3 - AR No. 4 - Reduce Electrical Demand

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Recommendation

Stagger operation of electric tank heating equipment to prevent running all six electic heaters at the same time. Doing so can reduce annual demand by 90 kW·mo and save 5.6% in total annual electrical demand cost.

Annual Savings Summary

Source	*Quantity*	*Units*	*Cost Savings*
Electrical Demand	90	kW Months / yr	$1,732

Implementation Cost Summary

Description	*Cost*	*Payback (yrs)*
Before Incentives	$3,529	2.0
No Incentives Found	-	-

Facility Background

The facility currently uses six electric heaters to maintain product temperature in specific holding tanks. These heaters operate 24 hours a day, seven days a week, 26 weeks per the year for a total of 4,368 hours per year. Analysts took live data readings of the electric heaters and placed data loggers to monitor their operation.

Technology and Opportunity Background

Using an automated operation schedule for the electric heaters via a programmable logic controller (PLC) is recommended to automatically stagger heater use. Automated control of the electric heaters allows the facility to prevent running all six heaters at the same time. This will prevent large spikes in electrical demand and associated demand changes reducing overall operation cost for the facility. A PLC is a digital computer used for automation of industrial electromechanical processes.

Proposal

Stagger electrical heater operation to reduce electrical demand spikes. These spikes can be reduced by manually controlling the heaters' operation or by use of a PLC. This can result in a reduction of 90 kW·mo per year (based on reductions of 15 kW·mo for 6 months). A breakdown of the proposed demand reduction is provided on the Monthly Electrical Demand table on the following page. The proposed actions can reduce annual electrical demand charges by $1,732. Implementation costs are estimated to be $3,529, resulting in a payback period of 2.0 years.

Calculation Methodology

Analysts estimated the minimal electrical demand that could be achieved to reduce the monthly demand charge for this analysis.

Notes

Analysts recommend limiting operation of electric heaters so that all six are not on at the same time. Proposed demand cost is calculated by reducing the monthly demand by one heater's demand.

Reduction to plant electricity demand can be controlled by manually shutting off one electric heater when the remaining five are in operation. While using a PLC would make this control easier, a well monitored system could also be controlled manually and the same savings could be achieved prior to installing a PLC.

Even greater savings might be achievable with careful staging/staggering when electric tank heaters are energized.

An alternative recommendation "Replace Electric Tank Heaters" has been included in this report. These recommendations are alternatives to each other and cannot both be implemented.

References

[1] "Grainger Industrial Supply - MRO Products, Equipment & Tools." Grainger Industrial Supply - MRO Products, Equipment & Tools. N.p., n.d. Web. 11 Nov. 2016. <https://www.grainger.com/>.

3 - AR No. 4 - Analysis Table

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Utility Data

Incremental Demand Cost	(IC_D)**(Rf. 1)**	*$19.24*	/kW·mo

Monthly Electrical Demand

Month	*Current Dmnd.* (D_C)**(Rf. 1)** (kW·mo)	*Dmnd. Savings* (D_S)**(N. 1)** (kW·mo)	*Proposed Dmnd.* (D_P)**(Eq. 1)** (kW·mo)	*Cost Savings* (S)**(Eq. 2)**
Sep-16	*246*	*15*	*231*	*$289*
Aug-16	*215*	*15*	*200*	*$289*
Jul-16	*200*	*15*	*185*	*$289*
Jun-16	*215*	*15*	*200*	*$289*
May-16	*97*	*-*	*97*	*$0*
Apr-16	*0*	*-*	*0*	*$0*
Mar-16	*0*	*-*	*0*	*$0*
Feb-16	*0*	*-*	*0*	*$0*
Jan-16	*0*	*-*	*0*	*$0*
Dec-15	*142*	*-*	*142*	*$0*
Nov-15	*242*	*15*	*227*	*$289*
Oct-15	*244*	*15*	*229*	*$289*
Totals	**1,602**	**90**	**1,512**	**$1,732**

References

Rf. 1) Developed in the Utility Analysis in the Site Data section of this report.

Notes

N. 1) Analysts only noted savings in the months where demand charges were notably high. Demand charge savings are not available in months where all six electric tank heaters are not in use simultaneously. 15 kW-mo is the demand of the smallest electric heater. This is a conservative estimate of the amount of demand savings that can be generated by staggering heater operations.

Equations

Eq. 1) Proposed Demand (D_P)

$$D_C - D_S$$

Eq. 2) Cost Savings (S)

$$D_S \times IC_D$$

3 - AR No. 4 - Analysis

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Implementation Cost Analysis

Programmable Logic Controller Cost	(C_{PLC})	***$1,550***	**(N. 2, Rf. 2)**
Electrician Labor Rate	(C_L)	***$82.45***	**(Rf. 3)**
Labor Hours	(t_L)	***24***	**(Rf. 4)**

Economic Results

Annual Cost Savings	(S)	***$1,732***	/year	**(Rf. 5)**
Implementation Cost	(C_I)	***$3,529***	years	**(Eq. 3)**
Simple Payback	(t_{PB})	***2.0***	years	**(Eq. 4)**

Notes

N. 2) Average cost of Programmable Logic controller is approximately $550. An additional $1,000 was assumed by analysts to cover labor to determine best operation schedule and set up of PLC.

Equations

Eq. 3) Implementation Cost (C_I)

$$C_{PLC} + C_L \times t_L$$

Eq. 4) Simple Payback (t_{PB})

$$\frac{C_I}{S}$$

References

Rf. 2) Prices for multiple output PLCs range from $100 to $1,000 on Grainger Industrial Supply's website [1].

Rf. 3) Labor rate for electrician from RSMeans 2016 labor costs.

Rf. 4) Labor hours determined through conversation with engineers that have experience in programming logic controllers.

Rf. 5) Developed on the Monthly Electrical Demand table on the previous page.

3 - AR No. 4 - Incentive Analysis

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Incentive Data

Annual Energy Savings	(E_s)	***0*** kWh	**(Rf. 1)**
Annual Cost Savings	(S)	***$1,732*** /yr	**(Rf. 1)**
Implementation Cost	(C_I)	***$3,529***	**(Rf. 1)**
Simple Payback	(t_{PB})	***2.0*** years	**(Rf. 1)**

Incentive Analysis Summary

No Incentives Found

The state and city the facility is located does not provide any published incentives at the time this recommendation was authored. Analyst recommend confirming with utility representatives before beginning implementation; custom incentives can sometimes be arranged.

References

Rf. 1) Developed in this recommendation on the previous pages.