30 Watt Generator

Hand cranked -

We set up the fluid clutch as shown in the photos, and experimented with various speed and torque combinations. It was immediately apparent that a man would get real weary trying to crank 30 watts, and he'd get even more weary trying to crank the 50 watts necessary to replace generator losses.

About the maximum ~~mxk~~ input for a handcrank is ten watts. Most comfortable speed was about 50 RPM with about 80 inch pounds of torque. Faster speeds were unrythmic and tiring. Slower speeds were unrythmic and the torque became noticeable.

The clutch would not give us more than 80 inch pounds torque on the input shaft, so we were unable to compare speeds and torques at the 50 watt input; but the one combination we could get - 50RPM and 80 in-lbs - was murder.

Foot Cranked -

50 watts (input) ~~xxxxxxxx~~ for one hour, is equal to ~~xxxxx~~ 133,000 foot pounds of work. If a 150 lb man pushed a pedal three inches every second, he would do the required amount of work. This is equivalent to climbing one flight of stairs ~~w~~very 48 seconds - and to climbing 75 flights of stairs in an hour. It wouldn't be comfortable, but it would be possible, and would be far more comfortable than trying to develop the power with a hand crank.

Thermopile

A collection of thermocouples in a power pack is generally called a thermopile. Eppley Laboratories in ~~Newport~~ Newport, R.I. has made a power supply for a behind-the-lines transmitter. (for ACGilbert who were working for Govt.) Using couples giving ~~80 volts xxxxxxxxxxxx~~ 80 microvolts output per microwatt of radiation, they built a power pack measuring 2" x4" x 6" which had an output of 30volts at 10ma - a third of a watt. The device required ~~x~~ 600 watts of input heat, and so had an efficiency of 0.05% . They used an electric heater in

the one they built for Gilbert, but have since made them with radio-isotope heaters. Since making this device, Maria Telkes of solar house fame has developed thermopiles which give 100 micro volts per micro watt, but this is still nowhere near the efficiency needed to get 30watts in the space we are talking about.

Model Airplane motors-

These come in sizes from 1/10 to 1 HP. Those designed for ships or racing car use are rated for continuous duty. 30 watts is the equivalent of only 0.04 HP, so these motors are definite possibilities. Don suggests getting one larger than necessary and dissipating some of the power in a muffler to kill the noise. The engine would have to be air-cooled also. Furthermore, the gas used in it would have to be mixed with oil.

Exact figures on gas consumption were unavailable, but these are two cycle engines, are therefore ~~very~~ efficient, and being low power, will consume less gas than a lawn mower.(My 1.6 HP mower uses about a quart of gas in two hours.) (If my memory serves.) The model shop in Middletwn estimated about 11 Ounces of gas per hour for a 1/4 HP motor.

Batteries-

I contacted the PR Mallory Co on the possibilities of using batteries for this application. They did some figuring and called back with a negative answer. They could give us the power required in a volume 2 and a half by three, by eleven inches. (I asked for one and a half by three by six.)

Photo-voltaic Cell -

Might get a collection of photocells, point them at the sun in daylight and at a burning wick at night. Kodak makes a very compact non-vacuum device called the Ektron whose output rivals that of a photomultiplier tube. Might be worth checking further. (Our catalogue is missing.)

Combination of Elements-

Might use combination of the above - eg foot cranked generator storing energy in a battery. This might allow the input-ee to rest part of the time - a desirable feature. However, unless the battery is also partly chargeable at home, by plug-in, the field operator would still have to supply the full amount. Furthermore a combination of elements will complicate the packaging problem, and space problem.

Table-

Following is a conversion table of energy equivalents- Each value given is equivalent to 30 watt-hours of energy.

0.03 Kilowatt-hours

0.0403 Horsepower-hours

102 Btu's

25.8 Kilo-calories

~~7196~~x

7.96×10^4 ft-lbs

Following is the amount of fuel needed to produce the above amount of energy. Values given are high-heat values obtained in calorimeter. Nor is conversion of heat to electrical energy considered.

1/100 lb coal or coke

1/200 lb gasoline (6 lbs per gallon)

1/186 lb kerosene

1/10 cu ft natural gas