Lighter Than Air Systems
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Lecture - 46
Effect of change in Lifting Gas Purity

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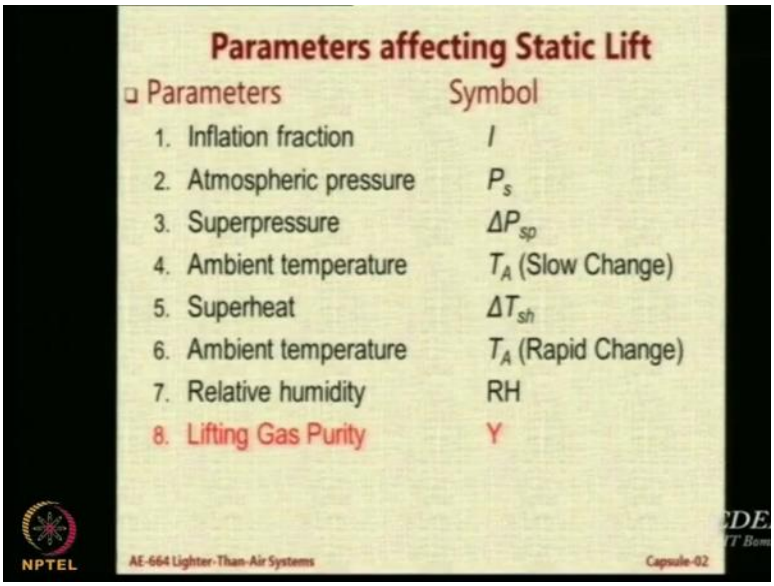

So, for we have looked at all the 7 parameters now we will look at the lifting gas purity Y. So, for this once again you like to go back to your notes and bring out this particular formula.

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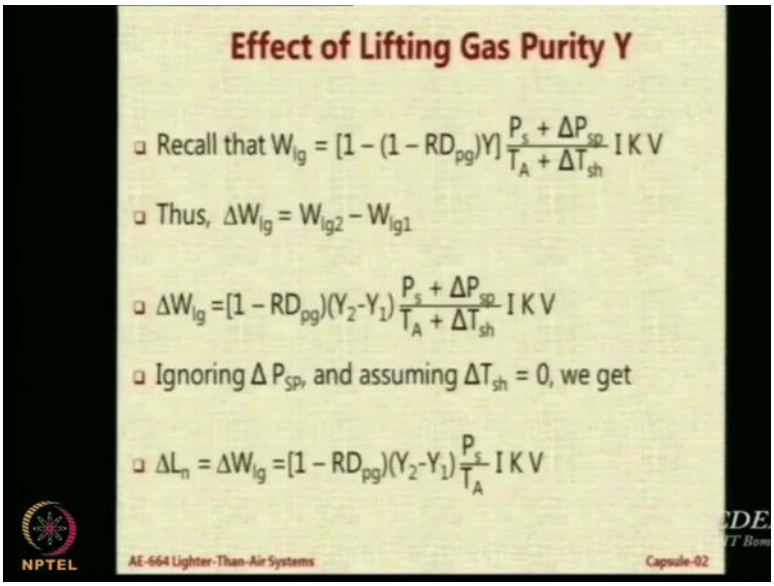

This biggish formula which tells you about the weight of the lifting gas in terms of the purity of the gas Y.

$$W_{lg} = \left[1 - \left(1 - RD_{pg}\right)Y\right]\frac{P_S + \Delta P_{SP}}{T_A + \Delta T_{SH}} IKV$$

and this RD_{pg} is the relative density of the pure gas. This is the fixed number it depends on the whether you use hydrogen or Helium or any other lifting gas. So, the value of $\left(1 - RD_{pg}\right)$ is a fixed number depending on the LTA gas that you use.

So, in other words, it will be (1 – K) some constant K into Y into the pressure upon temperature into I into K into V this will be the W_{lg}. If this is the case let us calculate so now, I want you to derive this expression yourself. Just work out the expression for ΔW_{lg} changing the lifting was weight because of the change in the purity. So, now you will have Y_1 and Y_2 but other things like ΔP_{SP}, I, K, V will remain the same. But recall I is going to change. I did not change sorry; I did not change in humidity. There were 2 parameters humidity and lifting gas purity due to which I was not changing. I was changing because of the other parameters, so I changes whenever the pressure or temperature changes superheat or superpressure, but I will not change with their relative humidity and with lifting as purity.

So, can you derive the new expression please it will be

$$\Delta W_{lg} = \left[1 - \left(1 - RD_{pg}\right)(Y_2 - Y_1)\right]\frac{P_S + \Delta P_{SP}}{T_A + \Delta T_{SH}} IKV$$

So that is it, so it is simple expression which simplification is possible only if you neglect superheat and superpressure

$$\Delta W_{lg} = \left[1 - \left(1 - RD_{pg}\right)(Y_2 - Y_1)\right]\frac{P_S}{T_A} IKV$$

otherwise get the expression, which is the slightly larger expression.