

Water Conservation and Energy Efficiency at Puris Proteins

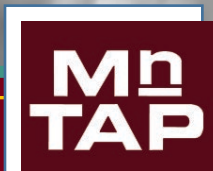
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Driven to DiscoverSM

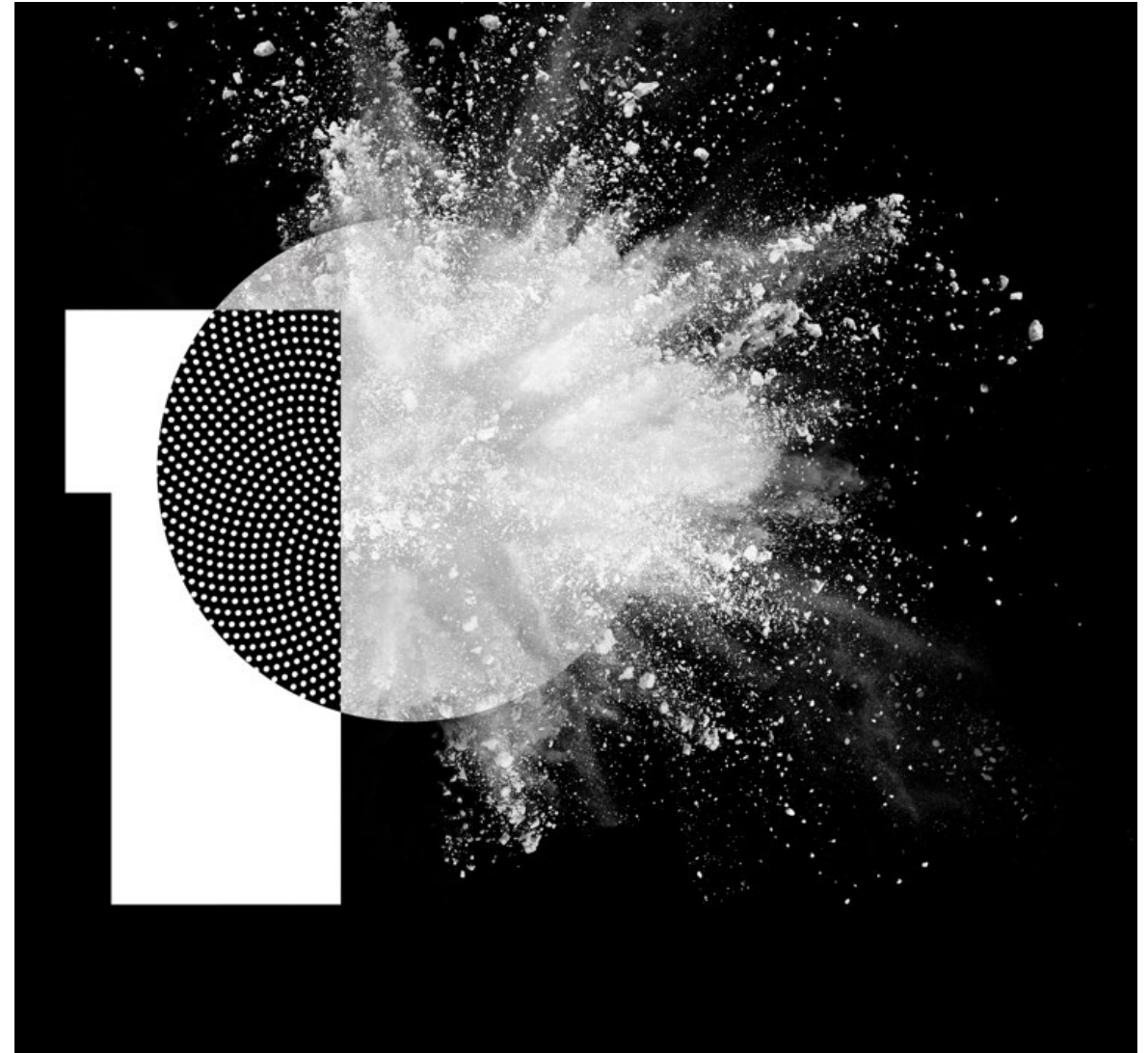


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Company Background

Puris Proteins

- Leading producer of organic plant-based proteins
- Main product: finest protein powder
- New 200,000 ft² flagship facility at Dawson, MN



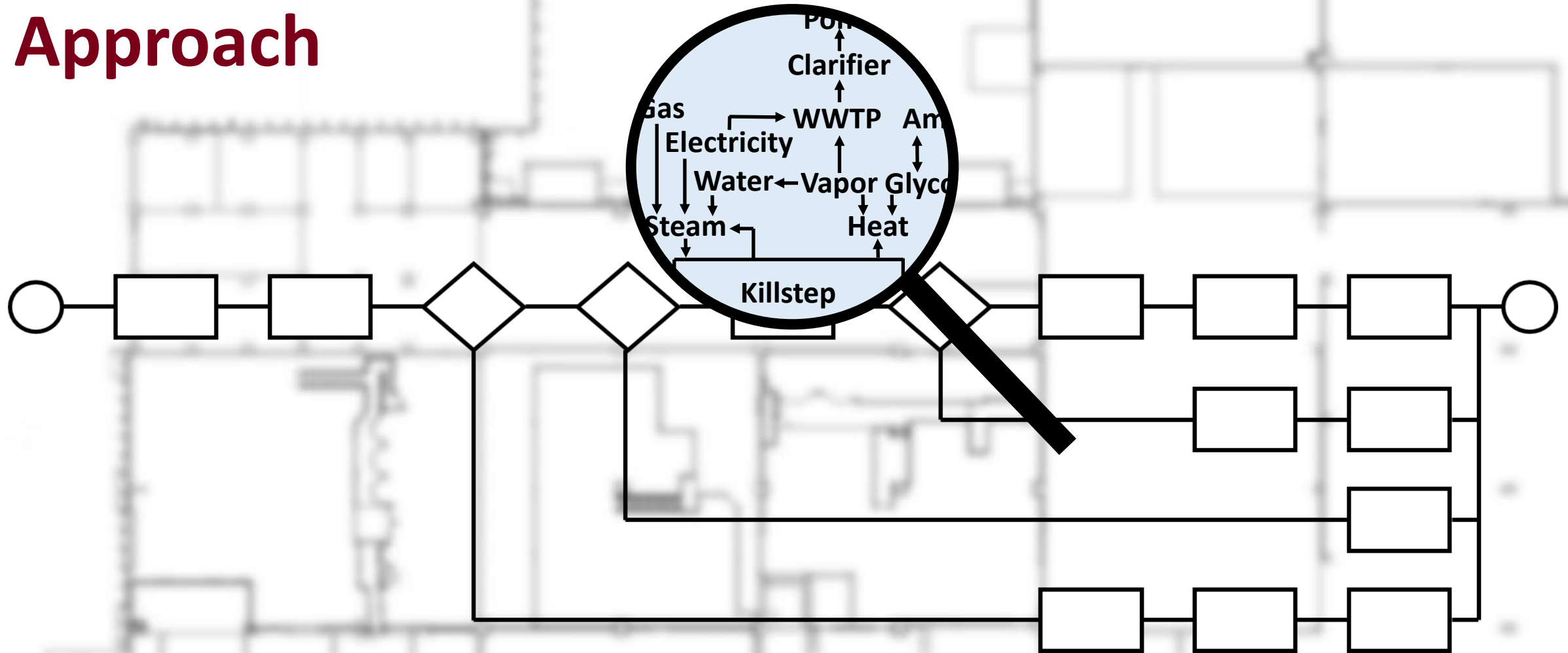
Incentives to change

Creating nutritious options that benefit both people and the planet.

- Taking responsibility for the environmental footprint of production
- Optimizing equipment after the new facility stabilization phase
- Saving costs on more efficient operation



Approach



Utilities and recommendations

Water

Steam

Electricity

Natural gas

Compressed air

Utilities and recommendations

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Upgrade spray nozzles

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Set a routine steam trap inspection

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Install capacitor bank

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Compressed air Modify baghouse pulsing

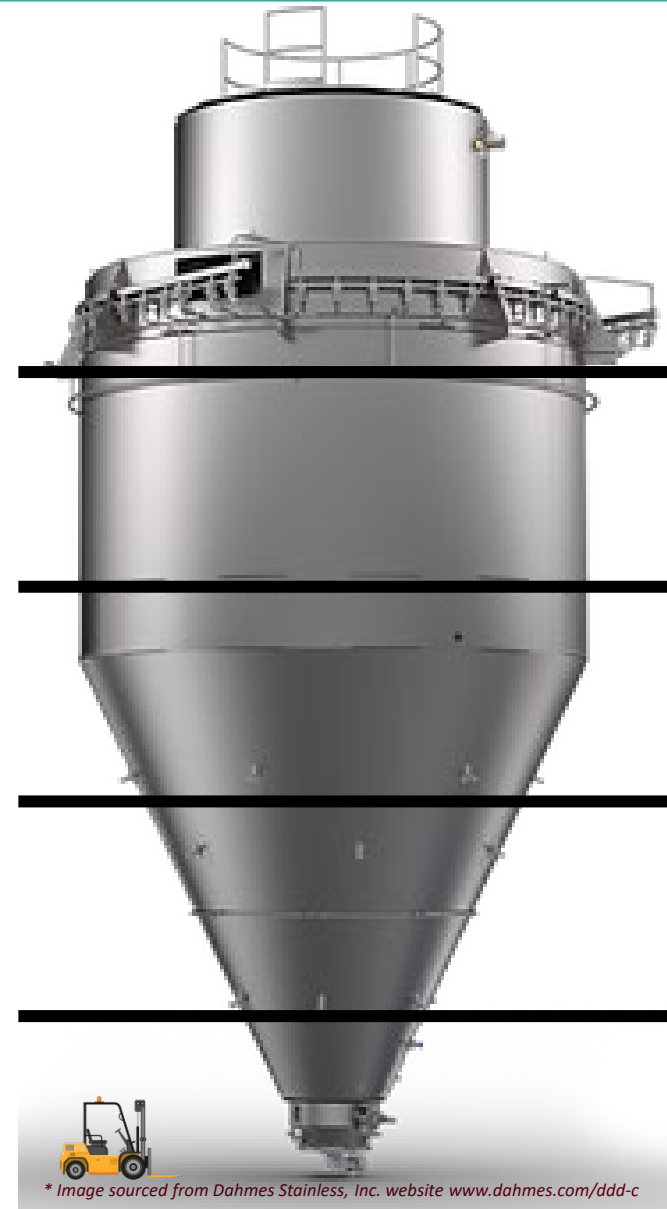
Modify baghouse pulsing

One of the largest pieces of equipment at the facility

Consumer of up to 40% of compressed air

Complex jet cleaning system with numerous elements

Controlled by PLC with logic upgrade potential



Baghouse jet cleaning overview

Incoming flow

Hot air with protein is sent to filters

Dozens of filters clean the ascending hot air

Protein particles fall down or accumulate on filter bags



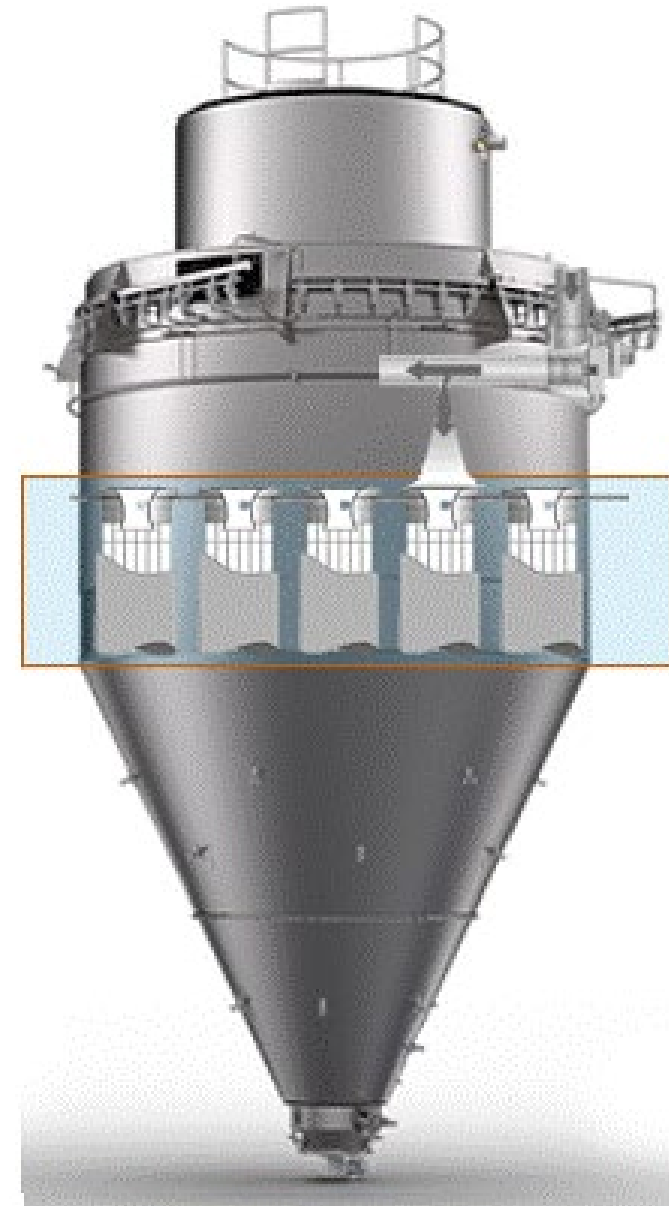
Baghouse jet cleaning overview

Cleaning

Compressed air is pulsed inside the bags

Bags expand dislodging the protein particles

Protein particles fall down



Baghouse jet cleaning overview

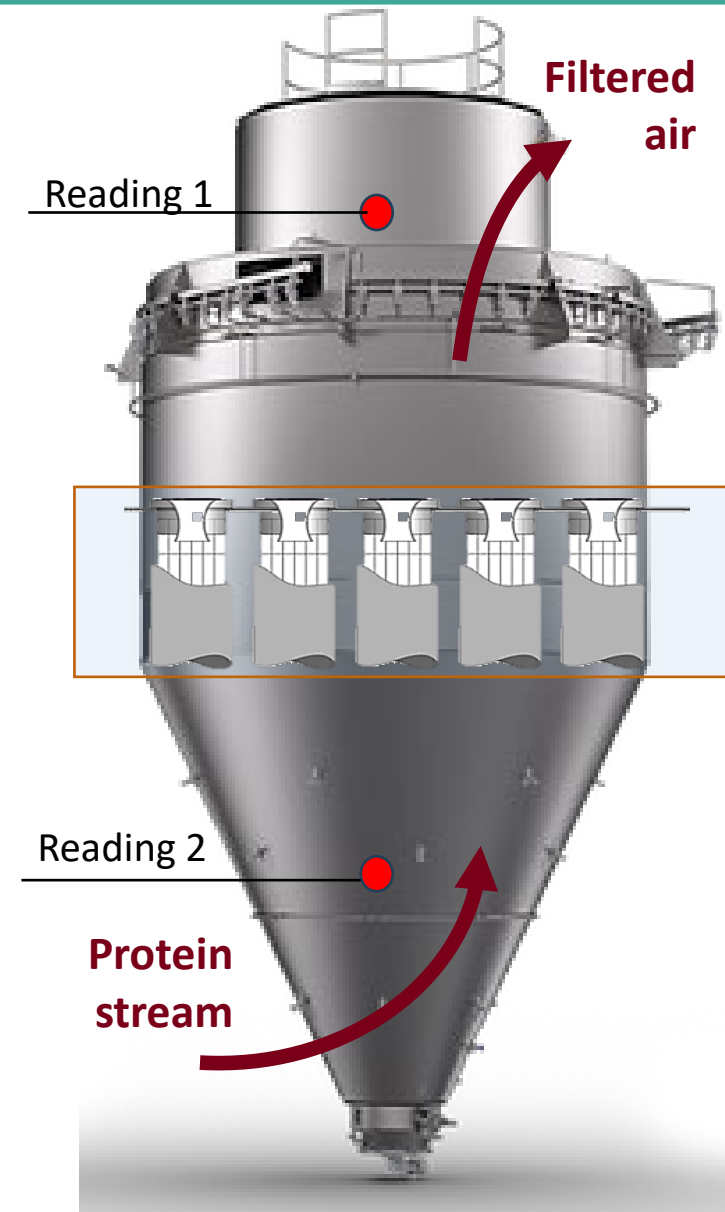
Controlling

Sensors are installed on both sides

Pressure differential indicates how clean the bags are

In PLC user interface operators could monitor the value

Historical data is used to analyze performance

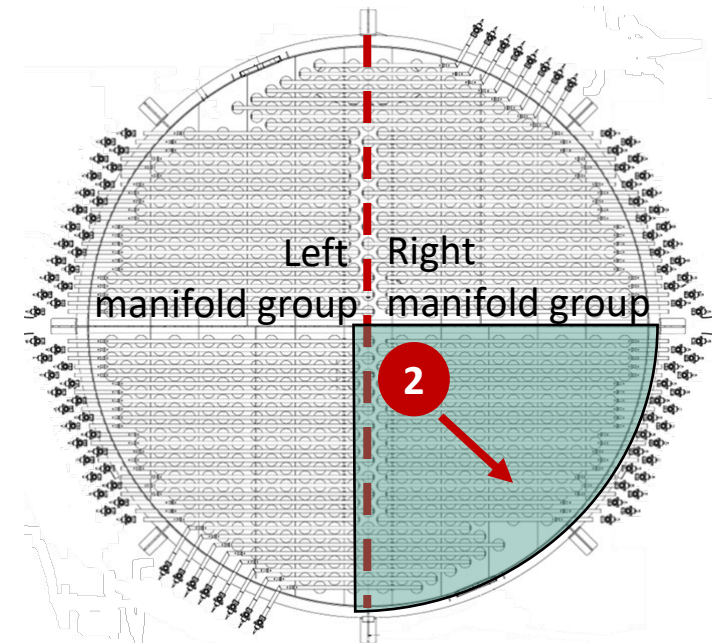
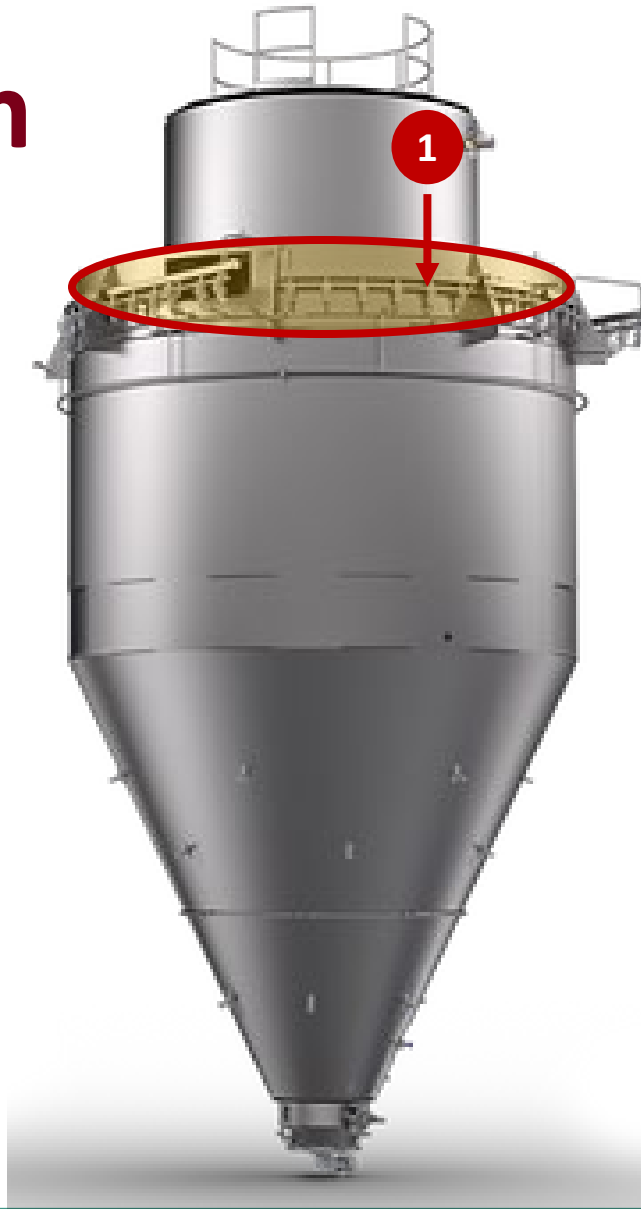


Jet cleaning system

Next slides:

circular top view (1),

the bottom left quadrant (2)



Baghouse jet cleaning settings

Initial

Implemented

Recommended

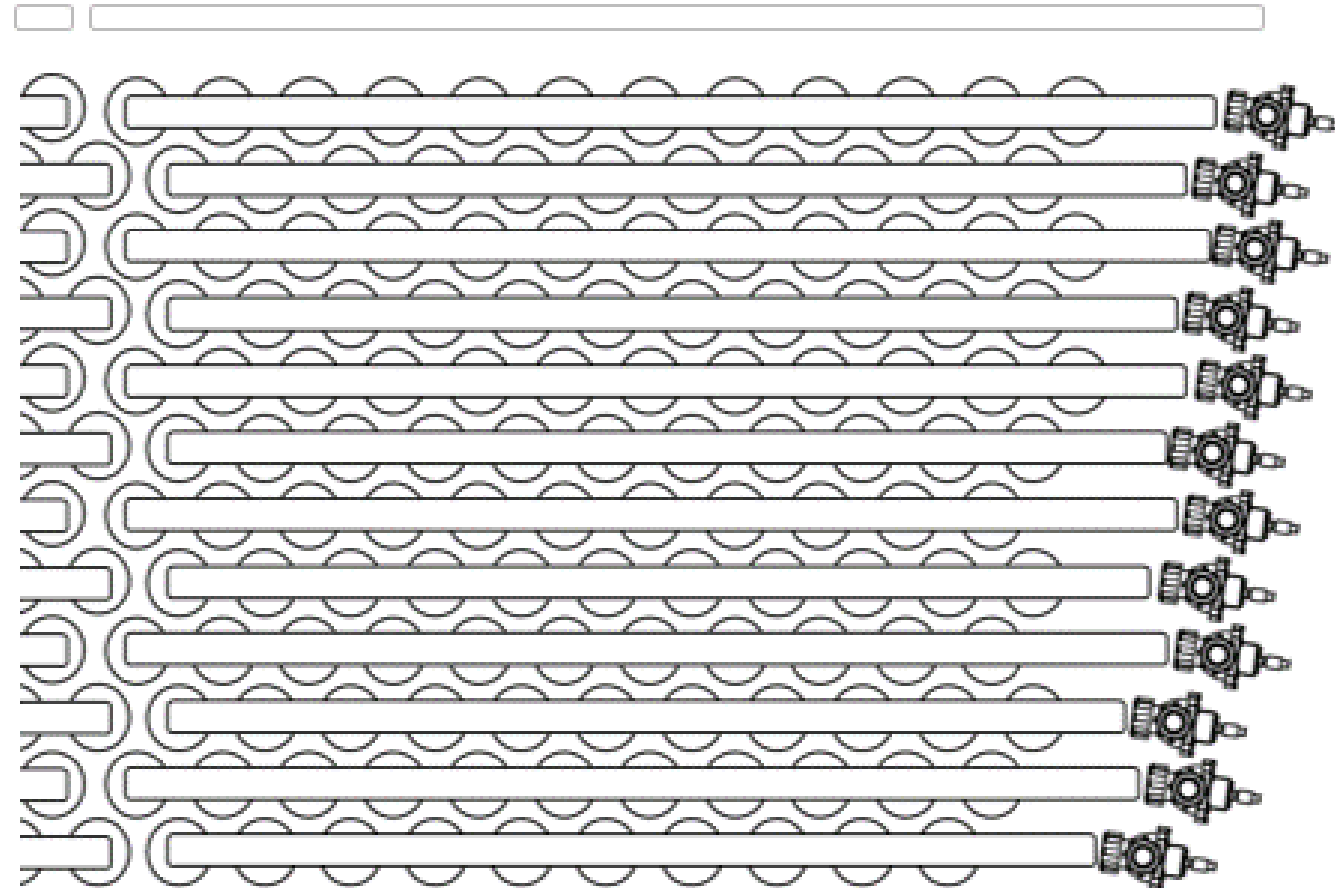
Timer based

Pre-configured

Prolonged pulsing

Shortened pulse delays

Semi-staggered approach



Baghouse jet cleaning settings

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Implemented

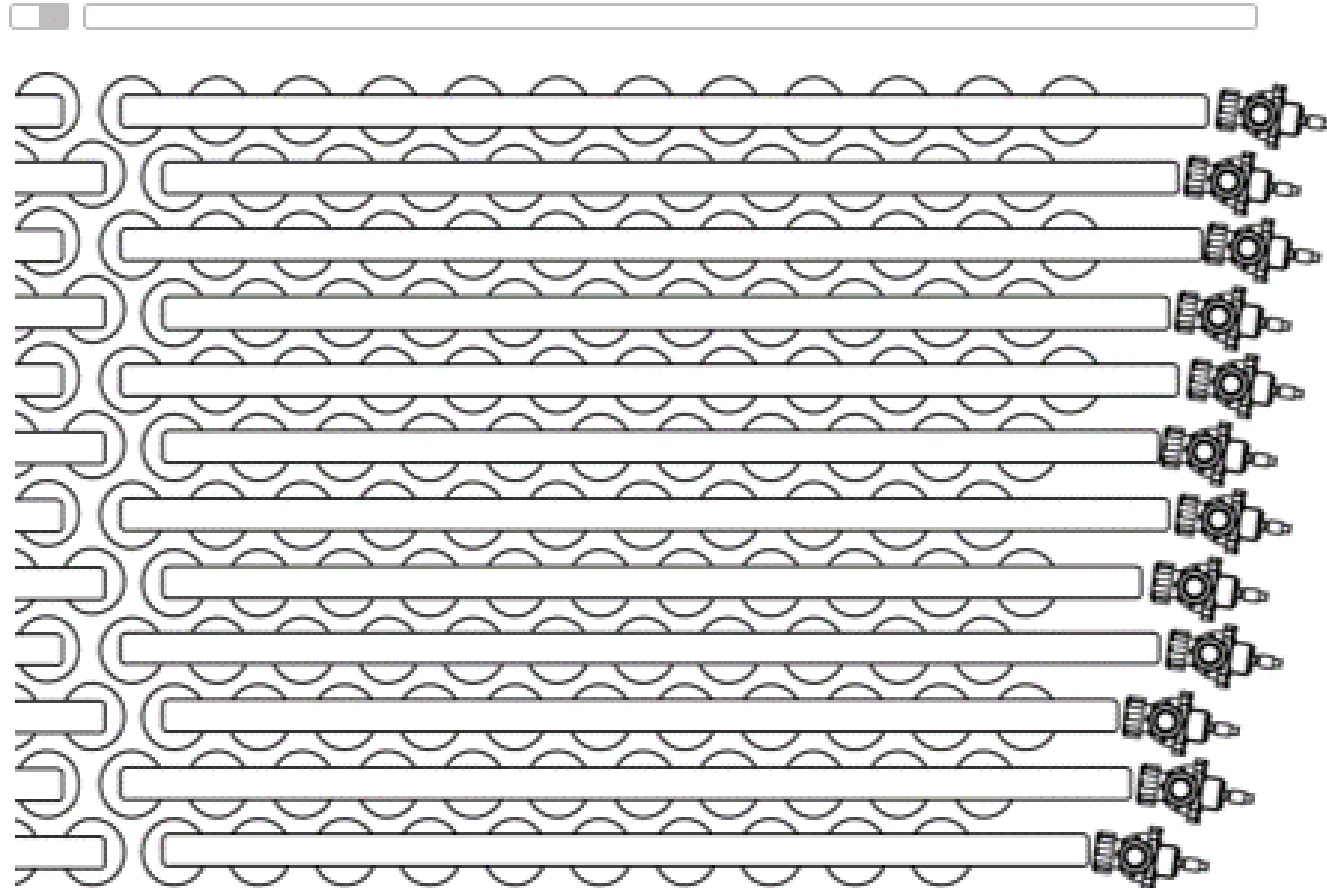
Recommended

Pulsing delay increased (■)

Pulsing duration shortened (■)

= less compressed air used

= energy savings



Baghouse jet cleaning settings

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Implemented

Recommended

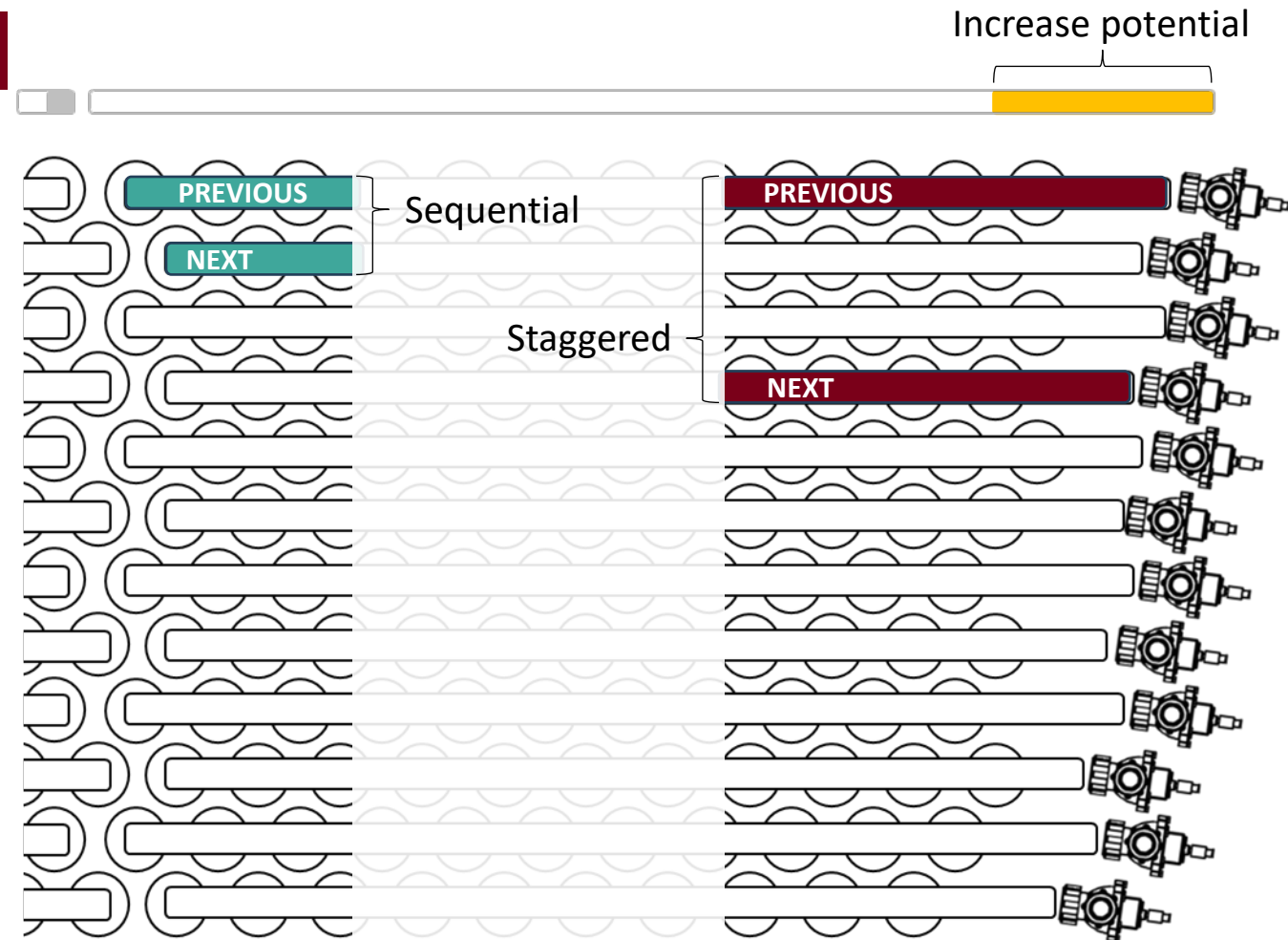
Increase delay further (■)

Adjust the sequence to staggered (■ -> ■)

Automate controls

= increase cleaning efficiency

= save even more



Solutions

Recommendation	Annual reduction	Total cost	Annual savings	Payback period	Status
Upgrade spray nozzles	280,000 gal	\$5,300	\$4,500	1.2 years	Recommended
Modify baghouse pulsing					
Decrease duration	145,000 kWh	\$100	\$5,100	Instant	Implemented
Increase delay	35,000 kWh	\$100	\$1,200	Instant	Implemented
Improve sequence	35,000 kWh	TBD	\$1,200	TBD	Recommended
Automate controls	35,000 kWh	TBD	\$1,200	TBD	Recommended
Upgrade boilers	182,000 therms	\$600,000	\$234,000	2.6 years	Recommended
Set routine steam trap inspection	5,300,000 gal	\$4,500	\$194,000	Instant	Recommended
Install capacitor bank	n/a	\$77,000	\$82,000	0.9 years	Recommended

Personal benefits

- Exercised engineering skills on a large scale
- Explored the food industry
- Analyzed manufacturing process
- Learned about sustainability
- Connected with great people

