**Management of Inventory Systems**
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Lecture - 09
Inventory Problems and Selective Inventory Management (Contd.)

So, during this session; the next half an hour, so, the Selective Inventory Management as you are aware, the selective inventory management deals with not only one type of the classification scheme say A-B-C, it deals with several other classification schemes.

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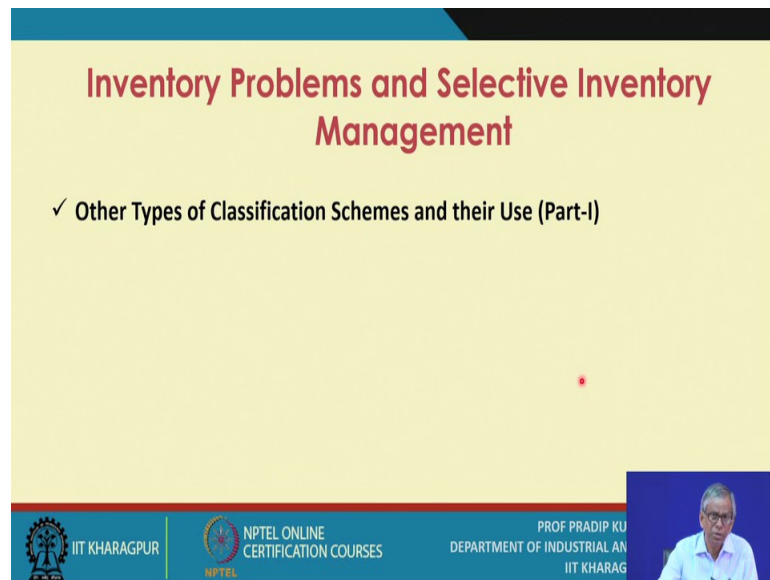
So, during this session, I will be discussing to some in some detail; 2 typical classification scheme; the first one is you know like say V-E-D classification and the second one is F-S-N, right.

So,; so, let us first talk about the V-E-D classifications. Now, in the majority of the organisations, as I have already pointed out, A-B-C classification along with 1 or 2 additional classification schemes are used. Though, we have mentioned that there are all together 6 classification schemes and in when you know you deal with a multi division multiproduct manufacturing forms.

So, to dealing with 100s and 1000s of items and facing you know the different sorts of the situations; like say you know, there could be say purchasing from in from say within the country, there could be international purchasing; purchasing from outside and you deal with all sorts of items like say you deal with raw materials inventory, you deal with. So, the finish parts inventory, you deal with. So, the finished goods inventories, you deal with purchase parts and you also deal with the MRO items.

So, when you deal with all sorts of the inventory items, it is natural and all sorts of the purchasing procedures you have been following for a long time so; obviously, in those cases, for those industries or for those originations, you have no other alternative, but to, but to. So, use all the 6 classifications schemes in, but then sometimes, you know, the time could be constant, sometimes, all these the 6 classification schemes, you do not need to use; necessarily, do not need to do not you do not use necessarily. So, hence you

can be selective also. So, out of this 6, usually 3 are always used. So, that is why A-B-C is common and along with A-B-C, V-E-D and F-S-N classification schemes are also found to be essential in many instances.

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Now, let us talk about the V-E-D classification, how to collect data for -E-D classification that is our the main issue. So, the V-E-D classification is based on criticality of an item; that means, the you have to define; what is the criticality and what is expected that that given a particular inventory item is item being used in a particular product or a process or in a machinery and the criticality of this item is defined with respect to is functional value means how important that the functional value of that product with respect to you know that the performance of the machinery or the product or the process. So, that is the key in defining the criticality of an item.

So, what you need to do? That means, you must be a technical person, you must know the design as well as the functioning of that particular system or the product or so, the process and then only, you will be able to define the level of criticality of an item; is it ok? So, usually it is it is the responsibility of the designers and their opinion will be sort.

Inventory items related to operations and maintenance of machineries and processes ok.

So, in a manufacturing or in a service system are classified under V-E-D scheme. So, this point is to be noted for classification of the items. Under this scheme, we need to define the level of criticality of each item with respect to its importance to the functional or use value of the machinery or the process of which it is a part; that means, here is a machine or here is a process in which this part this inventory item is required to be used and this particular item with respect to this particular machinery of the process solve this purpose; that means, what is its functional value with respect to the operation as well as the performance of the equipment or so, the process under consideration ok.

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So, this knowledge is a must. So, the items which vital for the functional value or the use value of the machinery or the process are considered as vital items, you may be knowing that any product you should be aware of that there are 4 types of the values a product in the item may have the first one is; obviously, the functional value for the use value, right.

So, suppose; so, the functional value. The second one is the appearance or say a sitting value appearance of sitting value; a sitting value. The third one is actually you know the cost value and the fourth one is the exchange. So, here for the V-E-D classifications, we refer to the functional value ok. So, the items, which represents the functional value of for the product where it is used, this is considered to be very very vital; that means, if

suppose this item is not available at a particular instant of time; what we will find that you will not be getting the functional value from the product; that means, the product stops functioning; is it or the system stops functioning entire system you know the stops functioning.

Similarly, on the other extreme; there are the parts which are in normal condition that is required, but they are not directly affecting the functional value; is it ok? So, they are they are consider is desirable. They are considered to be desirable the items that are considered to have appearance or say esteem value or say sometimes, you know is a aesthetic value are considered to be desirable there maybe one or more than one substitute for this items; that means, at one extreme you have the vital item and the other extreme, you have say the desirable one means that is definitely preferred, but suppose, it is not available, what you can do? You can get a substitute for this one; that means, for the time being, you can run the system; is it ok; that means, the there is no as such there is no effect on the functional value of the product.

So, the criticality is to be defined very clearly and explicitly essential items are those for which a few substitutes may be available with additional cost of procurement; is it ok? So, this way we defined; that means, there are 3 types of items. First one is the vital; that means, if without which or suppose, this is not made available at any point in time, the entire system will be affected ok.

If suppose item is considered to be essential, it means that if it is not available, then at any point in time or at instance of time, then; that means, substantial portion of the production systems will be affected stops functioning not the entire one where as if it is you know a desirable one; that means, as such the overall function of the performance is not affected, but maybe, it is not performing well or in future that could be some problems. So, immediately you can have a substitutes, but the later one you just the substitutes to be changed with the original one. So, these are the 3 types of classifications.

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Non functioning of vital items may render the machinery of the process useless; that means, you will not be getting any performance of the function out of it. Non functioning of essential items may jeopardize the functioning of a portion of the machinery or the process this point, already I have elaborated and for a given list of n number of items ok, the following data need to be collected for V-E-D analysis.

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Now, as I have already pointed out that essentially, this the classification is made the procedure, you follow that is while you follow the procedures, you must have enough knowledge to define the term called criticality. So, select a measurement scale for criticality. So, this is very very ital vital. So, you may select a 4 or 5 point scale like suppose, you use the 5 point scale. So, if you to say the scale value is one, it means the item is least critical, if you give value of 2 the rating is 2; that means; this is slightly critical.

Similarly, if it is 3; 3 means critical, 4 means highly critical and 5 means very highly critical. You may use a 5 point scale and or you know you may also use a 4 point scale, but unnecessarily, do not go for a 10 point scale. This will you know unnecessarily, you make the system more complex. So, that is also not desirable while you select the criticality scale, you need to define the criticality level against each rating value; that means, you need to very clearly define; is it in relative; what is least critical, right. So, certain sentences, you have to write, you have to define in the given context.

Similarly, for all other, you know say the terms which we use like; what you mean by slightly critical, in many cases, while you try to define these items. So, you may sight certain examples because one of thethat key aspects, you must keep in mind that is this. You develop definitely, you are an expert, you have the knowledge, you have the understanding. So, you will be proposing this V-E-D classification, but then again the entire systems will be used as well as you adopted by the people down the line. So, their understanding also should be very very you know correct. So, that is why you know you you need to write down the definition in such a way that this is clearly understood by the people down the line for easy adoption of the classification scheme.

Against each item i like in the in the previous cases, you have mentioned that each item is is referred to; i is referred to the functional diagram of the machinery, you know, this is very very important or the process while it is a part of; is it ok? So; that means, you refer to the functional diagram. Once you study the functional diagram of the machinery or the process, you will come to know that actually, you know normally you know there could be different the modules in the functional diagram or you find that this is this diagram is presented in a hierarchical form.

That means, what are the code components what are the you know the soft code components what are the peripheral components and how you know the machine starts and how it starts starts functioning; all the units are running one after another, what is the is the main component? What are the link components? So, all these details you must know and then only, you can clearly understand that the item belongs to a particular module, this module essentially the code module or the main functional module.

So; obviously, if this particular item; suppose is it gets damaged and immediately is to be replaced and while you go for replacement, you find there is no stock out of it so; obviously, to wait. So, the entire system is down, entire system is not working so; obviously, that item is considered to very very critical and that is why it is considered to be very very vital. So, this is the main say the approach of the or this is the way you use or you need to define the level of criticality against.

So, the you need to refer to the functional diagram assess functional value of item I in terms of the level of criticality the point which I have elaborated, right. Now next what you do? You prepare a table as follows.

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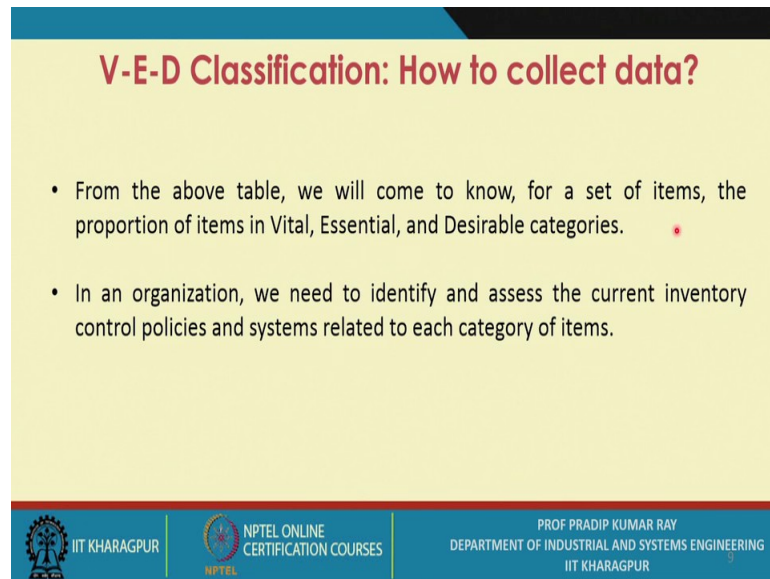| Item number	Criticality rating C_i	Ranking of criticality ratings	Categorization	Classification	Number of items	Proportion of items
1	C_1	C_1				
2	C_2	C_2	4-5	V	n_1	n_1/n
3	C_3	C_3				
.	.	.				
.	.	.	2-3	E	n_2	n_2/n
.	.	.				
n	C_n	C_n	1	D	n_3	n_3/n

Now, please study this table, like first one is in the first column, you will find there is a

item number 1 to n. Next is the criticality rating ok. So, you have to the follow certain scale. So, the criticality rating, suppose, you wants C 2, C 3, C n like this the ranking of criticality ratings; that means, what you find that the C 1, C 2, C 3, these are the categorisations like 4 to 5; that means, you know, there is a scale the suppose 5 point scale; that means, it is highly critical as well; very highly critical; that means, while say you look at item number 1, item number 2, item number 3, say you find their all rated as 4 or 5. So, this is the first categorisation.

Next say few items. So, the next set of items; not few, the set of items you will find, they are rated as either 2 or 3; that means, it is slightly critical and critical, is it ok? You refer to the 5 point the scale which we have discussed already, which we have mentioned, which have stated. So, they are considered to be the next category and; obviously, the remaining items, here remaining items up to n; what you find? They are all ranked as 1; that means, it is in this critical; that means, it is non critical also you might say. So, this is vital, this is essential, this is desirable. So, this is the procedure you follow; that means, the criticality you have to define with respect to the functioning of the product and then you have to categorise them, you have to scale the values the rating scales.

So, now you count how many numbers the say the like n 1 numbers in B category, n 2 number in E category and n 3 number in D category. So, the proportion of items in n 1 by n, n 2 by n and n 3 by n, n is the total number, actually, this is n is the total number items ok.

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So, this way, you present the table. Now, from the above table, we will come to know for a set of items the proportion of items in vital essential and desirable categories, already you know, I have mentioned, you look at the table. Immediately, you will get this proportions in an organisation, we need to identify and assess the current inventory control policies and systems related to each category of items. Particularly V class items and E class items ok. So, this for the time being or if suppose there is as such there is no specific problem, you come across for the desirable item you may continue with the existing systems with existing inventory control systems for the class items.

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Now, the next important classification scheme I am going to discuss that is referred to as F-S-N classification and again, the 4 issue will be discussing that is how to collect data for carrying out F-S-, you know the classification or F-S-N, classification scheme, it is observed in the majority of the nations that all the inventory items are not used at the same rate. Now this is the point to be noted, right, you have been using this inventory items for say with the last 5 years, for the last 10-20 years, for the some of the items, you have been using for the last 20 years, 25 years, 20 years since the inception of the company of the of the plant.

So, so, this items; so,; obviously, you are aware of this production rate; that means, per month; what is your consumption rate? How many units you require per day or per hour? So, all these the data you have; obviously, you know what particularly in a case where you produce 2 capacity, you have created capacity for your plant and what you want that suppose is the case is you know is produced to stock; that means, the item as a constant market, you know whatever say whenever you will produce it. So, there is a market for this one; is it ok? So, that could be the situation produced to stock not produce 2. So, the order produced to stock. So, that could be situations.
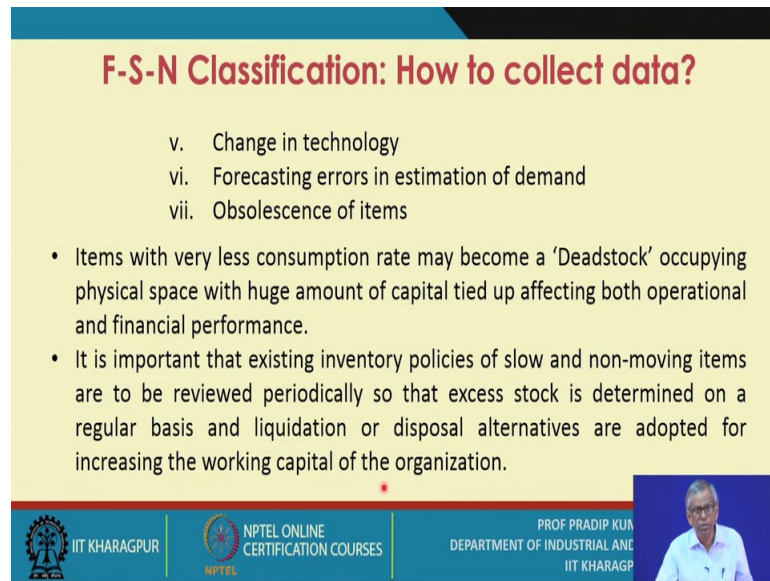
So; obviously, for many many items; almost all the items at this point in time; currently

what is the you know the production rate that is known, whereas, for certain items that are directly related to the produced products in an ongoing and recurring process; that means, what you what you will find that the certain item which are regularly used for the production purposes.

The remaining items; the consumption rate may not be that high. So, what you expect? The items which are regularly used in the production purposes, usually their consumption rate is high, whereas, for other items, the consumption rate may be very low due to number of reasons; is it ok? So, it is a real problem in any materials management executives he faces, he deals with this window problem like some of the items are you know you have procured, they are occupying space, but they are hardly being used and; obviously, you related to this problem to the current inventory control policies, but there could be many reasons that why you have this excess stock and where excess stock, but there is hardly any product or say used rate.

The reasons for low consumption rate are manifold; I will just mention some of the important reasons. First reason is you may note it down. First reason is a change in product design change in production methods; that means, if the design is change that particular item may not be required ok, you need the different type of item in the new design change in production methods; that is a second reason change in demand levels.

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So, obvious aggressive purchasing; that means, someone as purchased this items assuming that these items say will be as will be consumed or will be used at a high rate, but actually, it has not happened; change in technology. This is an important factor forecasting errors in estimation of demand, this also, this problem also you come across and obsolescence of items which in many cases may not be avoid may not be avoided, it remains unavoidable. So, these are the few important reasons for which the consumption rate may be very very low.
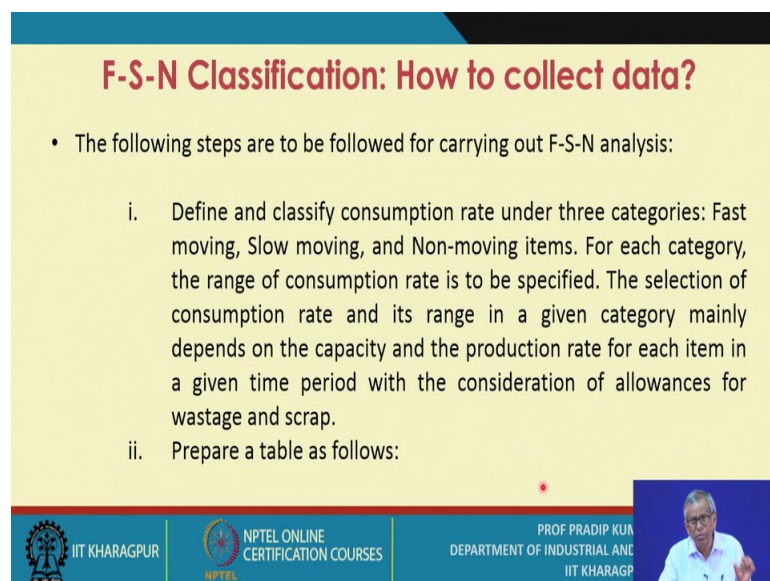
Items with very less consumptions rate or low consumption rate may become a dead stock and dead stock is a serious problem so, and when you deal with the dead stock problem. So, the first exercise; you carry out that is what is the proportion of the items considered to be non moving is the first exercise you have to do. So, you have no other alternative, but to go for F-S-N analysis, is it and later on when we deal with excess stock model ok. So, you will come to know say in how many different ways the excess stock can be liquidated can be disposed off, but first you need to determine the excess stock and this excess stock in majority of the cases.

These are considered to be non moving, I am not saying that that even for the first moving items, there could be dead stock, there could be excess stock, but in majority of

the cases, we will find that the dead stock problem actually originates from say non moving or non moving items.

So, this dead stock occupies you know the physical space with each amount of capital tied up affecting both operational and financial performance; is it ok? So, you should take step. So, that this you know this tied up capital is released as quickly as possible for other productive purposes, it is important that existing inventory policies of slow and non moving items are to be reviewed periodically. So, that excess stock is determined on a regular basis and liquidation or disposal alternative are adopted for increasing the working capital of an organisation, is it ok.

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So,; so, the working capital management is very very important for any organisation and this is closely linked the inventory management practices. So, what are the steps to be followed for carrying out F-S-N analysis define and classify consumption rate under 3 categories fast moving slow moving and non moving items this is the standard practice. In fact, for each category the range of consumption rate is to be specified, is it ok?

The selection of consumption rate and its range in a given category mainly depends on the capacity and the production rate for each item in a given time period with a

consideration of allowances for wastage and scrap. So, as such there is no any standard the rule or say some mathematical formulations. So, in a given situation, you have to study the system closely and then you decide and you must you must refer to the first data of the consumption rate and then you select the range ok.

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Rules for categorization: Fast moving: R_1 and above, Slow moving: R_2 to R_1, Non-moving: below R_2

Item, i	Consumption rate C_i	Categorization of items	Classification (as per rules given)	Number of items	Proportion of items
1	C_1	F			
2	C_2	F	F	n_1	n_1/n
.	.	S			
.	.	S	S	n_2	n_2/n
n	C_n	N	N	n_3	n_3/n

So, and then you prepare a table as follows like for the item i, the first column; in the second column, consumption rate is specified, then the categorisation of the items; that means, first what you have to do? You have to set the rules for categorisation like the first moving R one and above like 10,000 units and above that is considered to be fast moving per unit of time could be a day could be an hour.
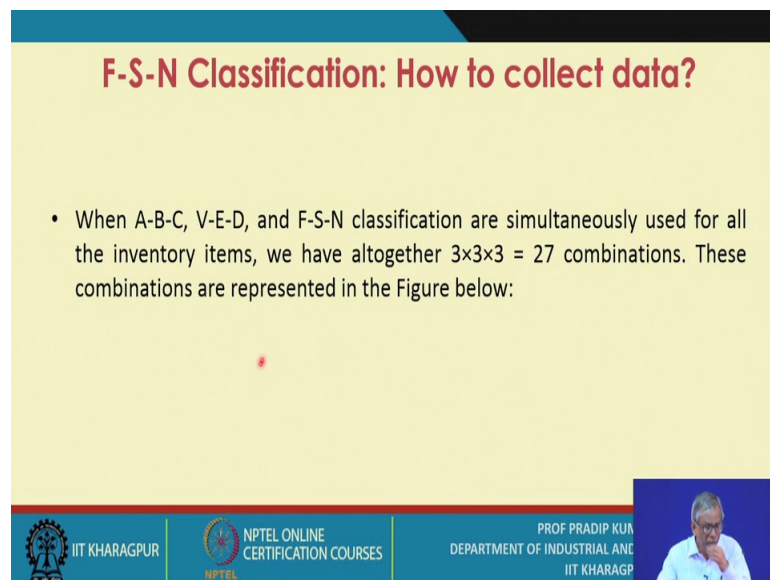
Slow moving means like say 5,000 to or 10,000 units per hour or say 3,000 to 10,000s; choice is yours. There must be some basis right and the non moving below R 2 you say ok, it is almost it is less than say 2,000 considered to be. So, this definition there is cannot be any absolute the definition. So, so relatively you have to the select this the range values.

So, once this is done; obviously, looking at the consumption rate, you check whether it is in the first category or in the slow category or is a non moving category or not. So, the

classification as per rules given that is it is F, this is S this is N; that means, the number of items in F category number of items in S category; slow moving and number of items N say the non moving case. Particularly, you should be bothering about the non moving non moving items, is it because and if you do not take corrective measures immediately or the preventive measures immediately, it could be a serious burden on you and it will affect the materials management systems significantly.

So, now you can definitely calculate the proportion of items, right.

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So, when A-B-C, V-E-D and F-S-N classifications are simultaneously used in many cases, you need to you select out of 6 classifications at least 3 for all the inventory items, we have altogether 27 combinations. These combinations are represented in the figure below.

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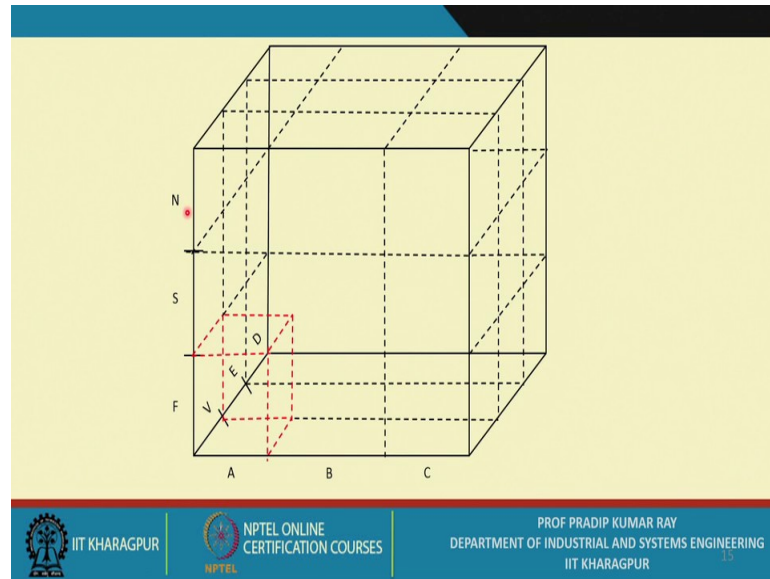
So, this way you calculate; that means one on y axis, you have A, B and C in the xy, this is the x axis, this is the y axis V-E-D and then you have on the z axis F-S-N.

So, the most important the category is most important items are the items which are a class items vital items and fast moving items, this is an one extreme and the other extreme is most unimportant item is C, then you have the D desirable and non moving. Now whenever you say, it becomes a non moving. Now if this number numbers will more proportionately is large number of non moving items that itself becomes critical item.

So, here the first moving may not be critical item is slow moving, may not be critical item, but non moving could be considered as very very important are the critical item ok. So, I conclude this session; so, only the 3 classification schemes; we have discussed in depth and the later on in the next sessions, I will also be referring to say other classification schemes with. So, certain key points we need to remember.

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So, I close this session. So, the combinations involving A and B, V and E and F and S may be categorised as very important as I have already told you, existing inventory policies for these items are to be regularly assessed and improved for items in remaining combinations, the existing inventory control policies may continue.

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So, this is the concluding remarks.

Thank you.