Evaluation of Textile Materials
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Module No.#01
Lecture No. # 01
Evaluation of Textile Materials – Outline

Hello everyone, today we are going to start a new course which is called Evaluation of Textile Material. So the Evaluation of Textile Material here will mainly deal with the physical texting of textile material. Textile material in the form of fibre, yarn, fabric; also we will discuss the intermediate material like sliver, roving. So in today's discussion we will discuss the introduction to the course, overall introduction ok.

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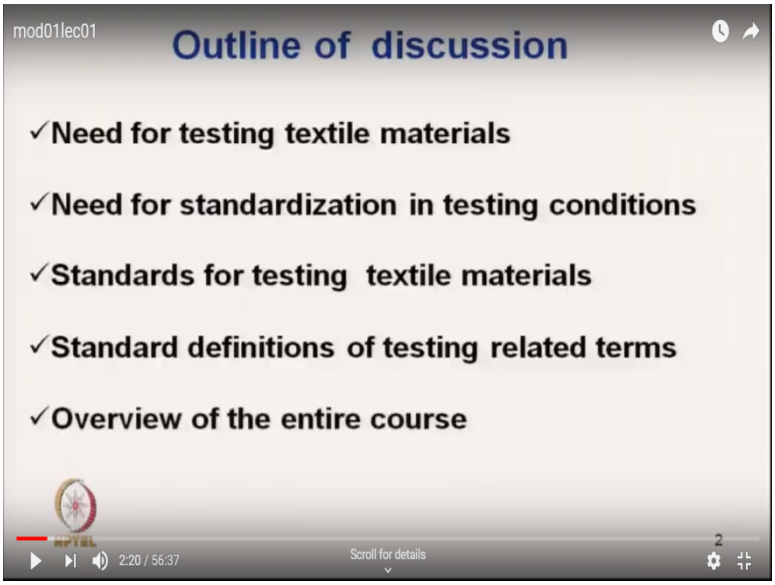

Now basic outline of today's discussion is that first we will try to understand the need for testing of textile material. Why do want to test textile material? Then we will discuss the importance of standardization. Standard test method is extremely important and we will discuss various standards available for testing textile material and also we will discuss that what are the effects, we will get if we do not follow any standard method.

Next, so different standard for textile testing, after that we will discuss different terms related to sample related to testing different standard definitions we will discuss. And at last we will give the total overview of the entire course. So what are we going to discuss in this course that we will give the work before we start actual course.

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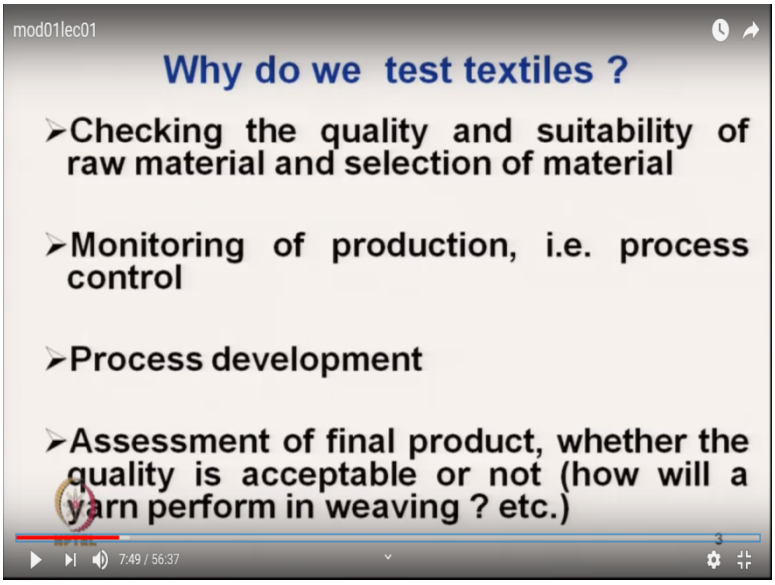

So, first question is that why do we test textile material. What is the importance? So first is that we have to check the quality of the material and suitability of the raw material for particular application. For example suppose we want to produce a particular yarn and for that we need a raw material like fibre say cotton; so for particular yarn, to achieve a particular quality of yarn and particular strength of yarn we need to know the strength of fibre, diameter of fibre, length of fibre; so if we want to know so how do we know? We have to check.

So, that is why we have to test the material. So, whether the raw material is suitable for a particular application that we have to decide. So we have various raw materials available. Different quality of raw materials available and particular quality is suitable to have particular yarn. So, similarly for yarn, we have different types of yarn. So, we need to know the characteristics of the yarn to have best quality fibre.

Next objective is that to monitor the production process. Like we are trying to manufacture a particular in product say yarn; okay and the yarn are targeted strength, targeted uniformity is there and to achieve that strength or uniformity we have to know the intermediate productions. Like this is yarn so to produce this yarn we have to go through different intermediate process.

So like, this is the raw fibre, say, raw cotton fibre. So this fibre, we have to convert this raw fibre to continuous strand this is called sliver. And from this sliver next stage we have to form a finer continuous strand which is known as roving. So to monitor this total entire production

process to achieve particular yarn we have to test the material in between us. If we do not have better quality sliver or roving, we cannot get the required quality of yarn.

So, monitor the production process we have to test at each and every stage. Next objective is that the process development. Suppose a particular process let us say, for example blow room. A blow room it has been observed that it is breaking the fibre. Large amount of fibre breaking is taking place. So, what do you do? So, fibre breakage means reduction in length of fibre.

So, what do you do, we have to test the fibre length before blow room process and if you know the certain length before blow room and then after blow room process and we can see the change percentage reduction in fibre length. In that way if it is beyond the acceptable limit then what do we do we have to change the setting of the blow room or we have to change the speed of the blow room.

So, not only in the blow room, for many other applications; like we want to impart certain twist in a yarn and if we do not test the twist then we cannot actually set the machine. So for process development for any process development we need to test the machine. And then assessment of the final product where the quality is acceptable or not; so whether the quality is acceptable or not that assessment we have to know**.**

Suppose our yarn, after production of the yarn; yarn goes to the weaving department; the weaving, it is a raw material for weaving. So and weaving needs the particular quality. Set quality. That is the final product of the spinning but the raw material for weaving. So, that quality checking we have to do. For that we need to test the machine.

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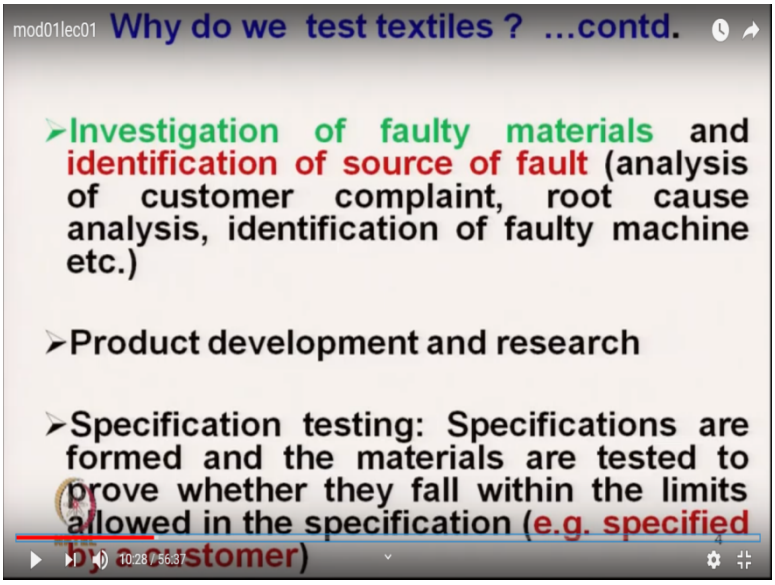

Another objective is that investigate the faultiness. Suppose a particular machine is generating fault like thicken simplisis in ring film. So if we do not test the evenness of the yarn; so we cannot identify the faulty location. So, if we test the material and that is called root cause analysis. So, Analysis of customer complaint, suppose a particular customer has actually given saying there is a complaint that the yarn is highly non-uniform. It has got too much thicken and thin places. Or the yarn is poor in quality in terms of strength.

So, for that we have to first test the machine. Thorough testing of the material is required to identify the source of fault. If we cannot identify the source of fault then the total the machine will keep on generating the fault; keep on producing the faulty material, so that the industry cannot survive. So for that we need to test the machine. Next is the product development and research.

For any product development, for any research we have to test. So, we must understand the testing. So suppose we want to produce the new fabric, new material. So, you must test the material. And last is that the Specification Testing. Our customer they give some specification. Suppose spinning mill is trying to sell its product to a particular customer abroad. So, what the customer gives, customer gives the specification; this uniformity rate; uniformity in percent; this is the strength; this is the hairiness all these parameter they give.

And you have to match these parameters. How do you match? For that we need to test. So all these very important aspects of textile materials and for that we have to test we have to know the characteristics of the material.

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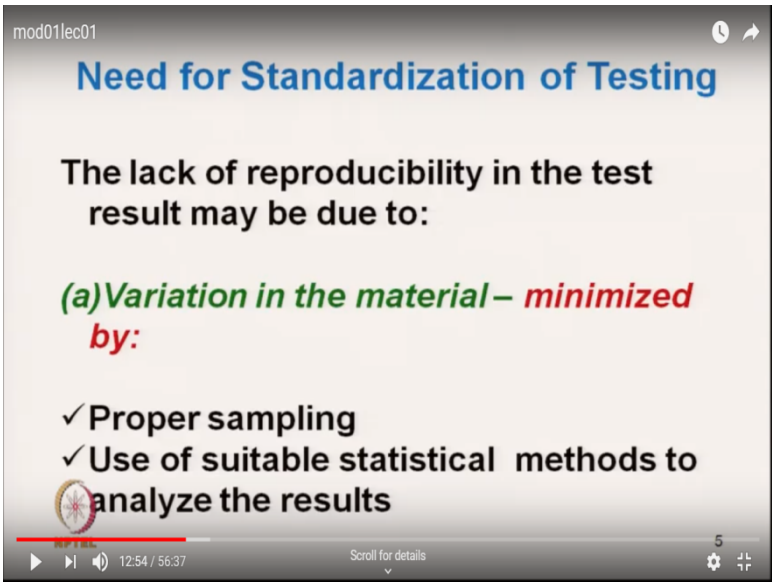

After knowing the requirement of testing then we must know the need for standardization. Why do we need to standardize the testing? Can we test material, any material at any environment at any condition? That will result us the wide variation in results. For a particular material it will give a wide range. So that the lack of reproducibility in the test result may be due to, first is in the variation in the material.

So, particularly textile material it is variable in nature; in terms of diameter, in terms of strength, in terms of cross sectional scale it is totally variable. So for that if we test the material under strictly standardized condition, then we will achieve the reproducible result. So variation in material we can minimize by proper sampling.

So, if we can sample we will discuss in detail the sampling processes. The, may be random sampling, may be any other types of sampling; that we will discuss in detail. So, proper sampling if we can do then we can little bit minimize the variation of material. Use of suitable statistical methods to analyze the test results like t tests, significant test. So we can actually come to know whether the material is actually variable or not, that these things we are able to understand this through the statistical methods.

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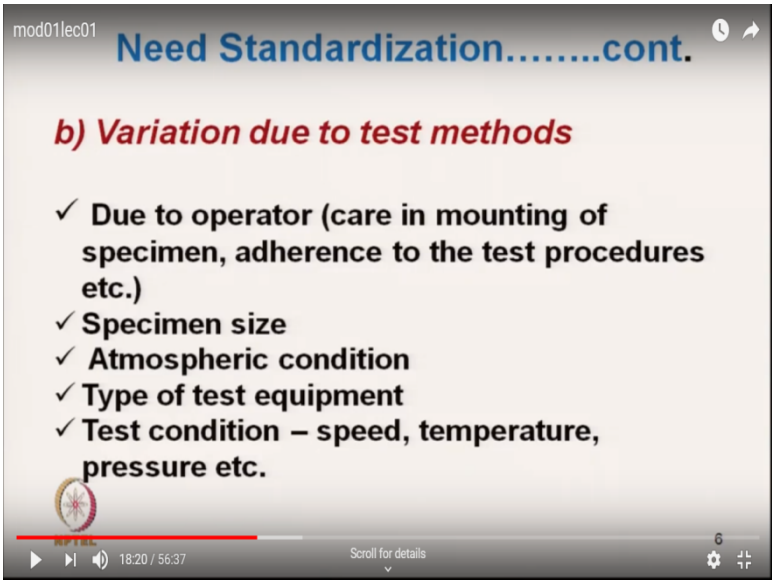

Next is that variation due to test methods. So during testing, the result can change. For a same material, if we do not test the material under standardized condition, you will land up with totally different test results. This variation in test results is due to various factors. First is the due to the operator. The person who is testing, suppose he is not taking care, proper care in sample mounting, jaw he is not fixing, there is jaw slippage.

He is not following the test method, test procedure. Okay. He is not able to set the machine apart a proper speed, proper guessed length. So, all these results that due to operator's carelessness, we will land up with that different test results. Next is that proper size of the specimen. See if we do not set the proper size, then we will have different tests; test results for a same material. We will land up with different test results.

Like one example is that, the guessed length of yarn. So, this yarn if we test with a smaller guessed length we will get a particular strain value. But if we test with a longer guessed length, the test result will be totally different. All these results will discuss. But the thing is here the specimen size actually affects the result widely. The materialism, same yarn but we will land up with different result. We are using the same testing instrument, same speed; same environment only by changing the size of the specimen or test results is changed.

Third is the atmospheric condition. In textile material most of the textile materials are hydroscopic in nature. The characteristics of textile materials affects too much on atmospheric condition, particularly the relative humidity. So the atmospheric condition has to

be perfect, the specified; it should be standardized. So, standard atmospheric condition must be there otherwise will land up with different results.

For cotton, if we increase the relative humidity, the strength of cotton will increase. But on the other hand for viscose if we increase the relative humidity the strength of viscose will decrease. So, to counteract this problem we have to set the specific relative humidity and temperature. That is known as the standard atmospheric condition. Type of test equipments; suppose if we test a fibre for strength in a single fibre test method or in bundle mode, bundle fibre test, the test result will change.

So, type of test equipment, there are various types of equipments for a particular parameter. For strength testing of yarn we will have different types of equipments. Like single yarn test, single yarn strength we can test using instron or any other instrument. Also we can test at very high speed which is known as tensorapid or tensojet. So if we see if we compared the result, these results will be entirely different for a particular type of raw material.

So, for any material like even other parameters like, evenness also if we test the evenness, in terms of say capacitors method. In capacitor's method you will get one particular method of evenness. But if we test in photo electric method, then the evenness value will be totally different. So type of test equipment or principle of testing also affects the test results.

And test condition, as I have already mentioned speed, temperature, also pressure affects the test results. Like you want to test the thickness of fabric, so to test the thickness of fabric we must specify the pressure otherwise because textile material is combustible in nature. So, for any standard test method, to test the pressure, thickness; pressure is actually specified. If we do not follow this specified condition, you will land up with totally different results.

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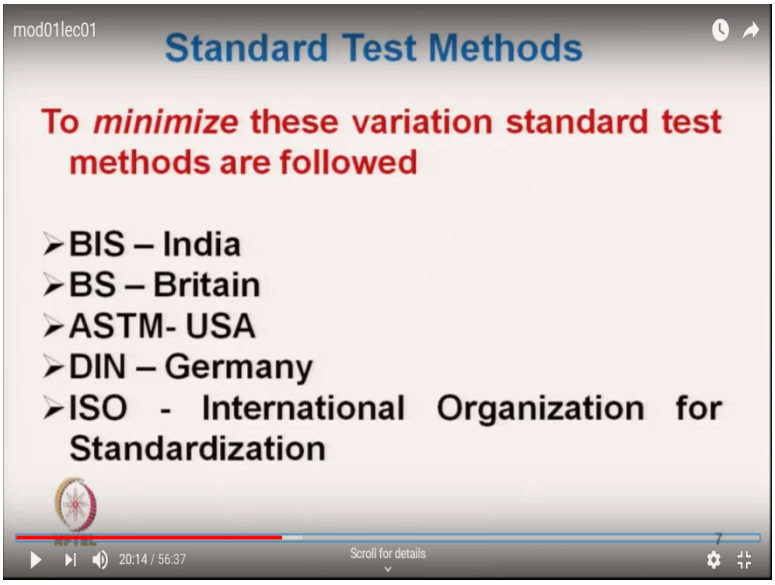

So, to minimize all these variations, we have discussed all the, variation; all the different types of variation, all the process of variation and to minimize these variations standard test methods are followed. So, worldwide there are various standards, different countries they have various standards, but they have specific format. Most of the test methods they follow the specific formats. Like in India we follow BIS standard; Bureau of Indian standard.

So, in India we follow BIS standard, in Britain we follow BS standard British standard, America ASTM standard, Germany DIN standard. So, different countries they have different standards. But overall, internationally ISO standard is actually established and it is being followed across the country. So, international Organization for Standardization, so all these standards, they have specific formats.

And this format they tell detail about the testing and they are numbered. For a particular tests, particular characteristics, they have different number. Like ASTM, they have for yarn, they have different series of numbers; fabrics they have different series of numbers. So, same parameter when we are we refer BIS standard it will have different, number okay. But over all if we see these standards are very close to each other. Okay.

And they have almost similar format. They, if you see the total format what are the information what is the information they are available in the standard?

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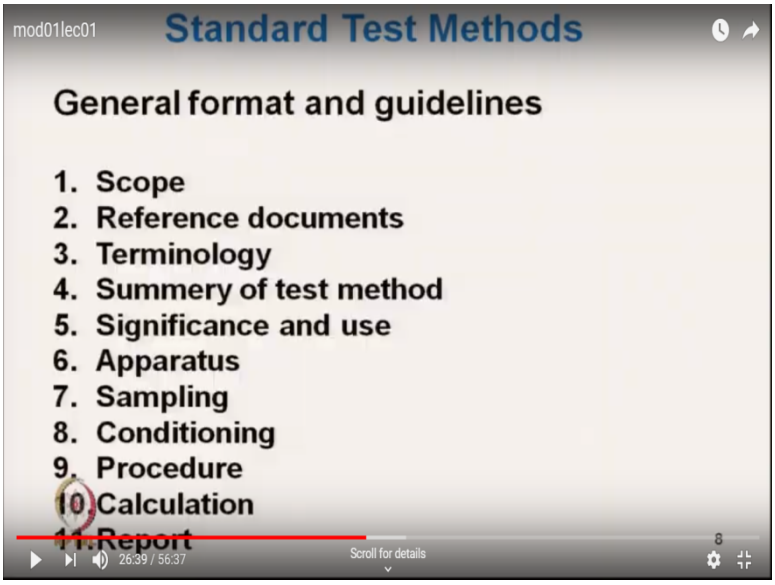

If we see, so general format and guidelines of this all the standards, in the standards first it will be scope of the test. It is given scope. There it is like scope of testing is the tensile testing of yarn. That is the scope and there total scope of this method, particular method is described. What type of yarn? What are the characteristics required everything is given their okay. Next is that reference documents.

What are the documents you have to refer to actually test the material; to how to test the material? So, there are different reference documents it has given there. Then different terminologies, so there are different reference documents it has given there. Then different terminologies, so for testing you must know the terminologies. Different terminologies you have to know okay? So what is the strength, what is the elongation, different terminologies related to that particular test?

Then broad overall summary of the test method in short so that if you do not want to read in detail. So you just go through that summary you can test. Okay. You do not need to go to detail test method there. Overall summary you can just come to know what are what are the test methods has been described. Next is the significance and use of the test. Okay. So, what are the significance of the yarn?

Why do we want to test that particular characteristic? So, that significance and what are the uses of this it has given? Then Apparatus; apparatus is mentioned. Particular company will not be mentioned what are the manufactures will not be mentioned but overall apparatus is mentioned because as we have already explained that the test result varies with the apparatus.

So, the apparatus is an overall broad outline of the apparatus will be given. And that all these apparatus has to actually follow these guidelines. So then only you will get the repeatable results. So, the standard test methods idea is to that that wherever you test, if the material is same you must get the same result. And it is not that that the test testing lab all the testing lab will have the same apparatus.

It cannot happen. They will have to have different manufacture. But these instruments they have to follow that particular test method. They will actually the instrument manufacturer will give will tell that this instrument follows, this standard okay, ASTM this standard, ISO this standard that they will give. So that particular apparatus you have to follow. Then only you will get the result.

Then comes how to sample? So for a particular material, particular type of test you have to follow strict sampling method. So detailed sampling process we will discuss. But there they will give you the strict sampling method. Because other if you do not follow the proper sampling method or test result will be totally different. Okay. Next is that how to Condition. So we cannot start testing immediately after getting the material. No.

We have to condition the material. And there is specific conditioning temperature, humidity or time is there. So that conditioning we have to follow strictly. Then come, the procedure in detail. So, earlier we have discussed that it is a summary of the test method. Then it is procedure, detailed procedure, so person who does not know the test method, who is doing for the first time.

If he reads the procedure he will just follow one by, step by step, and then he will be able to test material. Because the different person, they are testing in a different lab. Okay. Same material ultimately, ultimate goal is that from two labs, two different persons they are testing. But their test result should be exactly same. That is the idea. So they have to follow this procedure strictly line by line, word by word.

Then only we can reproduce the results and then how to calculate. We cannot calculate the results as per our own views. We have to follow their, own calculation like if you want to know the mean, how many readings are required? All these details are given. Okay. Then

report. Report should be had a particular format. The, format is given, so that format we have to frame the report.

So ultimately if we follow all these steps, so we must reach, we must get the same result. So the standard method, standard test methods, the idea is to have that the same material should give the same result. Okay. Otherwise if we do not follow, if we actually deviate little bit, then we will have totally we will land up with different results. And then we cannot compare. And that is why for any test the requirement is that we must write this is as per this test. Okay? Now we will see different

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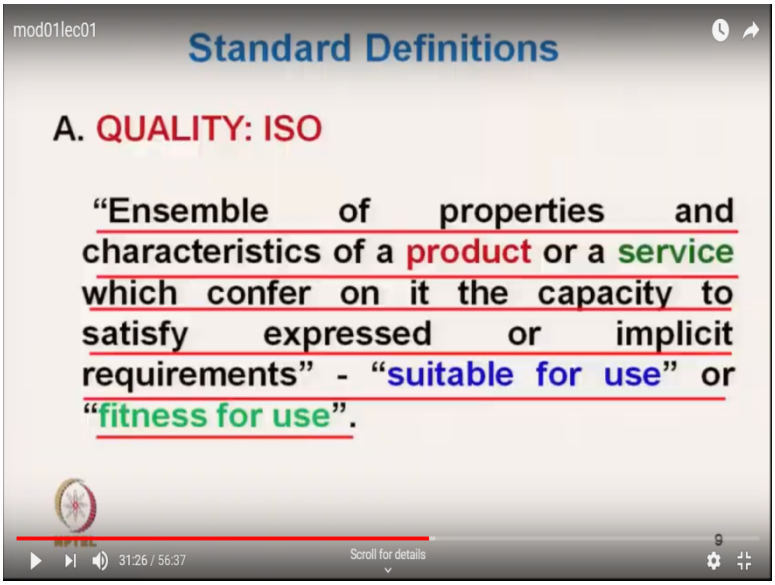

Standard terms related to testing. We must know these terms for actually after testing, we actually we should correlate with these terms. So before we start testing we must know the terms. First term is the quality. If you ask that what is quality. So normally, at the back of the mind we know that quality means it should be best in behaviour, best in characteristics. Actually that is not the quality.

Quality as per ISO it is stated that, Ensemble of properties and characteristics of a product or a service quality of product can be also a quality of a service, which confer on it the capacity to satisfy the expressed or implicit requirements. That means the expressed requirements; means I need one yarn see am giving example of yarn of strength say 10 gram per Tex. This is the strength required. Now if I am producing, yarn, my requirement is ten.

Or customer they are paying for 10 gram per Tex. Suppose I am producing a yarn of 20 grams per tex double that; so should I be happy? It is not that. It is actually I am not actually producing the quality. Quality does not mean that you have to produce the best one. It is a requirement. So our requirement is that expressed requirement is that it is the 10 gram per Tex. If I am producing say 9 gram per tex I am not producing the quality.

But if I am producing just 10 or just little bit above 10 then I am producing the quality because I am meeting the expressed or implicit requirement that is the requirement. So that characteristics of the product that is the requirement. Okay? And the capacity to satisfy the requirement that means if I am producing 10 that means it is satisfying the requirements. If I am producing the strength as of 20 it is also satisfying the quality.

But quality at certain cost, extra cost, my bag is not going to give extra money for extra strength. Okay? That 20 grams per Tex is actually it is for those customers who needs that. So that is called suitable for use or fitness for use. That is the point. So, in one word if you trying to say the quality it is suitable for use it is not more than that or less than that.

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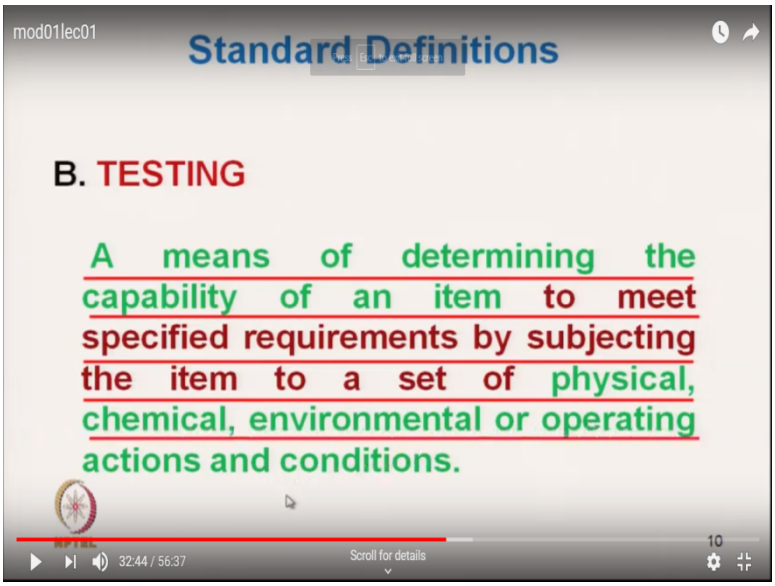

Next is that testing we are going to discuss all about testing of textile material, evaluation of textile material. But we must know what is testing? What is the term testing called? So it is a means of determining the capability of an item to meet the specified requirement, just try to understand that the capability of an item to meet the specified requirement. So to determine, so I want to determine, whether this yarn will be able to achieve 10 gram per tex strength. Okay? That is our requirement.

So I want to determine the capability of this yarn. So, how to determine the capability the yarn? That determination is known as Testing. So, how to determine? By a set of physical, chemical, environmental or operating actions and conditions; means if I want to know the capability this yarn whether it is a 10 gram per Tex or not, I have to give the, some physical action on this; I have to pull the yarn. Okay?

Have to extend the yarn. I have to apply force to the yarn. These are the physical characteristics. What is chemical? Suppose I want to know the blend percent. For blend percent I want to calculate the blend percent by dissolving. So for that chemical activity is required. Sometimes we need to know the environmental activity. Suppose I want to test the change in colour, with the sun light fastness particular environmental condition I have to expose the material.

So if we see the operating action; so you want to change the speed or any other things. So testing is that basically to determine the capability of the material. Why that material is actually satisfying the required characteristics? By subjecting certain physical, chemical or environmental condition so that is the overall testing. Okay? Next term is that Inspection.

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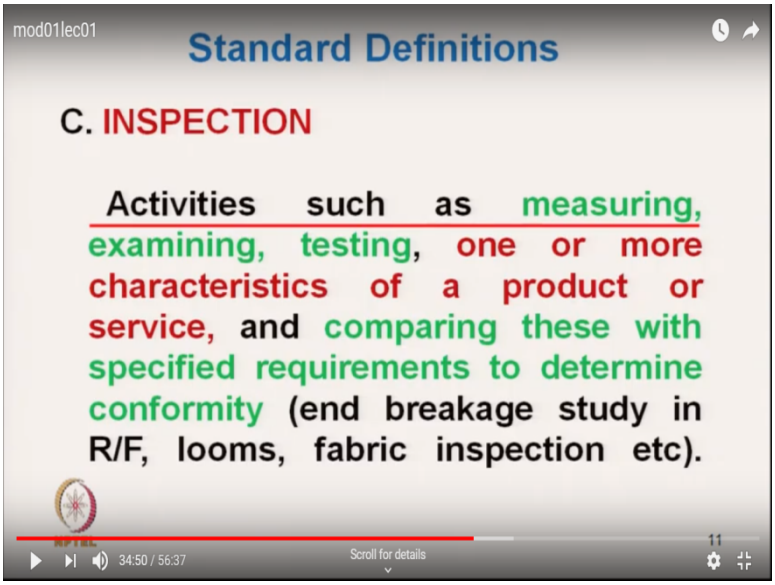

Testing is that it is a very, very specific. I am testing the yarn for strength. But inspection is overall. It is an area; It is volume is much bigger. Okay? It is a gambit a much bigger; like it is a activity such as measuring, examining, testing; testing is one of that. Okay. But I am

trying to examining, so 10 different lot. Okay. I am inspecting. So Inspection is I am testing the okay, I am telling the okay. You would get the strength of this yarn okay.

Now, after that the why; that this bobbin shape is okay or not? Why that there is damage is there or not? Okay? So all these things are taken together, it is called Inspection and I am trying to compare whether this yarn is better than this yarn. So comparison; so testing is one small aspect but inspection is overall so, the activities measuring, examining, testing one or more characteristics of a product, at a time.

Suppose I want to know the overall characteristics. I want to inspect. Okay this yarn is okay it is strong. This yarn is okay, there are very, very it is a dirty. It is not clean. There are foreign matters. So this, all this overall, one or more characteristics we try to evaluate in one go through inspection. Okay? And comparing this with the specified requirement to determine the, the conformity whether this yarn confirms the total requirement, the inspection will tell us.

Even in breakage study in the ring frame. It is not testing. So it is not necessary all the component has to be there. Even say examining, I am examining that whether I am counting the number of in breakages. Okay, per hour in a particular ring frame. And I am comparing with the other ring frame or I am comparing with the standard. So it is called inspection. Like we, have seen, we know that the buying house come to the industry; garment industry, they inspect.

They try to test; they try to take the sample randomly. They open the packet and try to see whether and measure the dimension. It is inspection. Okay, so fabric inspection. So there are different types of inspection. The advantage of inspection is that it is a quicker. It is a easy quicker method to know overall characteristics.

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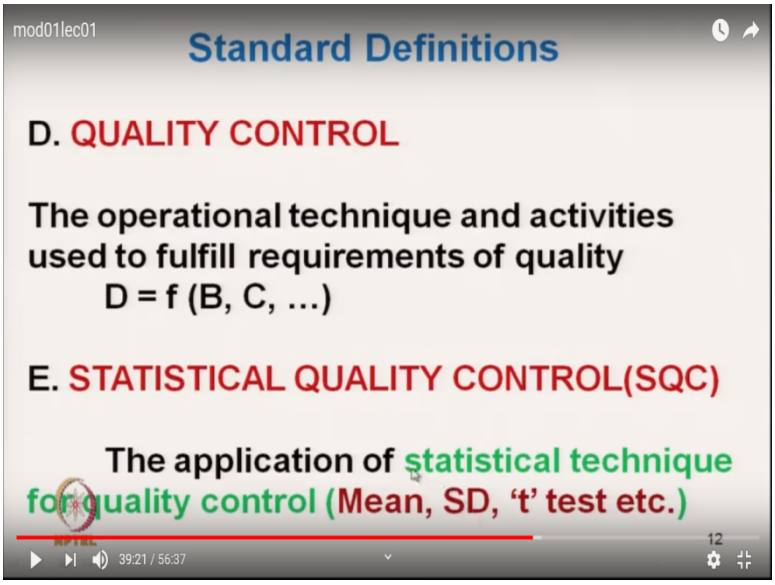

Next is the term Quality Control. That is the very commonly used term Quality Control. It is actually function of inspection; It is a function inspection testing everything. Okay? The operational technique and activities used to fulfil the requirement of quality. So we have the required quality. We know this is the quality we have to achieve. Like let me give, take the earlier example, our quality is that 10 gram per Tex. This is the quality achieved. So to achieve this quality, to fulfil this requirement, we have to test the material, we have to inspect the material it at every stages. And that is called Quality Control.

We must know to have this yarn we have, we need this much waste percentage, this much stress percentage this is the lea; so all this things, this is the function of say inspection, testing or different aspects to achieve a required quality. Okay? Next term is called it is that Statistical Quality Control. One is Quality Control and Statistical Quality Control, only difference is that when we use Statistics in quality control it is called Statistical Quality Control.

Like to use the application of statistical technique for quality control, like we have to know mean, measure mean, so that is Statistical Quality Control. We are achieving this. We want to know variability of the material. How much variation is there? Standard deviation, coefficient of variation; we want to know whether this difference is significant or not. So we do significance test. t test, F test. So this all these things are under statistical quality control.

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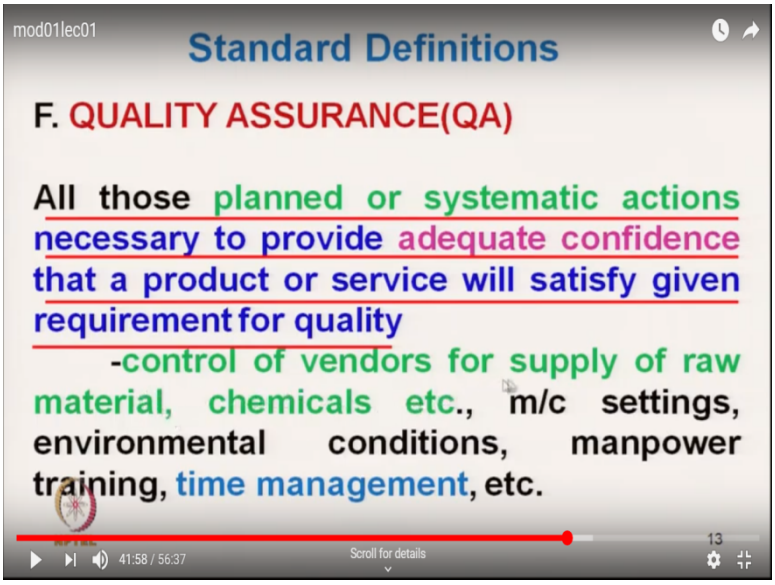

And next is that Quality Assurance. So Quality Control we know. Then that Quality Assurance; Quality Assurance is something broader. It is not, it does not talk about the material only. It talks about the total, it, takes care of human resource, takes care of time management. Okay? So motion study, time study everything. It is material characteristics is one of them. It is a total system. And just to assure the quality. Okay.

So, all those planned or systematic actions necessary to provide adequate confidence so the industry should have sufficient confidence that whatever I am producing, whatever we are producing. It is it will give us, lead us to a particular quality. That much confidence has to ever. So how do we get that confidence and that a product or service will satisfy the given requirement for quality. So, again I am taking the same example.

This is our requirement 10 gram per Tex. Okay. And Quality Control we have achieved. Okay. This is by testing we have achieved. But how do ensure how do the management know? That okay, my industry, this industry, particular industry will always produce that type of quality. That is the adequate confidence has to be there. For that we need to have systematic plan. So how do we have systematic plan.

So this planned activity if we do, then we will be able to achieve the quality. So these are the systematic achievement. Few examples are there. Like control of vendors for supply of raw materials. This is particular quality I want to achieve. And I cannot go to market and take randomly from different vendor because I do not have that much confidence. Based on our

previous experience, we have identified few vendors, two, three vendors, okay, who have already supplied consistent quality, consistent quality of raw material, okay?

That vendor identification is very important. So first thing is we have to control the vendor who supplies the raw materials, chemicals and all these things. And if we know that this particular vendor will give me a consistent quality of raw material, consistent quality of chemical then we are sure that okay I am getting raw material for a particular yarn or particular end product. Next is that proper setting of the machine.

For that proper setting, proper maintenance it will has to be there. So this, it is actually for ISO 9000 or different types of Quality Assurance. There it is a written that it is the machine setting for this particular yarn, this particular fibre. This is the roller pressure has to be there. It has written and that the lab, that supervisor, that floor level supervising, they have to follow these things.

They do not have to do any other thing, only has to they have to follow these particular setting, okay. We have to follow particular environmental condition. So it is specified for say spinning shed, we need to for a cotton, we need particular environment, particular relativity. For cotton we need different relativity, for polyester it is a different relativity. Otherwise the machine running will be getting affected. Next is the Man power training? Continuous Man power training has to be there. Human resource development has to be there. Otherwise they will not be able to produce the required quality of the product. That confidence has to will not be there. Okay and proper time management.

So, Time Management is very important. Suppose my buyer, he wants the material after one month particular time okay? And if I am not able to supply that material within that specified time, that means, the non conformity will be there and that, I am not actually supplying the quality product. Quality here quality assurance does not mean the quality of material. Quality of service will also be there. Okay?

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Next is the Quality Management. Quality Management is that you understand your quality okay you planned your quality. Then you have to manage that quality, you have to maintain that quality. And after that you have to go for the improvement of the quality. You cannot stick to that quality. Today you are producing quality grade D. Tomorrow you have to produce grade C. Then grade B. Continuous improvement has to be there.

That is, so Quality Management does not aim to assure best quality always. So if I am producing D grade yarn, I will tell this industry produces D grade yarn. Because for D grade yarn D grade quality you will have different product, different bars will be there for that, it is not always target for the best quality by the more general definition, but rather to ensure that an organization or product is consistent.

If I am producing B grade yarn, B grade quality it is consistent. So the, I am known for that. And I will have that type of bias. Okay. So it has got four components as I have mentioned. First is, you have to plan your quality then Quality control, quality assurance and last is that quality improvement. So today I am producing B grade quality. So tomorrow I will have target, I will target to have achieve the A grade target.

But till then till that time I have to be satisfied with that. I will tell this is my quality. I am not targeting the best quality because for different quality you have different buyers. Okay? Different users are there.

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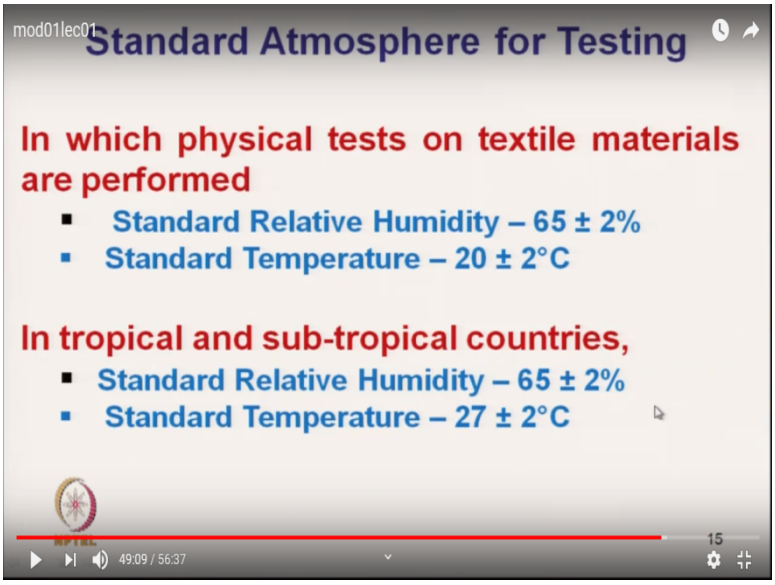

Now we are mentioned that for standard testing, for to get the standard test results, we need to have standard testing atmosphere. So standard atmosphere is that in which the physical tests of textile materials is performed so as textile materials are, most of the materials as I have mentioned that hygroscopic in nature, and they are directly affected by the humidity and temperature of environment.

So we must know and we must maintain the relative humidity and the temperature. So in cold country, the standard, there are 2 different standards we follow. In cold country, the standard is the relative humidity 65 +- 2 % and standard temperature is 20 +-2 degrees Celsius. This is the cold country. And in tropical country or sub-tropical country it is a relative humidity is same but temperature is 27 +- 2 degree Celsius.

So, that you do not have to go for too much air condition. Okay. So that is the reason. And we must actually mention in any test result we must mention that this is that state under this condition. Okay? Because if we test a cotton say under say 100% relative humidity and we are telling okay this yarn is giving very good results. Then we are misleading so we because the particular yarn and you have shipped the material.

You have actually, sold the material. Okay. But when your customer will test in under standard condition, then you will land up with lower value. So we have to follow standard test method. And we must mention that this is the standard.

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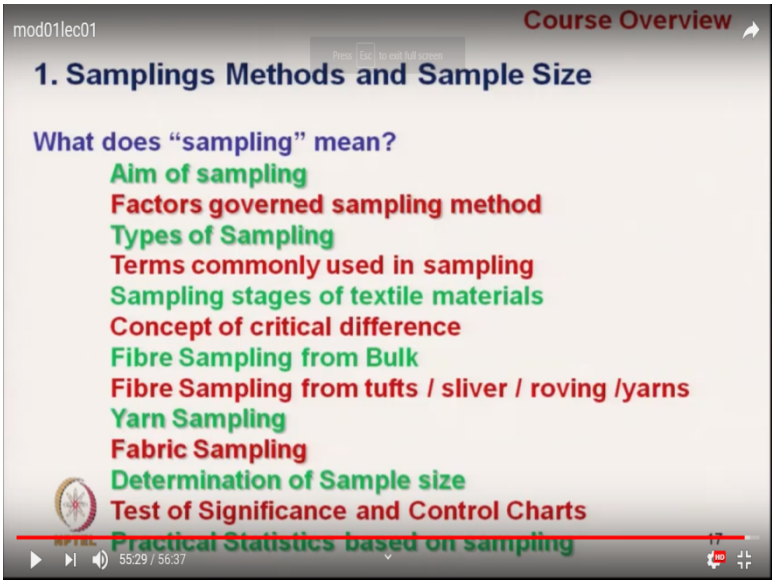

Now we will keep the overview of the course. The course overview that is what we are going to discuss in the total entire course. Okay. First we will start with the sampling. So sampling methods and sample size, we will start with the different sampling method and different sample size to achieve certain confidence level. Okay? So in that, we will discuss the meaning of sampling. What is sampling.

So all these things we will discuss here. Next is that we will discuss the aim of sampling. Why do need to sample the material. Why do not you test the total material? So sampling, aim of sampling we will discuss there. After that the different factors which governed the sampling method so, we do not follow the same sampling method for say the fibre or if you want to sample the fabric that we have to follow the different sampling method.

So, there are various factors which governed the sampling method. This we will discuss in his part. Then there are different types of sampling; statistical sampling, non- statistical sampling within statistical sampling, there are four different types of sampling. So all these techniques we will discuss methods we will discuss with example. Here I will keep all, the example related to textile materials okay. And different terms commonly used for sampling. So bulk sample, consignment, lab sample. So these terms we will discuss. Methods we will discuss with example.

Here I will keep all, the example related to textile materials okay. And different terms commonly used for sampling. So bulk sample, consignment, lab sample so these terms we will discuss and the meaning of these terms. So we must know these terms. And sampling

stages of textile materials at whose, stage, different stages we sample so different stage like fibre, at the stage of fibre, at the stage of bale.

So fibre testing also we can do at different stages. From bale we have, we can sample. From sliver we can sample. Even from see carding machine we can sample. So but their techniques will be different. So this we will discuss, different sampling techniques, then one concept is there critical difference is there. Concept of critical difference we will discuss here.

Then fibre sampling from bulk so we have, we can, as we have mentioned that different type of sampling. So from bulk, say from bale, we can sample. So, how to sample the fibres from the bulk or from bale this sampling techniques we will discuss. Then fibre sampling from tuft or sliver or roving, like this is sliver. If I want to sample from the sliver, it will be totally different character then if we want to select from the loose.

Because in sliver, fibres are aligned and if we try to sample from the surface, from this point or from the end, the ultimate result will be totally different. This I will discuss here in detail okay. Then we will discuss the yarn sampling. Yarn sampling from fabric, Yarn sampling from bobbing; how to sample the yarn? Even then from the cone, how to sample? So, we will discuss. Then we will discuss the sampling of fabric. So fabric sampling will also discuss.

So all these sampling techniques we will discuss here. And fabric sampling is we will see entirely different from, from the yarn sampling, or fibre sampling. Then we will discuss the how to determine the sample size. Say for yarn we want to test the strength. Okay. So how many yarn sample do I take, 10, 20, 100, so there are statistical techniques to know the sample size.

So we will discuss in detail the number of sample. Number of what is the sample size? This we will discuss here with the numericals. And then we will discuss the test of significance. Suppose or we are sampling and the whether the sample is actually different from the population, that significance test will be there. Suppose we have to change the certain parameter.

By sampling technique we should be able to tell with certain confidence that this difference is significant or this difference is not significant. That testing we will do. We will do different

numerical samples. And also a control charts which is very important for day to day mill practice okay, where we have to take actual action or not okay.

And then we will discuss detail about the Practical Statistical based sampling. Okay. Practical Statistics we have to see based on the sampling. So we will give various example and various numerical we will do, based on the sampling, okay. And we will come to know, we will see that T-test, F-Test, sampling of variation of, significance in mean, variation of significance in dispersion or we have, we can test the various parameters we will, for statistical techniques we will discuss here. Next we will continue this things the course overview in next class. Till then, Thank You.