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CHE 574
CHEMICAL ENGINEERING

ASSIGNMENT 4

30-04-2020

How much energy is being produced from the dams in Nigeria? Compare with energy produced from the crude.

Nigeria is endowed with large oil, gas, hydro and solar resource, and it already has the potential to generate 12,522 megawatts (MW) of electric power from existing plants, but most days is only able to generate around 4,000 MW, which is insufficient.

GENERATION CAPACITY

Oil and Gas (Thermal) : 10,142 MW

Hydro : 2,380 MW

Hydro Power Plants	Capacity
Kainji Jebba Power Plc	1,330 MW
Shiroro Power Plc	600 MW

Oil and Gas (Thermal)	Capacity
Ughelli Power Plc	942 MW
Sapele Power Plc	1,020 MW
Afam Power Plc	987.2 MW
Niger Delta Power Holding Company	5,455 MW
IPP's	1,392 MW
Edin Power Plc	1,392 MW
	1,020 MW

$$\text{Tuesday } P = 1.4 \times 1300000 \times 11$$

$$0.991 = 20201816.35 \text{ W}$$

~~$$\text{Wednesday } P = 1.4 \times 1300000 \times 11$$~~

~~$$Q = 20201816.35 \times 21600$$~~

~~$$= 436300 \text{ MJ}$$~~

$$\text{Wednesday } P = 1.4 \times 1300000 \times 10$$

$$0.991 = 183628287.59 \text{ W}$$

$$Q = 183628287.59 \times 21600$$

$$= 396700 \text{ MJ}$$

$$\text{Thursday } P = 1.4 \times 1300000 \times 11$$

$$0.991 = 20201816.35$$

$$Q = 20201816.35 \times 21600$$

$$= 436300 \text{ MJ}$$

$$\text{Friday } P = 1.4 \times 1300000 \times 12 = 22088345.11 \text{ W}$$

$$0.991$$

$$Q = 22088345.11 \times 21600$$

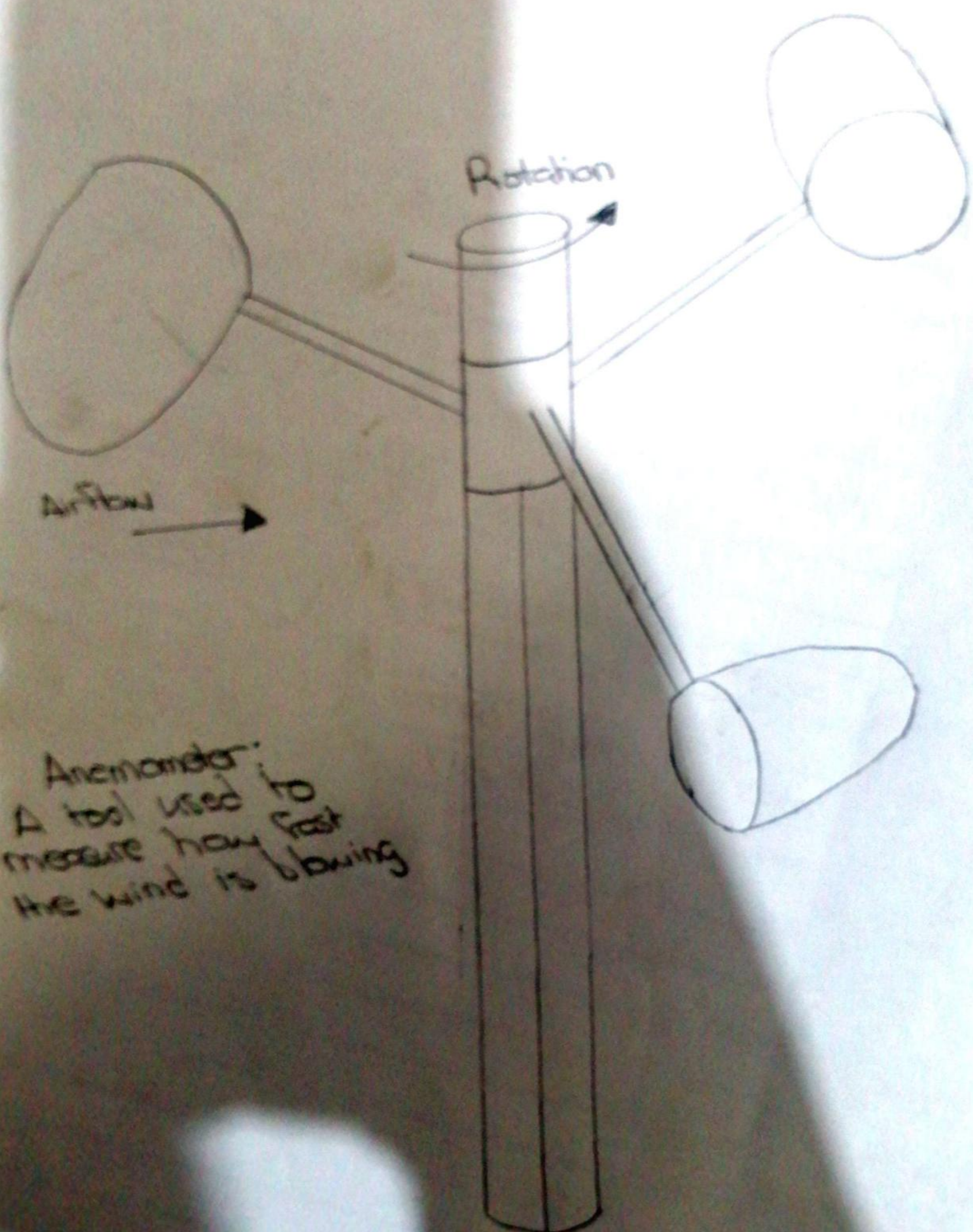
$$= 476000 \text{ MJ}$$

$$\text{Average} = \frac{396700 + 436300 + 396700 + 436300 + 476000}{5}$$

5

The average daily thermal energy from the sun in ABUAD from 17th to 21st February

is 420460 MJ



Rotation

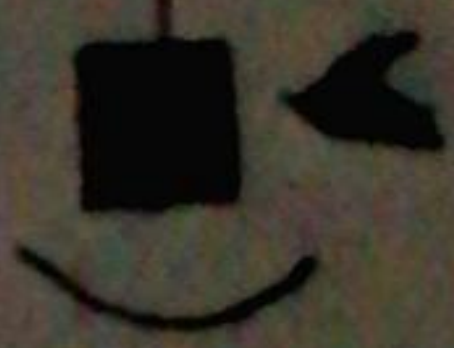
Airflow

Anemometer:
 A tool used to
 measure how fast
 the wind is blowing

Reed
 Switch



Rotating
 Magnet



ASSIGNMENT 3

Day	Average Ambient Temperature	Night
Monday 17/02/2020	35°C	25°C
Tuesday 18/02/2020	36°C	25°C
Wednesday 19/02/2020	35°C	25°C
Thursday 20/02/2020	36°C	25°C
Friday 21/02/2020	37°C	25°C

$$P = \frac{\Delta Q}{\Delta t} ; P = \frac{k \cdot A \cdot \Delta T}{L} ; Q = P \times \Delta t$$

Where P = rate of energy transfer (Watts)

Q = energy transfer (J)

ΔT = difference in temperature

Δt = change in time (s)

h = Thickness of material

k = Thermal conductivity

A = Area

Assumptions

k_{air} at 35°C - 37°C = 1.4

A = area of land in abud = 1,300,000 m²

h = average thickness = 0.991 m

For Monday = $\Delta T = 35 - 25 = 10^\circ\text{C}$

Tuesday = $\Delta T = 36 - 25 = 11^\circ\text{C}$

Wednesday $\Delta T = 35 - 25 = 10^\circ\text{C}$

Thursday $\Delta T = 36 - 25 = 11^\circ\text{C}$

Friday $\Delta T = 37 - 25 = 12^\circ\text{C}$

Monday $P = \frac{1.4 \times 1300000 \times 10}{0.991}$

$$0.991 = 18365287.59 \text{ W}$$

$$Q = P \times \Delta t$$

$$\Delta t = 6 \text{ hrs} = 6 \times 3600 = 21600 \text{ s}$$

$$Q = 18365287.59 \times 21600 = 396700 \text{ MJ}$$