

The background of the slide is a grayscale photograph of industrial machinery. On the left side, there is a circular pressure gauge with a needle pointing towards the 0.4 mark. The gauge has markings for 0, 0.2, 0.4, 0.6, 0.8, and 1.0. The rest of the background shows various pipes, valves, and mechanical components of a machine.

Product Recovery and BOD Reduction

Davisco Foods International, Inc.

Stephen Raab
Advisor: Matt Domski
On-site Supervisor: Jeff Shodean



UNIVERSITY OF MINNESOTA
Driven to DiscoverSM

Who I Am

- **University of Notre Dame undergraduate**
 - Class of 2016
 - B.S. in Chemical Engineering
- **Lives in Bloomington, MN**
- **Longtime fan of the U of M**



Davisco-Le Sueur Overview

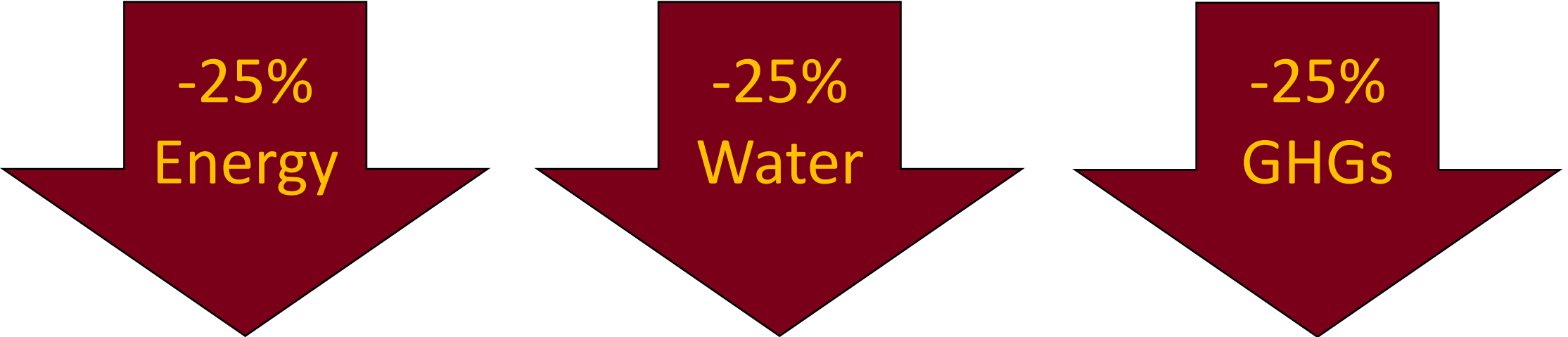
- **Le Sueur Cheese Company**
 - Cheese
 - Lactose
 - Whey Protein
- **Food Ingredient Plant**



www.daviscofoods.com/locations/index.htm

Company Mindset

DOE Energy Star Program/Energy Savings Initiative



-25%
Energy

-25%
Water

-25%
GHGs

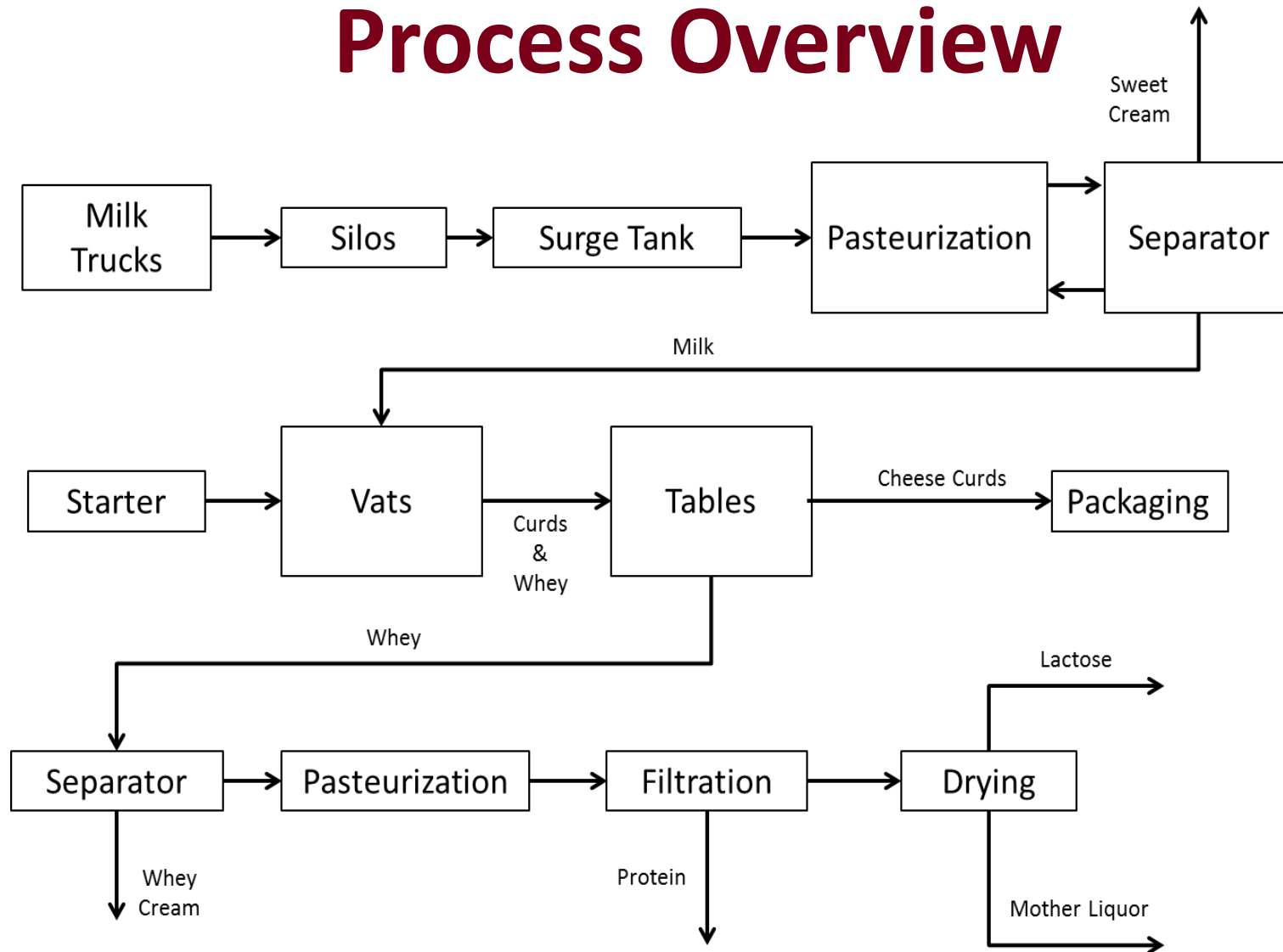
Over 5 Years

Incentives to Change

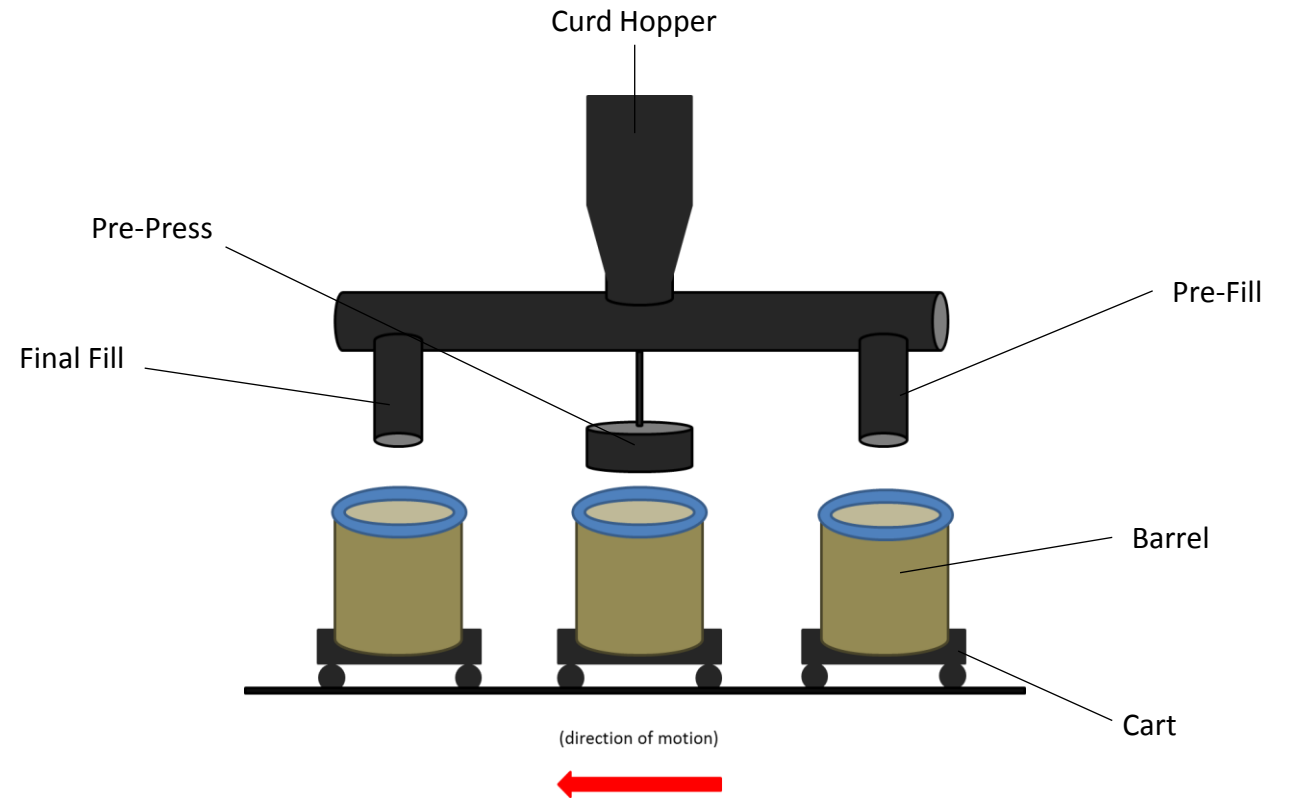
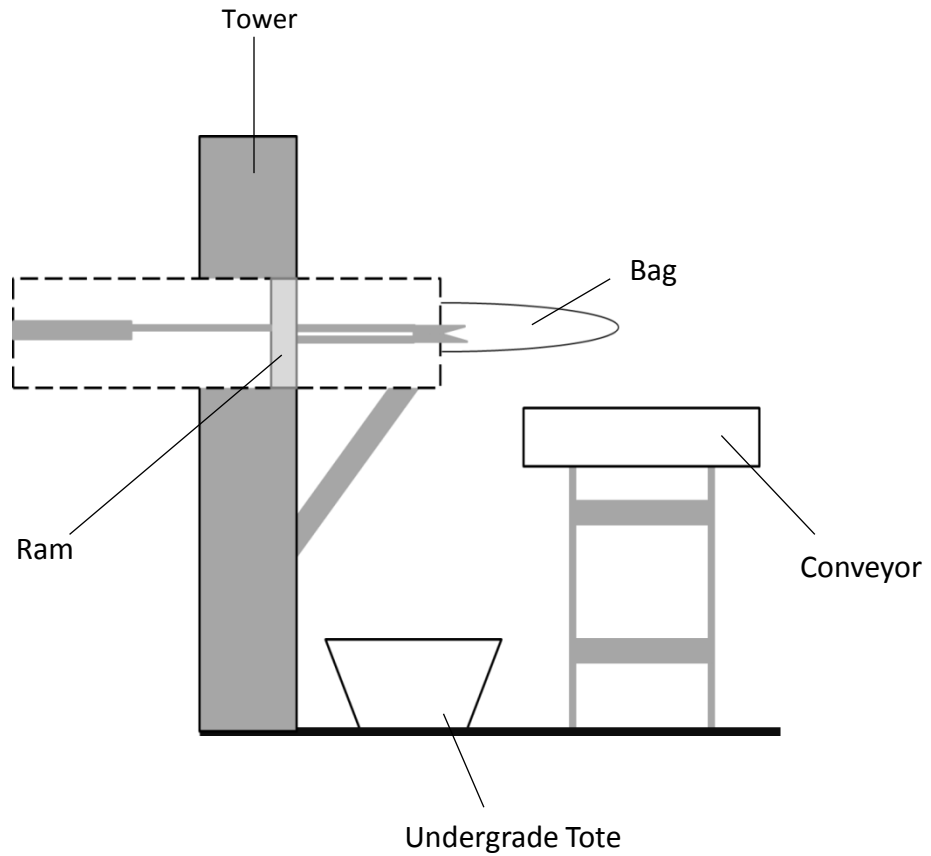


- Annual water use: 180,500,000 gallons
- \$1.25 million annual BOD charges
- Risk of exceeding pollution allowances
- Floor Cheese
 - 184 pounds daily
 - “Costs twice”

Process Overview



Packaging



Filtration/Water Polishing

- Whey filtered of lactose, protein
- Leftover water sent to polisher, purified via membrane filtration
- COW water used for rinses



www.wheyoflife.org

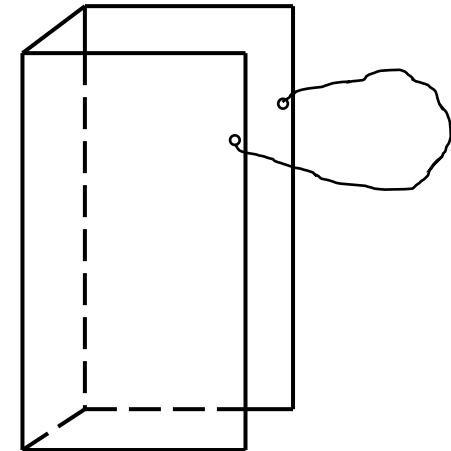
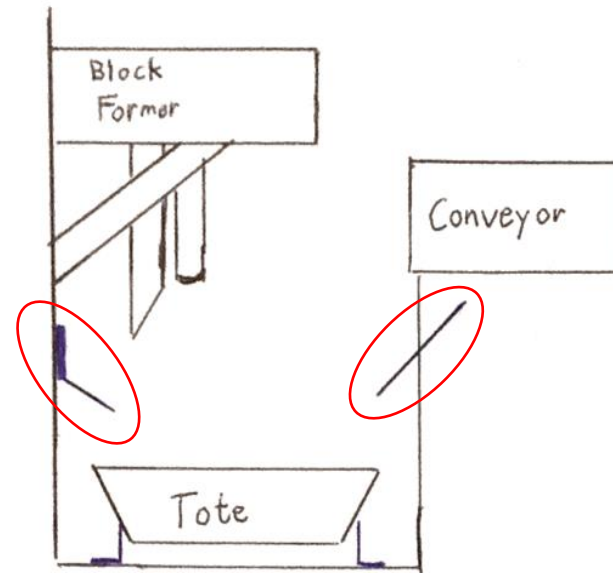
Drying/Scrubber



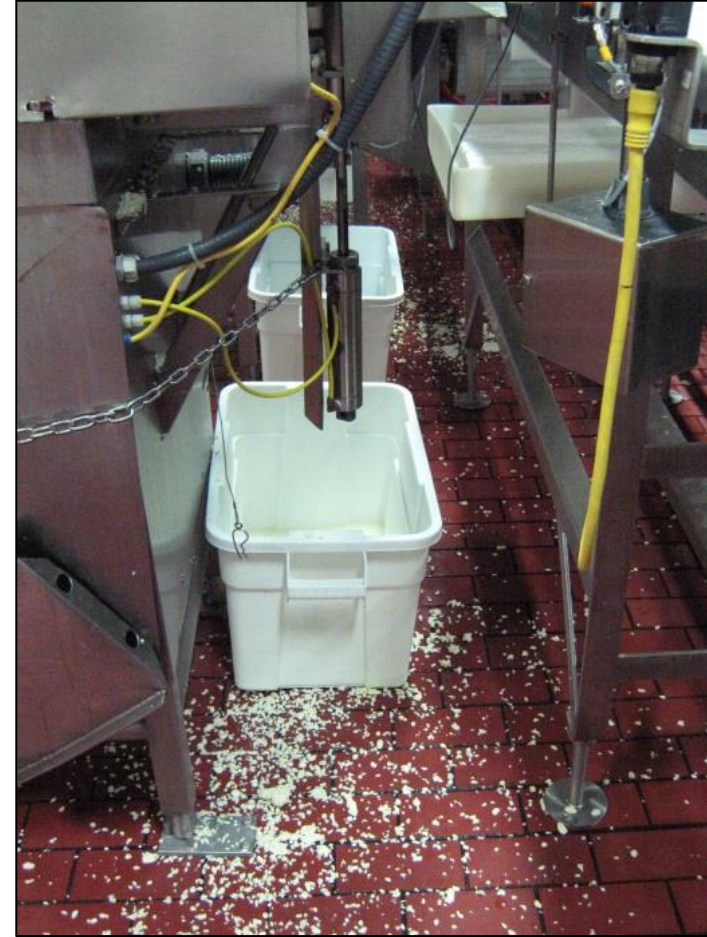
<https://www.youtube.com/watch?v=uEizgsW-He4>

- Product dried through contact with hot air
- Scrubber spray removes dry particles from air to ensure clean venting

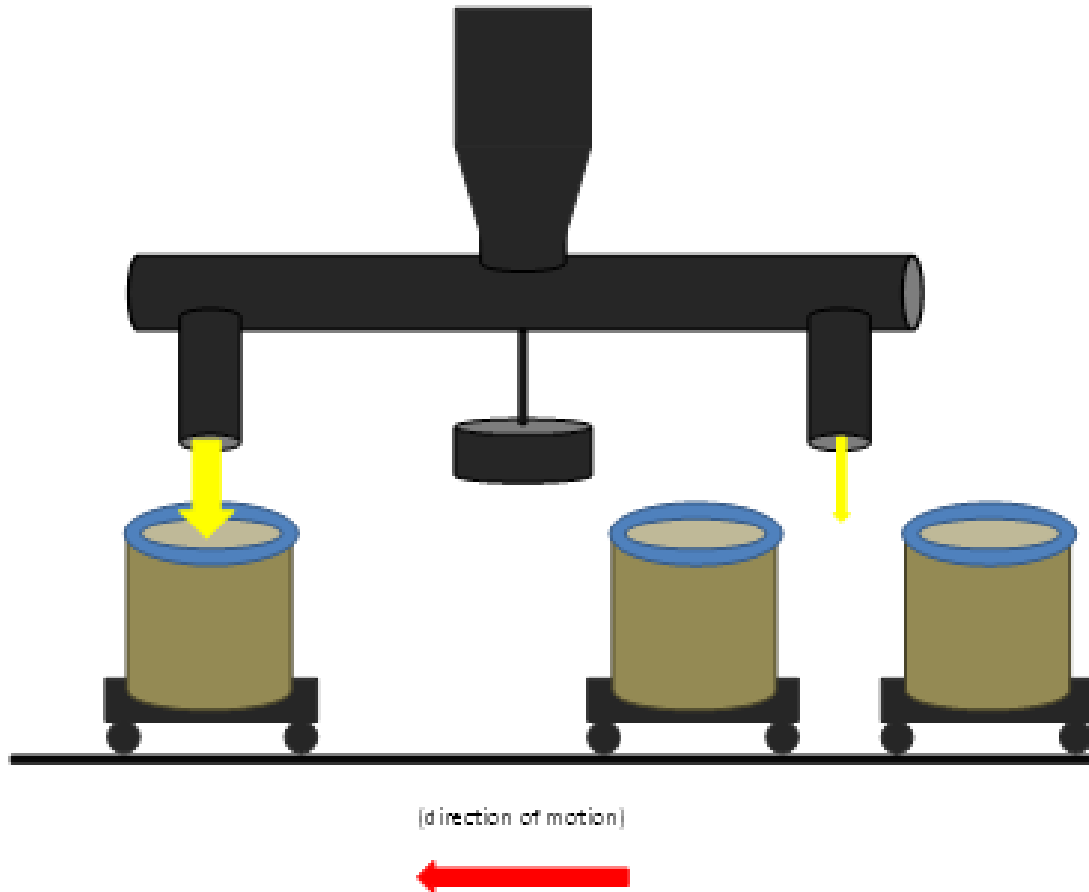
Packaging Solutions



Packaging Solutions, cont.



Packaging Solutions, cont.



Economic Analysis-Packaging

Recommendation	Implementation Cost	Annual Savings (product)	Annual Savings (\$)	Payback Period (years)	Status
Catch Pans	\$1,000	7,100 lbs	\$3,650	0.27	Recommended
Totes	\$50	270 lbs	\$183	0.27	Approved
Automation Changes	-	1547 lbs	\$2,939	Immediate	Implemented
Fill Extensions	\$800	128 lbs	\$322	2.48	Recommended
Total	\$1,850	9,045 lbs	\$7,094	0.26	

Scrubber Solutions

- **Feed scrubber with polisher permeate**
 - 2.5% reduction in municipal water purchases
 - Also potentially useful for CIP makeup
 - Requires plumbing a line across the street

Implementation Cost	\$22,000
Annual Savings	4,625,000 gallons (\$23,126)
Payback Period	0.95
Status	Recommended

Economic Analysis-General

Recommendation	Implementation Cost	Annual Savings	Annual Savings (\$)	Payback Period (years)	Status
Floor Cheese					
Catch Pans	\$1,000	7,100 lbs	\$3,650	0.27	Recommended
Totes	\$50	270 lbs	\$183	0.27	Approved
Automation Changes	-	1547 lbs	\$2,939	Immediate	Implemented
Fill Extensions	\$800	128 lbs	\$322	2.48	Recommended
Scrubber					
Feed Water Substitution	\$22,000	4,625,000 gallons	\$23,126	0.95	Recommended
Total	\$23,850	-	\$30,220	0.79	

Personal Progress

- Industrial operations experience
- Data collection and analysis in a factory setting
- Leadership and teamwork
- Compromise/negotiation
- The economics of engineering



Questions?