RUTGERS
New Jersey Agricultural Experiment Station

Cooperative Extension
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Case: Electricity Monitoring on a Diversified Farm

Farm Operation Description

JT's Farm has been in operation since the 1930's. The farm owners have survived economic difficulties and drought. Over the years they invested in new technologies which increased productivity and efficiency. Recent weather related crop losses and rising energy costs has the farm owners again looking for innovative ways to cut costs. After a careful review of their utility bills, it is clear that changes need to be made to improve electric energy efficiency.

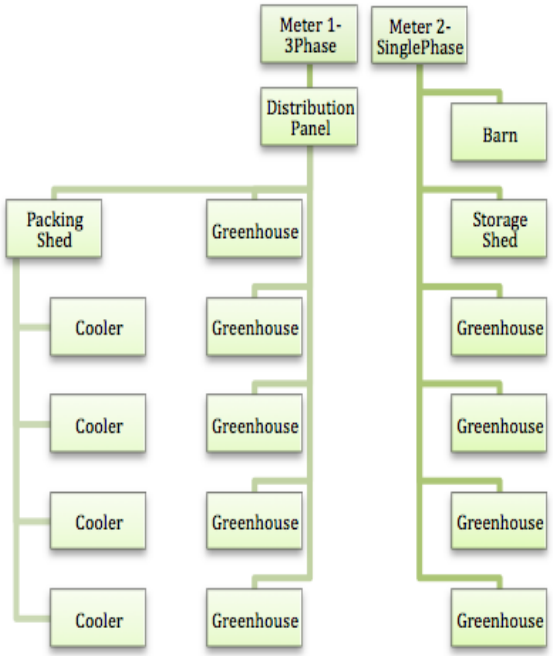
JT's Farm includes 100 acres, 80 of those acres are used for ag production. Planted areas are about half tree fruit and half vegetables. On the remaining 20 acres are:

- The farm house (for the purposes of this exercise, we are ignoring the single phase electric service to this structure)
- Three storage barns
- A barn that includes office space, bathrooms, farm shop and storage
- A packing shed with four walk-in coolers
- A small pesticide storage and handling facility
- Nine Quonset-style greenhouses of various sizes – 4 used year round; 5, in the spring & fall
- One gutter-connected greenhouse – used year round

Electricity Monitoring Plan

The electricity monitoring plan for this farm will identify the areas of greatest use, equipment that is operating inefficiently, and opportunities for better control and scheduling of electricity use.

The farm has two electric meters – a *three phase meter for five of the greenhouses and the packing shed* and a *single phase meter for all of the other buildings*. There is a main distribution panel. Each of the buildings, including greenhouses, has its own electrical subpanel.



The plan is to:

- install Monitors on each of the 2 Farm Operation Meters
- install Monitors on the main distribution panels and subpanels
- install Monitors on individual circuit breakers to monitor specific equipment

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Electricity Monitor System

On this farm, the 2 meters dedicated to farm operations are some distance apart; and the three-phase distribution panel is in a different location than the walk-in coolers. The least expensive solution is to install two separate monitoring systems:

- One three phase monitor with expansion capacity and
  - (3) 600 Amp current transducers for the main wiring
  - (3) Voltage transducers for the distribution panel
  - (6) 100 Amp current transducers for subpanels
  - (9) 50 Amp current transducers for walk-in coolers
- One single phase monitor with
  - (2) 600 Amp current transducers for the mains
  - (2) Voltage transducers for the distribution panel
  - (8) 100 Amp current transducers for subpanels

Current Transducer

For the current transducers to monitor the walk-in coolers, the farm owners chose to use wireless sensors. They could have chosen to install another independent monitor or extend the wiring to the location of the refrigerators but the wireless choice made recording and reviewing data easier, and installation less complex and costly.

Monitoring System Outcome

The electricity monitors installed were able to point to a number of electric energy inefficiencies on the farm. In particular, the four cooling units were not running efficiently due to maintenance issues, simultaneous cycling times - which raised the farms electric "demand charges" rate, and being left on when not in use. By learning where and how electricity was utilized on the farm and then modifying operational procedures, the owner's of JT's Diversified farm saved thousands of dollars.

Later, in talking with their greenhouse vendor they learned of an additional method to save money and conserve energy: integrating electrical monitoring sensors into their greenhouse environmental controls. Multi-zone greenhouse controllers typically have the ability to monitor many types of sensors, including current and voltage transducers.

Utilizing electricity monitors to discover electric energy inefficiencies on the farm is a sustainable practice that can lead to increased profits and conservation of energy.