Indian Institute of Science

Design of Photovoltaic Systems

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NPTEL Online Certification Course

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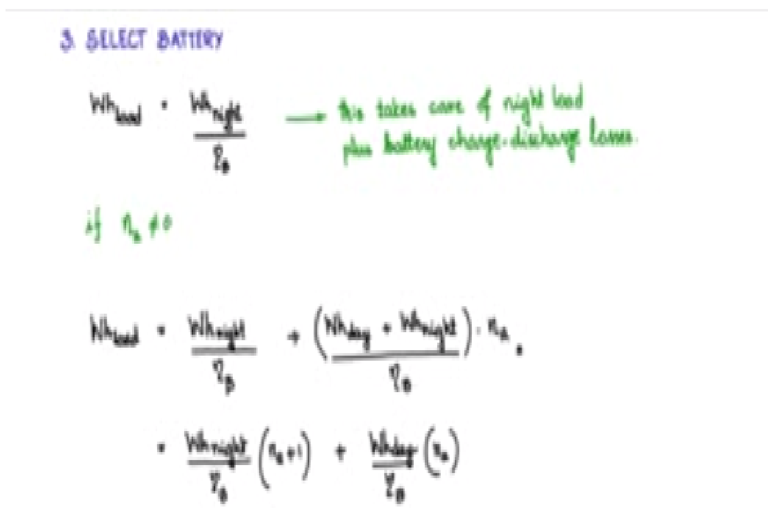

Next week select the battery let us see what is the matter over requirement for the battery the Wh_{load} Wh_{night} by the efficiency we see that in a normal condition the day load Wh over day is apply by the for old like panel and the night load is supplied by the battery, photo will like panel which charger the battery to accommodate in the night load and the Wh these insulation is not present the battery will see to wait that it supplies sufficient number amount of energy for the load.

This efficiency factor here is included to take care of charge discharge losses, so this Wh_{night} by efficiency will take care of the night load plus the battery charge day charge losses that we have already discuss, now this phase if the PV panel participates ends of line to the load everyday however just now we discussed on number of days or autonomy there can be a cloudy days there can be cannot take ways days pick out significant amount of sun power now let us say the night n_a number of days of autonomous operation.

Number of days or autonomy is not 0 which means you have 1 days without the Pv panels are participating there could be two days without the PV panels, and participating and so on, so if we take this na0 = 0 the what is the load that the battery has to supply suppose it has to take care get into the night load of that day which is flat over night by efficiency of the battery plus which would take care of Wh_{day} by Wh_{night} which means the entire load of the day by efficiency now this would be the entire load of the day.

And the battery has to supply this complete load for a entire day for how many hour days the sun power is not available which is the number of days of autonomy into na now this would give you a the total W hovers you know that the battery has to get or to, so this can be simplified as Whnight / efficiency of the battery na + 1 + Wh_{day} / efficiency to na.

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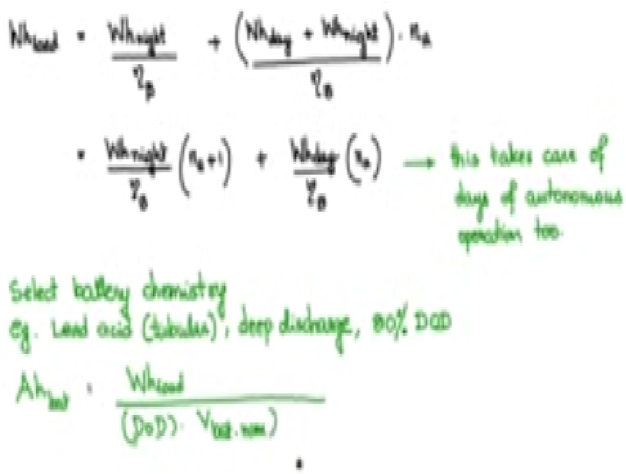

Now select the battery chemistry example let us say load acid battery to the lot lat acid battery which has been discharge characteristic about 80% DOD, so normally one would choose this for a PV application tubular load acid battery deep discharge of 80% DOD can kept over to continuous long tern loads, and the Ah_{bat} can be calculated as Wh_{load} this Whload is as calculated here which includes the efficiency of the battery also / DOD into V_{bat} normal.

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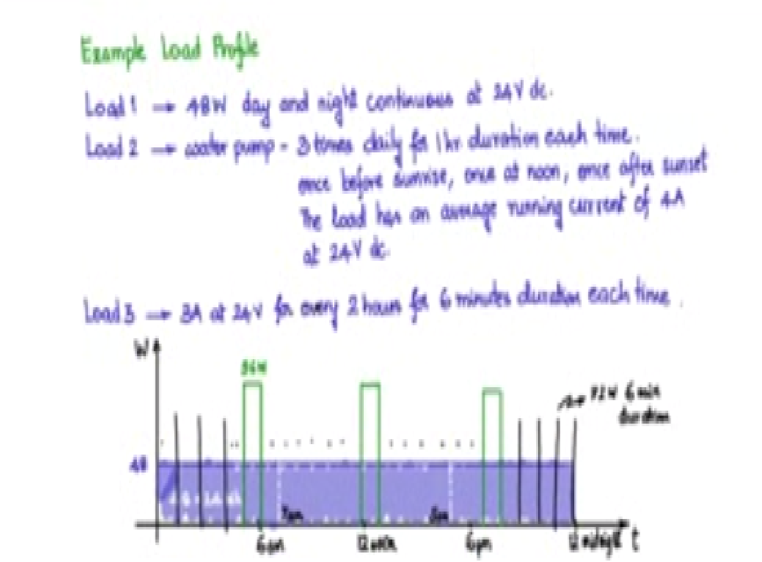

For the example that we had discussed earlier recall that it had three loads load 1 load 2 load 3 load 1 was at continuous 48W in the night load the 24V dc is load to other water pump three times daily 1over duration again 24Vdc and load 3 was 3A 24V every towards was 6 minute duration.

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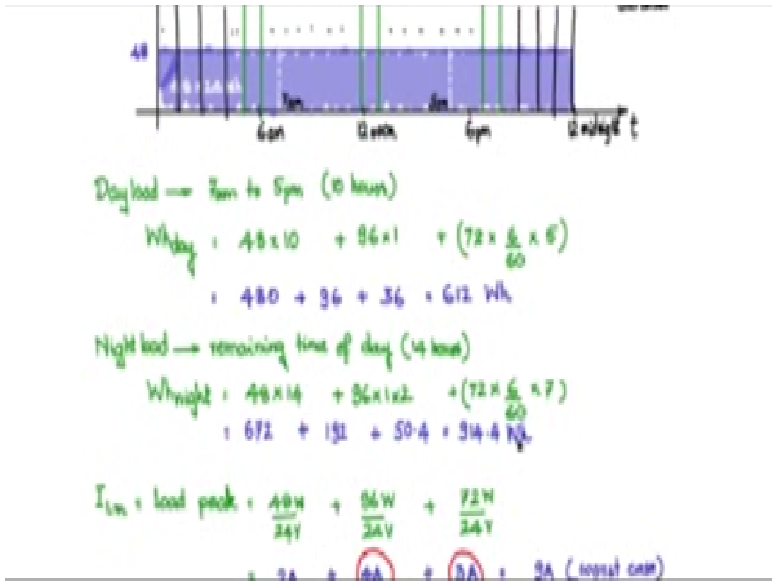

And we had the day load of 612Wh in the night load of 914.4W lowers let us use this value or selecting the battery calculating the battery capacity.

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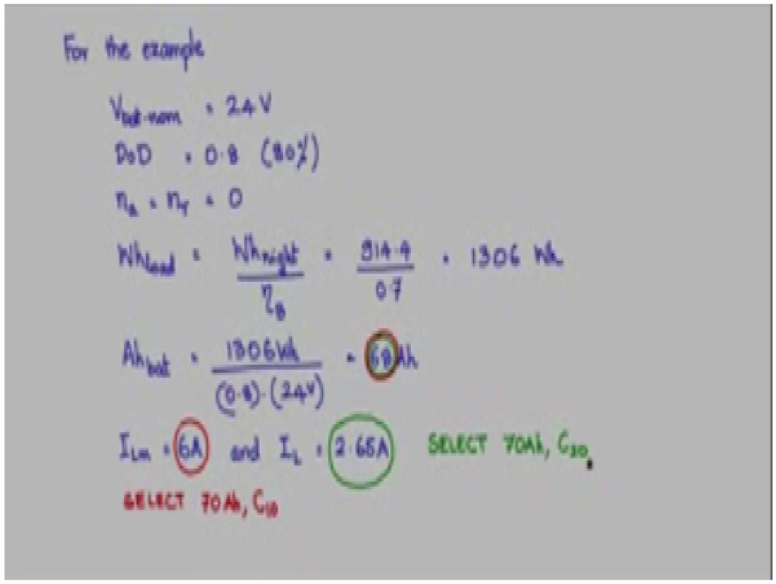

So V_{bat} norm in this 24V DOD.8 which is 80% depth of this charge na = nr is number of days of autonomy and number of days of recharge we will set into 0 because we are designing it, such that the photo volt take panels are participating in the in supplying to the load every day Whload is Whnight / Eb which is equal to 914.4Wh / 0.7 I am taking 70% efficiency for the battery which is a practical value Wh efficiency of the battery is 70% there is a particle value this turns out to be 1306Wh.

Ah_{bat} can be calculated as 1306Wh / 0.8 depth of discharge into 24V is the battery in other voltage and this comes out to be is 68Ah and we have seen earlier that the load current maximum is around 6A and normal lat condition and the load current average is around 2.65A, if you consider 68Ah and 6A to see that let us say we take a 70A our battery and if you it choose a C10 rate, so it will be around 7A, 70A / 10 7A charging and charge 8 and therefore we could go in for a battery which is 70Ah C10 or C / 10.

This is the case a worst case design in a sense that you are seeing to it that even the maximum current rating is within this 6A the capacity is preserved, but this result in a bigger size battery and costlier battery, however we go to also we go a big more conservative in the cost by choosing the 68Ah and the average current 2.35A this result in selection of a battery or 70Ah and C20, C20 will give a or 3.5A which is still > 2.65A average and therefore even this will work better but at maximum current discharge.

The maximum current discharge 6Ah will be more than the C20 value and therefore that can be slight loss in capacity but without presumable them it may be advantages to go for this because it is definitely much ever and a small or in size.