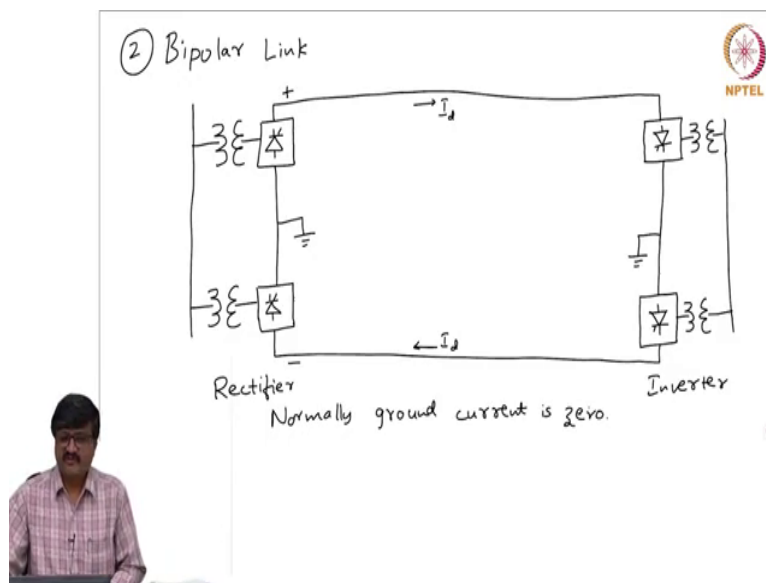


**DC Power Transmission Systems**  
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**Lecture – 52**  
**Types of DC link: Bipolar and homopolar**

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So, we are trying to see what are the different possible DC links we have seen monopolar, the second type of DC link is bipolar. So, again I will try to draw a schematic diagram. So, its not a circuit diagram. So, the schematic diagram is like this. So, a transformer which is shown in the figure and box with the thyristor actually represents a 12 pulse converter. So, this is on one side. So, there are two sides; one is rectifier other is inverter.

Suppose, I say this is the positive terminal and this is the negative terminal and the current positive current  $I_d$  is flowing in this direction. So, with this polarity of the DC voltage, now can you say which one the left side is the rectifier or the right side is rectifier?

Student: Left side.

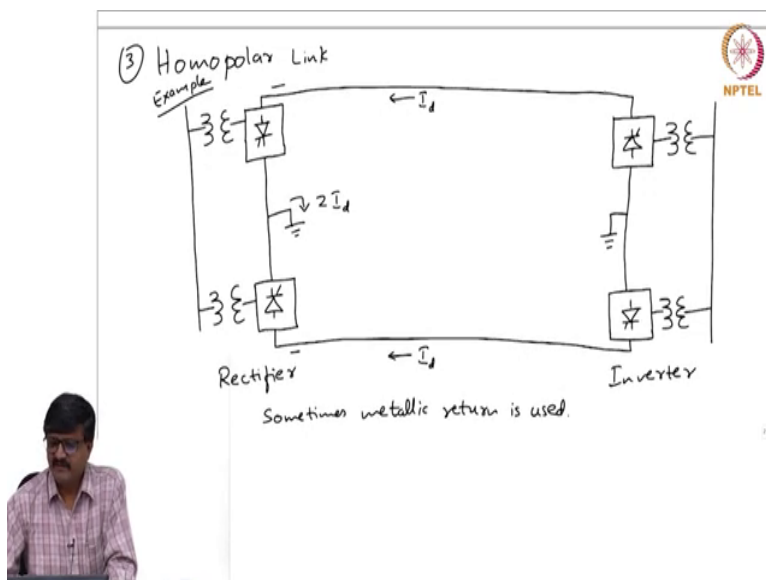
So, this is rectifier. So, this is rectifier side and this is inverter. So, at each side we have two 12 pulse converters and there is a midpoint on the DC side which is grounded ok. So, please note we need grounding. So, that the two conductors or at the same magnitude put I mean same magnitude of the potential with respect to ground; one is positive other is negative.

But the magnitude of the voltage between any of the conductor and ground is same whether its positive or negative, so that is the idea. Now, sometimes the grounding is provided at both sides. So, its always not necessary some I mean on rare occasions grounding is provided on both sides ok. So, even one side I will do, but at least I mean one side has to be grounded.

Now, the purpose of grounding on both side does not mean that current will flow through the ground though there is a closed path. So, that two 12 pulse converters are operated identically. So, that the current  $I_d$  is flowing only through the 2 conductors and there is no current through the ground.

Normally ground current is 0. So, this is what is known as bipolar when there is one more possibility that is homopolar.

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Now, these types of links are just mentioned for the sake of completeness. So, we will see that the only one type is actually preferred in practice. Again I will draw the schematic diagram.

So, in the case of homopolar both conductors are at the same potential with respect to ground and we saw that it having negative potential will result in less corona compared with positive potential. So, both the conductors are at the negative points. Now, again the left side is rectifier or inverter?

Student: Rectifier.

Right is rectifier. Please note this is different from bipolar hope you have noticed that difference between the bipolar and the homopolar links and this is inverter. Now, this is just an

example of homopolar. In fact, what one can have as a general homopolar link is any number of such 12 pulse converters on both sides of course, identical number.

If I have say instead of 2 12 pulse converters on the rectifier side I can have 2. So, if I have 3 on the rectifier side I will also have 3 on the inverter side. So, this is one example where I have 2 12 pulse converters on both sides ok. So, when any of 12 pulse converters are there on both sides all the conductors are at the negative potential. So, there is a return current. So, suppose this current is say  $I_d$  and this current is say  $I_d$ .

So, normally all are operated identically. So, if this I mean in all the conductors carry same current. So, the current that flows through the ground is?

Student:  $2 I_d$ .

$2 I_d$ . So, this is actually flowing through the ground. So, sometimes metallic return can also be used. So, there are a few other possible links I will not get into all the possible links when even in the among the three which we have seen in this course. The most commonly used link is bipolar; see bipolar link does has some advantages if you look at bipolar; bipolar does not have any ground correct.

Please note its there is grounding provided that is all, but the 2 12 pulse converters are operated identically. So, the currents that flow in the two conductors are exactly the same. So, there is no ground current. So, bipolar is used, but monopolar is something if you look at monopolar, what is monopolar? If you remove one of the 12 pulse converters on both sides it becomes monopolar ok.

Then there should be a ground current ok. So, monopolar is actually used as the initial phase of bipolar. Say suppose we want to build a bipolar we initially build one I mean system with only one 12 pulse converter on both sides which will meet the load for now maybe after a few years more power has to be transferred, then we need one more 12 pulse converter on both sides.

So, monopolar can be used as an initial stage of bipolar and bipolar can come into existence once there is load growth and as the requirement increases. So, most commonly used type of link is the bipolar link.