

Example 3.5. A factory has a 240-V supply from which the following loads are taken :

Lighting : Three hundred 150-W, four hundred 100 W and five hundred 60-W lamps

Heating : 100 kW

Motors : A total of 44.76 kW (60 b.h.p.) with an average efficiency of 75 percent

Misc. : Various load taking a current of 40 A.

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Assuming that the lighting load is on for a period of 4 hours/day, the heating for 10 hours per day and the remainder for 2 hours/day, calculate the weekly consumption of the factory in kWh when working on a 5-day week.

What current is taken when the lighting load only is switched on ?

Solution. The power consumed by each load can be tabulated as given below :

	Power consumed
Lighting	$300 \times 150 = 45,000 = 45 \text{ kW}$
	$400 \times 100 = 40,000 = 40 \text{ kW}$
	$500 \times 60 = 30,000 = 30 \text{ kW}$
	<u>Total = 115 kW</u>



A factory needs electric power for lighting and running motors

Heating	= 100 kW
Motors	= $44.76/0.75 = 59.7 \text{ kW}$
Misc.	= $240 \times 40/1000 = 9.6 \text{ kW}$

Similarly, the energy consumed/day can be tabulated as follows :

	Energy consumed / day
Lighting	= $115 \text{ kW} \times 4 \text{ hr} = 460 \text{ kWh}$
Heating	= $100 \text{ kW} \times 10 \text{ hr} = 1,000 \text{ kWh}$
Motors	= $59.7 \text{ kW} \times 2 \text{ hr} = 119.4 \text{ kWh}$
Misc.	= $9.6 \text{ kW} \times 2 \text{ hr} = 19.2 \text{ kWh}$
Total daily consumption	= <u>1,598.6 kWh</u>
Weekly consumption	= $1,598.6 \times 5 = 7,993 \text{ kWh}$
Current taken by the lighting load alone	= $115 \times 1000/240 = 479 \text{ A}$