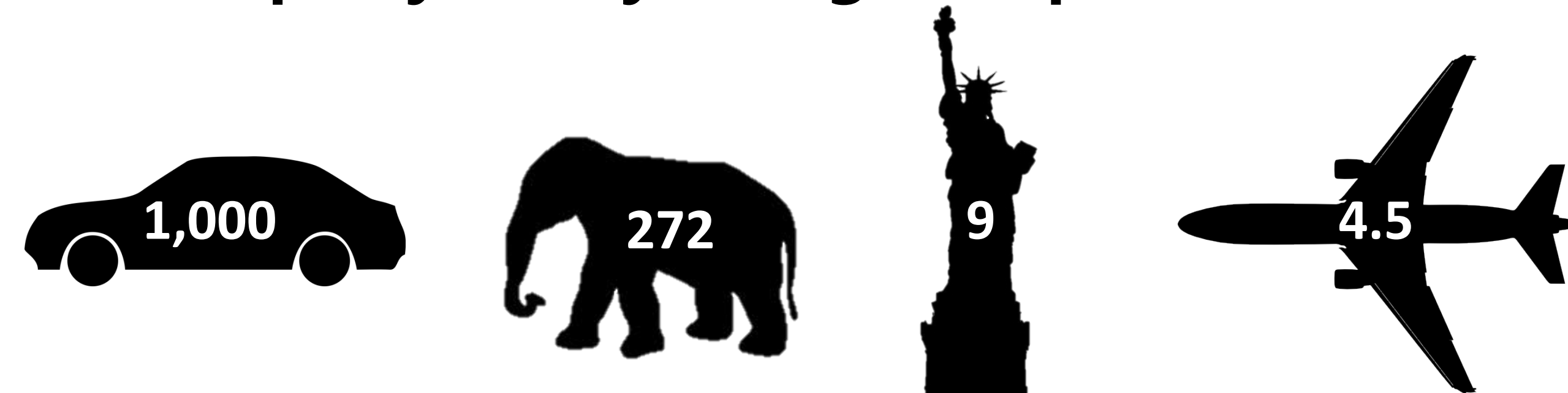
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## Introduction:

With the ever increasing consumer base in electronic touch screen devices, an increase in demand for screen protectors that both protects the screen while not limiting the functionality of the device. Our product:

- reduces the amount of plastic from landfills
- utilizes soy components that are non-toxic to the environment
- minimizes component waste

How many pounds of plastic can be saved per year by using this product?



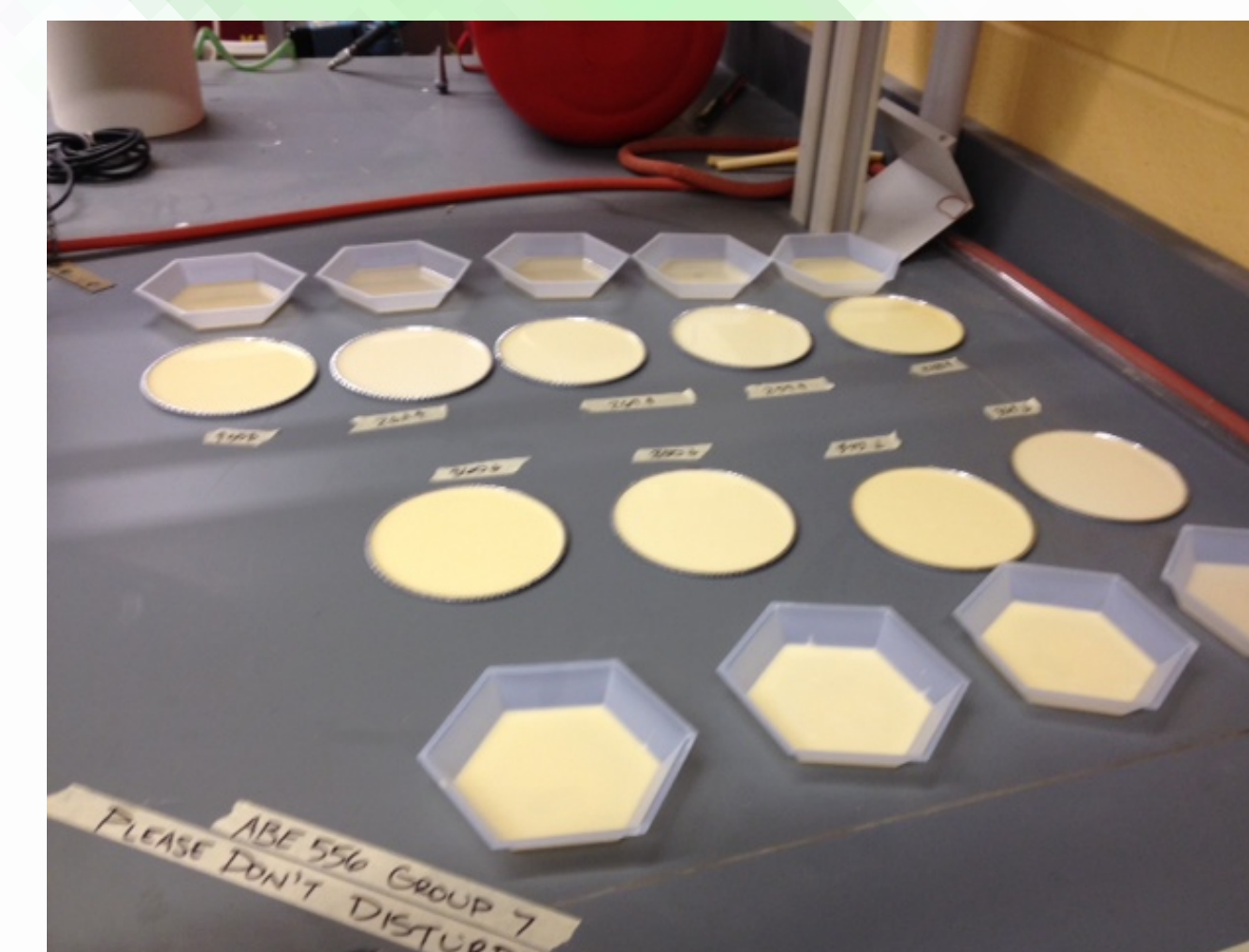
## Objective:

Develop a 100% soy-based electronic touch screen protector that:

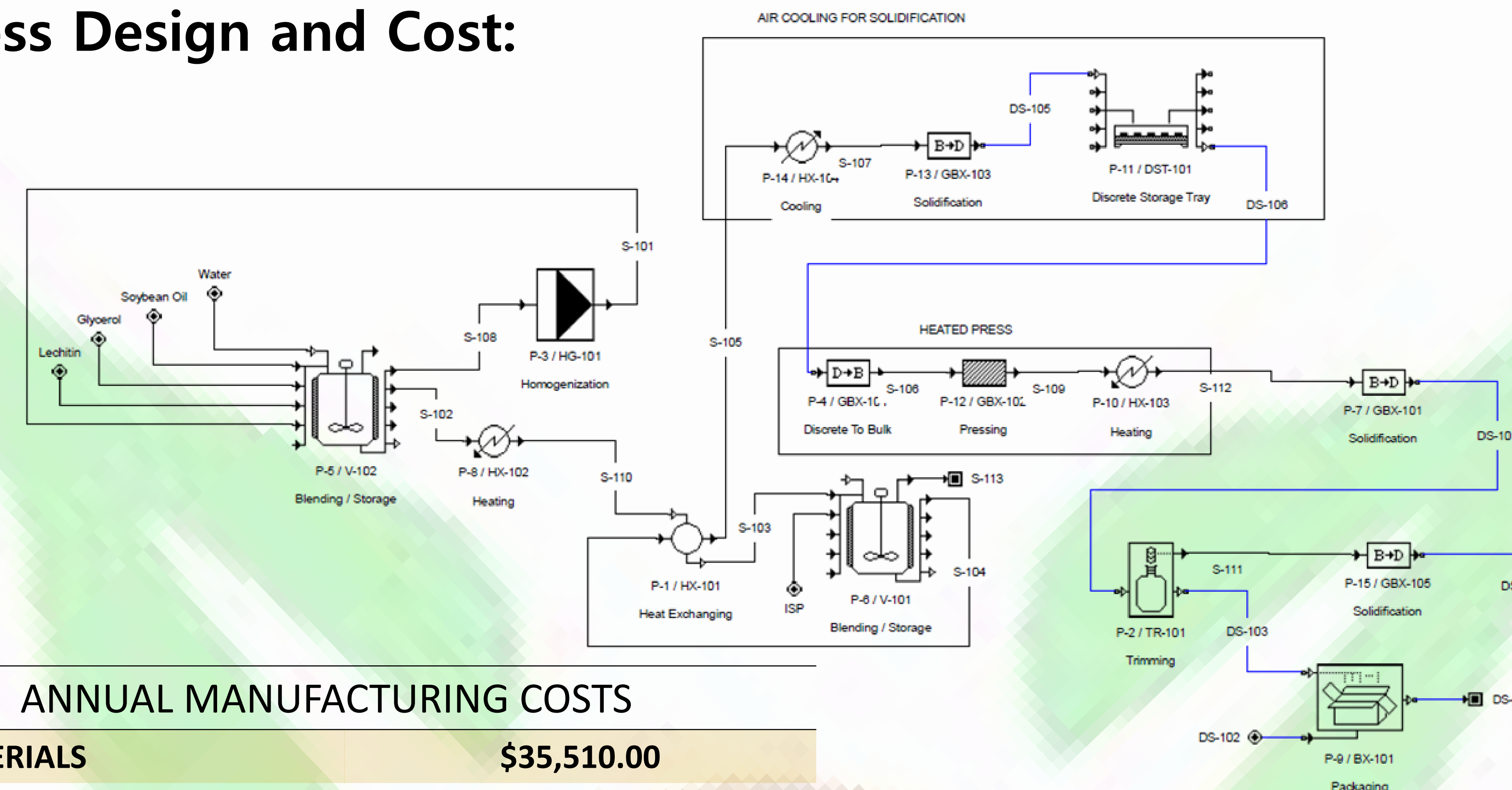
- Optimizes soybeans by using all available parts of the bean
- Is biodegradable and "green"
- Contains no hazardous chemicals
- Has physical properties similar to that of standard petroleum-based screen protectors
- Is a safe alternative for current products
- Reduces reliance on petroleum usage

## Experimental Design:

- **Homogenization**- Blend soybean oil, soy lecithin, water, and glycerin to get a well mixed solution.
- **Addition of Soy Protein Isolate**- Add Soy protein isolate to liquid mixture
- **Heating and Agitation**- Heat and stir to ensure homogenous mixture and evaporate some water from the solution.
- **Drying**- Let product dry at room temperature for 40 hours.
- **Heated Pressing**- Heat at 150 degrees Fahrenheit and press product for 30 seconds using Carver heated press to ensure uniform thickness.
- **Trimming**- Cut the pressed product into the correct dimensions.



## Process Design and Cost:



### ANNUAL MANUFACTURING COSTS

RAW MATERIALS	\$35,510.00
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UTILITIES	\$19,070.00
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Steam	\$15,710.00
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Electrical Power	\$2,892.00
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Water	\$474.00
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DIRECT COSTS	\$2,100,000.00
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Labor	\$1,524,000.00
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Supervision	\$228,600.00
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Maintenance	\$102,900.00
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Operation Supplies	\$15,430.00
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Lab Charges	\$228,600.00
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Overhead	\$927,900.00
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FIXED COSTS	\$73,480.00
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Taxes	\$58,780.00
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Insurance	\$14,700.00
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TOTAL COST	\$3,156,000.00
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### EQUIPMENT SIZING AND COST

Type	Size (Capacity)	Purchase Cost
Homogenizer	10.56 L/hr	\$23,000.00
Blending Tank	281.49 L	\$163,000.00
Heat Exchanger	0.03 m2	\$8,000.00
Heat Exchanger	0.02 m2	\$8,000.00
Blending Tank	311.91 L	\$166,000.00
Trimmer	465.56 products/hr	\$3,000.00
Cooling Racks	4.85 m2	\$1,055,000.00
<b>TOTAL</b>		<b>\$1,434,000.00</b>



## Optimization:

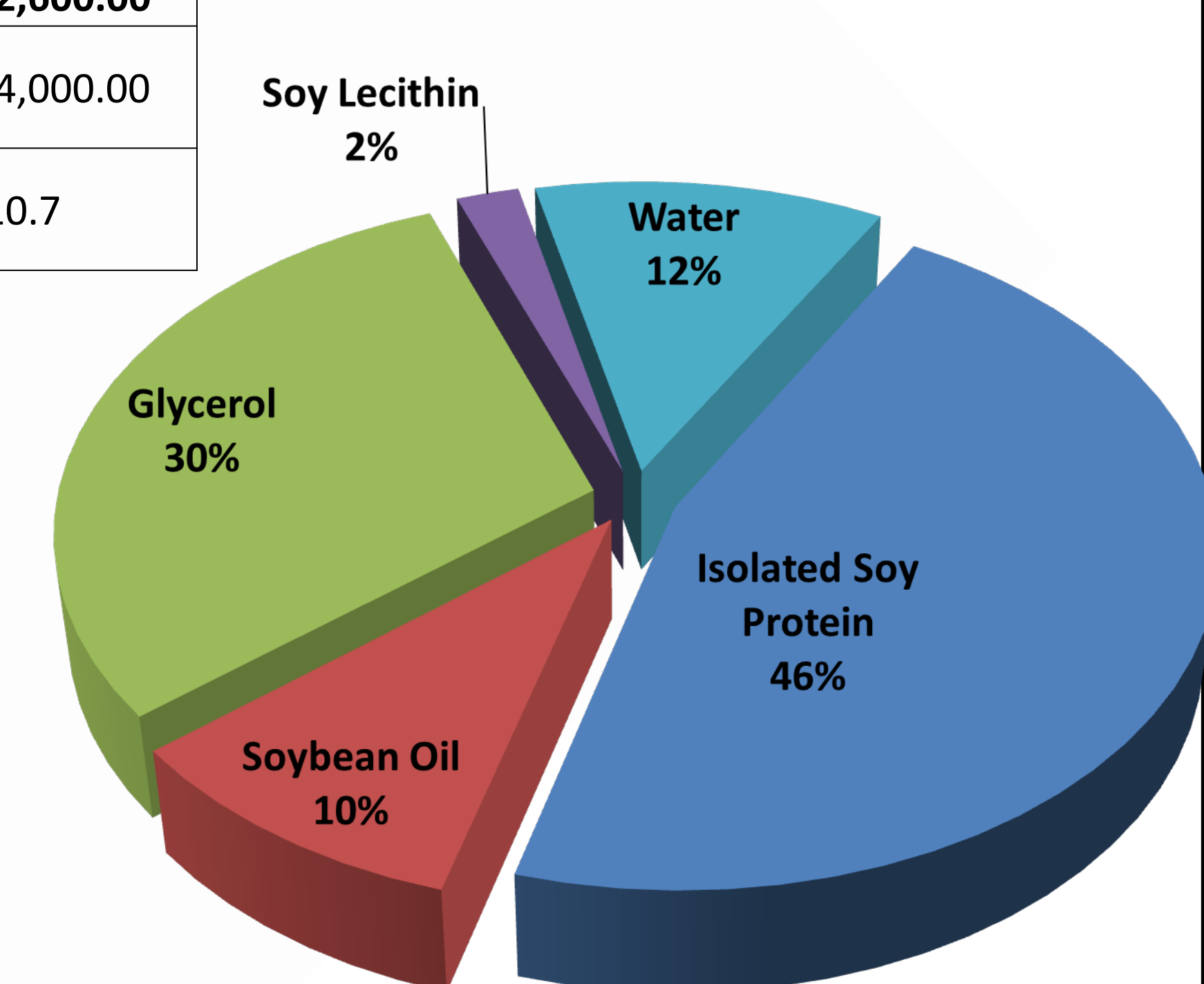
- Uses all parts, and byproducts, of the soybean
  - Soy Protein Isolates
  - Soybean Oil
  - Glycerol
  - Lecithin
  - Chaff
- Remaining waste is biodegradable
  - Can be sold as animal feed filler
- Reduced input energy
- Decrease of waste

## Economic Analysis:

Type	Annually
# of Packages	\$1,700,000.00
# of Screen Protectors	\$3,400,000.00
Revenue	\$15,283,000.00
Manufacturing Cost	\$6,310,400.00
Profits	\$8,972,600.00
Equipment Cost (initial)	\$1,434,000.00
Return on Investments (ROI)	10.7

Type	Price per Pack
Sale Price	\$ 8.99
Manufacturing Cost	\$ 1.86

### Material Costs



### Improvements:

- Use same company for all ingredients
- Process our own soybeans instead of buying
- Get deals from soy companies
- Selling waste for profit

Material Costs				
Ingredient	Amount	Cost	Cost for Product	Annual Cost
Isolated Soy Protein	0.0016575 kg	2.9 \$/kg	\$0.00480675	\$ 16,342.95
Soybean Oil	0.00125 L	0.8158 \$/L	\$0.00101975	\$ 3,467.15
Glycerol	0.0025 L	1.26 \$/L	\$0.00315000	\$ 10,710.00
Soy Lecithin	0.0001875 L	1.185 \$/L	\$0.00022219	\$ 755.44
Water	0.015 L	0.083 \$/L	\$0.00124500	\$ 4,233.00
Total Material Cost of 1 Screen Protector			\$0.01044369	\$ 35,508.54

## Alternative Designs:

- Solar panels are used to run mixers and pumps to decrease operating costs.
- Geothermal energy is used to preheat liquid mixture to decrease total amount of heating required.

## Advisors:

Professor Martin Okos  
Eric Holloway

