DC Power Transmission Systems
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Lecture – 61
Problems with harmonics

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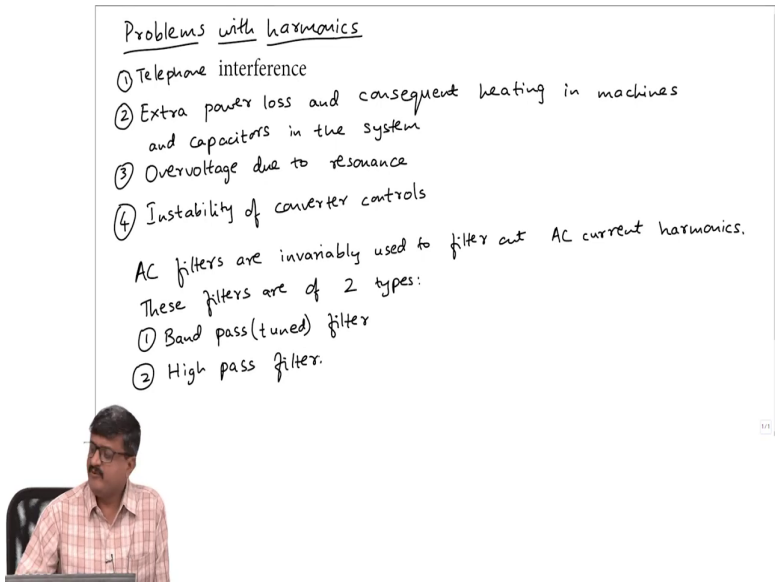

So, in the last class we saw that in addition to the usual harmonics or characteristic harmonics, there is a possibility of no characteristic harmonics. So, the problems with harmonics are actually well known. So, its not necessarily with the I mean something to do with the DC transmission; any power electronics will introduce harmonics. And the problems of harmonics are known see even in the case of electrical machines we try to design the equipment such that there are no harmonics.

So, if there are harmonics there are problems ok. Let us try to see what are some of the problems due to which we need to somehow minimize them in if not totally eliminate them. One problem is telephone interference. Especially this is a problem with overhead lines. So, DC transmission lines are overhead lines ok. So, this will be a problem. So, its not only the DC transmission there is a there are harmonics on the AC side also in the form of current harmonics.

So, these current harmonics will produce I mean very large frequencies with that can have interference with the telephone. So, that has nothing to do with power system of course,, but it will cause problems to other systems. And we all know that there is some extra power loss, which will be due to the harmonics. And this power loss will also cause additional heating, its not just a loss of power it causes another problem it will heat the equipment machines or capacitors.

So, one has to design the equipment withstand that heat also ok. So, extra power loss and of course, and consequent heating in machines and capacitors in the system. Now, whenever there are harmonics; that means, any frequency which is other than 50 Hertz or 60 Hertz, there can be problems of over voltage due to resonance especially parallel resonance. So, over voltage due to resonance. See normally we design system such that there is no resonance; because we assume that the system operates at one particular frequency 50 or 60 Hertz ok.

So, if there is anything other than these frequency resonance is a possibility. Now, we have not actually gone into the details of converter controls there can be instability of converter controls. Now, there can be other forms of problems in converter controls, which is due to harmonics. So, these are some of the problems with harmonics. So, we should try to as I said minimize them if not totally eliminate them. Now, we saw that there are harmonics on the AC side, which are in the form of current harmonics.

So, in order to actually minimize these current harmonics on the AC side, there are AC filters which are invariably used. So, AC filters see when I say AC filter I mean the filter on the AC side. AC filters are invariably used to filter out AC current harmonics. So, there are 2 types of

AC filters; these filters are of 2 types; 1 is band pass or tuned filter. The other type of filter is high pass filter ok.

Now, I will try to explain or define these filters band pass or high pass filter by taking an example ok. You may be at least familiar you maybe familiar with these filters if not we will try to see what is this band pass or tuned filter high pass filter. First we will consider one type of band pass filter or tuned filter, which is known as single tune filter.