4. DC link however, produces current harmonics which must be filtered out at a substantial cost. It also delays the current at the rectifier end and advances it to the inverter end and advances it it at the inverter end, which requires large amounts of reactive power to be supplied locally at both ends

SOME ADVANTAGES TO HVDC TRANSMISSION

The primary economy in DC power transmission is that only two conductors per circuit are needed rather then 3.

Consequently transmission towers carry less load weight and they can be smaller, less costly to fabricate and easier to install For the same size conductors, line line losses are smaller with DC then AC. Neglecting skin effect, AC line loses are aprox 33% greater then DC losses.

EX:

A new DC transmission system compared to with a 3Ø A.C. system transmitting the same power and the same loses and size of conductor. Assume that the voltage breakdown of an insulator string is equal to the peak value of the AC voltage to cause breakdown. Show that a bipolar DC. line with 2 conductors instead of 3 will have an insulator level of 87% of that of the AC system. Assume that the AC. power factor is 1, also assume a Y connected AC system

SOL:

AC power transmission $= P_{ac.} = 3V_p I_L = \sqrt{3} V_L I_L$

where

$$V_p = \frac{V_L}{\sqrt{3}} \quad , I_L = I_p$$

$$P_{D.C.} = 2V_d I_d$$

losses

$$P_{L\,a.c.} = 3I_L^2 R$$

$$P_{L.D.C.} = 2I_D^2 R$$

For equal losses, then:

$$I_d = \sqrt{\frac{3}{2}}\, I_L$$

$$3V_p I_L = 2V_D I_d$$

$$\therefore V_d = \sqrt{\frac{3}{2}}\, V_p$$

Assuming DC voltage for breakdown of an insulator is equal to the peak value of A.C. voltage, the insulating level of the A.C. line $= \sqrt{2}\, V_p * k_1$

k_1: Insulating constant

The insulating level of D.C. line =

$$= V_d * k_2$$

let $k_1 = k_2 = k$

$$\frac{\text{DC (insulating level)}}{\text{AC (insulating level)}} = \frac{V_d}{\sqrt{2}\, V_p} = \frac{\sqrt{3}}{2} = 0.87$$

$\therefore$ 87 %

(6 pulse) bridge configuration is used as a building block. The 6 pulse configuration is shown below.