Energy Efficiency at CHS

Sam Matuseski

MnTAP Advisor: Michelle Gage

Company Supervisor: Stephanie Simms

UNIVERSITY OF MINNESOTA

Driven to Discover℠

CHS

- **Agricultural Cooperative**
- **10,000 employees nationwide**
- **Businesses**
  - Grain, agronomy and feed
  - Refined fuels, propane, renewable fuels

Project

- **Incentives**
  - Significant cost savings, $3 million spent on energy annually
  - Institution of a sustainability program
  - Improved quality control during grain storage
- **Goals**
  - Reduce energy usage by 10% for MN Xcel locations (270,000 kWh)
  - Create energy efficiency white papers

Xcel Energy®

Facilities

- Over 60 locations across MN
- Sustainability is beginning to take off
  - Establishing corporate wide initiatives
  - Lots of opportunity for growth and cost-savings
- What is a leg?
- Major points of energy usage
  - Fertilizer – Running legs, pneumatics and conveyors
  - Grain – Storing grain in grain piles and bins

https://auctionresource.com/auctions/3189/online-only-equipment-auction/353891/ranco-fertilizer-leg-np9139

https://www.agweek.com/business/agriculture/6628123-A-drain-on-grain-elevators-SDs-facility-count-continues-decades-long-shrinking

Ground Storage

- **Large piles used to store grain after harvest**
  - 500,000 – 2,000,000 bushels
- **Higher risk for spoilage than bin storage**
- **Typically run 4-12 fans 100% of time**
  - Airflow prevents spoilage
  - Pressure for tarp
  - Large energy usage

http://www.ethanolproducer.com/articles/10707/piling-it-on-strategically

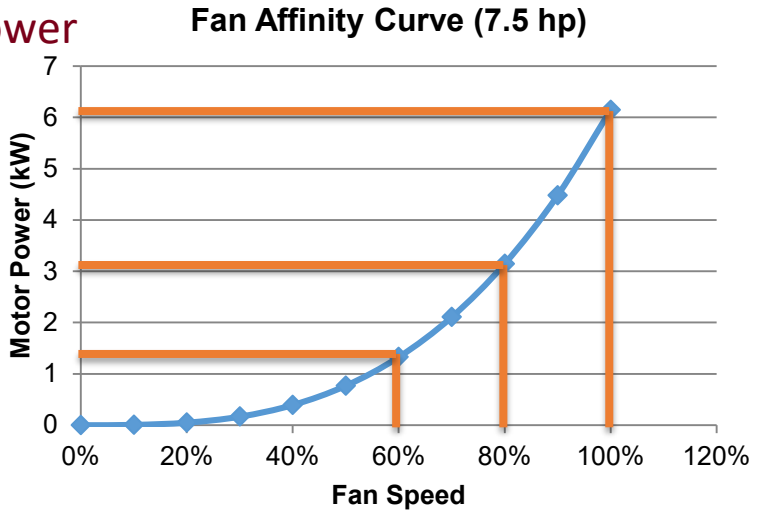
VFDs

- **Variable Frequency Drive (VFD)**
  - Speed control on motors
- **Extron AgTECT**
  - Read wind speed, adjust fan speed
  - Temp, CO2, Humidity sensors

https://www.extroncompany.com/agtect-agricultural-solutions/grain-management-systems/ground-piles/fan-vfd/

VFD Recommendations

- **VFDs should be installed on the 15 grain piles across MN**
- **70%-80% in energy savings**
  - Cubic relationship between fan speed and power
- **Install Temp, CO2 and humidity sensor**
  - Improved quality control



VFD Potential Savings

Location	Xcel Energy	Recommendation	Implementation Cost	Energy Savings (kWh per year)	Cost Savings ($ per year) *	Payback Period **
Herman	No	Install VFDs on Grain Bunker fans	$98,000	481,000	$67,000	1.10 years
Glenwood	Yes	Install VFDs on Grain Bunker fans	$119,000	323,000	$45,000	2.16 years
Ruthton	Yes	Install VFDs on Grain Bunker fans	$70,000	203,000	$28,000	2.04 years
Jasper	Yes	Install VFDs on Grain Bunker fans	$52,000	190,000	$27,000	1.68 years
Morris	No	Install VFDs on Grain Bunker fans	$35,000	97,000	$14,000	2.26 years
Chokio	No	Install VFDs on Grain Bunker fans	$47,000	102,000	$14,000	2.85 years
Erskine	No	Install VFDs on Grain Bunker fans	$41,000	83,000	$12,000	3.01 years
French	No	Install VFDs on Grain Bunker fans	$25,000	46,000	$6,000	3.44 years
Long Prairie	No	Install VFDs on Grain Bunker fans	$38,000	70,000	$10,000	3.35 years

** Factors in prescriptive rebates and other savings beyond just energy savings, does not account for custom rebates which would reduce payback period for VFD projects

- **Payback period ranges, depends on fans and usage**
- **Savings calculated assuming average fan speed of 60%, Extron's method**

Energy Audits

- **Walkthrough of facilities**
- **LED Lighting**
- **Compressed Air**
  - Fix leaks
  - Zero-loss drains
- **Professional audit for Ruthton**
  - Franklin Energy
  - Large energy usage annually, ~$200,000

https://greenbusinesslight.com/services/led-warehouse-lighting/

FRANKLIN ENERGY

Overall Recommendations

Recommendation	Implementation Cost	Energy Savings (kWh per year)	Cost Savings ($ per year) *	Payback Period **	Status
Install VFDs at 9 locations	$525,000	1,595,000	$223,000	1.95 years	Recommended
Install LED lighting at 2 locations	$18,500	66,000	$12,000	1.25 years	Implementing
Fix compressed air leaks at 3 locations	$0	18,000	$3,000	Instant	Implementing
	Total Savings	**1,679,000**	**$238,000**		

- **Xcel locations : 735,000 kWh in savings**

Personal Benefits

- Experiencing farms
- Top of a leg (safely)
- Connect with people passionate about energy
- Inspire others to think sustainably