

REDUCING YOUR PUMPING COSTS

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Pacific Gas and Electric Company

Introduction: How many of you growers have ever asked the question "How can I reduce my pumping costs?" How many of you have found the answer?

The obvious answer is, of course, "lower the power rates". I am pleased to announce that both PGandE and S.C.E. Company have recently applied to reduce power rates. Above average rain and snow last winter boosted hydroelectric generation and allowed us to cutback on the burning of imported oil and natural gas to generate power.

PGandE had requested a .45% decrease to be effective August 1 of this year. The CPUC authorized this reduction effective September 21, 1980. We have asked for a second decrease of .32% effective December 1, 1980. This has (has not) been authorized.

S.C.E. Company has requested a 6.5% rate decrease.

Obviously you do not have much control over reducing utility rates, however you do have control over other factors that can effectively reduce your pumping costs. You can:

- A. Improve pump efficiency
- B. Improve irrigation efficiency
- C. Reduce total amount of water applied
- D. Reduce pressure
- E. Change to time of use power rates

Improve Pump Efficiency

Significant savings can very often be achieved by improving pump efficiency depending on the existing pumping plant efficiency and the number of hours operated.

As you may know, most utilities in California offer a free pump test service for their customers. This is an example of the report (Exhibit A) that a PGandE customer receives after having his pump tested. The efficiency on this pump is 49% which is considered low.

An additional report (Exhibit B) called a Pumping Plant Efficiency Comparison is prepared on all pumps, 10 HP or more, that have a low efficiency. By improving the efficiency on this pump from 49% to 64%, the customer will save 23,910 KWH in energy, \$1,021.84, and 479 operating hours each year.

By improving efficiency from 43% to 68% on this second example (Exhibit C) the customer will save 106,562 KWH in energy, \$5,542.50, and 823 operating hours. With this much savings, the payback for having the pump overhauled will not be very long.

Sometimes a simple adjustment will improve the overall pumping plant efficiency 2% to 3%. If you have never had your pump tested or if it has been a few years since it was tested, I would recommend that this be your first step in reducing pumping costs.

Improve Irrigation Efficiency

Efficiency of Various Water Application Methods has already been covered, so I will not dwell on this subject, however, I would like to mention one point that relates to irrigation efficiency that affects pumping costs.

A tail water recovery system that returns excess water at the end of your field back into your irrigation system will not only improve your overall irrigation efficiency, but will reduce pumping cost as well. By lifting water only a few feet rather than from one hundred or more feet in the ground, you will save energy.

This chart (Exhibit D) shows the relation between efficiency and KWH/Acre Ft. of Lift. At 60% overall plant efficiency it takes about 1.7 KWH to lift an acre foot of water one foot. At an average cost of 6.5¢ per KWH, it will cost you only \$1.11 to lift an acre foot 10 feet as compared to \$11.05 to lift it 100 feet.

Even with an efficient irrigation system, run off losses can be as high as 10% to 15%. A tail water recovery system will eliminate this run off loss and reduce pumping costs.

Reduce Total Amount of Water Applied

During the drought, you may have learned that you could get by with less water. By applying less water you will naturally reduce your pumping costs. It relates back to irrigation efficiency-applying just enough water to produce a crop, without wasting water.

Soil moisture meters, evaporation pans and soil augers have been used for some time to determine when and how much water to apply. New techniques are constantly being developed to assist a grower in applying just the right amount of water to produce a crop.

The University of California with other agencies has begun reporting weekly evapotranspiration figures through the press and radio that can guide a grower in his water use. I would suggest that if you are not already taking advantage of this service, that you do so to reduce water and energy use.

There are several firms in California that use a computer predictive model system (CPMS) to determine irrigation water requirements and timing. These services can reduce on farm water and energy use significantly.

Changing your method of irrigation may reduce the total water applied to your fields. Depending on type of soil, topography and other factors, generally speaking, sprinkler application will require less water than furrow or flood application, especially with the relatively new center pivot and traveling drip systems which someday may even be computer controlled to turn on automatically when soil and weather sensors indicate the need for water.

Reducing total water application with sprinkler or traveling drip systems may not necessarily reduce pumping costs because these systems require pressure and pressure means more horsepower which brings us to our next subject.

Reduce Pressure

By this I mean conversion of high pressure sprinklers (50 PSI or greater) to low pressure sprinklers (less than 35 PSI). According to estimates that we have made, if just 10% of our customers using sprinkler irrigation were to convert to low pressure sprinklers, we could reduce generating capacity by 25,000 kilowatts with an annual energy savings of more than 30 million kilowatt hours for the growers.

We propose to make a thorough evaluation of a sprinkler conversion program this next year including tests at the Center for Irrigation Technology at CSUF of sprinklers and nozzels, and comparisons of high pressure and low pressure sprinklers under actual field conditions to determine water and energy savings and grower benefits.

You may have read in a recent agricultural publication of a farmer in the Selma area that converted to a low pressure system simply by changing the nozzels on his sprinklers in his almond orchard. He reduced his evaporation losses, thereby cutting his irrigation time from 36 to 24 hours from every week to every 10 days. He changed from a 100 HP diesel engine driven booster pump to a 15 HP electric booster pump with an estimated savings of more than \$75 per day in fuel costs. He has controlled a shot hole fungus problem because the new nozzels no longer direct the spray on the trees. The lower pressure has reduced wear on the nozzels thus reducing maintenance.

I realize that you are alfalfa growers and not almond growers but you could realize the same benefits except for perhaps elimination of the fungus problem.

Reducing pressure from 60 PSI to 30 PSI will reduce total lift by 69.3 feet. Using the 1.7 KWH/Acre foot/foot of lift at 60% overall plant efficiency that I showed you on the chart previously, this would mean a reduction of 117.8 KWH per acre foot. At 6.5¢ per KWH this would be a savings of \$7.66 per acre foot. With 3 acre feet per acre on a 160 acre crop of alfalfa, the annual savings in power costs would be \$3,676.80.

If you use sprinkler irrigation, you might consider converting to a low pressure system. I believe that our evaluation will show that this is the most cost effective means of reducing pumping costs for a sprinkler system.

Change to Time of Use Power Rates

At the beginning of my talk I said that you do not have much control over reducing utility rates. You can however take advantage of the new experimental time of use rates that utilities now offer.

If you are a PGandE customer, you may have received a packet describing this new PA-2X rate and may have even signed up for the rate. The PA-2X was designed to be attractive to virtually all of our agricultural customers.

will now run through a few slides that will best describe the rate

1. We call it our Agricultural Load Management Program
2. The purpose is to:
 - a) Influence Energy Use Patterns.
 - b) Achieve Economic Balance Between Energy Requirements and Existing Supplies
3. We are offering customers an incentive to shift load from our peak demand periods which occurs:
 - a) Winter - 4:30 p.m. to 8:30 p.m.
 - b) Summer - 12:30 p.m. to 6:30 p.m.
4. If a grower can avoid the peak demand periods he will pay only \$8.50 per month service charge regardless of the HP connected. To qualify for the rate, you must have more than 35 HP connected.
5. If a customer should happen to operate during the On Peak Period, he will pay 80¢ per KW but only during the month in which the demand occurs during the On Peak Period.
6. Not only will the demand charge be cheaper, but the energy charge will be cheaper as well, as this chart indicates. This line indicates the lowest block on the PA-1 rate. Both the partial peak and off peak rates on the PA-2X are below this. You are penalized by a higher rate if you operate during the On Peak Period.

Customers who sign up for the experimental PA-2X rate are being contacted and comparisons are made for them based on their present operating conditions and on what they say they could do to shift load from the on peak period. This chart (Exhibit E) shows examples of the savings for growers on the PA-2X rate.

Conclusion: Pumping costs can be reduced. I hope that you will take advantage of one or more of the methods I have suggested. Ask yourself - Can I:

- A. Improve pump efficiency?
- B. Improve irrigation efficiency?
- C. Reduce total amount of water applied?
- D. Reduce Pressure?
- E. Change to time of use power rates?

If your answer to any of these is yes, you can reduce your pumping costs.



PUMP TEST REPORT

Exhibit A

R205CE
03/31/80

SAN JOAQUIN Division

SELMA Office

Customer Account # XTT220150

Location # 68417100447215

Dear AL FALFA

Test Date 03/27/80

Meter # 5T9342

Motor U.S. _____

H.P. 50.0 Volts 440

Rated RPM 1800

Serial # 1021367

Pump FAIRBANKS-MORSE Type TURBINE

Below are the results of the recent test on your pumping plant. Please let us know if you have any questions or if we can be of further service.

Remarks:

- WATER TEMPERATURE WAS 74 DEGREES F.
- THE OVERALL EFFICIENCY OF THIS PLANT IS LOW UNDER EXISTING WATER AND OPERATING CONDITIONS.

PGandE

AL FALFA

999 MOWER LANE

FRESBURG CA 93246

Number of Copies:

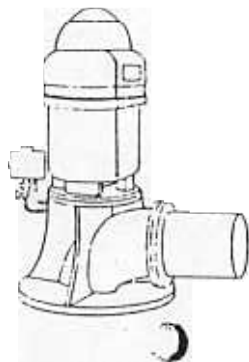
Customer 3
Office 3

Plant Location- SE NE NE 18 16 19
Customer Plant Identification- 17
Test Engineer- W.C. "BILL" LINDQUIST

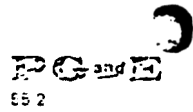
TEST 1

Shutdown Time
Standing Water Level Below CENTER LINE OF DISCHARGE PIPE
Draw Down from Standing to Pumping Level
Pumping Water Level Below CENTER LINE OF DISCHARGE PIPE
Discharge Level Above CENTER LINE OF DISCHARGE PIPE
Discharge Pressure Measured at Gauge
TOTAL LIFT (Water to Water)
WATER PUMPED
Yield of Well (G.P.M. per foot draw down)
Water Pumped in 24 Hours
HORSEPOWER INPUT TO MOTOR
Kilowatt Input to Motor
KILOWATT HOURS PER ACRE FT. OF WATER PUMPED
OVERALL PLANT EFFICIENCY

05 Min. (*=24 hrs.)
143.8 Ft.
17.1 Ft.
160.9 Ft.
11.6 Ft.
5 P.S.I.
172.5 Ft.
637 G.P.M.
37.2 G.P.M./Ft.
2.82 ACRE FT.
57.2 H.P.
42.7 KW.
364.0 Kwh/ ACRE FT.
49 %



GET THE MOST GALLONS FOR YOUR MONEY WITH EFFICIENT PUMPS!



PUMPING PLANT EFFICIENCY COMPARISON

R210CE
03/31/80

SAN JOAQUIN Division

SELMA Office

Customer Account # XTT220150

Location # 68417100447215

Customer Plant Identification—

17

Dear AL FALFA

Test Date 03/27/80

Remarks:

Below is a pumping plant efficiency comparison made on your pump which we recently tested. This report compares the pump's present operating condition to a higher efficiency level which your pump should obtain.

The higher plant efficiency figure selected for comparison is one that we anticipate your pump should be achieving.

We suggest that you consult your pump dealer to determine what can be done to increase the overall pumping plant efficiency.

Please contact us when the necessary repair or adjustment is made so a retest of your pump may be made.

PGandE

AL FALFA

999 MOWER LANE

FRESBURG CA 93246

Results:

Our estimates indicate that by improving your plant efficiency the following will be realized:

Annual Energy Saved	23910	Kilowatt Hours
Annual Dollars Saved	1021.84\$	
Annual Operating Time Saved	479	Hours
Savings per ACRE FT.	81.5	Kilowatt Hours

Energy costs are based on the current electric rate for your size of motor and usage.

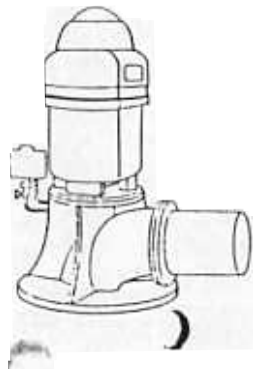
Number of Copies:
Customer 3
Office 3

Plant Location— SE NE NE 18 16 19
Meter # 5T9342 Serial # 1021367
Motor U. S. _____ H.P. 50.0
Pump FAIRBANKS-MORSE _____ T Type TURBINE _____

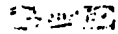
Operating Condition
At Present

Operating Condition
After Repair/Adjustment

Water Pumped	637 G.P.M.	788 G.P.M.
Total Lift	172.5 Ft.	176.6 Ft.
Horsepower Input to Motor	57.2 H.P.	55.0 H.P.
Kilowatt Input to Motor	42.7 K.W.	41.0 K.W.
K.W.H. Per ACRE FT. Pumped	364.0 KWH/ ACRE FT.	282.5 KWH/ ACRE FT.
Overall Plant Efficiency	49%	64%
Annual K.W.H. Consumption	106739 K.W.H.	82829 K.W.H.
Annual Cost	4960.32\$	3938.48\$
ACRE FT. Pumped Annually	293.2 ACRE FT.	293.2 ACRE FT.
Cost Per ACRE FT.	16.91\$ / ACRE FT.	13.43\$ / ACRE FT.
Annual Operating Time	2499 Hours	2020 Hours



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PUMPING PLANT EFFICIENCY COMPARISON

FORM 5
10/15/80

AN JOAQUIN Division

SELMA Office

Customer Account # YTT2304701

68417175045158

Customer Plant Identification # 7

Dear JOE BALE

Test Date 10/09/80

Below is a pumping plant efficiency comparison made on your pump which we recently tested. This report compares the pump's present operating condition to a higher efficiency level which your pump should attain.

Remarks:

The higher plant efficiency figure selected for comparison is one that we anticipate your pump should be achieving.

We suggest that you consult your pump dealer to determine what can be done to increase the overall pumping plant efficiency.

Please contact us when the necessary repair or adjustment is made so a retest of your pump may be made.

PGandE

JOE BALE

842 BLOSSOM WAY

FRESBURG CA 93642

Results:

Our estimates indicate that by improving your plant efficiency the following will be realized:

Annual Energy Saved	106562	Kilowatt Hours
Annual Dollars Saved	5542.50\$	
Annual Operating Time Saved	823	Hours
Savings per ACRE FT.	177.6	Kilowatt Hours

Energy costs are based on the current electric rate for your size of motor and usage.

Plant Location— NW SE 1 16 18
Meter # T24273 Serial # 9882
Motor WESTINGHOUSE
Pump WINTROATH T

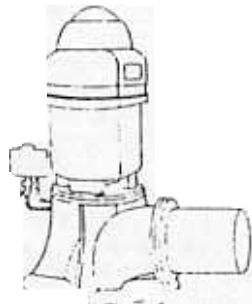
Number of Copies:
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Office 4

H.P. 100.0
Type TURBINE

Operating Condition
At Present

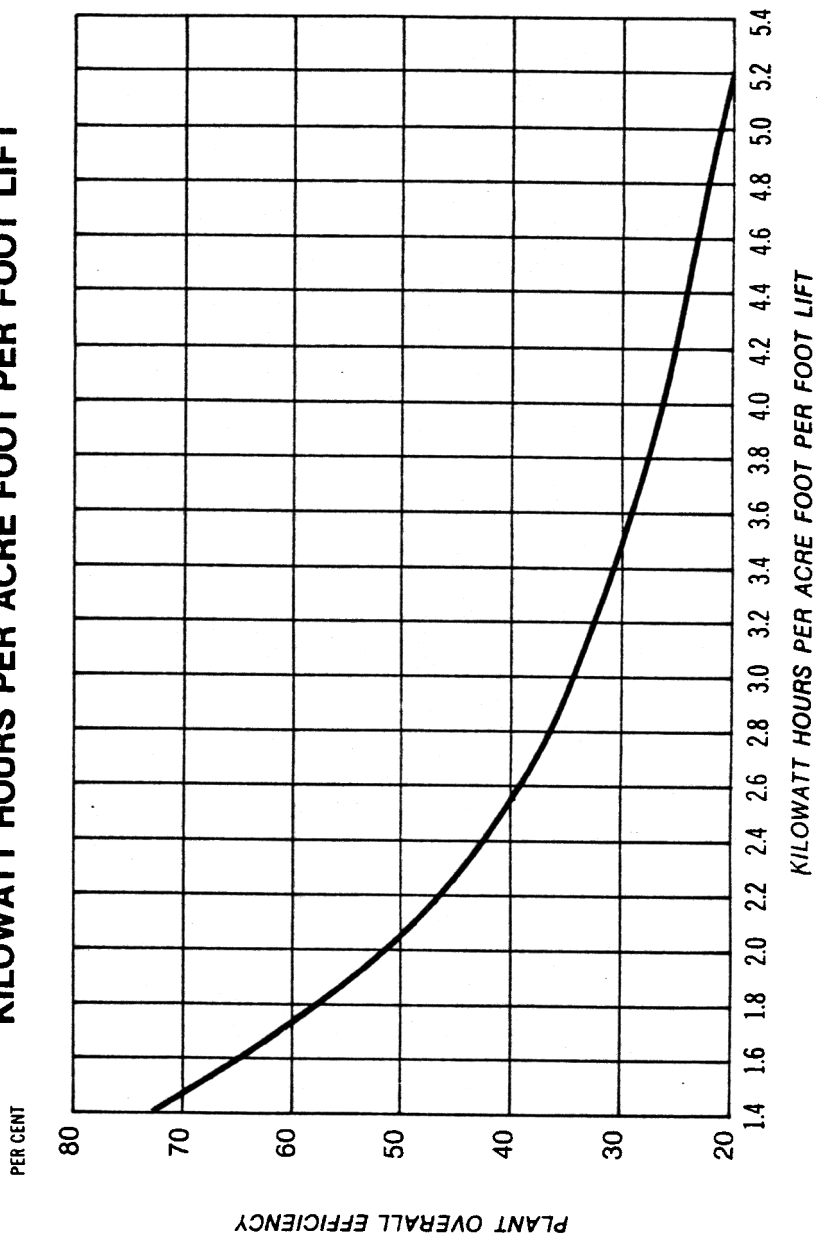
Operating Condition
After Repair/Adjustment

Water Pumped	1027 G.P.M.	1387 G.P.M.
Total Lift	207.4 Ft.	213.3 Ft.
Horsepower Input to Motor	126.4 H.P.	110.0 H.P.
Kilowatt Input to Motor	94.3 K.W.	82.0 K.W.
K.W.H. Per ACRE FT. Pumped	498.67 KWH/ ACRE FT.	321.07 KWH/ ACRE FT.
Overall Plant Efficiency	43%	68%
Annual K.W.H. Consumption	299200 K.W.H.	192638 K.W.H.
Annual Cost	16219.51\$	10677.01\$
ACRE FT. Pumped Annually	599.99 ACRE FT.	599.99 ACRE FT.
Cost Per ACRE FT.	27.03\$/ ACRE FT.	17.79\$/ ACRE FT.
Annual Operating Time	3172 Hours	2349 Hours



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**RELATIONSHIP BETWEEN OVERALL PLANT EFFICIENCY
AND
KILOWATT HOURS PER ACRE FOOT PER FOOT LIFT**



PA-1 VS. PA-2X COMPARISON

Example 1

Irrigation Method: Center Pivot
 Pump HP: 2 - 75 HP
 Present Operation: Pumping from pond on 2 nights, off 2 nights
 Totally off peak

PA-1 Billing	\$11,881.07	
PA-2X Billing	<u>9,334.25</u>	
Savings on PA-2X	\$ 2,546.82	21.44%

Example 2

Irrigation Method: Flood
 Pump HP: 60 HP
 Present Operation: 24 Hour April-December

PA-1	\$10,896.57	
PA-2X Billing	<u>10,812.67</u>	
Savings on PA-2X	83.90	.8%

Change of Operation: On Peak operations July and August only

PA-1 Billing	\$10,896.57	
PA-2X Billing	<u>9,674.67</u>	
Savings on PA-2X	\$ 1,221.90	

Example 3

Irrigation Method: Flood
 Pump HP: 100
 Present Operation: 11 days 8:30 a.m.. Monday - 8:30 a.m., Friday
 1 weekend included

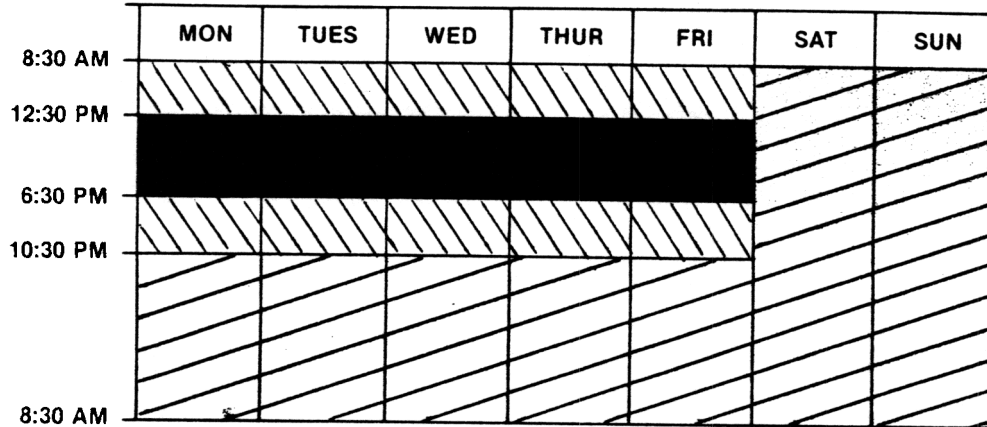
PA-1 Billing	\$14,599.94	
PA-2X Billing	<u>14,278.03</u>	
Savings on PA-2X	\$ 321.91	

Change of Operation: 11 days 6:30 a.m., Friday - 6:30 a.m. Tuesday
 2 weekends included

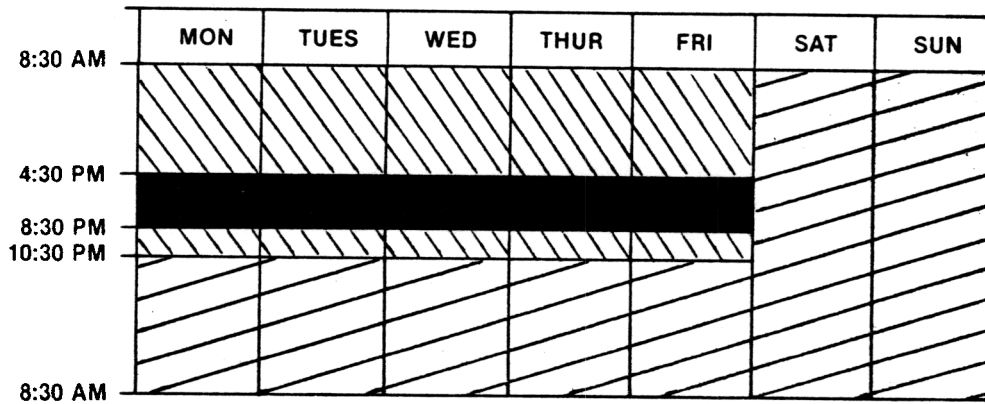
PA-1 Billing	\$14,599.94	
PA-2X Billing	<u>13,963.03</u>	
Savings on PA-2X	\$ 636.91	4.36%

AGRICULTURAL PG and E WEEKLY TIME OF USE ENERGY GUIDELINES

PERIOD "A"
MAY 1 THRU SEPT. 30
(SUMMER)



PERIOD "B"
OCT. 1 THRU APRIL 30
(WINTER)



-
- ON PEAK - MAXIMUM CONSERVATION EFFORT**
 Limit power use to essential needs.
 - PARTIAL PEAK - MAXIMIZE CONSERVATION EFFORT**
 by restricting power use whenever possible.
 - OFF PEAK - NO RESTRICTION ON POWER USE**
 Conserve whenever possible.
 Do not waste energy.