Principles of Industrial Engineering
Professor D. K. Dwivedi
Department of Mechanical and Industrial Engineering
Indian Institute of Technology, Roorkee
Lecture 16
Plant Location & Layout: Methods for Selection of Site 3

Hello I welcome you all in this presentation related with the subject Principles of Industrial Engineering and we are talking about the Methods used for Selection of the Site, so that plant or an organization can be located or installed or developed accordingly.

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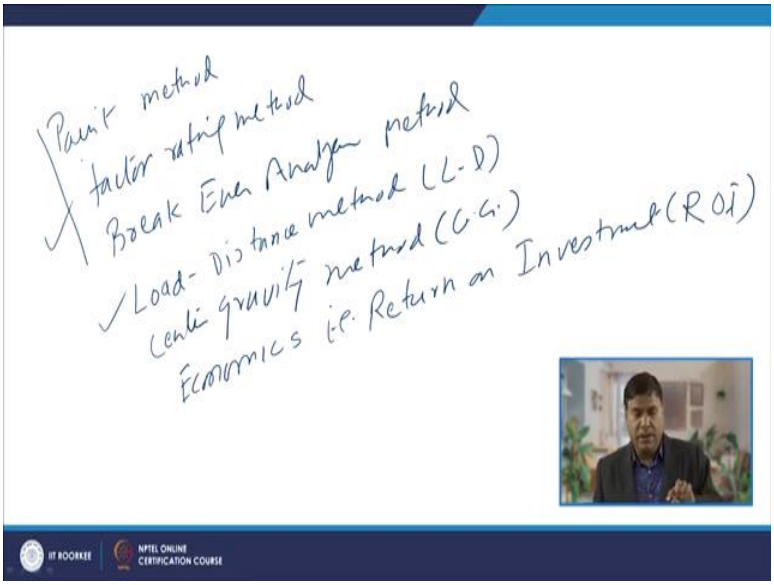

If we see there are different methods which are used for selection of the site or selection of the plant location like the point method, then factor rating method. About these two methods we have already talked as in there was a break even analysis method. There are 2, 3 more methods about which we will be talking like the load distance method, it is also called LD method.

Then there is the centre of the gravity method, CG method and then there is one more based on the economics or economic analysis. Economics that is indirectly termed as return on investment. So, ROI method, we will be initially talking about the load distance methods about other three methods we had talked in earlier presentations. So initially we will start with the load distance method.

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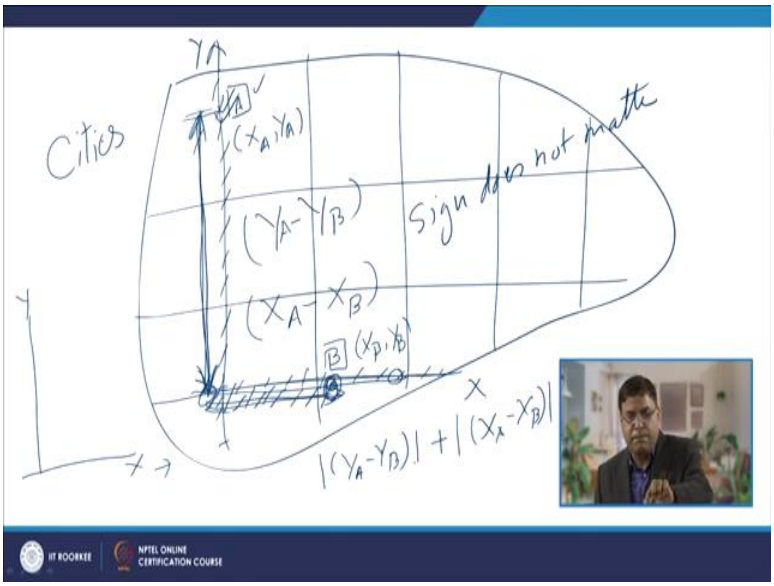

We know that in the cities, there are different like say there is a area over which city is spread and it has so many roads. Like what we see in India, like in cities like Chandigarh, Surat, etc. You will see there are primarily 2 roads. One category of the roads running vertically and another horizontally like this. So, if there is one site at a particular location like say A and if you want to make a travel to another site B according to this method, the diagonal or the movement along the at an angle is not possible because there are different blocks.

And next to these blocks we have the different roads like this. So, we say if we take a graph then it represents to the Y axis and then there are horizontal means that are there and there is another category of the roads which are perpendicular to this one which we can say as it X direction. So, if we want to travel from A to B, then we have to travel all through this distance and then this distance.

So, movement is rectilinear means along a particular line and then movement will be occurring at a 90-degree. So, to find out this distance. What we have to do is we have to find out the coordinates. We have to identify the coordinates. So, like say the coordinates of the location A is XA YA and the coordinates of the location B is XB YB. So, the distance to be travelled from this location along this direction will be equal to how much like say why A because this is this is representing the movement in Y direction say this is Y direction and this is X direction.

So, the move extent of movement in Y direction will be equal to YA minus this location of the Y, Y B. This is the vertical movement or movement in the Y direction and then additionally to reach at location B we have to travel further by this much distance which is equal to the X coordinate at location B and X coordinate of the location A. So, difference of these two will give us the distance, do we travel in X direction. So, the distance to be travelling is X direction will be equal to the difference of X A minus X B, since all these distances are positive, so sign does not matter and we take the absolute values of that difference.

So, the distance to we travelled to reach from location A to location B will be the difference of like say YA minus YB. Again the absolute value plus absolute value of the difference of XA minus X B, absolute value. So these absolute value even if they have positive or negative sign it does not matter. We have to take the numerical values of that difference to find out the distance to be travelled. This is the basic principle of this method.

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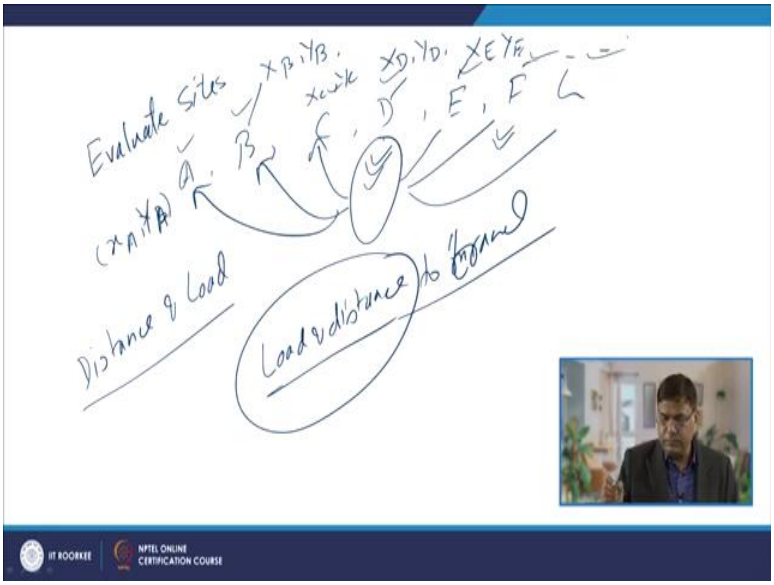

This method is primarily used to evaluate. The sites potential sites where plant can be located. Let us say if there are 5, 6, 7 sites, potential sites where plant can we locate. There is 5, 7 sites like site A, B, C, D, E, F, G out of these sites say D and F are the potential sites, where we can locate the plant. So for locating the plant we have out of these 2 options we have to, these options can be more also in that case, the calculations for the load into distance movement. It will be obtain for all those potential sites.

So, if the D and F are the potential sites for locating the plant, say these are the distribution points and warehouse is to be located. So, warehouse can be located either at B location or F location. So, whether D will be good or F will be good. That choice can be made easily using this kind of method.

Considering the distance to be travelled from these potential sites to the different distribution points and the kind of the load which is to be transported, the volume of the movement, the kind of like how many weights, how many units, how many trucks need to be transported from the warehouse to these different distribution points.

So, this method helps in minimizing the load and the distance to be travelled. Distance to be travelled. So, it will help in locating the plant or warehouse in such a way that the load and distance to be covered is minimized in distribution of the things to the different distribution points from this particular warehouse or the plant location. So, say the coordinates of A location is XA, X B. XA, YA coordinates of B location is XB, YB. And likewise XC, YC for C, XD, YD for D location. XE, YE and likewise.

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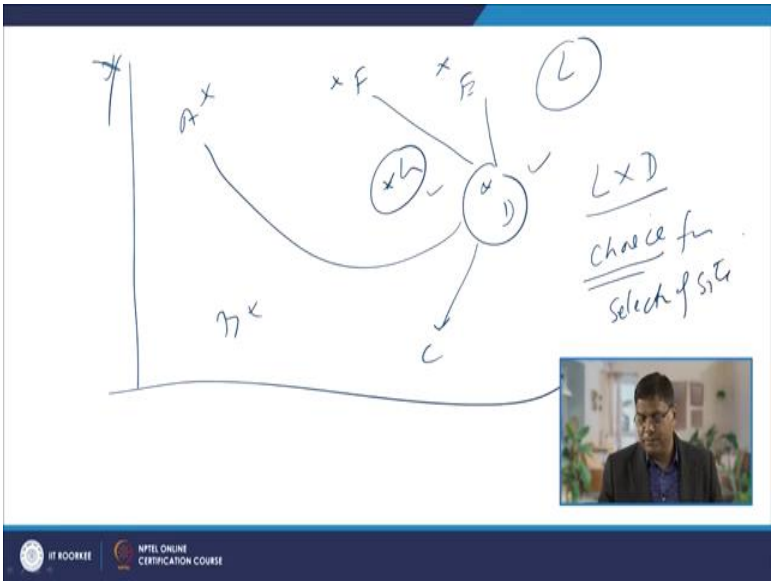

So, what we have to do is we have to say now we will understand in terms of this plot. Y and X here we have all these plants like this, all these distribution points like A, B, C, D, E, F and G. So, say if the location G and the D are the potential sites. So what we will see? What is the

distance to be travelled from A to G and G to A or F to G or G to F, G to E and these distances will be multiplied with the corresponding load or the volume to be travelled.

Similarly, we will be considering the distance to be travelled to the location from XA to the D or D to X. A to D, F to D and D to F, E to D and D to E, C to D and D to C. Likewise. So, like this is how we will be considering the distance to be travelled and the load which is to be moved and out of this two, one which is giving the minimum load into the distance, that will be the kind of the choice for o the selection of site.

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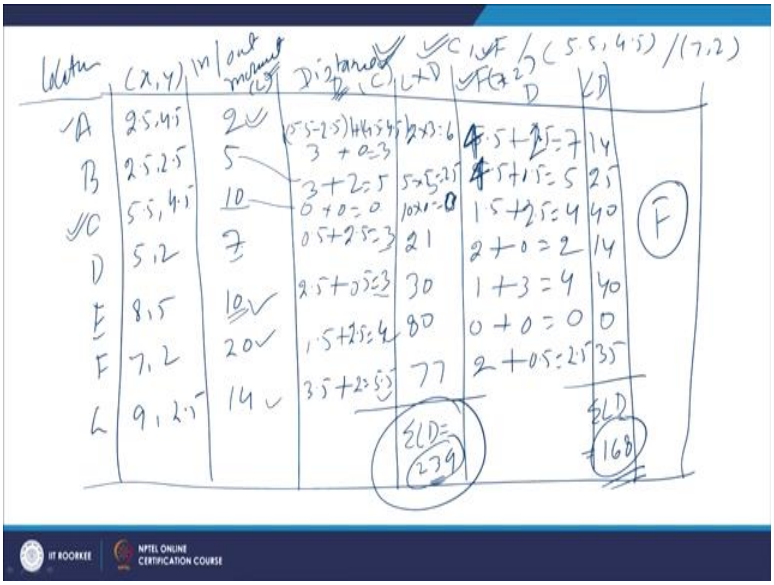

So, for this, we will take an example and according to the example. Let us say, there are, the different locations, like location A, B, C, D, E, F and G and the coordinates of these locations have been identified say x and y coordinates for each location. Location A is 2.5, 4.5 for B is 2.5, 2.5 for C 5.5 and 4.5, for D it is 5 and 2, for E it is 8 and 5 for F 7 and 2 and G 9 and 2.5.

These are the coordinates of the different sites and say the inward and outward movements from the different sites or different locations. So, what we will write in oblique out, movement that is termed as load L from the different sites is given as from A it is 2 from B it is 5, from C it is 10 From D it is 7. E It is 10. Then it is 20 from F in inward outward movement from the location G is 14.

Now, what we have to do is, we have to determine that the distance travelled, Distance travelled distance to be travelled from where from, from the location A to the possible location of the choice, say here. The possible location of the choice is C and F. So, the coordinates of the C are like 5.5 and 4.5 and that for F are like 7 and 2. So, we have to identify the location, we will initially find out the distance to be travelled from A to the C, so if these are the 2 possible locations where we can have a plant.

So, will try to assess the suitability of the location C first. So, what we have to do is, the movement or the distance to be travelled from A to C and C to A. That is what will be identified. So, the distance to be travelled is how much for A to C is the how can we obtain like 5.5 minus 2.5 absolute value plus 4.5 minus 4.5. So, difference off XC minus XA or we can also say like difference of X A minus X C because we have to consider the absolute value, not the sign.

So, here it will it will be reduced to 3 plus 0 likewise will be determining the distance to be travelled from B to C. So, that will be the difference of what like 2.5 minus 5.5. So, in absolute terms it is 3 and the difference of 2.5 and 5.5 that will be 4.5, so that will be 2. So, the total here is 3 and here it is 5. That is the distance to be travelled.

Now the centre C to C movement will be 0. So, 5.5 minus 5.5 will be 0 and 4.5 minus 4.5 will also be 0. So, the distance to be travelled is 0. Now the distance to be travelled for movement from D to C. So, 5.5 minus 5 that is 0.5 plus 4.5 minus 2. So, it will be left with the 2.5 sum is 3. Now we will be finding that difference of 5.5 minus 8. So, the difference will be 2.5 and 4.5 minus 5 so difference is 0.5 sum is 3.

Now the difference of 7 and 5.5, because we are considering the distance to be travelled from C to F. Distance to be travelled between the C and F locations. So, it will like 5.5 minus 7. So, it is 5 point a 1.5 and then 4.5 minus 2. So, it will be 2.5 sum is 4. That is the distance travelled and then 9 and 5.5 minus 9.

That will be 3.5 plus 4.5, minus 2.5 that is 2. So, it is 5.5, this is the distance basically to be covered. If we choose the C as a potential site. So, the distances to be travelled from C to the different locations have been now identified. What is the load or the inward and outward movement in terms of the load is like say for A in and outward movement for the location A is 2.

So, L into D for the location A will be equal to 2 into 3 that is 6. Then likewise for location. For location B it is 5 into 5. So, it will be 25. For location C the load is 10 and the distance to be travelled 0, so 10 into 0 is 0. The load of the movement is 7 and the distance to be travelled is 3 so here it is L into D is 21.

Load inward outward movement in terms of the load is 10 and the distance to be travelled, so here it is, 30. So 20 into 4 80 and 14 into 5.5. So, it will be giving us 77 and sum of all these load into the distance for the potential site C that will be equal to 239. So 239 is indicating the sum of the load and distance to be load and the distance to be covered for from the different sites. If C is choosing as a potential site.

So, some of the load into the distance for the C as a potential site is coming 239. If we consider F as a potential site for choice. Having the coordinates of the 2, 7 and 2 then for that the distance is to be obtained. So, what will be the distance to be travelled between A and F, A and F distance to be travelled can be obtained from the difference of 2.5 minus 7.

That is 5.5 plus 4.5 minus 2. So, it is 1.5, that is how it is, it is 4.5. So here it is 2 and 4.5, 4.5 minus 2 it is 2.5 and 2.5 minus 7. So, 4.5. So that is how it is leading to the 7. Now for a location B 2.5 minus 7 that is 5.5, 4.5 and 2.5 minus 2 that is 0.5, so it is 5. Then for C location 5.5 minus 7, that is 1.5 plus 4.5 minus 2, 2.5, so that is how it is 4.

Now for D location 5 minus 7. That is 2 plus 4.5 then 2 minus 2 is 0. So, 2 is the distance to be travelled. For E location 7 and 8 minus 7. So, here it is 1 plus 5 minus 2, it is 3, so here it is 4. 7 minus 7 0 and 2 minus 2 0 for location F. and for G 7 minus 2, 7 minus 9, 2 plus 2 minus 2.5 it is 0.5. So, here it is 2.5.

Now what we have to do is determine the load into distance for each of these locations. So load is for L location load is 2. So, 2 into 7 that is 14, 5 into 5 that is 25, 10 into 4. So 40, 7 in 2 to 14 for location D is the L into D for location E now will be 10 into 4 that is 40 again. 20 into 0, so 0 and 14 into 5.5. 14 into, 2.5, so it is 35. Some of this L into D for the potential site F that will be equal to 168. So, if C is considered as a potential site then some of the load into distance is coming 239 and if we consider F as a potential site then some of the load into distance is coming 168.

So, it will be more appropriate to select the site F as a potential site for locating the plant. So, the load into the distance travelled is reduced or it is, it is minimum or lower as compared to the location site C.

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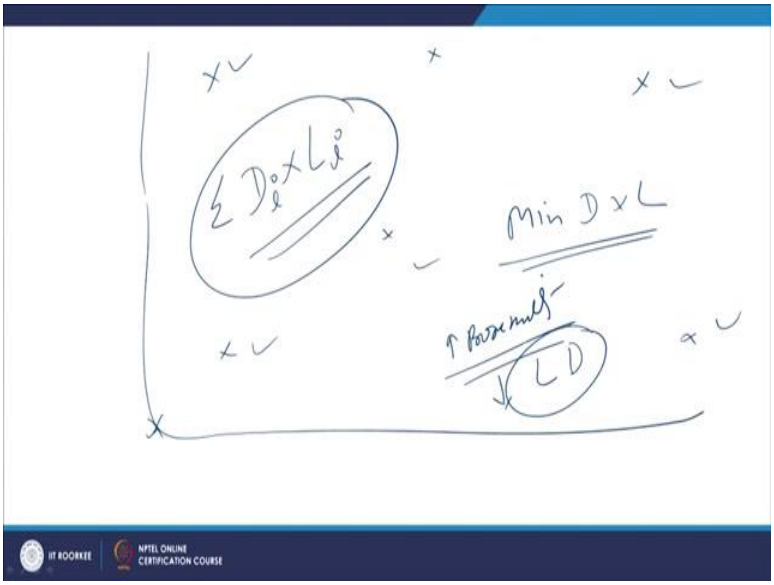

So, this is, so in this case basically the different sites. Which are to be considered for selection of location. Their coordinates are identified with reference to the some point. With respect to some reference point, their coordinates are identified and after identification, the distance to travel from the possible site to the different points is identified, that is Di and the kind of load which is to be transferred, which is to be moved in and out.

That is it obtained and the sum of all these 2 gives us the location which will be leading to the minimum distance and the load to be moved. So, basically it helps in identification of the location which will increase the proximity and reduce the load into the distance to be travelled for realizing a particular thing.

So, this is about the load and the load distance method for identification of the suitable site for selection of the plant. Now here I will summarize this presentation. In this presentation basically I have talked about the load distance method for identification of the suitable site, where warehouse with respect to the different distribution points can be located. Thank you for your attention.