



NORTHERN ARIZONA
UNIVERSITY

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Task 2: Drinking Water Stabilization



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Overview

- Goal
- Project Statement
- Approach
- Research
- Testing
- Results
- Bench Scale Model
- Economic Analysis
- Final Statements

Goal

- Healthy
- Mineral Additive
- Economical



Project Statement



- Optimum Mineral Composition
- Nutritional Requirements
 - Children
 - Adults
 - Elders

Approach

- Tasks:
 - Extensive Research
 - Nutritional Health Information
 - Impact on Water Distribution System
 - Existing Regulations
 - Test current and popular RO bottled water brands
 - Test optimum mineral composition designs
 - Design bench scale model
 - Marketing Plan



Background Research

- Nutritional health information

Mineral	Children RDA Range (mg/day)	Adults (18-65yrs) RDA Range (mg/day)	Elderly (65+) RDA Range (mg/day)	RDA Average (mg/day)
Calcium	700-1300	1000-1300	1000-1200	1000
Iron	7-15	8-15	8-17	11
Magnesium	30-240	240-410	310-420	270
Iodine	0.09-0.13	0.12-0.15	0.12-0.15	0.12
Potassium	1000-2000	2000-4700	2000-4700	3450
Zinc	2-11	12-20	10-18	18
Sodium	900-2000	1000-2200	1500-2300	<2300

Background Research



– Nutritional health information for livestock:

- Calcium
- Phosphorus
- Magnesium
- Potassium
- Sodium
- Chlorine
- Sulfur

Background Research

- Effects of RO water on water distribution system

- Corrosion

- Prevention by adding:

- Calcium Carbonate

- Sodium Bicarbonate



Background Research

– Current regulations for bottled water

Mineral	Regulatory Maximum Concentration (mg/L)
Calcium	Not Regulated
Copper	1.0
Iron	0.3
Magnesium	Not Regulated
Iodine	Not Regulated
Potassium	Not Regulated
Zinc	5.0
Sodium	Not Regulated
Chloride	250
Total Dissolved	500

Preliminary Testing

Mineral	Popular Brand #1 (mg/L)	Popular Brand #2 (mg/L)	Popular Brand #3 (mg/L)
Calcium	0	0	6
Iron	0	0	0
Magnesium	3	0	2.2
Iodine	0	0	0
Potassium	3	0	5.9
Zinc	0	0	0
Sodium	1.1	1	4

Preliminary Testing

Test	Popular Brand #1	Popular Brand #2	Popular Brand #3
pH	6.03	6.58	7.35
Total Dissolved Solids (mg/L)	0.04	0.01	0.08
Turbidity (NTU)	0.22	0.21	0.43
Conductivity (mA/V*m)	7.44	3.42	14.30
Alkalinity (mg CaCO ₃ /L)	Below Detectable Limit	Below Detectable Limit	0.71
Acidity (mg CaCO ₃ /L)	Below Detectable Limit	Below Detectable Limit	-0.71
Hardness (mg CaCO ₃ /L)	12.35	0.00	24.04
Hardness Classification	Soft	Soft	Slightly Hard
Color (PtCo)	7.00	2.00	0.00
Odor	No Smell	No Smell	No Smell

Mineral Composition Results

Test	Composition 1	Composition 2	Composition 3	Composition 4	Composition 5
pH	8.90	8.75	8.60	7.60	7.50
Total Dissolved Solids (mg/L)	8.75	212.00	148.33	56.67	55.67
Turbidity (NTU)	8.60	5.73	4.31	0.97	0.43
Conductivity (mA/V*m)	54.90	39.33	28.07	10.77	10.63
Alkalinity (mg CaCO ₃ /L)	7.60	134.00	102.67	26.33	25.50
Acidity (mg CaCO ₃ /L)	7.50	N/A	N/A	-23.33	-21.50
Hardness (mg CaCO ₃ /L)	181.98	132.30	48.80	48.80	48.80
Hardness Classification	Very Hard	Hard	Slightly Hard	Slightly Hard	Slightly Hard
Color (PtCo)	10.00	7.33	5.33	4.00	3.33
Odor	Slight Smell	No Smell	No Smell	No Smell	No Smell

Bench Scale Model

Mineral	RDA Average (mg/day)	Popular RO Bottled Water (mg/L)	% Daily Value	Composition 5 (mg/L)	% Daily Value
Calcium	1000	0	0%	8	2%
Iron	11	0	0%	0.005	0.1%
Magnesium	270	0	0%	10	11%
Iodine	0.12	0	0%	0.001	3%
Potassium	3450	0	0%	7	1%
Zinc	18	0	0%	1	17%
Sodium	<2300	1	0%	12	2%

Economic Analysis

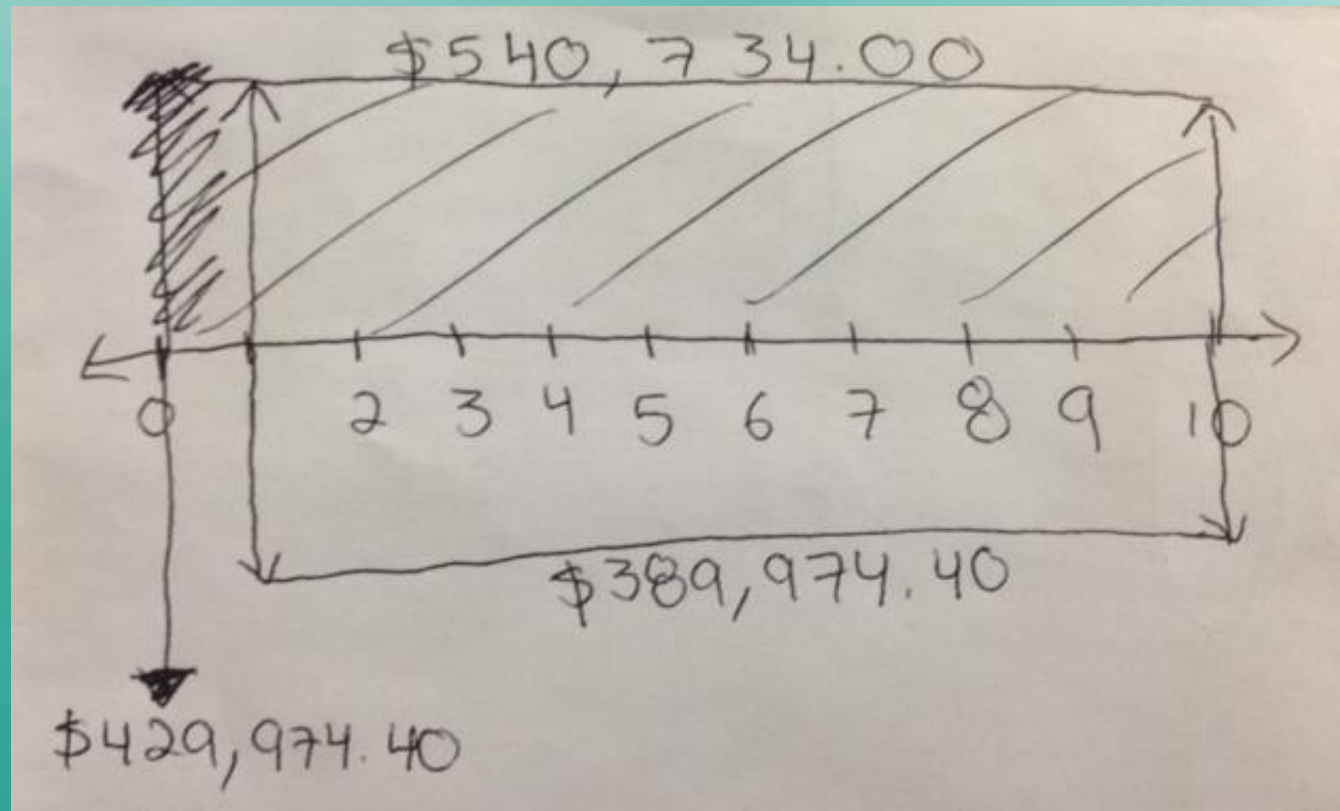
Scenario 1:

- Independent Company
 - Assumptions:
 - 6 million capsules/year
 - 3 bottle sizes
 - 1) 4 oz (w/ 28 capsules)
 - 2) 8 oz (w/ 60 capsules)
 - 3) 16 oz (w/ 140 capsules)
 - Start-up Costs

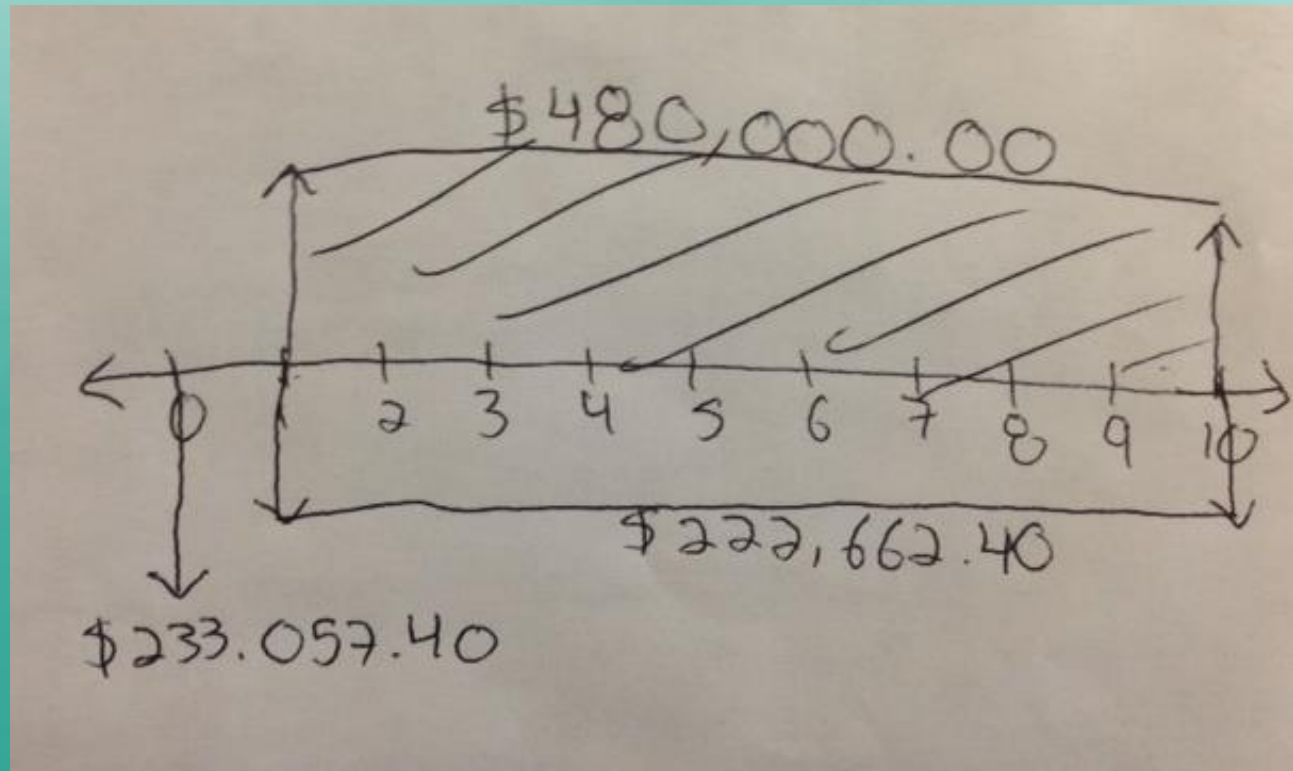
Scenario 2:

- Partnership with Current Bottled Water Distributor
 - Assumptions:
 - 6 million capsules/year
 - Same Start-up Costs

Cash Flow- Independent Company



Cash Flow- Current Bottle Water Distributor



Final Statements

- Environmentally-friendly
- Low % DV
- No effect on water distribution system
- Sustainable Companies
- Clear
- No odor
- Low-cost



THANK YOU FOR YOUR TIME!

Are there any questions???