688.6 EXAMPLE PROBLEM

The following example is a means of comparing energy costs with different irrigation systems and different efficiencies of operation of present systems.

The following formula is valid if the system has a pump efficiency of 80%. It will take .1364 hp-hr to lift 1 Ac-in of water against 1 Ft of head. The conversion factor would be .1364 hp-hr/Ft of head-Ac in. Ft of head = Total head = lift + friction loss + velocity head.

The following formulas can be used to convert hp-hr to energy used (at 100% of the Nebraska Standard):

Electricity	.9 Hp-hr/Kw-hr
Diesel	12 Hp-hr/Gallon
LP Gas	7 Hp-hr/Gallon
Natural Gas	62 Hp-hr/1000 cu. ft.
Gasoline	8.5 Hp-hr/Gallon

A landowner has an irrigation system which has an electric pump that is operating at an efficiency of 60%. He lifts the water 200' and has a pressure reading of 75 psi (174 Ft of head) at the pump. At the present time, 20" of water is being applied. If electricity is $.07/KWH, what is the annual fuel cost to irrigate 140 Ac?

Hp-hr/acre = .1364 hp-hr/Ft-Ac in x 20 in x 374 = 1,020 hp hr @ 80% eff. How much fuel will be used per acre?

$$\frac{1{,}020\,hp-hr}{.9\,hp-hr/Kw-hr}=1{,}133 Kw-hr$$

Cost/Acre =
1,133 Kw-hr x .07/Kw-hr =

$$\frac{\$79.35}{@80\%\ pumpeff}$$

At measured 60% eff. the cost per acre will be

$$\$79.35\,x\frac{.80}{.60}=\$105.80$$

Annual fuel cost on 140 ac = $105.80 x 140 = $14,812.00.

If the following changes were made in this order, what would be the annual fuel bill?