Reprogram and Setback the Programmable Thermostats (Arc 2.7261)

(The analysis below was extracted from one of the assessment reports by the Clemson University Industrial Assessment Center (IAC). This is only an example recommendation and hence, not all the background information and sources for numbers are included here.)

Est. Electric Consumption Savings	= ***220,122 kWh/yr***
Est. Electric Consumption Cost Savings	= ***$18,050/yr***
Total Est. Electric Consumption Cost Savings	= ***$18,050/yr***
Est. Implementation Cost (without programmable thermostats)	= ***$250/yr***
Simple Payback Period	= ***0.2 months***

Recommended Action:
It is recommended to adjust programmable thermostats throughout the plant to avoid over-conditioning the space when unoccupied.

Background:
The building is currently consistently conditioned at about 60°F, and temperatures do not change throughout the day or year. A preferred temperature of 60°F was decided by the plant employees because of heat radiated by equipment during production. Conditioning continues when spaces are no longer occupied. The U.S. Department of Energy predicts that plants can save about 5% to 15% of HVAC energy by setting the thermostat to use less cooling for 8 hours outside of occupation hours, and that up to 1% energy can be saved for each degree Fahrenheit during the 8-hour period [1]. This prediction was used to approximate the cost savings in the following section. The plant operates 2000 hours per year and is charged $0.082/kWh for electric consumption and $10.01/kW for electric demand.

Anticipated Savings:
Using the U.S. Department of Energy estimated savings per degree Fahrenheit and annual electricity consumption, it can be approximated that $3,610 can be saved annually on electricity costs per degree Fahrenheit. Assuming overcooling was reduced by 5 degrees Fahrenheit during the warmer months and standard temperature was now 65°F, the plant could save $18,050 annually on electricity costs. If overcooling could be reduced even further outside of operation hours, significant additional savings can be achieved. The estimated electrical consumption savings per degree Fahrenheit was estimated using following equation:

Electrical consumption savings per degree Fahrenheit

= 1% of annual electrical consumption

= 1% × 4,402,900 kWh

= 44029 kWh/°F

Estimated cost savings per degree Fahrenheit

= Electrical consumption savings per degree Fahrenheit × energy cost ($)

= 44029 kWh/°F × $0.082/kWh

= $3610/°F

Estimated cost savings for 5-degree Fahrenheit

= Estimated cost savings per degree Fahrenheit × 5

= $3610/°F × 5

= $18,050

The estimated annual *electric consumption savings per degree Fahrenheit* was calculated using the equation below:

Energy savings per year = savings($/year) ÷ energy (cost$/kWh)

= ($18,050/year) ÷ ($0.082/kWh)

= 220,122 kWh/year

Implementation Cost:

If the facility does not have programmable thermostats, there will be an implementation cost associated with this recommendation. The implementation cost will directly reflect paying a worker to change the settings on all the thermostats that assist in heating and cooling the areas. The *implementation cost, IC*¸ would be approximately $250 per year.

Implementation Cost (IC) = $250/year

Simple Payback Period:

The *simple payback period, SPP*, is the time required to pass before the estimated total cost savings equal the estimated implementation cost, and is calculated by:

$$SPP = \frac{IC}{TCS} \times 12\ months/yr.$$

$$SPP = \frac{\$250}{\$18{,}050/yr.} \times 12\ months/yr.$$

SPP = 0.2 months

References:

1. USDOE. Program Your Thermostat for Fall and Winter Savings. 2012; Available from: https://energy.gov/energysaver/articles/program-your-thermostat-fall-and-winter-savings.