

Course on Ancient Indian Technology
By Professor D.P. Mishra
Department of Aerospace Engineering
Indian Institute of Technology, Kanpur
Lecture 17
Module 4
Textile Technology in Ancient India

Let us start this lecture with a thought process “Handloom textile, a signature of Indian Civilization is the bread earner for millions of people in India”.

(Refer Slide Time: 0:17)



Today, we will be basically discussing about the textile technology particularly related to handloom in Ancient India. And if you look at in the last lecture we discussed about the agriculture, I mean for a spanning over the several lectures and the food is one of the basic need. Apart from that, the cloth is another basic need along with the shelter. So today we will be discussing about how to make cloth and how our ancestors were doing that.

If you look at the our ancestors were familiar with different types of plant fibres, what generally people call it bast fibre, and this plant fibres are made from the root, grasses and inner bark of the trees. And fortunately in India, we were having 500 indigenous varieties of cotton but unfortunately at this we are growing only 20 varieties and the rest of the things had gone with the wind. And because of India is endowed with very good climate and good soil therefore several bio-diversities we are having very several kinds of cottons.

(Refer Slide Time: 2:04)

Why to Study Ancient Indian Textile Technology?

- Cloth is one of the basic needs apart from food and shelter.
- The early communities were familiar with different types of plant fibers (bast fiber) made from roots, grasses or the inner bark of trees.
- Over 500 indigenous varieties of cotton were grown in India in the past. Today, we grow less than 20 varieties
- Cotton was the single largest natural fibre used in clothing.
- Today India occupies the second position in cotton production in the world.
- They were also using the long hair of wild animals such as wild sheep and goat, to twist into rope, for weaving and netting.
- At present apart from providing one of the basic necessities of life, the textile industry plays an essential role through its contribution to industrial output, employment generation and export earnings.

So that is why we need to you know look at the cotton textile kind of things and fabricate it so that we can. And cotton was the single largest natural fibre used in clothing. Of course nowadays lot of other things have come in particularly artificial fibres like a polyesters, nylons and other things even today the India occupy the second position in cotton production in the world, entire world and there are also using the long hair of wild animals such as wild sheep, goat and also camels to twist into rope for weaving and nettings. And at present apart from providing one of the basic necessities of human life it is the plays an essential role to the cultivation of industrial output and also the textile industry generates a lot of employment and we do earn you know lot of money from by exporting it.

So therefore it is very important to look at our textile technology in Ancient India. And as I told earlier textile is the largest industry in the world which uses fibre as a raw material and particularly in this country it is the largest provider of employment after agriculture. And agriculture and the cotton textile making and others also silk or jute or any other fibres like wool woollen stuff are really going well with the agriculture. So that is important.

(Refer Slide Time: 4:03)

- Textile is the largest industry in the world which uses fiber as raw material and it is the largest provider of employment after agriculture in India.
- The Indian textile industry consumes a diverse range of fibers and yarn, and were predominantly cotton based. Annual consumption of cotton fiber in India is more than 400 lakh bales (1 bale = 180 kg) in the year 2014-2015 [1].
- Indian textile industries at present contributes about 14% to the industrial production, 4% to country's gross domestic and 13% to the country's export earnings 2014-2015 [1].
- With introduction of modern technology, the textile production considerably increased but those are having lack of flexibility in design with compare to handloom and incapable of producing decorative and artistic value.
- The modern textile technology are also using hazardous chemicals like benzene, aniline, dioxin, formaldehyde, etc to get attractive colour fastness (fixing of colour to the fabric), which pollutes the atmosphere and water bodies and having antagonistic health effect on human bodies.

And beside this the Indian textile industry consumes a large range of fibres and yarn where of course pre-dominantly cotton based, earlier days as I told earlier, but not today. And annual consumption of cotton fibre in India is more than 400 lakh bales, 1 bale is around 180 kg in a year according to 2014 and 2015 data.

And Indian textile industries particularly in 2014 and 2015 contributes around 14percent to the industrial production and 4percent to countries Gross Domestic Product and 13percent to countries export earnings, so it is a bit amount of revenues what you know we get so also garment.

Of course with the introduction of modern technology the textile production has increased considerably, but the flexibility in design and also the decorative art work you know is cannot be implemented in this mechanize textile machines. So therefore the creativity is being lost among the people, masses of the people. Therefore, we need to go back to the handloom textile.

The modern textile also using hazardous chemicals like Benzene, aniline, dioxin, formaldehyde, etcetera to attract the customers by having good colours and which not only dangers, endangers the health of the people who are wearing but also pollutes atmosphere and water and you know it is really not good for to continue, and I will be discussing about little bit more of this points because lot of you people may not be aware and as I was not aware

about that. And maybe some of you will be knowing but still for common people may not be knowing.

(Refer Slide Time: 6:38)

1.	Number of handlooms	23.77 lakh 20.66 lakh looms- rural areas 3.11 lakh looms- urban areas
2.	Number of handlooms in NER	15.5 lakh (65% of total looms)
3.	Number of persons engaged in weaving and allied activities	43.31 lakh 36.33 lakh workers- rural areas 6.98 lakh workers- urban areas
4.	Number of adult weavers and allied workers	38.47 lakh
5.	Man days worked per weaver per annum	234 days

Source: <http://www.handlooms.nic.in>

So let us look at certain data on handloom cloth particularly how it could generate you know employments. According to the 3rd handloom census in 2009 and 2010 which is something around 6 to 7 years old data but still it is interesting. The number of handlooms in our country is 23.77 lakhs out of which majority of them are in rural areas around 20.66 lakh looms. And of course 3.11 lakh looms in urban areas with the poor people you know whom get employment out of it. And interestingly number of handlooms in North-eastern regions like of the our country around something you know 15.5 lakhs and those areas you can say hub of handlooms around 65 percent of total looms handlooms are in that part. And of course if you look at independence or before independence we are having several handlooms, but those are being converted into now what you call power-looms.

Interestingly I will tell you I had gone recently to see some handloom myself, but when I reach that place that not a single handloom was there which was prevailing may be 5 years back and all are converted into hand, power looms. And number of person engaged in weaving and allied activities is around 43.31 lakh people, of course this number are receding maybe today it will be little lower number because most of them are either switching their job or most of them are converting into power-looms.

And number of adult weaver and allied workers is something 38.47 lakh and these people they get a very good or man days rather per year which is 234 days out of 365 days they could be employed 234 days it is a great number and they are self-employed, they are not depending on the people for getting salary. And they also do from their hard the work unlike the workers and then they get benefit out of it and get a very good life.

(Refer Slide Time: 9:12)

Why to Use Ancient Indian Textile Technology?

- Ancient techniques use natural dyes whereas modern techniques use artificial dyes which are not good for health and environment.
- Common chemicals that are present in the artificial dyes are **aniline, formaldehyde, dioxin** etc.
- These chemicals are **toxic, explosive and Carcinogenic**.
- Skin absorbs some chemicals directly from cloths which are tight or close enough to skin that can cause serious health issues.
- When toxins are absorbed from clothing, **they are taken into lymphatic system and the bloodstream**. Over time, they end up suffocating an individual's skin and shutting down the toxin release process entirely.

So now I will also be emphasizing little bit further on why to use Ancient Indian textile technology. That is because the ancient textile technologies basically were using natural dyes as compared to the modern days in which people use artificial dyes. And artificial dyes are not good for health and environment.

The common chemicals present in the artificial dyes are, aniline, formaldehyde, dioxin etcetera whatever I had mentioned earlier. These chemicals are not only toxic but explosive and carcinogenic. And it is hazardous for the people who are using and particularly in our country where the poor people are involved in that and not much education with them, and they are prone to this hazardous things. And they may get lot of disease without their knowledge for earning their bread and butter.

Skin absorb a certain amount of chemical directly from the cloths because the surface area is more so therefore also you know it can absorb a chemicals and which are tight of course this cloths particularly nowadays youngsters are using this cloth which are tight or which are close enough to the skin and that can cause serious health issues. In earlier days we are using

loose cloths and nowadays you know for to have a commensurate to the contour of their bodies particularly young people they are using. So they are subjected to more you know harms because of this chemical hazardous chemical being used in textiles, modern textile.

When toxins are absorbed from clothing they are taken directly to the lymphatic system and the blood stream, it is as good as injecting the poison into the blood stream. And over the time they end up in suffocating an individual skin and shutting down the toxin release process entirely. And of course some of people can sustain and some of people can get disease like your skin diseases and other things.

(Refer Slide Time: 11:40)

Chemicals which are present in Modern Cloths

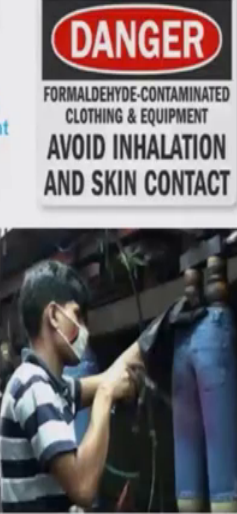
Formaldehyde: It causes lung cancer & skin /lung irritation and contact dermatitis.

The manufacturer's claims are:
Anti-cling, anti-shrink, Waterproof, Perspiration-proof, Moth-proof and mildew resistant, Chlorine resistant

- **Formaldehyde** are used extensively in the clothing and can make "poison clothes" under high temperature and humidity condition.

Disperse Blue Dyes
Although these dyes make cloths to look gorgeous but they may cause dermatitis, eczema ... especially dark blue, brown, and black synthetic clothing. Disperse Blue 1 is classified as a human carcinogen due to high malignant tumour levels in lab animals.

Synthetic undergarments traps body heat, encourages chemical absorption, and creates electrostatic build-up which all affect sperm count leading to **infertility in men.**



And of course formaldehyde causes a lung cancer and skin and lung irritation and contact dermatitis, right? And manufactures always claim that anti-cling, anti-shrink and waterproof, perspiration proof, moth-proof, mild dew resistance and chlorine resistance lot of thing they write on that to lure the people so that they can use and people get also (12:11) by their advertisement. Although we know that this is the formaldehyde contaminated clothing and equipment which is dangerous and one should avoid inhalation & skin contact.

But this may be somewhere they will be putting this kind of sign but however lot of people may not be knowing that formaldehyde used in the in the modern cloths can make poison cloths basically. And under high temperature, humid condition and all of you will be knowing that our country is in tropical region, expect varying few regions most of are having high

temperature and humid conditions. So therefore it is dangerous to have the, you know the modern cloths using formaldehyde and other chemicals.

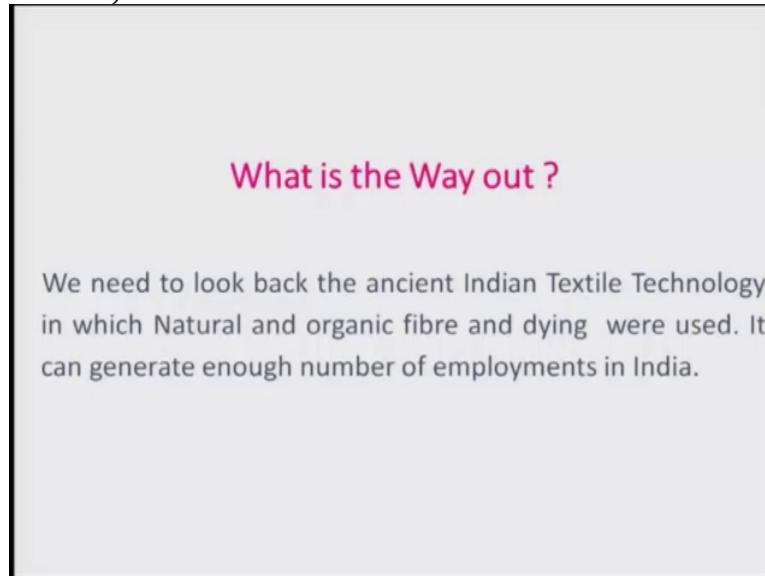
Although these dyes make cloth looks gorgeous, but they may cause dermatitis, eczema and other skin diseases especially the dark blue and brown and black synthetic cloth, clothings. And the disperse blue one is classified as a human carcinogenic due to high malignant tumour levels in lab animals, people have conducted experiment in western countries, particularly what I remember that a dog is subjected to this kind of things and thy found that it is affecting the dog and dog being mammal so also the human being is being mammal will be affected. If you look at a person here in this is basically dyeing this one with of course a mask in the, in the nose and mouth and this is a jean which is you know we people are using or particularly youth like you are using.

And another important things this synthetic undergarments, right? Which a lot of people are using at least I remember my son used to use that for swimming purposes I told why you are using that, synthetic garments. And traps body heat encourages chemical absorptions and create electrostatic build-up which all affect the sperm count leading to the infertility in men. So this is very dangerous one has to look at it.

And let me tell you lot of poor people without any knowledge they are using it. Maybe it is cheaper, that is why. And maybe it is looks to be gorgeous, colourful and one has to also use, I remember that my son when he was small he used to always go for that kind of things which is looking jazzy and then colourful and synthetic things and one has to basically not use that.

So then question arises, what is the way out? I mean these are the problems created by the using these cloths, manufacture by the companies and luring the people by through the battened advertisements and also the masking the information. And it is spoiling the health, not only human health but also the air pollution, water pollution and other things, so what is the way out?

(Refer Slide Time: 15:50)




Way out is that, we need to look back the ancient Indian textile technology in which natural, organic fibres and dyeing were used. And it can generate enough number of employments in India because if we are could get into that handloom mode and that talents, the creativity, satisfaction of doing something, helping the people will remain and mind and body will be remain working in balance, I will talk about little later on.

And as a result that we can utilize the cottons what we get, varieties of cottons we do get. We should not get suede by these Bt cotton which is a genetically modified cotton nowadays coming up. And we will have to use indigenous cottons and then it will be helpful for us, indigenous, right?

(Refer Slide Time: 16:43)

Literary Evidences of Textile Technology in Ancient India

- Nettle cloth has been mentioned in Ramayan.
- References to linen occur in Maitraayansanhitaa (4000 BC, 3.6.7), and in the Taittiriyanhita (1600 BC, 6.1.1-3).
- Hemp (Cannabis sativa), one of the strongest and most durable of all natural textile fibers, has been mentioned in Satapatha Brahmana (4000-1000 BC) as *sana*.
- The Arthasastra, a handbook of administration tentatively dating to the **third century BC** [2], dealt with methods for distributing materials to spinners and weavers.
- The **Arthasastra** also mentioned about the textiles such as white bark cloth from odisha, linen from Banaras, cottons from south India, and several kinds of blankets.



And let us now look at the textile technologies in Ancient India pertaining to the literary evidences. So if you go back to the Ramayan you can find the nettle cloth has been mentioned in Ramayan at times and the references to linen, a one kind of fibre and one can make a cloth occur in Maitraayansanhitaa and 4000 B.C. And in Taittiriyanhita in 1600 B.C. kind of things. So that means our ancestors were aware about how to use this fibre for cloth and Hemp is one kind of again fibre. Its botanical name is Cannabis sativa, one of the strongest and most durable all natural textiles has been mentioned in Satapatha Brahman in Veda, around people claim to be something 4000 to 1000 B.C. as sana, it is known as sana.

So Arthasastra handbook of administration as tentatively dating to the 3rd century B.C. dealt with methods of distributing material for to the spinners and weavers, that means this cotton, jute, linen and other things has to be distributed through the government machinery at that time and as being done today. So if you look at that system was there earlier days to cloth, Arthasastra also mention about textile such as white bark cloth from Orissa, linen from Banaras, cotton from South India and several kinds of blankets.

You might be knowing a story about blankets which was around the Chankaya, right? I will not get into that because of paucity of time and if you look at this is the thing I want to show you that this is the nettle ant which is very fine. And this is the linen cloth which is having a very good you know strength and then it is being used nowadays, nowadays people are very much you know gaga about this cloth is coming up again. So also the nettle nettle yarn. And

this is about the hemp fibre bags, which is lot of eco-friendly people are promoting nowadays, not only in this country, other countries also.

And I will tell you that lot of concern among the people at this moment for the using unnatural fibres and also the textiles and mix textile is also is bad because you cannot really recycle it. And you cannot destroy it also, because if you put that to destroy on the maybe soil or something that again it will affect the soil. Whereas, the cotton if it is made out of natural way or handloom it can you know be it can be destroyed very easily.

So that is the problem what we need to look at that is why we need to go back to the ancient way of using it, particular textile technology and learn something from that and carry forward.

(Refer Slide Time: 20:21)

Evidences of Textile Technology in Ancient India

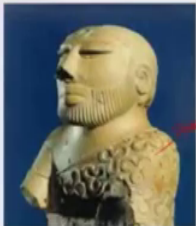
The record of ancient and medieval Indian textiles exists mostly in literature and sculpture.

- There is archaeological evidence of a cotton textile industry at **Mohenjo-Daro** in the Indus Valley around **3500 BCE**, and a few fragments survive from much later periods.
- The Greeks with Alexander saw and wrote about the fine flowered muslins and robes embroidered in gold in India.

Few good commentaries also observed from the early medieval period (**900-1200 AD**). Fabric names apparently represented the places where they were woven, and details about weaving techniques were scanty.

Marco Polo, a traveler, in **1294 AD**, mentioned in detail about the production of buckrams (the finest and most beautiful cloth in all the world like the tissues of spider webs) in Coromandel Coast, **dyeing with indigo** in the great textile center of **Cambay** and **spinning of cotton** in Gujarat.

During the Muslim period in India (**1200-1760 AD**) also, the textile arts flourished until the late seventeenth century.



So the record of Ancient and Medieval India textile exist mostly literature and sculptures, right? If you look at there is a archaeological evidence of a cotton textile industry at Mohenjo-Daro in the Indus Valley civilization around 3500 BC. Of course few fragments survive from much later periods but you know to get evidence about the textile is very difficult this thing but however people are trying to look at this image what they got. And this portion if you look at, this portion is basically of made of textile kind of thing. So therefore they are thinking that you know this Mohenjo-Daro people were having knowledge of textiles.

And when alexander invaded this country and he saw and wrote about the fine flower muslins, you know one kind of very fine cloths, right? And ropes embroidered in gold in India, you know if you look at today also people are having very fine gold being embroidered in the cloth particular in Banaras regions and which are those cloths are you know the sarees and the other things are quite costly, but still that work is going on at this moment but maybe it may not really sustain further.

And few good commentaries also observe from early medieval periods 900-1200 AD. And the fabric name, names apparently represent the places they belong, because India was a country as I told, it is not a country, it is a basically sub-continent. The several various cultures each people having their own way of netting, that is the beauty of the what India was having.

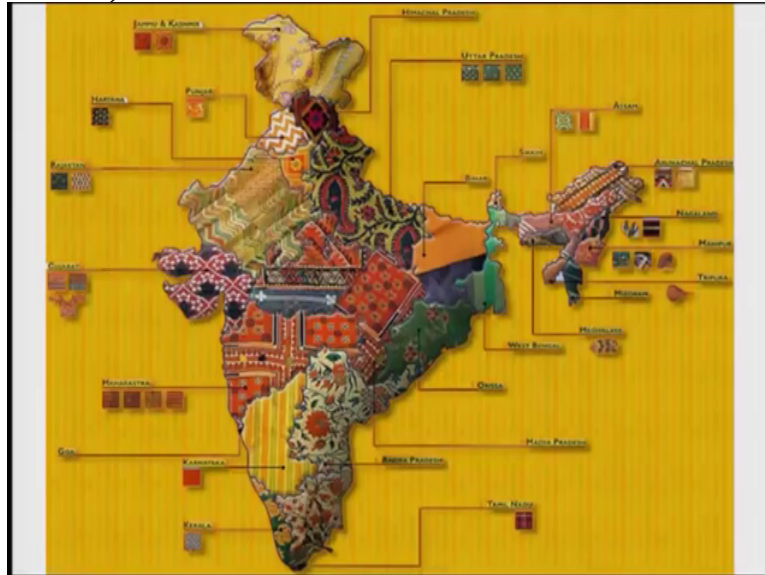
Not like the mill cloth where all the design will be similar or people are having their own speciality and they that is why in various regions this cloth was woven and details about weaving techniques were scanty kind of things because unfortunately those things are not recorded, because the methodologies are not recorded properly. The it the knowledge of the making these fabrics and then designs, motifs in that cloth are basically transfer from one generation to another. Due to sudden introduction of this textiles, mill textile, of course it started with the Britishers, and nowadays it is being very blatantly used and those things are not recorded properly.

And if you look at another traveller like Marco Polo, who came around 1294 AD and mentioned about the production of buckrams, the finest and most beautiful cloth in the world like the tissues of the spider webs in Coromandel Coast that is in Deccan areas of the Tamil Nadu. Dyeing with indigo in the great textile centre of Cambay and spinning of cotton in Gujarat, of course I will tell you I am not going to talk about the history I have taken few of the points because the history is quite exhaustive in nature and I will not get into that.

But I will just want to impress on you people that we are having evidence that ours were the very good in textile technology. During Muslim period in India 1200 to 1760 kind of thing, textile arts flourished until late 17th century but unfortunately what happened like in the Britishers came and then they basically introduced the mill textile technologies into this country and then they did not allow the weavers to you know make the textiles and there was

a lot of rift among the local people and the the British government at that time who was ruling in this country forcefully. And that is why lot of things you know people got dissuaded not to have textile.

(Refer Slide Time: 25:19)



If you look at like this I have shown you just to a various kinds of textiles what I was mentioning to you just look at each region let us say Kashmir, this is the Jammu Kashmir region is having a different kind of fabric. Whereas the Punjab will be having, each state is having their own varieties, specialities and let me just tell you that this look very beautiful. And if you go to each state, each zila or the district will be having their own speciality of the design and also the fabrics.

So if you look at count all those things, it will be enormous. So that kind of display or the manifestation of creativity among the people. And if we will go for the the handloom and we can retain the creativity of the people, which is the natural nature of human being. And flourish it further and they can lead a very peaceful life. So therefore, it is important to look at this thing and I will stop over here that what is the beauty and then aesthetic sense of our people were having earlier days that can be reflected in the textile textures made by our weavers even today and unfortunately this is at stake and in a very bad shape at this moment due to the various reasons which I am not going to discuss, but I will urge all of you to take necessary steps as an individual, as a group to keep our you know technology intact and also record it how it is being done, that is important. Thank you very much.