

Natural Dyes
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Lecture No. # 19

Having learnt about the basics of dyeing, about the typical dyeing procedures of cotton, silk, about vat dyes and vat dyeing; let us now take a look at the different types of dyeing machines that are used in the industry. Because we know that in a laboratory, we can do dyeing in a beaker, in a round bottom flask, and somehow small pieces can be dyed in any kind of conical flask or beakers or round bottom flask. But when it comes to dyeing, larger volumes of fabric, it needs a very organized dyeing machine. And the **privet** visit for every machine is that, it should have a fairly good contact time with the fabric. The solution of the dye must get dipped into the fabric, and that must take place in a rotation. That is what is that you know, the fabric should not be in contact with the solution for too long a time at a particular position.

Otherwise those positions will take up more dye than the other part of the fabric and that will cause patchiness. So, therefore the design of the dyeing machine becomes a very important factor, because these machines are designed for the facility or **fac** for facilitating the dyeing process. So, now let us take a look at the different types of dyeing machines that are being used in the dyeing industry.

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- Dyeing machines are fabricated to cover all kinds of dyeing machines to be used in dye houses, textile college & universities.
- These are fully capable of providing efficient dyeing.
- Given in the next slide is the exhaustive range of dyeing machines:

Dyeing machines are fabricated to cover all kinds of dyeing machines to be used in dye houses, textile, college and universities. So, it is not just meant for **the** in the industry, but even for you know, small colleges aware at this dyeing processing is taught. These are fully capable of providing efficient dyeing. Given in the next slide is the exhaustive range of dyeing machines.

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- ### Different dyeing machines used
1. [Beaker Dyeing Machine](#)
 2. [Textile Dyeing Machines](#)
 3. [Multi Nozzle Soft Flow Economical Dyeing Machine](#)
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 8. [Industrial Basket](#)
 9. [Maxi Type Jumbo Jigger Machine](#)
 10. Winch Machine
 11. Hank Dyeing machine
 12. Arm Dyeing machine

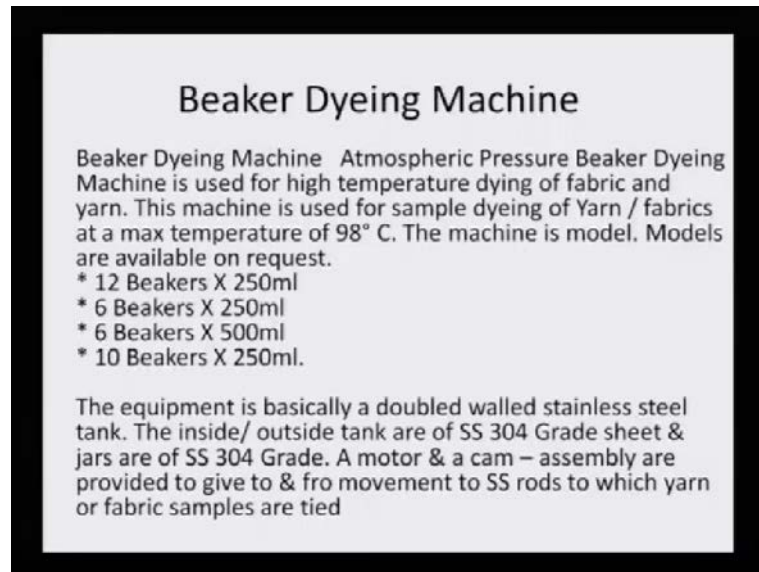
Now, let us take a look at the different dyeing machines that are being used in today's dye industry. Beaker dyeing machines are beaker dyeing in the laboratory, textile dyeing

machines, multi nozzles soft flow economical dyeing machines, H. T. H. P. “U” type fabric dyeing machines or scouring machines, IR beaker dyeing machine, HTHP beaker dyeing machine, U type fabric dyeing machine, industrial basket type dyeing machine, maxi type jumbo jigger machine, winch machine, hank dyeing machine, arm dyeing machine and the list is exhaustive. But I had earlier meant two machines very exclusively that is the jigger machine and the winch machine.

Jigger machine is a very age old technology or the machine that was primarily used for conventional dyeing from a very old time. And winch machine is meant for very soft kind of fabric. So, as we go along we will learn a little detail about these different dyeing machines; so that you get an overview of these different types of dyeing machine. But primarily you should know that these twelve types of dyeing machines are the more common ones. There are many other uncommon ones and specialized dyeing machines as well.

But we will not go into those details of those very, you know exquisite machines, but at least these twelve machines that is the beaker dyeing machine, textile dyeing machine, multi nozzles soft flow economical dyeing machine, H. T. H. P. “U” type of fabric dyeing machine which also does scouring, IR beaker dyeing machine, HTHP beaker dyeing machine, U type fabric dyeing machine, industrial basket machine, maxi type jumbo jigger machine, winch machine, hank dyeing machine and arm dyeing machine. We will take a look at these also as we go along and learn a bit about what is so special and which machine is meant for which fabric. Because this information will help you to understand that not all machines are fitted for all purposes and all fabrics. Some are meant for only yarn dyeing, some are meant for small fabric dyeing and some are meant for very large volumes of continuous fabric. So, these a little, little no answers you will learn as we go along.

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Beaker dyeing machine: Beaker dyeing machine actually is also an atmospheric pressure beaker dyeing machine is used for high temperature dyeing of fabric and yarn. So, it is meant for yarn as well as fabric. This machine is used for sample dyeing of yarn, fabrics at a maximum temperature of 98 degrees almost close to boiling temperature. The machine has several models and beakers are available, it may have 12 beakers of 250 ml capacity or 6 beakers of 250 ml capacities, and various models are possible. So, between 6 to 12 beakers, it is possible with different capacities of the beaker that can be fitted on that.

The equipment is basically a doubled walled stainless steel tank. The inside and outside tank are all made out of stainless steel grade 304, sheet and jars are made out of stainless steel 304 grade itself. A motor and a cam assembly are provided to give to and fro movement of the stainless steel rods to which yarn or fabric samples are tied. So, you see that it is all made out of stainless steel. There is no other metal that has been used. Remember that I have when I was talking about dyeing and the conditions of dyeing I had mentioned three things; one was that the water should be soft, the second was that the dye to water ratio to should be at least 1 to 1 is to 15 or 1 is to 20, and the third thing was that it is better to use stainless steel utensils.

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So, here you will see that industrial dyeing machines are all made out of stainless steel and this is how the models look like. So, once you have seen this let us proceed to the next dyeing machine that is the textile dyeing machine.

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Superior functioning dyeing machines of reputed make come under the category of textile dyeing machines. These dyeing machines are extensively used for dyeing woven and knit fabrics of viscose, silk, light weight cotton and wool. So, you see all the light weight material that is viscose, silk and light weight cotton, wool; these are all dyed in

this textile dyeing machine available at industrial competitive rates, the range is offered in tamper proof packaging that ensure full protection against damage. So, these are marketed **in a may in may** in a manner which is actually very lucrative to the buyer. So, they give all kinds of advertisement to show that you know, they have been to supply a machine which is very, very nicely packed and does not have any tampering.

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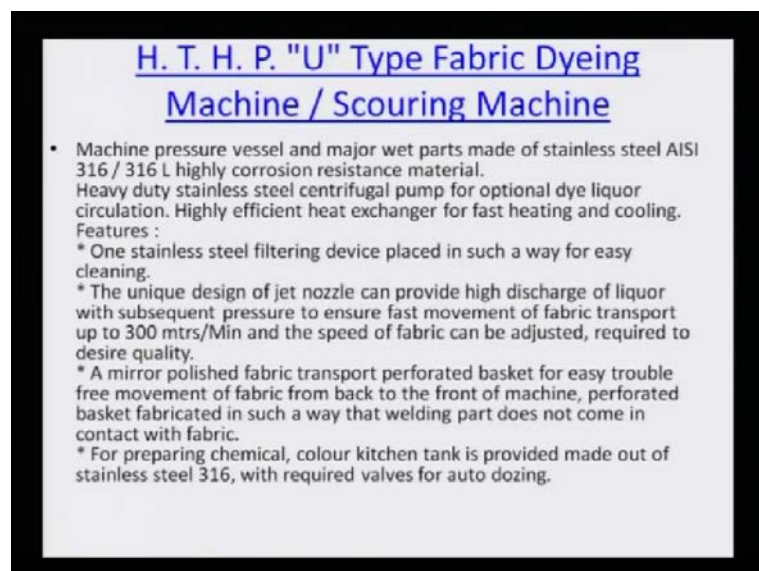
This is how the machine looks like; this is the typical textile dyeing machine which has a cylindrical base and inside that the there are outlets or inlets **which** through which the fabric can are the viscose or silk or light cotton or wool can be introduced, and it is like a drum dyeing kind of a facility.

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The third one is the multi nozzle soft flow economical dyeing machine. Multi nozzle soft flow economical dyeing machine looks like this and it is meant for fabric or pieces. So, here also it is more or less similar in its structure as what I showed you the earlier one. But here what happens is that small pieces can be dyed. It is not meant for big fabric pieces or you know the vats and yards of fabric cannot be dyed in this.

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H. T. H. P. "U" type fabric dyeing machine or scouring machine; machine pressure vessel and major wet parts made out of stainless steel that is this steel quality is 316;

highly corrosion resistance material is used; heavy duty stainless steel centrifugal pump for optional dye liquor circulation; high efficient **high exchange** heat exchanger for fast heating and cooling features. One stainless steel filtering device is also placed in a way for easy cleaning. The unique design of the jet nozzle can provide high discharge of liquor, and subsequent pressure to ensure fast movement of the fabric transport up to 300 meters per minute. So, you see it is a very, very fast fabric dyeing machine, 300 meters are passed in just one minute and the speed of the fabric can be adjusted, required to the desired quality.

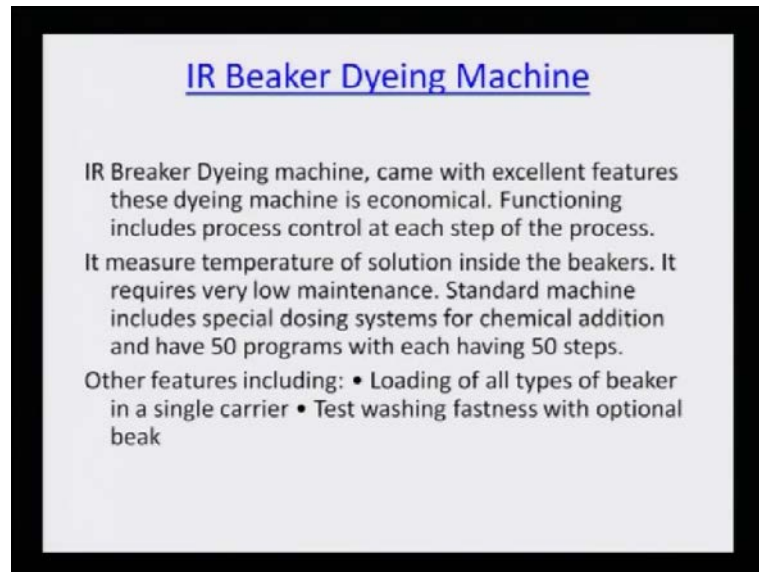
So, this is a very, very specialized kind of machine. A mirror polished fabric transport perforated basket for easy trouble free movement of the fabric from back to front of the machine, perforated baskets fabricated in such a way that welding part does not come in contact with the fabric. For preparing chemical, color kitchen tank is provided made out of stainless steel which requires valves of auto dosing. So, everything is made out of a special non corrosive 316 variety of stainless steel. There are nozzles to bring the dye solution on to the fabric and the fabric is moving at a very fast paid.

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This is how the machine looks like. You know it is a everything is a made out of a very specialized material. And the speed at which the fabric moves is very, very fast. And at move position, the welded position is exposed to the fabric, because at the point of welding there could be some rusting that may occur and may get transfer to the fabric.

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Coming to IR beaker type of dyeing; IR beaker dyeing machine came from excellent features, these dyeing machine is very economical. Functioning includes process control at each step of the process. It measures temperatures of solution inside the beakers. It requires very low maintenance. Standard machine includes special dosing systems for chemical addition and have 50 programs with each having 50 steps. So, this is like a programmed machine. Where you can put on to the chemicals and dosing according to the choice of the recipe of the dyeing. And this is you know, it is the temperature inside the solution is kept low. So, it works under the IR infra red rays which is keeping the temperature low. So, not much heating is required. Other features include, loading of all types of beaker in a single carrier, test wash fastness with optional beaker. So, it is from time to time one can even take out the samples and test the wash fastness. So, that is an advantage of this **beaker type** of IR beaker type of dyeing machine.

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And this is how it looks like it has a stainless steel body. And everything is put inside and there is a micro processor where all these, you know process recipes can be said. And it will work according to that recipe that has been fed into the micro processor.

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HTHP Beaker Dyeing Machine

- HTHP Beaker Dyeing Machine is used for dyeing sample of fabric and yarn at high temperature and high pressure, for all type of synthetic fibres like polyester, viscose, nylon, acrylic and acetate, which is dyed by disperse dye. All these fibres/fabric can easily dye by this Sample Beaker Dyeing Machine. Technical Specification: HTHP Glycerin Bath Beaker Dyeing Machine (Fully SS)
 - * With Digital Temperature Indicator and Controller
 - * Double walled Structure filled with Mineral Glass Wool Insulation
 - * No. of Heater : 3 x 1500 W
 - * Maximum Temperature 1400C
 - * Maximum rate of heating 1.50C
 - * Maximum rate of cooling 1.50C (Water temperature max 250C)
 - * Cooling arrangement Through Copper Tube.
 - * Glycerin medium is used for heating.
 - * Limit Switch is provided for Open Door Safety.
 - * Fully SS Body of SS 304 Grade
 - * Beaker made of SS 316 Grade

Coming to the HTHP beaker dyeing machine, this is also a very special type of machine where dyeing sample of fabric or yarn at high temperature and pressure. As the name suggest HTHP - high temperature high pressure beaker dyeing machine. So, the name itself is very suggestive that the dyeing is been carried out at a very high temperature and

pressure. For all types of synthetic fibers like polyester, viscose nylon, acrylic and acetate which is dyed by disperse dyes. So, it is specifically meant for the synthetic fibers and using synthetic dyes; polyester, viscose, nylon, acrylic and acetates are being dyed by disperse dyes. All these fibers or fabric can easily dye this by the sample beaker dyeing machine.

The technical specification is that HTHP glycerin bath beaker dyeing machine is fully made out of stainless steel. SS means stainless steel; with digital temperature indicator and controller, double walled structure filled with mineral glass wool insulation, number of heater are 3 which are having 1500 watt heating capacity, maximum temperature that can be attained is 1400 degree centigrade, maximum rate of heating is 1.50 at the rate it can go up to 1400 and maximum cooling time is also 1.50 degree per minute, water temperature maximum goes to 250 degrees, cooling arrangement through copper tube, glycerin medium is used for heating. Why, because water will only heat up to 100 degrees. So, if higher temperature is to be attained some additive has to be added. So that it lowers the boiling point. So, sorry it elevates the boiling point.

Switch limit switch is provided for open door safety, fully stainless steel body and the stainless steel that is used in this machine is of 304 grade, whereas the beakers that are used in this, these are not glass beakers, you must have seen it that in all these dyeing machines, the beakers that are used or made out of stainless steel and the stainless steel variety is 316 grade. So, this is a very useful machine for synthetic fibers using synthetic dyes, and the temperature can be raise up to very high temperature. But in order to avoid accident, there are limit switch which is a you know, provided for opening the door very safely.

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This is how the machine looks like. Now, let us go on to the next type that is the U type of fabric dyeing machine.

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U Type Fabric Dyeing Machine

U Type Fabric Dyeing Machine. The specifications are provided as follows:

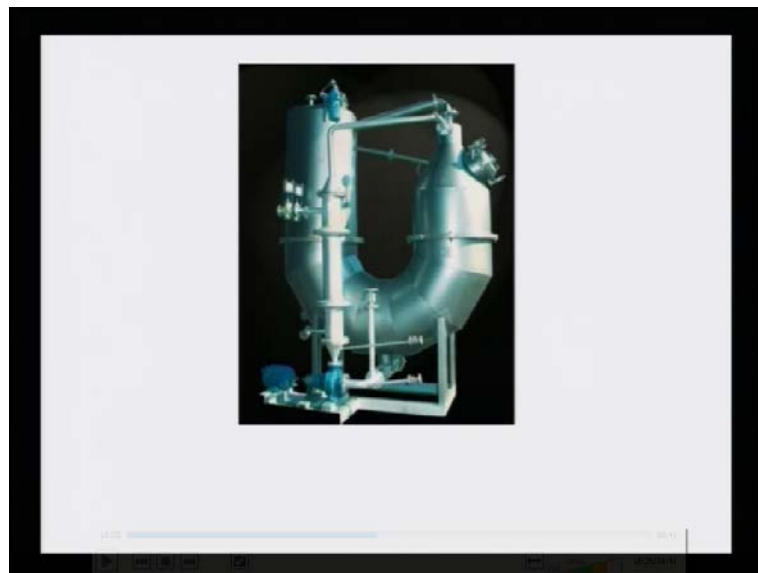
- * No pilling effects
- * No Abrasion
- * No Foaming problem
- * No Weight Loss
- * No distortion
- * No crease mark & cracking
- * Even Dyeing Effect
- * Complete Reel operated
- * Liquor Ratio 1:3 to 1:5
- * Feel of Fabric is retained

The U type of fabric dyeing machine, the specification are no pilling effects, no abrasion, no foaming problem, no weight loss, no distortion, no crease mark or cracking, even dyeing effect - the dyeing effect is very even, complete reel operated, liquor ratio is just required as 1 is to 3 or 1 is to 5. Whereas, we saw in the case of natural dyeing, we have to take liquor to ratio as 1 is to 20. So, you see these are very effective, very high

concentrations of dyes are used, but at the same time there is very even dyeing feel of the fabric is also retained. Sometimes what happens, because of abrasion, the surface of the fabric becomes very rough. And because the surface of the fabric becomes rough, the process is not considered as a very good process.

But in this type of U type fabric dyeing machine, these problems like no pilling effect, no abrasion, no foaming problem, because it is happening at a very high speed; still there is no distortion, there is no weight loss, the yarn or the fabric does not crack or brake or anything of like that happens. And more so much it has a very even dyeing and that is what is very advantageous.

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This is how the U type of dyeing machine looks like and it is very well controlled, and it **it** produces very good results.

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Now coming to the industrial basket; industrial basket is one such machine which actually is very popularly used, **a** when you will see the picture of the dye, you will understand **sorry** dyeing machine, you will understand and this is the type of dyeing machine, you may have seen in many, many pictures or if you have visited any dye houses, these are very common. The industrial basket that are immensely used in textile dyeing plants; these baskets using high grade raw material to ensure their durability, corrosion resistance and abrasion resistance.

Because you see the fabric is moving at such a high speed inside this lesson, there is bound to be abrasion. But it does not have any effect, because of the smooth surface of the stainless steel and the inner side of the valve of these industrial basket. There it is corrosion resistance and it is abrasion resistance, and it is highly, highly durable machine. The range is available in variegated sizes and specifications of to suit the application. So, it can be in smaller sizes, it can be medium sizes, it can be in bigger sizes and all of them are available for different types of requirement. In fact, the dyer can actually have a tailor made industrial basket according to the amount of fabric that he needs to dye at a time.

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The this is how it looks like; you will just take a look at these and you will understand that these are very common dyeing machine. It has a lid also and sometimes even an open jar can also work as an industrial gasket.

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Maxi Type Jumbo Jigger Machine

- The technical specifications of Maxi Type Jumbo Jigger Machine are geared to offer maximum efficient and high performance. Making the machine a durable product are the following features -
 - * Gradual Start and Gradual Stop.
 - * The equipment is constructed from AISI 316 Stainless Steel.
 - * The door operates pneumatically.
 - * Large inside viewer windows design incorporated.
 - * Special gasket to seal the steam from escape.
 - * Steam coils in the hood absorb condensate drips.
 - * Circuit pumps the dye liquor for better circulation, leavening of the dye as well as controlling the flow from the spray pipes for washing and raising.
 - * A large surface area dye filtering area is attached on the outside of the machine.
 - * Dye and Chemicals have different service tanks.
 - * The machine is controlled through the microprocessor according

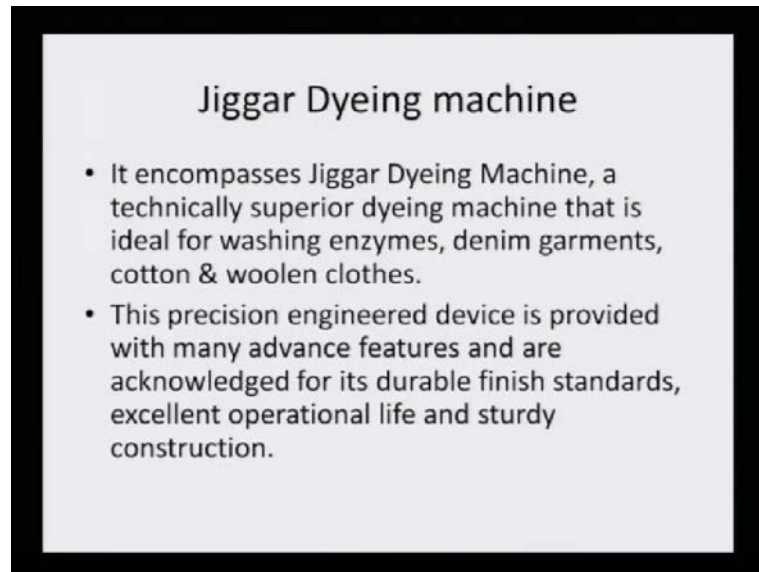
Coming to the next type of dyeing machine the maxi type jumbo jigger machine; jigger machine is one machine which has been used from ancient times and several, several modifications have come about to make or facilitate the process of dyeing more easy. The technical specifications of maxi type jumbo jigger machine are geared to offer

maximum efficient and high performance. Making the machine a durable product are the following features; gradual start and gradual stop, the equipment is constructed with stainless steel 316, the doors operated pneumatically, large inside viewer windows design incorporated, special gasket to seal the steam from escape, steam coils in the hood absorb condensate drips, circuit pumps are the dye liquor for better circulation, leavening of the dye as well as controlling the flow from the spray pipes for washing and rinsing, large surface area dye filtering area is attached to the outside of the machine, dye and chemicals have different service **tankers** tanks, the machine is controlled through a microprocessor accordingly.

So, now you see that it has all the features that a dyer would ideally want to have in a dyeing machine. Because it starts slowly, gradually stops, it is not abrupt. So, when things had not abrupt, everything happens **in a very**, the dye uptake is very smooth. Second thing is that **the** it is made out of stainless steels. So, there is no problems of any kind of corrosion or abrasion and it is durable also. The doors of these dyeing machines open pneumatically. So that also opens very slowly and perfectly. Inside - large inside viewers, windows are there which can give an insight view how much dyeing has been taken, what is the kind of dye uptake that has taken on the fabric, and therefore, it can be of great use.

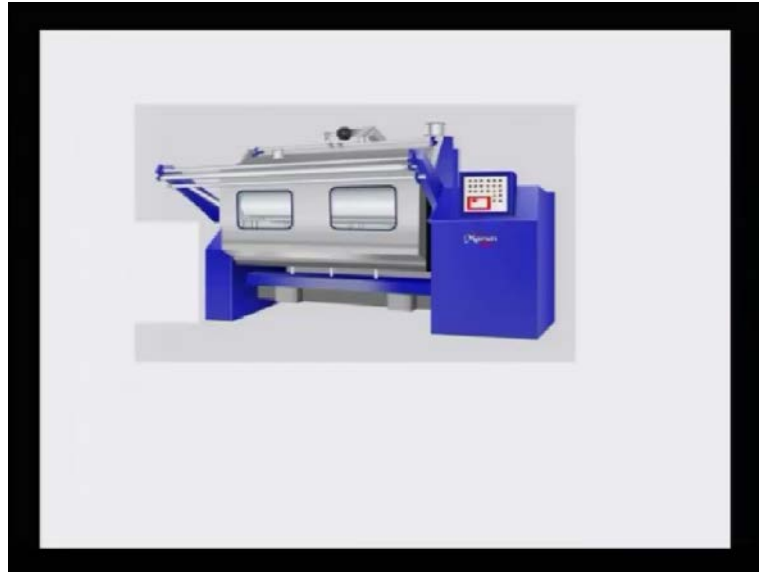
Special gasket to seal the steam that can escape; so, it is also happening under the steam condition. In most of the open jiggers what happens is a lot of steam is lost, because the system is opened. So, although the dye solution is being heated up. But as it the vapor raises it go escapes in to the atmosphere. But in this kind of jumbo jigger machine, the steam of the hot solution of the dye is actually in contact with the fabric all the time. It is not escaping and the steam coils in the hood absorb the condensate drips. So, again it is going back in to the same solution, nothing is being wasted. So, this gives an advantageous situation for the dyer to use this machine accordingly, and this is the most popular machine. That is the jigger machine is one machine which every dye house will have. So, this machine you should understand and look at the picture more carefully.

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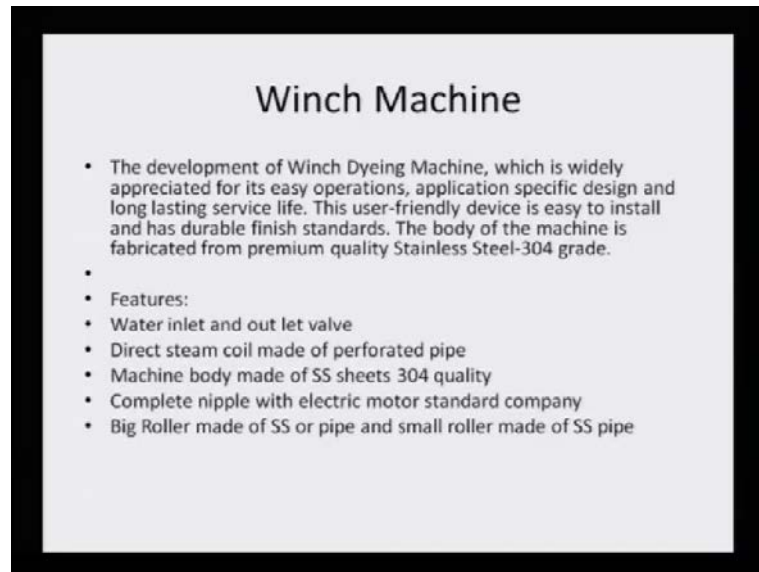
Jigger dyeing machine, an it **encomp** encompasses jigger dyeing machine, a typically superior dyeing machine that is ideal for washing enzymes, denim garments, cotton and woolen clothes. So, it is meant for washing with the enzymes using denim dyeing; the denim garments which is very you know, tough and cotton, and woolen clothes both soft and tough clothes can be dyed on jigger dyeing machine. This precision engineered device is provided with many advance features and are acknowledge for its durable finish standards excellent operational life and sturdy construction. So, as I told you this is one of the most popular machines that is being used in the dyeing industry. And that is why I am spending so much time especially, explaining to you, because at least you should know that there is something called jigger machine, and this jigger machine is so sturdy and it is so well engineered. That it facilitates the method of dyeing for the dyers.

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This is how the machine looks like. You see it has a beautiful edge which an everything is made out of steel and there is a micro processor. So, all the programming can be given on the micro processor. That is an advantage of the industrial dyeing machine. That everything can be already, the recipe has been planned, the dosages have been decided and **the** you know when to add what chemical. So that the dyeing is very even. And in this what happens every time the fabric comes in contact with the dye, it is for a short while. **So..** And it is coming at a very repeated process. So, at not more time the fabric is too much in is in contact with the dyed solution. So, therefore the uptake is very uniform. And throughout the length of the fabric, the color will remain the same.

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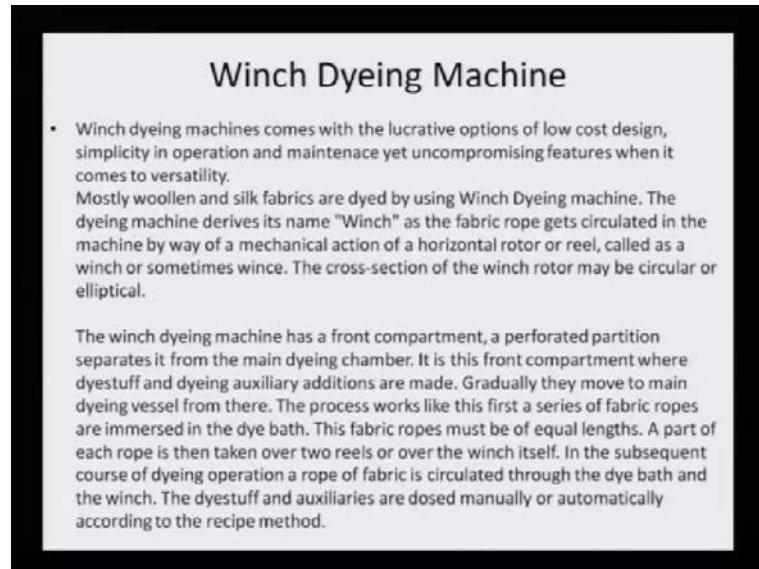
Coming to winch machine, the developmental winch dyeing machine which is widely appreciated for its operations, application, specific design and long lasting service life like. This user friendly device is easy to install and has durable finish standards. The body of the machine is fabricated from premium quality stainless steel that is a 304. So, you must have noticed; that there are only 2 varieties of steels which are used for these machine; one is the 304 for the outer body and 316 for the beakers and other you know inner parts of the machine.

Features that of the winch machine are water inlet and outlet valve are present, direct steam coil made of perforated pipe, machine body made of stainless steel sheet of 304 quality, complete nipple with a electric motor standard company, big roller made of stainless steel or pipe and small roller made up of stainless steel pipe. So, there are two rollers on which the fabric is rolled and every time it dips into the dyeing solution. So, at a time not much is exposed to the dye bath. But the fastness by which this winch machine moves is very, very fast and very fascicled, and it does dyeing in a very uniform manner; the entire body of the winch machine is made out of stainless steel.

There are inlets and outlet valves. And there is a direct steam coil which has perforated pipe. So, the steam is being controlled through these perforated pipes. Silk and wool are two such fabrics which are dyed on winch machine. Because jigger moves very fast and it is not meant for very soft materials or materials which can get torn out or can get destroyed during the fast rotation process. So, winch moves in a silk leaves slower

manner, but the rotation process is quite similar and that causes the dye uptake in a very uniform manner.

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Winch Dyeing Machine

- Winch dyeing machines come with the lucrative options of low cost design, simplicity in operation and maintenance yet uncompromising features when it comes to versatility. Mostly woollen and silk fabrics are dyed by using Winch Dyeing machine. The dyeing machine derives its name "Winch" as the fabric rope gets circulated in the machine by way of a mechanical action of a horizontal rotor or reel, called as a winch or sometimes wince. The cross-section of the winch rotor may be circular or elliptical.

The winch dyeing machine has a front compartment, a perforated partition separates it from the main dyeing chamber. It is this front compartment where dyestuff and dyeing auxiliary additions are made. Gradually they move to main dyeing vessel from there. The process works like this first a series of fabric ropes are immersed in the dye bath. This fabric ropes must be of equal lengths. A part of each rope is then taken over two reels or over the winch itself. In the subsequent course of dyeing operation a rope of fabric is circulated through the dye bath and the winch. The dyestuff and auxiliaries are dosed manually or automatically according to the recipe method.

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done into the winch bath. So, that is why it is a very facile method of dyeing. And the entire machine has been designed for handling softer materials like wool and silk.

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This is how the winch machine looks like. And as you will see that it is more flattened and there are circular bars which hold the rope material of the fabric or rather the fabric is converted into a type of a loose rope and so that it can pass on to it very easily.

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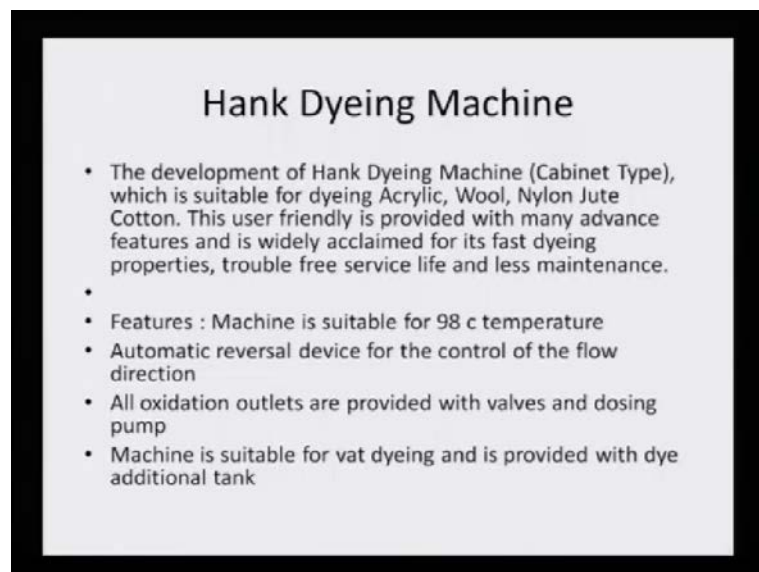
Hank Dyeing Machine (Carrier Type)

- Banking on the rich industrial expertise and knowledge, technically superior Hank Dyeing Machine (Carrier Type) has been engineered, which is easy to install, operate and has reliable service life.
- This device is developed after thorough research and is widely appreciated for its optimum performance and trouble free service life.

Coming to hank dyeing machine - the carrier type; banking on the rich industrial expertise and knowledge, technically superior hank dyeing machine that is the carrier

type has been engineered, which is easy to install, operate and has reliable service life. This device is developed after thorough research and is widely appreciated for its optimum performance and trouble free service life. So, hank dyeing machines are commonly used in smaller laboratories or some or smaller dyeing houses. Because they are very they have been made according to the tailor made according to the requirement of the dyer. So, therefore it is very easy to, it is not those bulky kinds of machine which cannot be moved from here to there. You can take a look of the picture a little later.

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the development of hank dyeing machine that is the cabinet type, which is suitable for dyeing acrylic, wool, nylon, jute and cotton. This user friendly is provided with many advance features and is widely acclaimed for its fast dyeing properties, trouble free service life and less maintenance. So, this is a as I told you, just like jigger and winch even hank dyeing machine are very popular. And they can they have been made for facilitating the dyeing process, and this is used for dyeing acrylic, wool, nylon, jute as well as cotton.

The features that include in the hank dyeing machine are that the machine is suitable to be used at 98 degrees temperature that is boiling point of water; automatic reversal devices for the control of flow direction, all oxidation outlets are provided with valves and dosing pump, machine is suitable for vat dyeing and is provided with the dye additional tank. So, you see we were talking about vat dyeing. Now, here is a machine that can actually do the vat dyeing without using the vat and hank dyeing can do that. So,

it has that kind of an **a** equipment, where no oxidation will occur while the dyeing is taking place. Because we saw we just learnt about vat dyeing and that is if a precisely way I took the vat dyeing before this chapter or before this lecture, because I wanted you to understand that there is a machine on an industrial scale, hank dyeing machines can be used for vat dyeing. So, you one need not or necessarily have a vat to do the vat dyeing. That was the initial or the historic way of doing it. But now hank dyeing machine can do vat dyeing very easily.

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This is how the machine - the hank dyeing machine looks like, and it is all concealed and **it has a...** Because **it can** it has to be at one point of time used for vat dyeing which should not any exposure of air at the undesired stage.

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Arm dyeing machine

Arm dyeing machines is made of corrosion resistant and is equipped with a low pressure pump with a variable output. It is suitable for treating delicate yarn such as pure silk, rayon, mercerised and superfine cotton yarn



24:55 30:41

The image shows a person in a white lab coat operating an arm dyeing machine. The machine has a red frame and several white fabric items hanging from it. The person is adjusting the fabric. The video player interface at the bottom shows a progress bar and a timestamp of 24:55 out of 30:41.

Coming to arm dyeing machine - arm dyeing machine is made up of corrosion resistant and is equipped with a low pressure pump with a variable output. It is suitable for treating delicate yarn such as pure silk you see. Now, here it is only meant for the yarn, whether it is pure silk or rayon or mercerized or superfine cotton yarn. So, there is one arm dyeing machine which is only and only meant for the dyeing of these very specific yarns. And these have circular knobs and there is a bath. So, from time to time it is actually lower down and it is also rotated at the same time.

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Soft Flow Dyeing Machine

Soft Flow Dyeing Machine, which ensures even dyeing with low tension and accurate rinsing system.

Fabricated as per international quality norms, this device is widely appreciated for hosts of outstanding features like trouble free service life, optimum functionality and energy efficiency.

So, looking at these various machines; we also have some machines which are of other specification like soft flow dyeing machine, which ensures even dyeing with slow with low tension and accurate rinsing system. Fabricated as per international quality norms, this device is widely appreciated for hosts of outstanding features like trouble free service life, optimum functionality and energy efficiency. As the name suggests soft flow dyeing machine is meant for having very even dyeing and **it has** it works under very low tension. Because jiggers and winch, they work on a very high tension, the fabric is always in the pull state, where as in this it is not so. So, it works under a very trouble frees situation, it has a long life and it has optimum functionality, and more so much it is important, because it is an energy efficient machine. And in today's industrial process such machines are very desirable which require less than amount of energy consumption.

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This is how the soft flow machine looks like. It is all very concealed, but the process goes on at a slower rate, and therefore, it is quite popularly accepted in the industrial dyeing scenario. So, if we try to look at the arm dyeing machine, you will see that this is the only machine that has been used for yarn. Others are all meant for fabric. So, arm dyeing machines are meant for yarn dyeing be it is silk yarn or cottoned yarn or super fine yarn cotton or mercerized cotton yarn or rayon, but all other dyeing machines that we enlisted or **when** which we learnt are meant for fabric dyeing; whether it is synthetic fabric dyeing or whether it is cotton dyeing or denim dyeing all are meant for yards of yards of a fabric to be dyed.