2014 Case Study

Capstan Ag System, Inc.

Intern: Austin Motley
Major: Mechanical Engineering
School: Kansas State University

Company background
Capstan Ag's headquarters in Topeka, Kansas specializes in the research, engineering, and production of new proprietary systems for the agricultural industry, particularly with chemical and fertilizer applications. The management is consistently searching for new ways to reduce waste and improve efficiency within their company. During the summer internship the focus was on energy reduction. The largest concerns for the company included energy assessments for their lighting, air conditioning, and air compressor systems.

Project background
The lighting assessment became a two part project, for the production floor and separately for their office space. The project consisted of evaluating the current lighting status and researching energy efficient alternatives for long term efficiency. The air conditioning assessment included an air leak audit as well as a sizing evaluation. For the air compressor project, the size of air conditioners was evaluated as well as finding possible gaps where conditioned air escaped.

Incentives to change
Capstan Ag recently moved to their present address that fits their production needs. Some systems are outdated and are not considered energy efficient. In an effort to reduce energy use the management at the facility wanted to examine their facility for energy saving opportunities. To achieve this, Capstan Ag partnered with the Pollution Prevention Institute at Kansas State University through the intern program. With the advancement in technology and the rise of electricity costs Capstan Ag recognizes the benefits of implementing energy saving projects and techniques.

Projects reviewed for E2/P2 potential
1. Air Leak Audit
With the help of Jeremy Bey from UE Systems, an air audit of Capstan Ag's air compressor systems was completed on July 9th, 2014. The goal of the air leak audit was to ensure the facility air is being used appropriately with minimal waste. The audit discovered only two air leaks amounting to $25 in electricity costs per year.

2. Air Compressor Sizing
Capstan Ag currently uses two large tank air compressors for their various applications. To determine the correct sizing for these, information was gathered on the flow rate necessary for the different uses of the compressors. Then to find the needed cubic feet per minute (cfm) of air flow, these applications different flow rates were added together to find the maximum air use (some applications are mutually exclusive and therefore the max cfm of these choices was taken). The maximum flow rate was found to be about 6cfm.

It was found that both air compressors were oversized. The air compressors in question are a Craftsman 6.5 HP 60 gallon Twin Cylinder compressor and a Campbell Hausfield 5.5 HP 80 Gallon air compressor. Both of these compressors are kept at 100 pounds per square inch (psi) and have a rated cfm over 10 at 100psi.

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Both of these air compressors are lightly used, often times not even being used each day. Of the 250 work days a year it is estimated that these compressors are

only in use about 150 days for about an hour at a time. This represents a minimal energy cost.

Because of this sparing use it is not cost efficient to downsize the compressors. Using specifications from smaller craftsman models with a flow rate of 6cfm at 100psi it was estimated that by downsizing, 800 kWh could be saved in a year and $96. The two downsized model would cost approximately $1000 each (Air Compressors Direct). This would give a payback period of about 20 years.

3. Lighting Assessment
Capstan Ag's current lighting system uses a variety of lamps in different areas and for different applications. Due to the age of the building many of the lamps being used are the older T12 fluorescent lights that are no longer in production due to federal mandates. This requires Capstan Ag to update its lighting systems to continue to meet the site's needs. For the sake of clarity site was split into two main areas with various sub groups to accurately determine the current lighting use and for analyzing possible alternatives. These were split into the production floor and the office area.

It was found that while implementing both of the recommended options, Capstan Ag would save an estimated 260kWh per day or 65000kWh per year. This amounts to a savings of 182 $MTCO_2e$ each year (GHG calculator). The total monetary savings came to be $7,800 annually with a payback period of approximately 9 years.

4. Air Conditioning and Insulation
On the lower level where the production floor is located there are also offices and other air conditioned spaces. As the production floor leads directly to the outside via air vents and loading docks, any of the conditioned air that escapes the to the production floor is essentially lost to the outside environment. Upon touring the facility many gaps were located to the production floor were located.

Because the different gaps came in different shapes sizes and locations they must all be dealt with in a unique manner. Several various methods of weather proofing exist from weather stripping doors and using insulating foam to seal cracks and gaps.

Summary of 2014 E2/P2 intern recommendations for Capstan Ag Systems, Inc.

Project description	Annual estimated environmental impact	Annual estimated cost savings	Status
Lighting (office area)	26,000 kWh	$3,000	Recommended
Lighting (production floor)	160,000 kWh	$4,800	Recommended
Air conditioning insulation	Not evaluated	Not evaluated	Recommended
Air compressor leak repair	Not evaluated	$25	Implemented
Air compressor sizing	800 kWh	$96	Not recommended
Total savings *	**186,000 kWh**	**$7,825**	
GHG reductions *	**182 metric tons CO2e (P2 GHG calculator, May 2014)**		

* Does not include projects that are "not recommended" or "further research is needed."