Energy Conservation At Kraft Foods, Albany

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Minnesota Technical Assistance Program

UNIVERSITY OF MINNESOTA

Driven to Discover℠

Plant Overview

Plant:

Began in 1929, Albany, MN
Square Footage: 84,800 sq. ft.
Employees: 69

Production Lines:

- 3 Spray Dryers (Cheese Powder)
- 1 Dry Blend (Flavored Powder)
- 2 Thermal Reactors (Grill)
- 1 Semi-Soft (Liquid Cheese)

Motivations for Change

- Sustainability Project in Kraft
- Sustainability Team Formed in 2009
- Rising Energy Costs
- Energy Curtailment

Reasons for MnTAP Assistance

- Assist Sustainability Team
- Benchmarking
- Compartmentalizing Energy Consumption
- Compressed Air System Study
- Efficiency Study (Boiler, Steam Coil, and Burner)
- Discover Future Improvement Opportunities

Approach

- Understand Current Systems
- Literature Review
- Data Logging
- Using PLC to Collect Real Time Data
- Interaction and Feedbacks from the Operators
- Vendor Contacts

Process

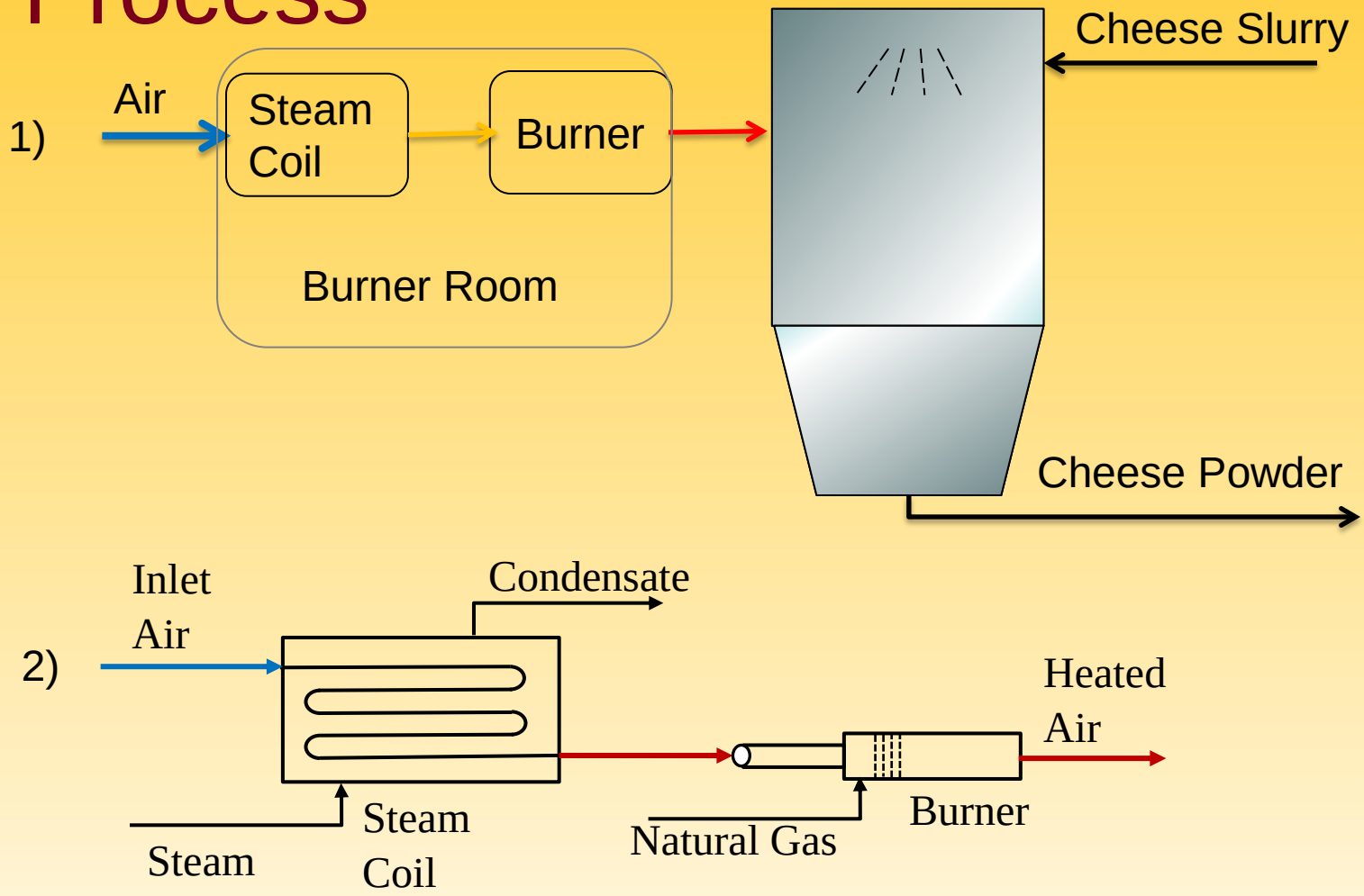
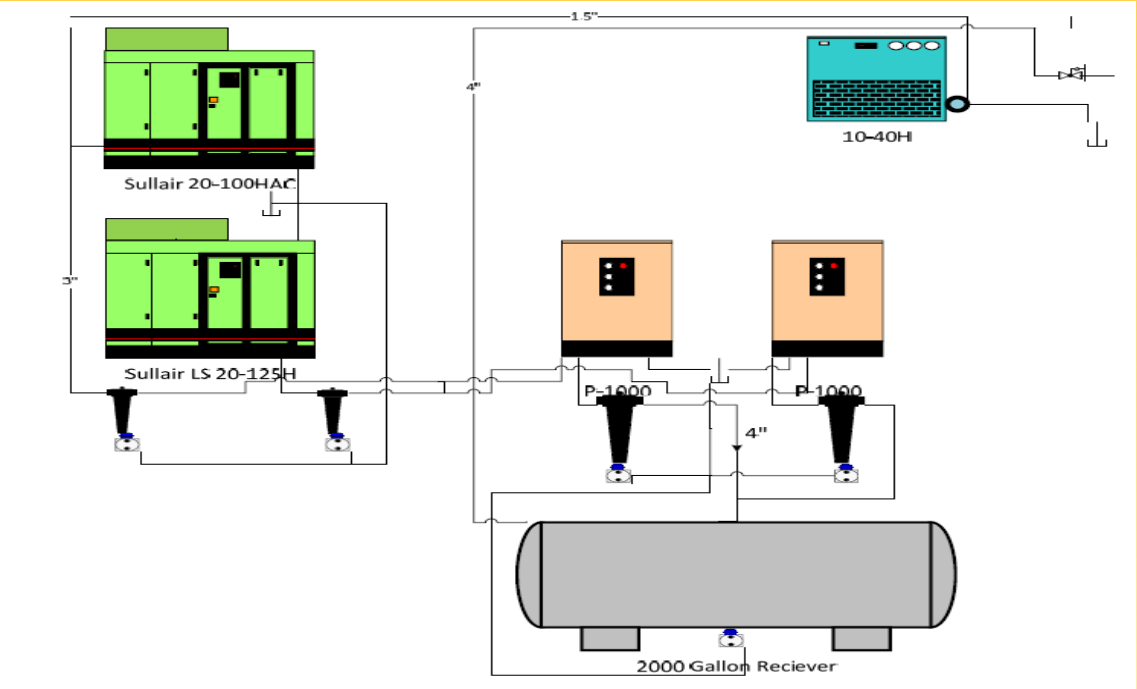


Fig. Schematic Process Diagram

Compressed Air System

- 3 Compressor
  - 125 hp
  - 100 hp
  - 40 hp



- System Pressure: 115±2 psi
- Annual Electricity Cost on 125 hp Compressor: $29,200
- Current Efficiency: 28 kw/100 cfm delivered

Compressed Air System (Ctd.)

1) Repairing the Air Leaks

2) Compressed Air System Pressure Reduction

3) Applying Advanced Control Strategy (VFD retrofitting)

Compressed Air System (Ctd.)

Determine Air Leaks

Initial Pressure (psig)	End Pressure (psig)	Time (min)	Leakage (%)
115 ± 1	58 ± 1	11'21	37

Table. Draw Down Test Result

Helped to Develop Air Leak Preventive Maintenance

Recommendation	Utility Savings	Annual Savings	Status
Repairing air leaks (Air leak percent drops down to 15%)	107,000 KWH	$6,400-7,500	In Progress

Table. Savings for Repairing Air Leaks

Compressed Air System(Ctd.)

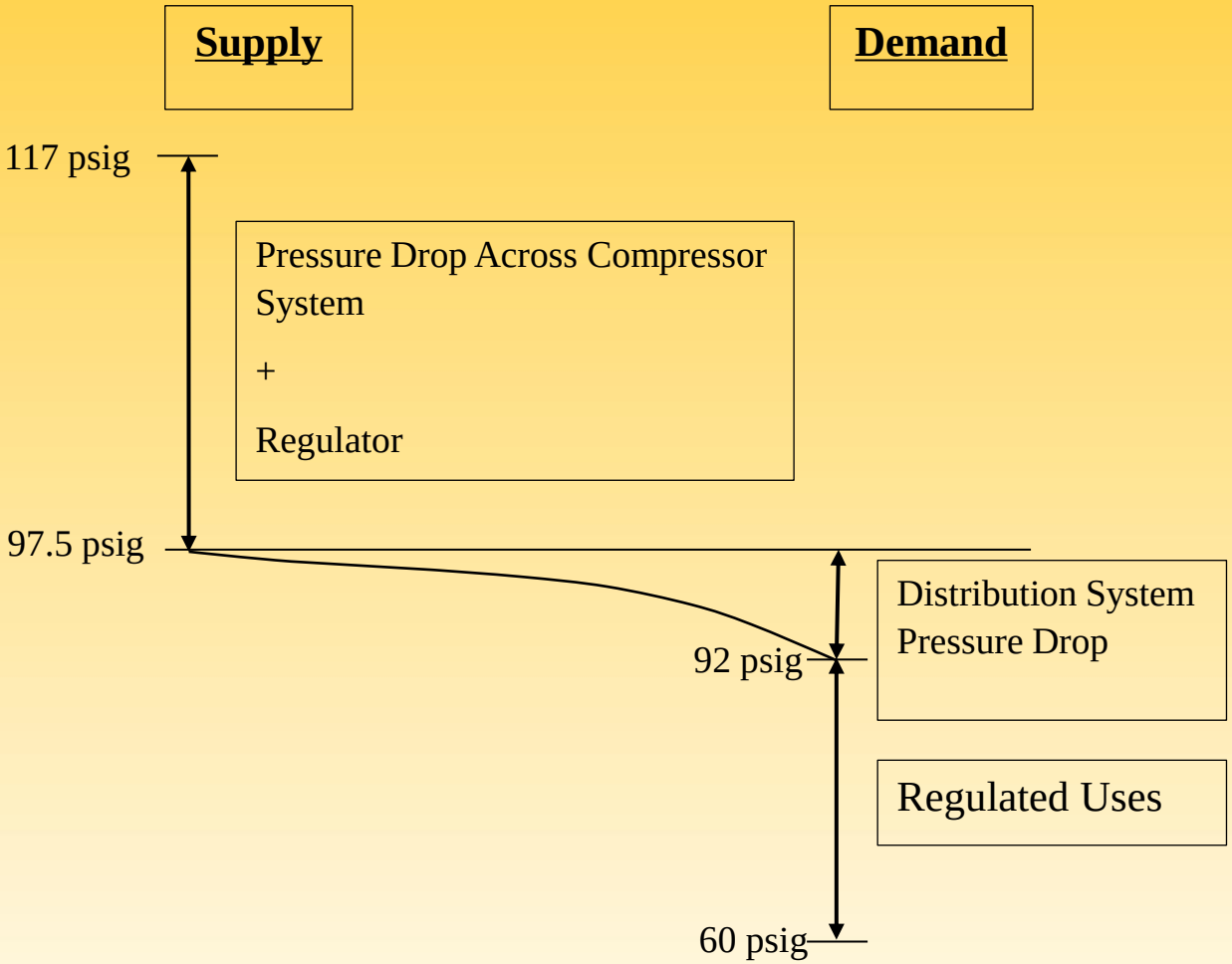


Figure. Current System Pressure Profile

Compressed Air System(Ctd.)

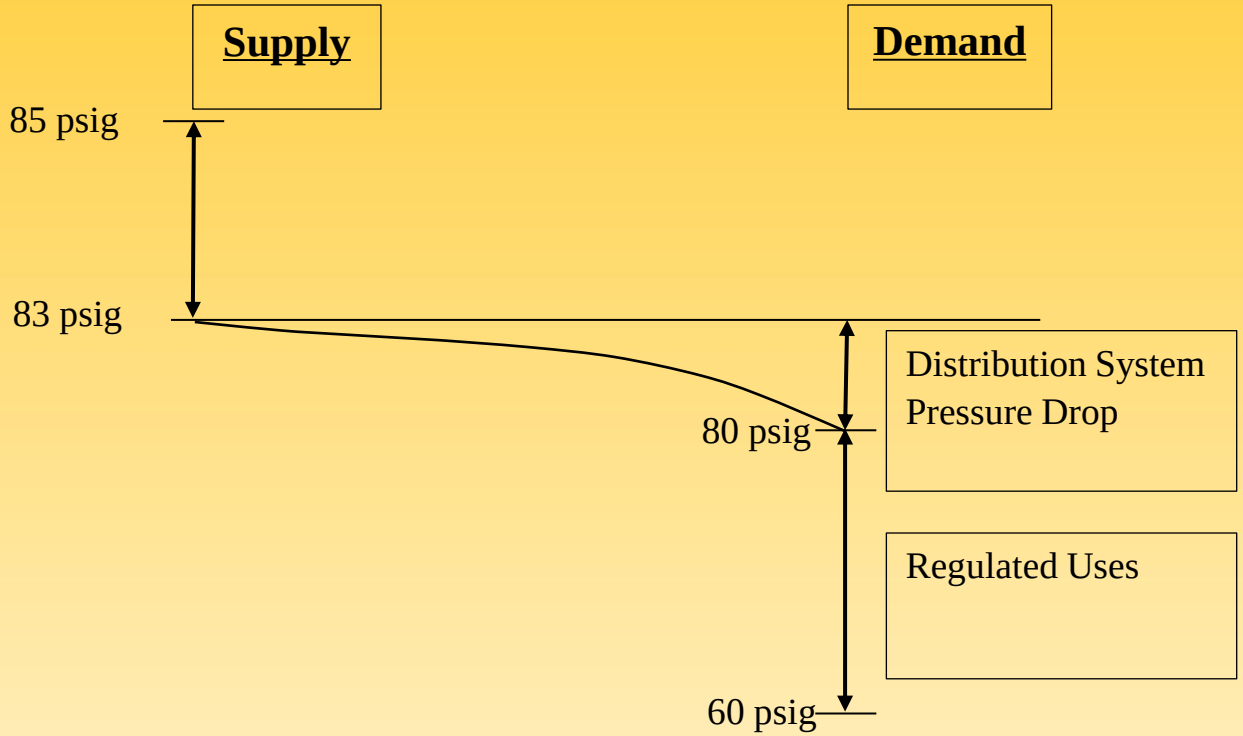
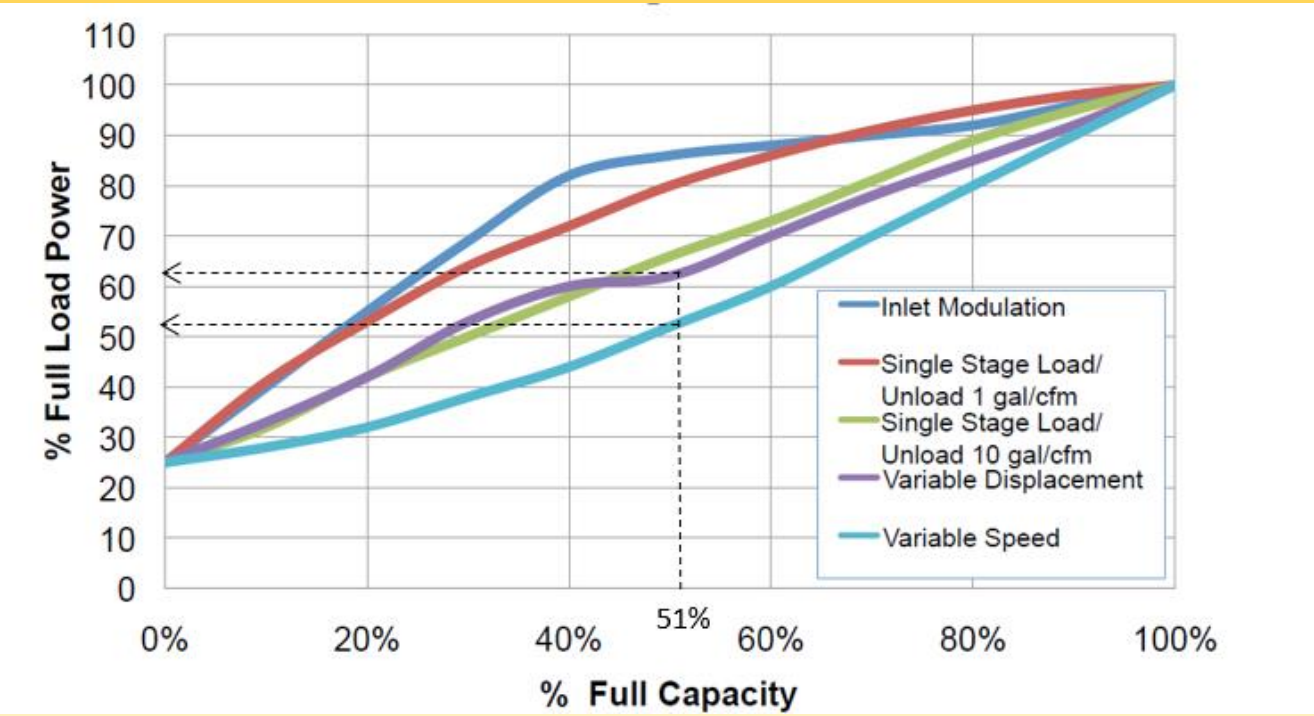


Figure. Improved System Pressure Profile

Recommendation	Utility Savings	Implementation Cost	Annual Savings	Payback Period	Status
Lowering the system pressure from 115 psi to 85 psi	73,000 KWH	$2,400	$4,400-$5,100	6 months	Pending

Compressed Air System (Ctd.)

Fig. Average Power vs. Capacity of compressor with different control



Recommendation	Utility Savings	Implementation Cost	Annual Savings	Payback Period	Status
VFD retrofitting If reached 21.8 kw/100acfm	38,700 KWH	$7,250	$5,300 -$6,200	1.2 to 1.4 years	Recommended

Steam Conservation

Reduce Unnecessary Steam Use

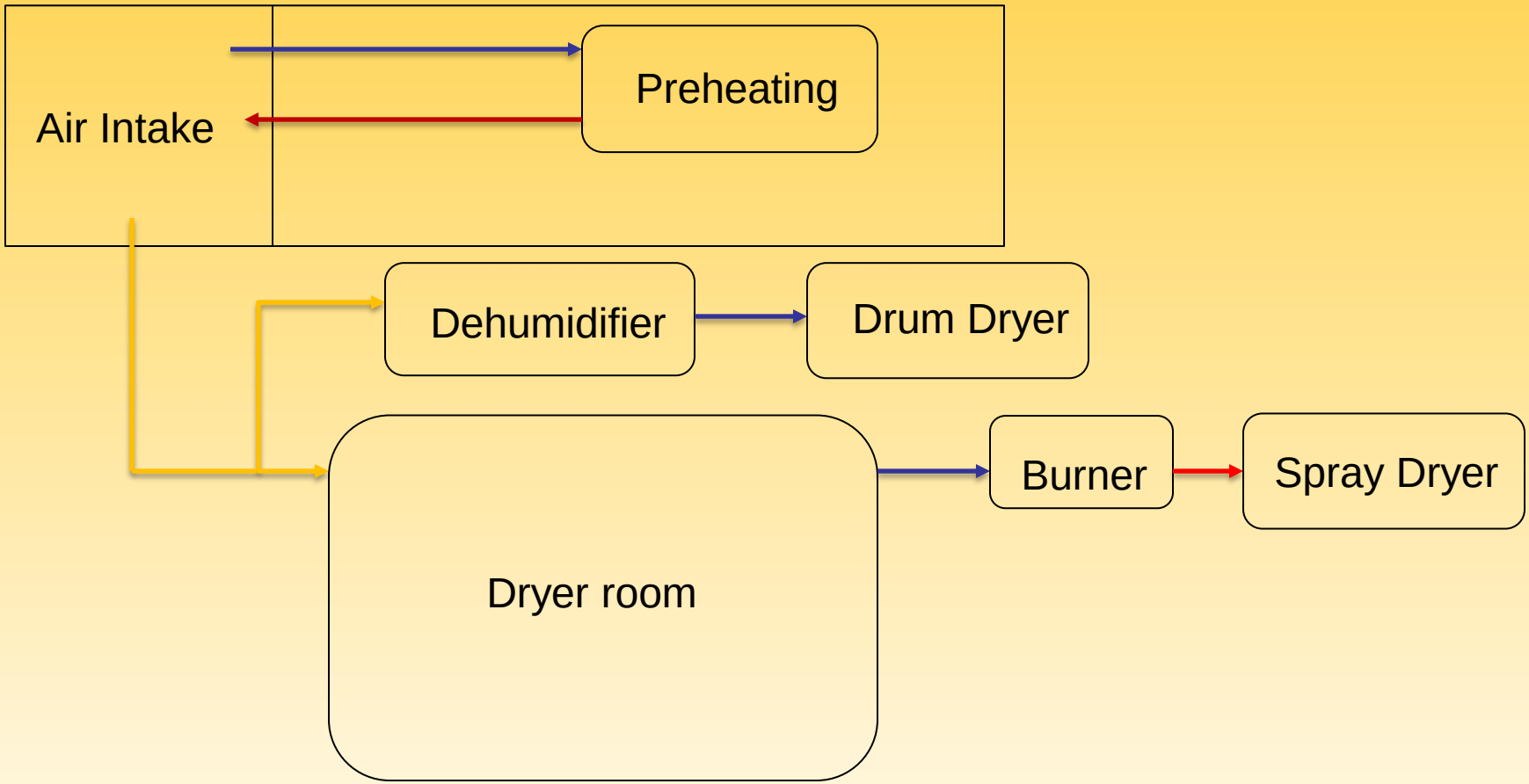


Figure. Current Preheating System Diagram in Dryer 3

Steam Conservation (Ctd.)

With Preheating System Turned Off

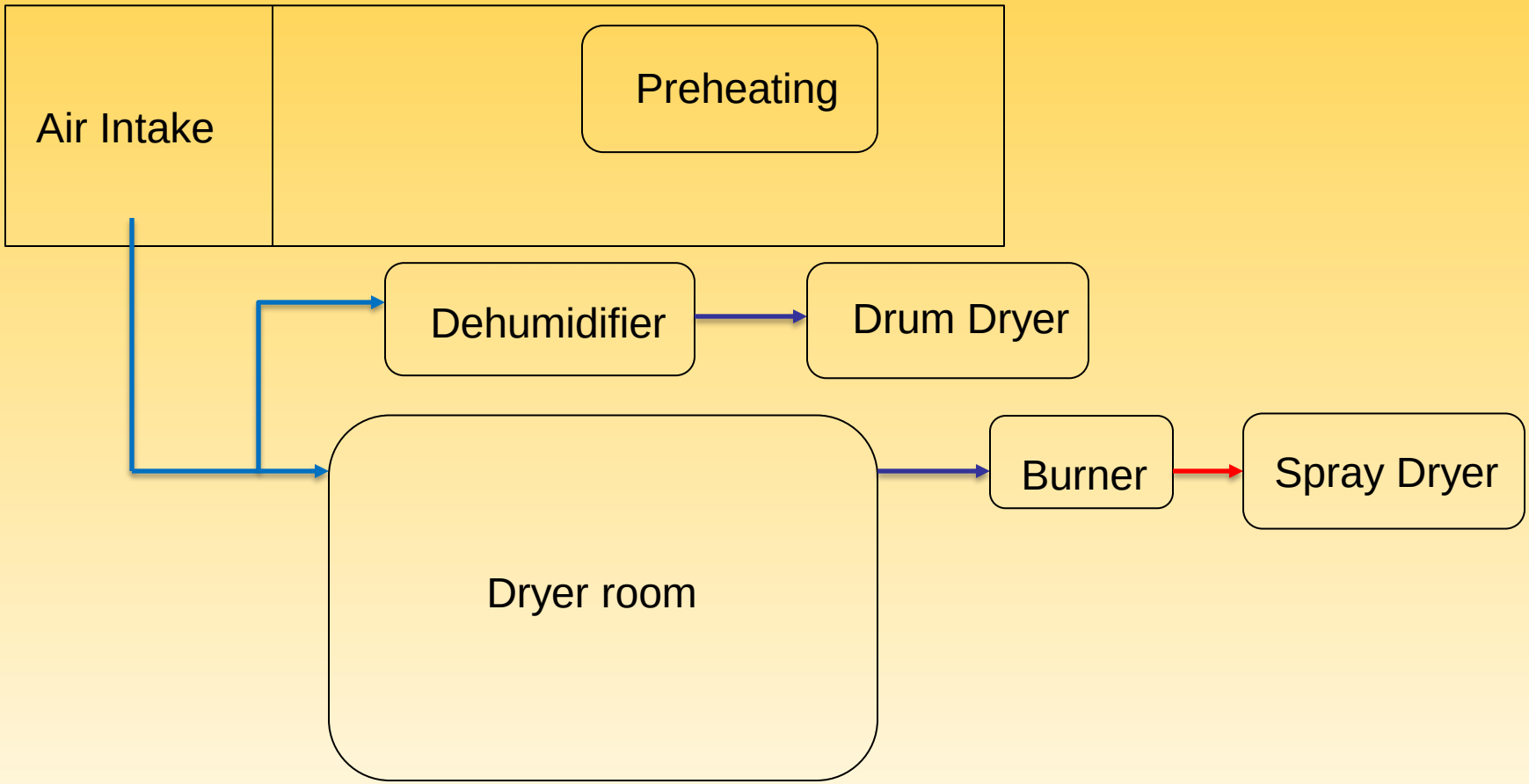


Figure. Improved Preheating System Diagram in Dryer 3

Steam Conservation (Ctd.)

Recommendation	Utility Saving	Implementation Cost	Annual Savings	Payback Period	Status
Shutting down Steam Use in SA-4	411,000 lbs Steam	$0	$2,800	0 months	Pending
Turn off the Supply Fan	11,700KWH	$0	$ 900	0 months	Pending

Table. Savings if Preheating System is turned off in the Summer

Future Opportunities

- Research in the possibility that if preheating system can be turned off in the winter

Future Opportunities

1) Reduce Unnecessary Steam Use

2) Increase Boiler Efficiency

3) Improve Current Dryer Performance

Approach

1) Programming in PLC, collecting and processing real time data

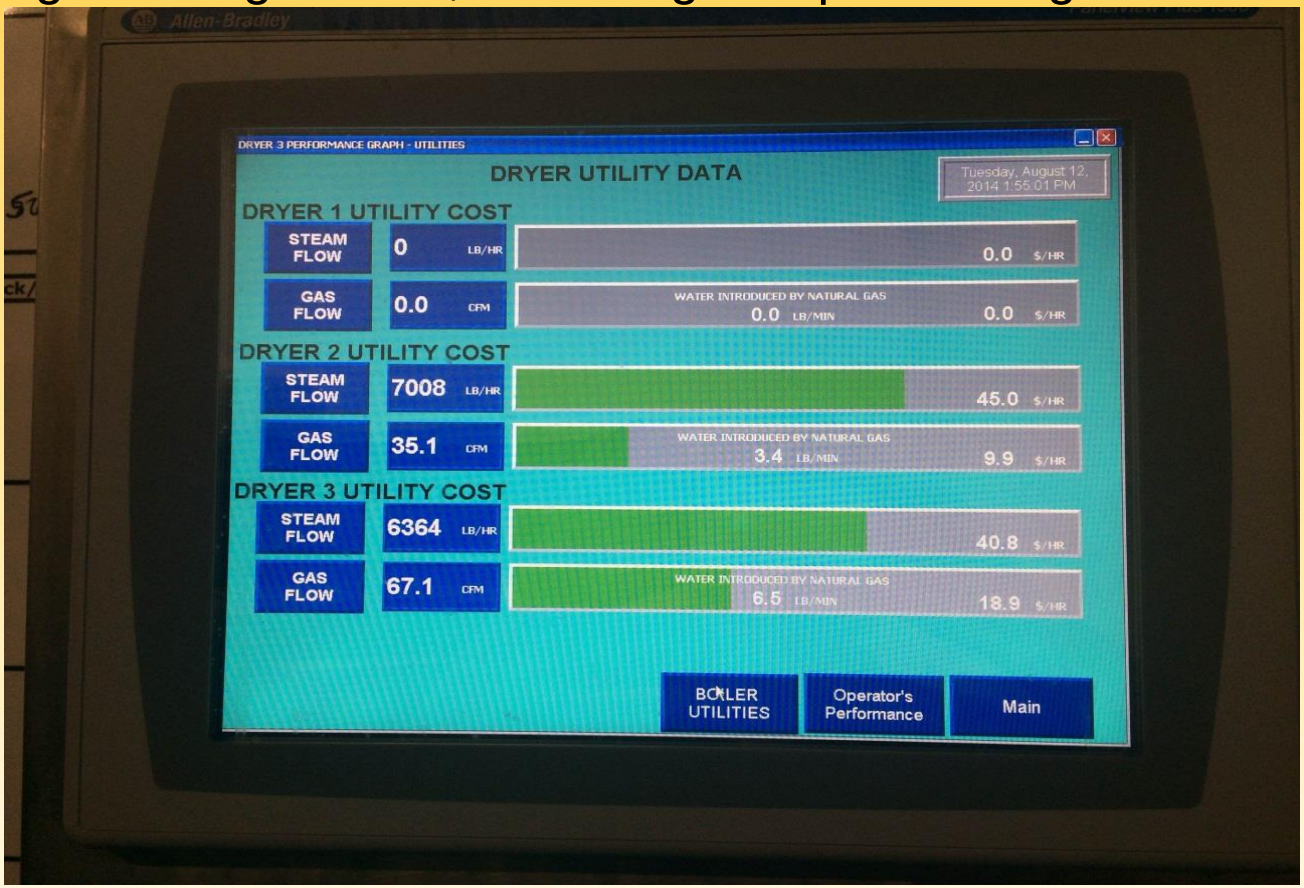


Figure. Display Panel for Dryer Utility Use

Approach

1) Programming in PLC, collecting and processing real time data

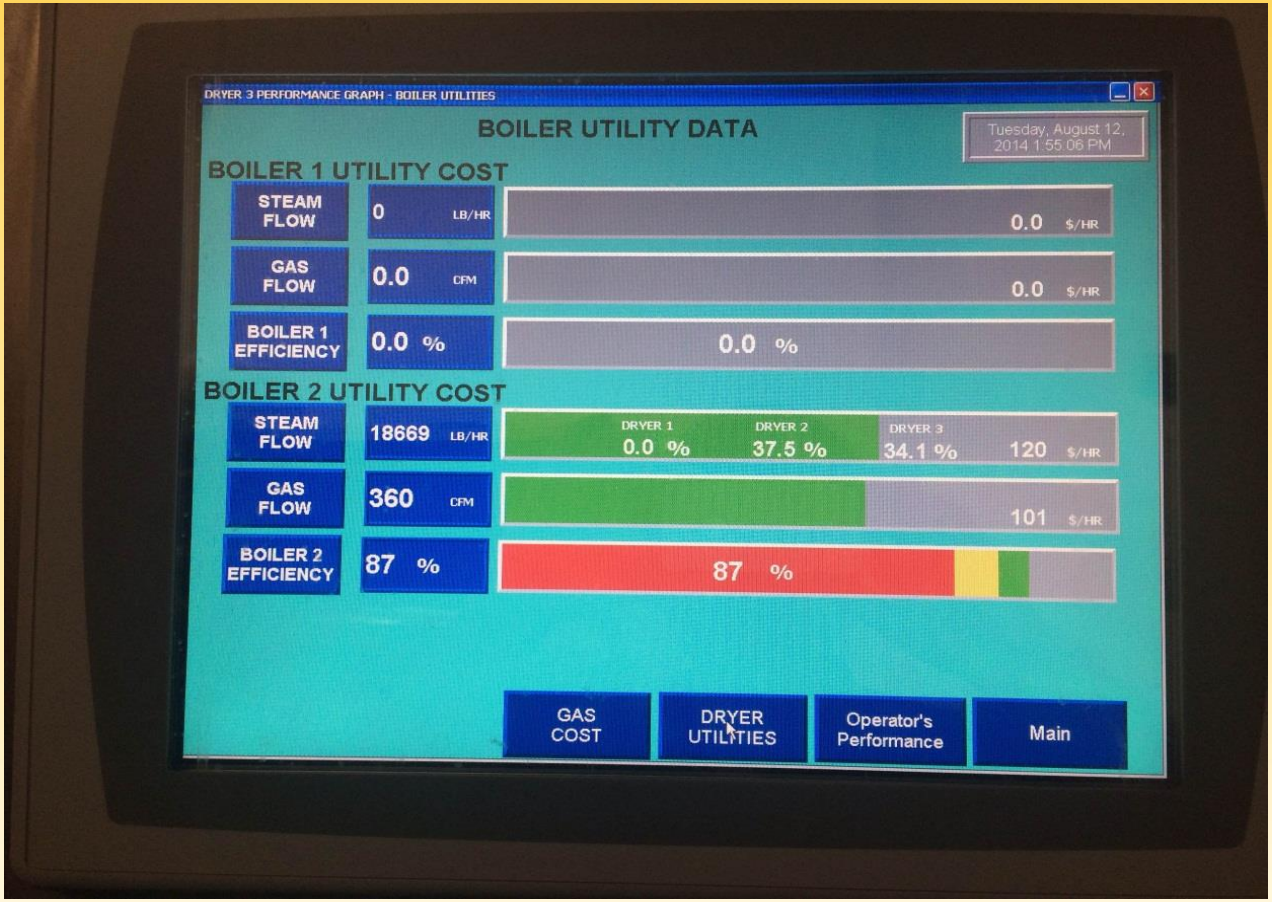


Figure. Display Panel for Boiler Utility Use

Approach

1) Collecting Real Time Data to Assist Decision Making

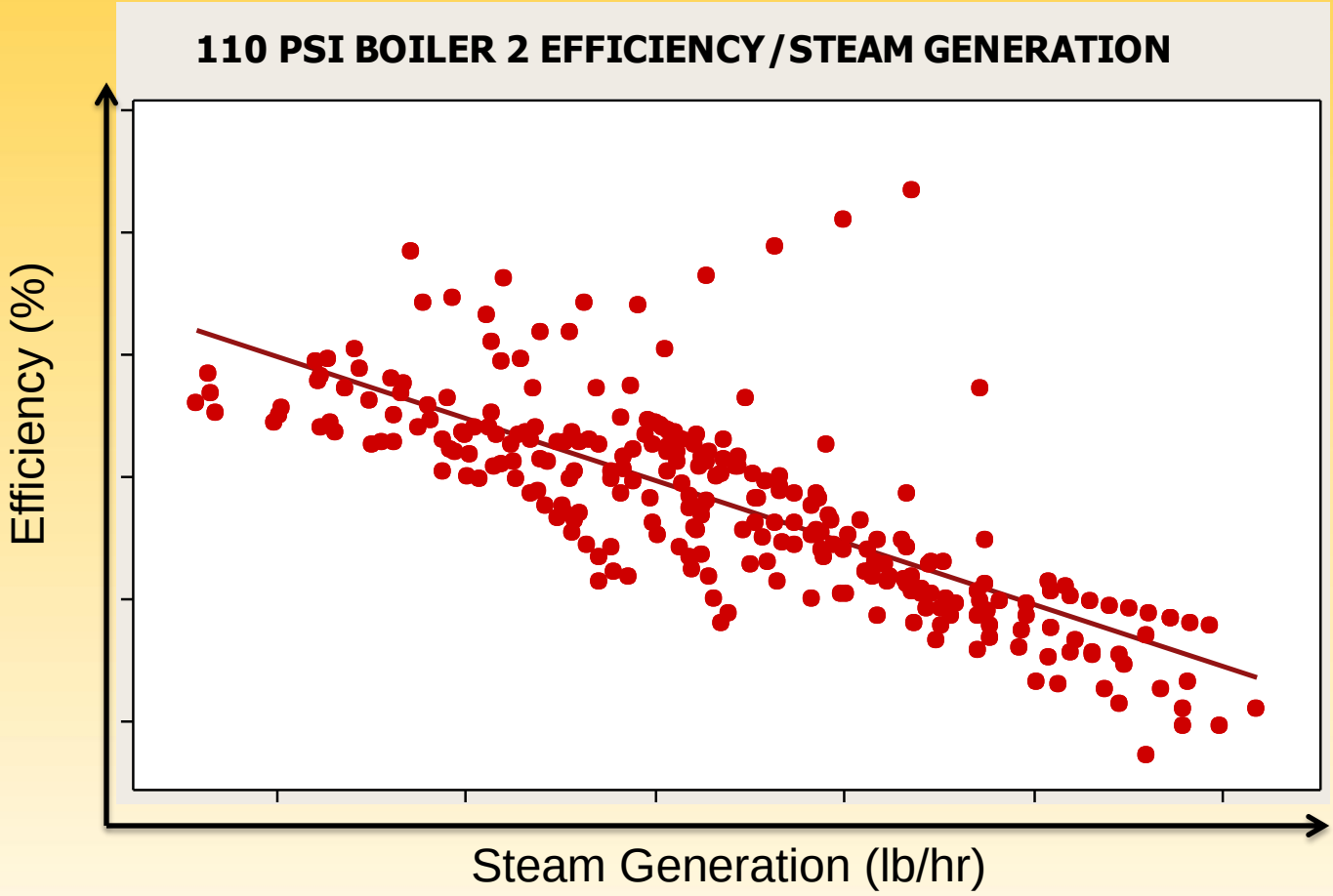
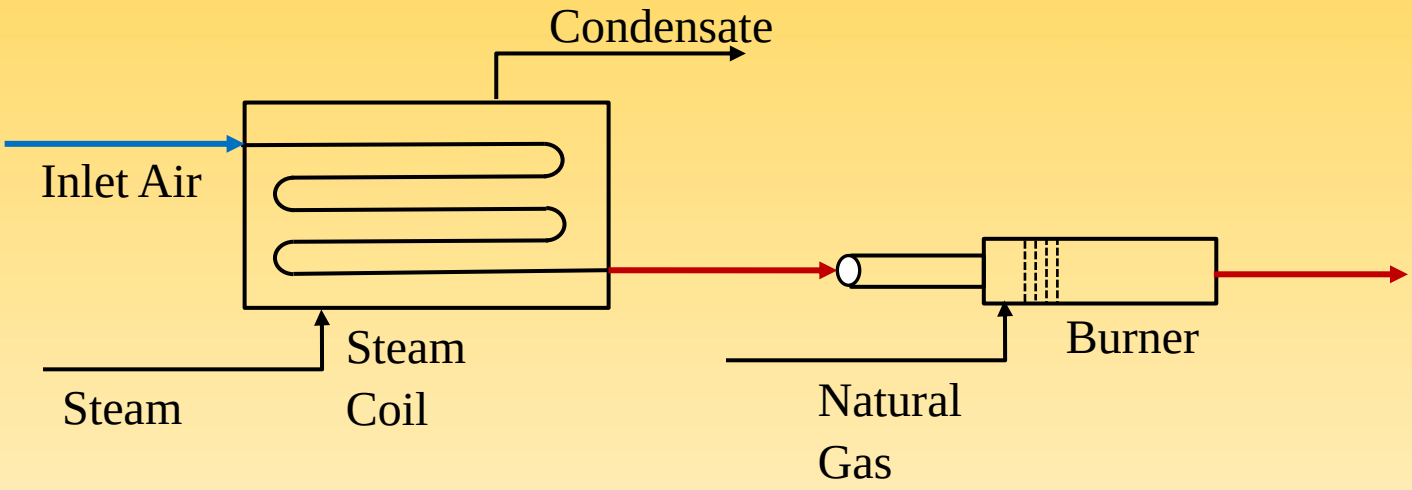


Figure. Analysis of Boiler Efficiency vs Boiler Load

Approach

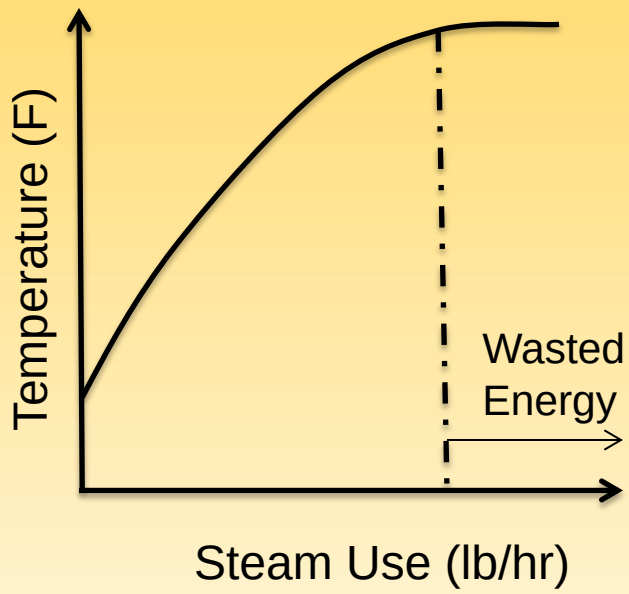
2) Understanding the Influence of Moisture Content on Dryer Performance.

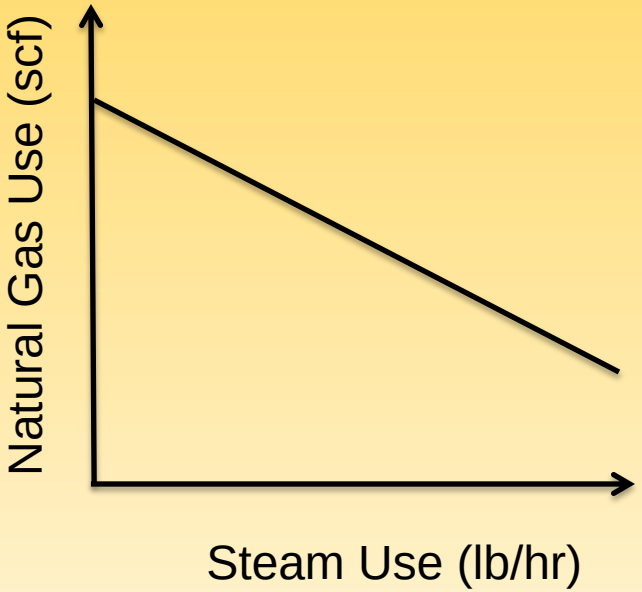


$$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O + \text{energy}$$

Approach

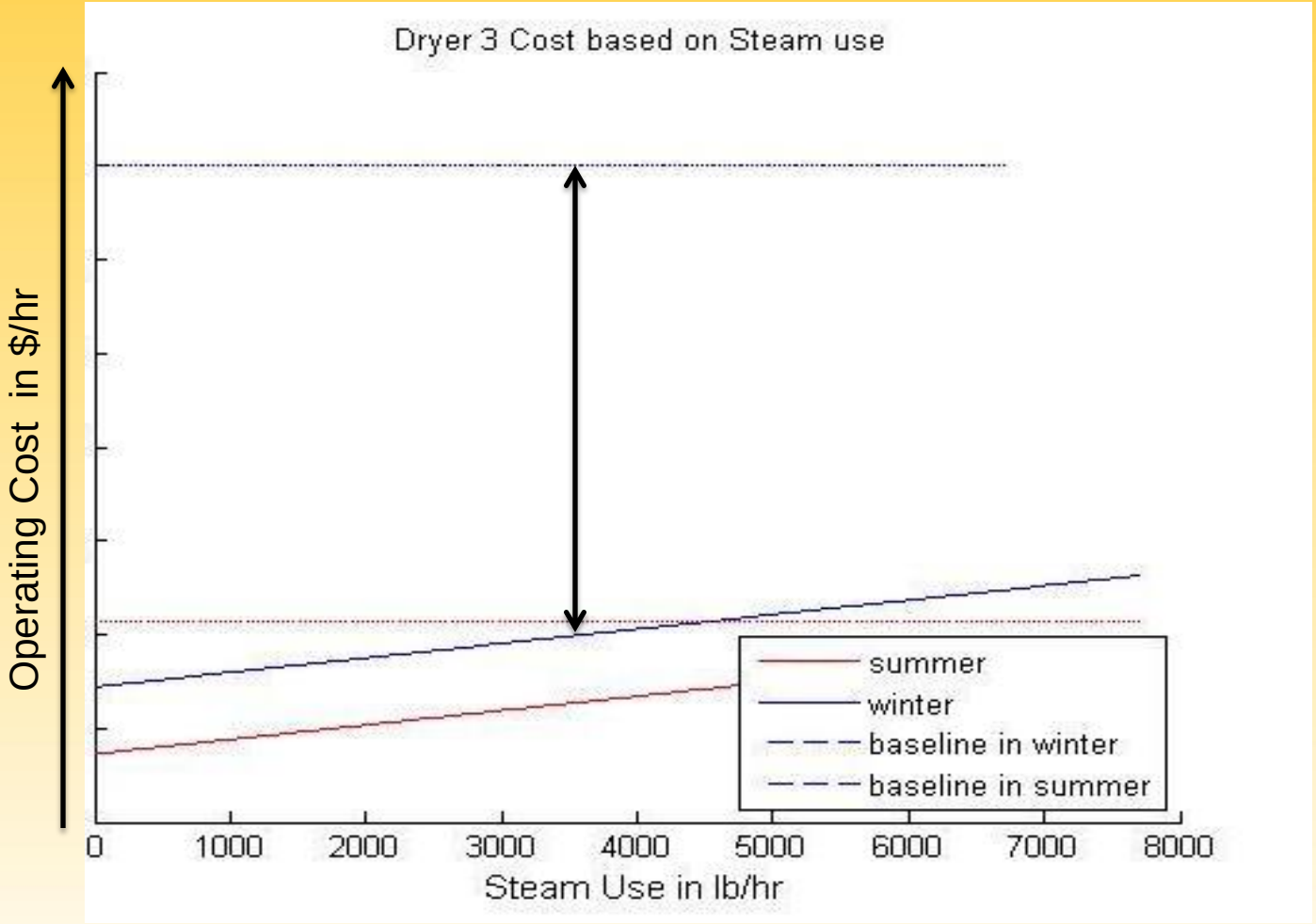
2) Understanding the Limitation of Steam and Reduce Unnecessary Steam Use





Approach

3) Computational Model to Assist Decision Making



Approach

3) Computational Model to Assist Decision Making

Season	Estimated Maximum Saving	Operating Hours	Estimated Annual Saving
Summer	$ 7/hr	3120 hrs	$ 21,800
Winter	$ 25/hr	3120 hrs	$78,000
Total			$99,800

Table. Estimated Maximum Savings in Dryer 3

Recommendation Summary

Recommendation	Annual Utility Saving	Annual Savings	Status
Lowering the system pressure from 115 psi to 85 psi	73,000 KWH	$4,400-5,100	Pending
VFD retrofitting If reached 21.8 kw/100acfm	38,700 KWH	$5,300-6,200	Recommended
Repairing air leaks (Air leak percent drops down to 15%)	107,000 KWH	$6,400-7,500	In Progress
Shutting down Preheating Unit in Dryer 3	411,000 lbs Steam	$2,800	Pending
Turn off the Supply Fan in Preheating Unit	11,700 KWH	$ 900	Pending
Total		$19,800-22,500	

Personal Benefits

- Technical Understanding Acquired
- Industrial Environment Exposure
- Data Analysis
- Programming Skills
- Project Cost Understanding
- Vendor Contact
- Working Alone As Well As in Groups

Questions

Thanks!