CO652.1207 State Supplement

Energy Use and Conservation

Energy loss from leakage can be significant. As an example of the power cost caused by a leak, calculate the cost with and without the loss. Assume an electric pump with a total flow of 800 gpm and a head of 100 ft. The power required to pump this is:

Hp = Q gpm * Head ft. / 3960

Hp = 800 gpm * 100 ft. / 3960

Hp = 20. 2

The pump efficiency varies by flow rate and manufacturer. The pump curve for the make and model would be the first source for efficiency information. Assume the overall efficiency of the pump and motor is 70%. This means that the horse power needed at the pump would be:

$Hp_{required}$ = 20.2/0.70

$Hp_{required}$ = 28.86

Assuming the system operates for 1500 hours during the season the hp-hrs would be:

Hp-hrs = 28.86*1500

Hp-hrs = 43285.7

To convert to Kilowatts multiply the Hp-hrs by 0.746. The Kw-hrs would be:

Kw-hrs = 43285.7 * .746

Kw–hrs = 32291.1

The location is a site with energy costs of 0.10 $/kw-hr.

The annual cost to operate the pump would be:

Seasonal cost = 32291.1 kw-hr * 0.10 $/kw-hr

Seasonal Cost = $ 3229.11

If there is a leak in the system flowing at a rate of 8 gpm (1% of the total flow), the following demonstrated the potential increase in seasonal power cost.

The increase in pumping cost is 1% of 3229 or $32.29. This is fairly small, but 8 gpm is a very small leak. However, even a small flow adds up over the course of an irrigation season. Depending upon the overall leakage amount, there can also be a loss in distribution uniformity in the irrigation system resulting in a decrease in crop yield and/or quality.

Monitor the irrigation during the season to determine changes in the flow. This could be done with a flow meter, pressure gauge, or, if necessary, the power meter. Reading changes with any or all of the above would show potential leaks or plugging of nozzles or outlets.

NRCS has developed several tools to assist with estimating energy use from various inputs and operations involved in irrigated agricultural systems. These Energy Estimators for irrigation, tillage, nitrogen applications, and animal housing are available online at: http://energytools.sc.egov.usda.gov/.

The Colorado State University Extension Service has published a several fact sheets regarding potential energy savings from improved management of irrigation systems and nitrogen applications. These fact sheets can be found at:

Nitrogen and Irrigation Management: http://www.ext.colostate.edu/pubs/crops/00514.html

Irrigation Pumping Plant Efficiency: http://www.ext.colostate.edu/pubs/crops/04712.html

Irrigation Scheduling: http://www.ext.colostate.edu/pubs/crops/04708.html

Propeller Meters for Irrigation: http://www.ext.colostate.edu/pubs/crops/04710.html

Colorado NRCS has developed an interim standard for conservation power plants, defined as power plants used for generating power for farm and ranch operations from renewable sources. A link to the standard for Conservation Power Plant (Code 716) can be found at:

http://efotg.nrcs.usda.gov/references/public/CO/CO716_INT_STD_120706.pdf.