Dairy and Food Process & Products Technology
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Lecture - 60
Flow Chart for Manufacturing Some Dairy and Food Products

Hello students, we are now on the verge of completion of the course. Today is the 60th class of these Dairy and Food Products, Dairy and Food Process and Products Technology. And since we have covered a lot I feel that I should also share with you some of the data which we generated in our laboratory classes, or in our rather I should say PhD programs because these are authentic data our students have done it.

And let me share with you manufacturing some of the both dairy and food products. I am not saying in that entire gamut of the dairy and food products we can show. But few of them which are which we have done in our lab by our students again they got their degree PhD so their data are authentic right.

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So, we come to our 60th lecture; that is Flow Chart for manufacturing some dairy and food products right. So, this is some flow charts we will be showing you and this data are authentic right.

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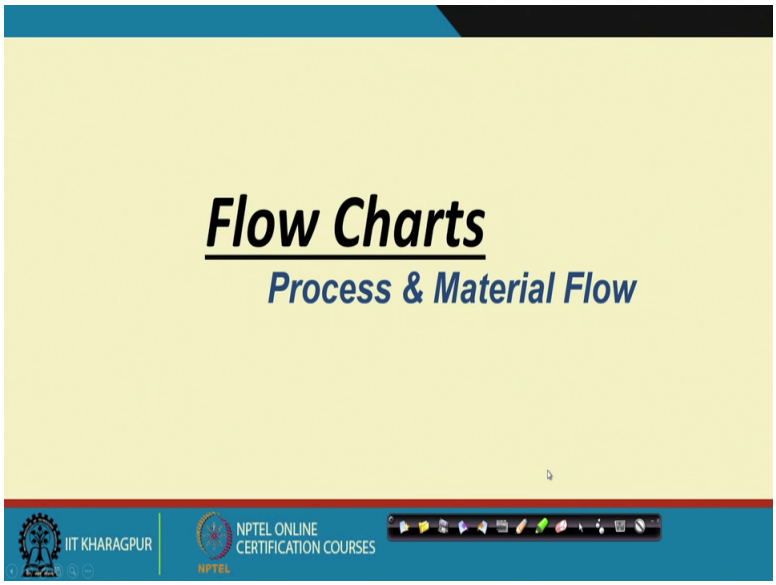

Flow Charts Process and Material Flow right.

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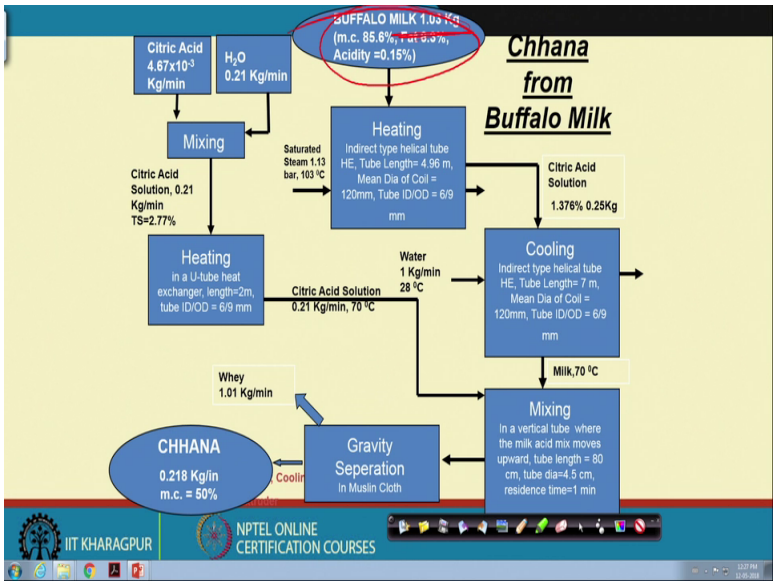

So, in this first we see that chhana from buffalo milk right. We are taken buffalo milk and from that we have quantitatively formed chhana right. Chhana we have said earlier that is the acid coagulation product of milk right. So, that acid coagulation how best you can get maximum chhana so that is debatable right. The reason being the milk with which you are starting that milk will contain different fat content and s and f

So, until and unless you have the source or raw material identical your end product will not be. So, that is why it took several months or years to come to these statistics or data. And we could make a streamline provided again you have the input or intake of the material identical. So, we took buffalo milk, we took buffalo milk that milk 1.03 kg we had taken.

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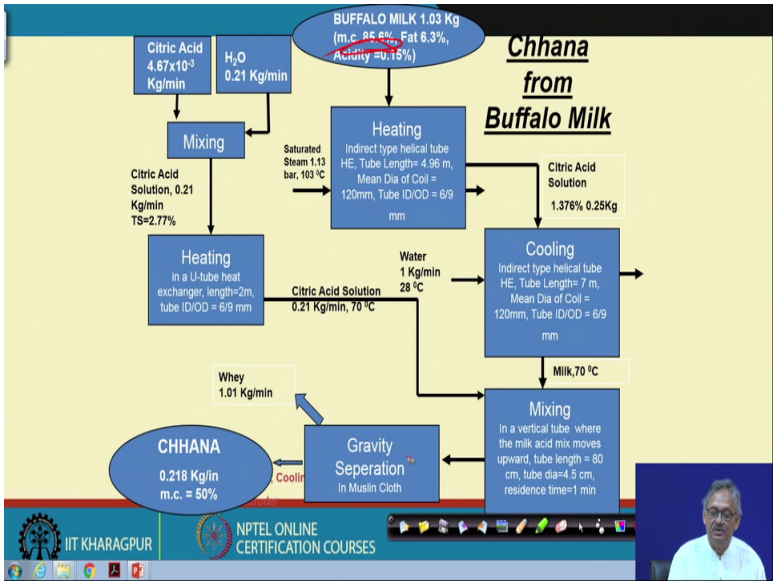

And that contains 65.6 percent moisture and 6.3 percent fat.

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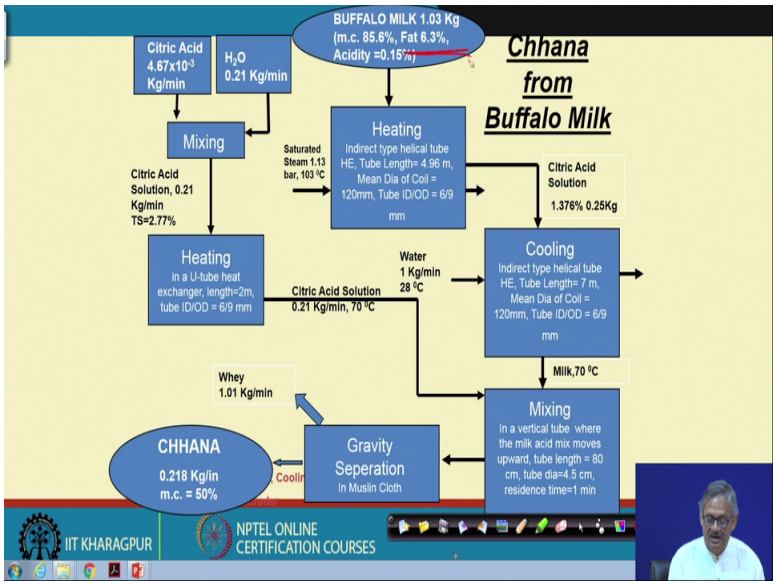

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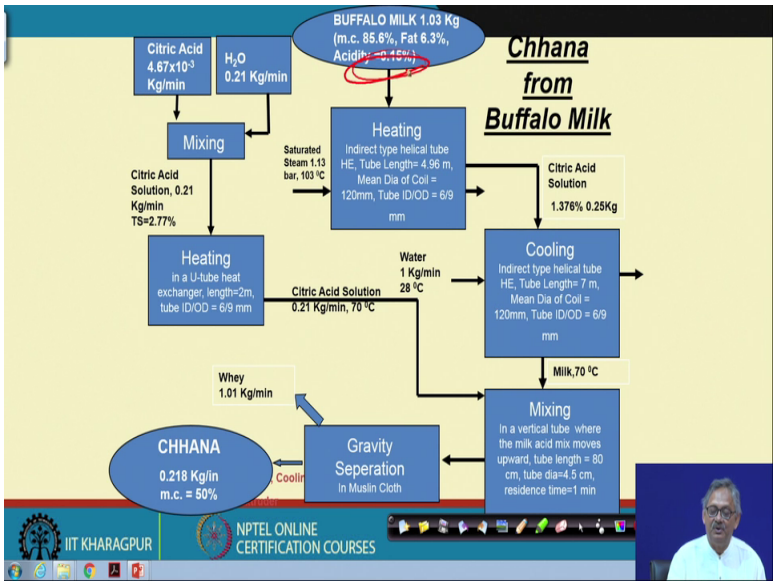

And its acidity level at that moment was 0.15.

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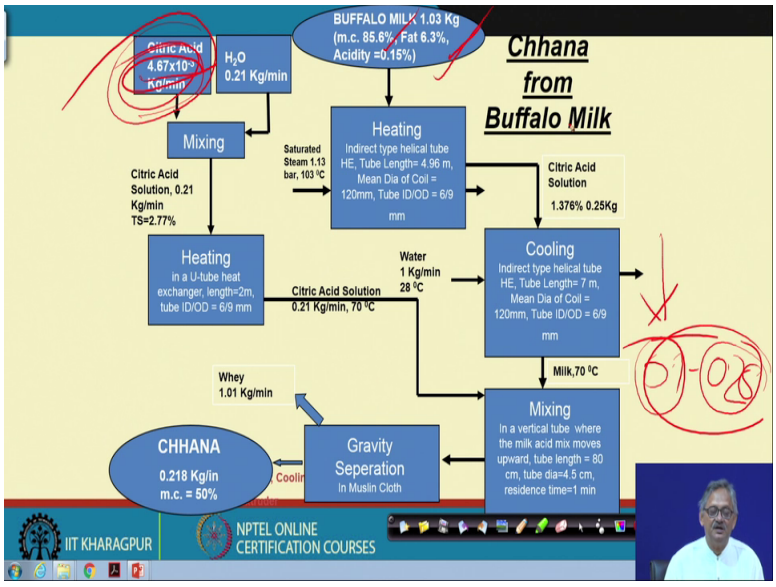

We said earlier that milk between 0.1 to 0.28. The milk is taken best 0.1 is the best, 0.28 is gradually going to worse, but up to that limit it can be accepted. So, here our acidity level is 0.15 so it is a very reasonably good milk right; having 6.3 percent fat and 85.8 percent moisture 85.6 percent moisture right.

So, this is the starting side by side we have taken citric acid, citric acid in the solid granules. So, citric acid 4.67 into 10 to the power minus 3 kg per minute is the flow rate right because, this is a continuous chhana making process.

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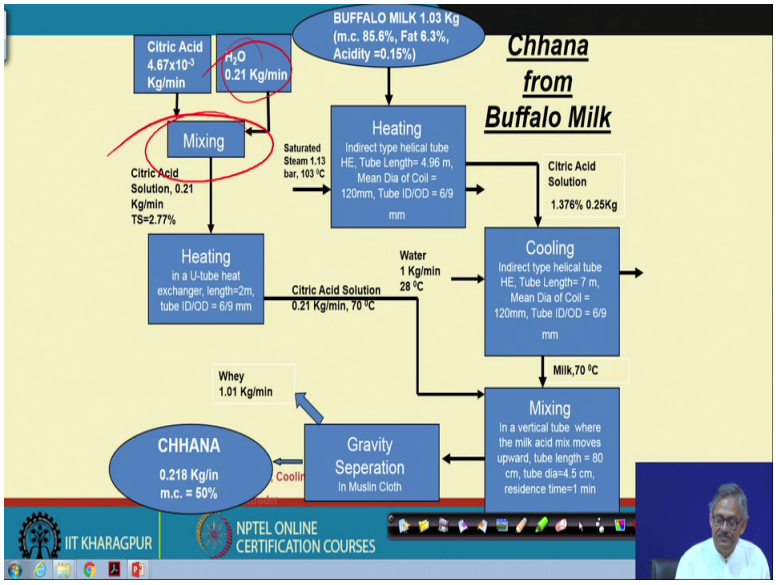

So, that is why per hour it has come or per minute kg per minute that is flow rate has come. So, it is this is mass flow rate 4.67 into 10 to the power minus 3 kg per minute is taken as the granule. And water is taken 0.21 kg per minute right. So, they are now mixed so that mixing is done.

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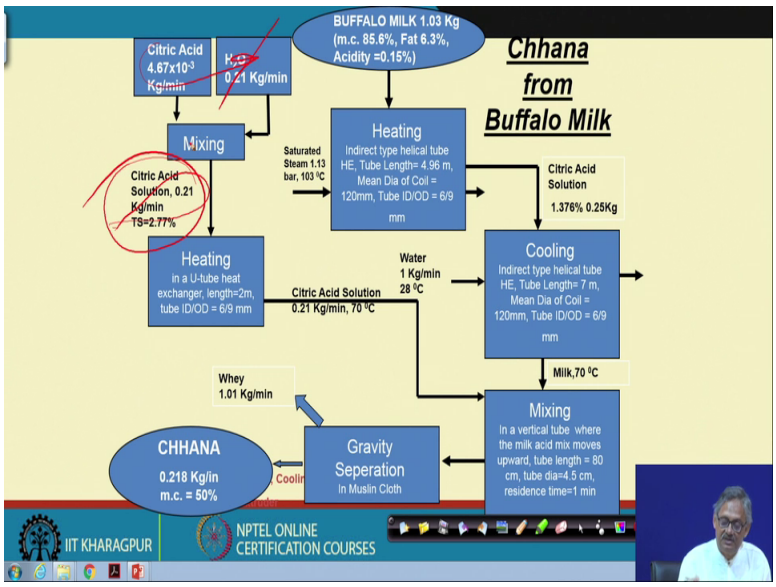

So, after mixing this makes citric acid solution, containing 0.21 kg per minute solution; because your water was there and the entire acid is soluble in the water.

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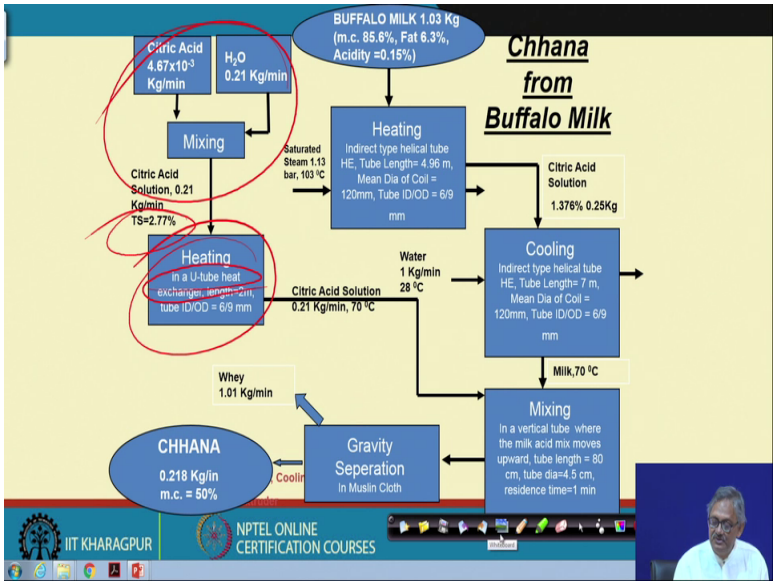

So, you got a total solid of 2.77 percent. Then the entire solution is heated in a U-tube heat exchanger. So, U-tube heat exchanger is looking like.

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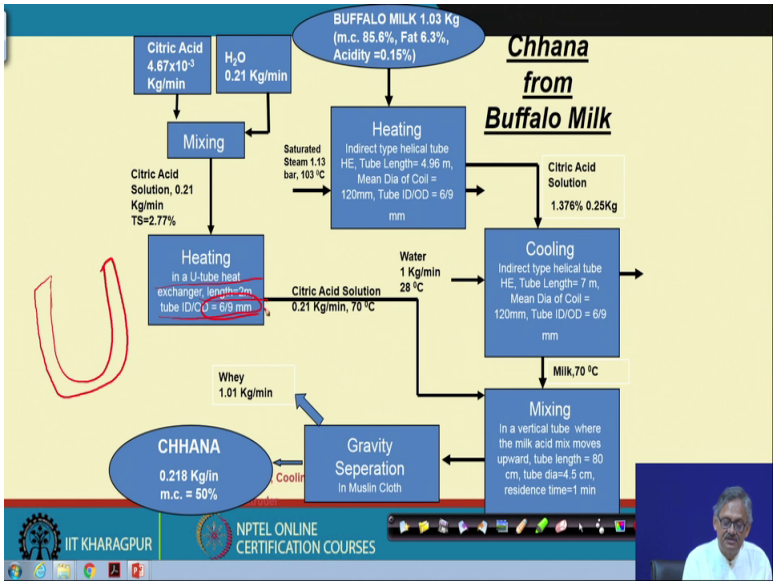

So, you have U-tube like this. So, this type of heat exchanger is used for heating right. So, U-tube heat exchanger length 2 meter, tube ID or OD is 6 by 9 millimetre right. So, that we prepared or made in our lab.

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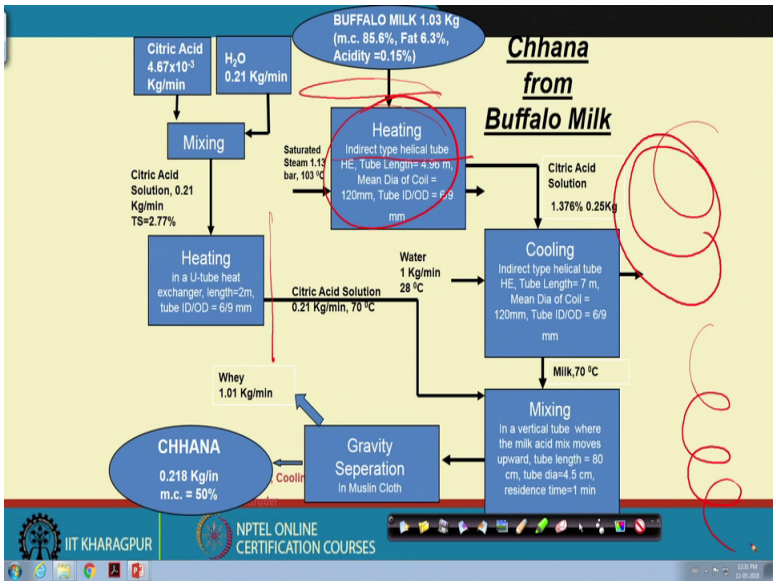

And this side this is already ready, this side milk has come. So, what we are doing? We are now heating that milk. So, your milk heating is done in indirect type of helical tube right, helical tube like this helix right. So, helical tube is this way it is a helic is being formed.

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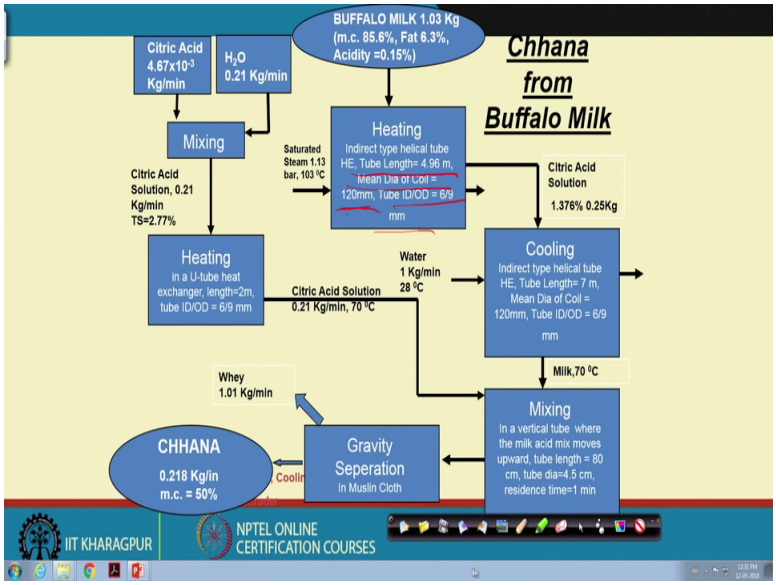

So, in a helical tube heat exchanger, tube length 4.96 meter mean diameter of the coil is 120 millimetre tube ID OD is 6 by 9 right.

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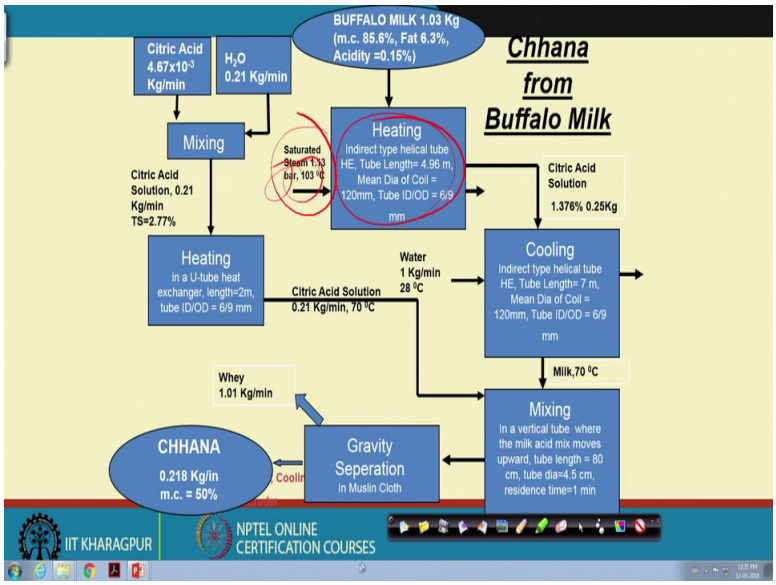

Then this is heated by saturated steam at 1.13 bar at 103 degree centigrade right. At 103 degree centigrade it is to be heated so then, what do you get? Along with this, what do you get? You are getting this hot milk then this is cooled.

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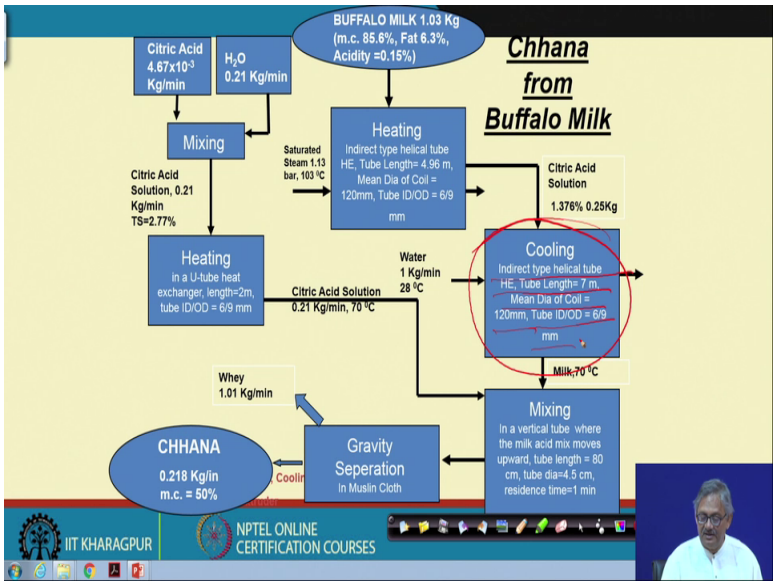

So, cooling by indirect type helical tube heat exchanger tube length 7 meter mean diameter of the coil is 120 millimetre and tube ID OD is 6 by 9 millimetre right.

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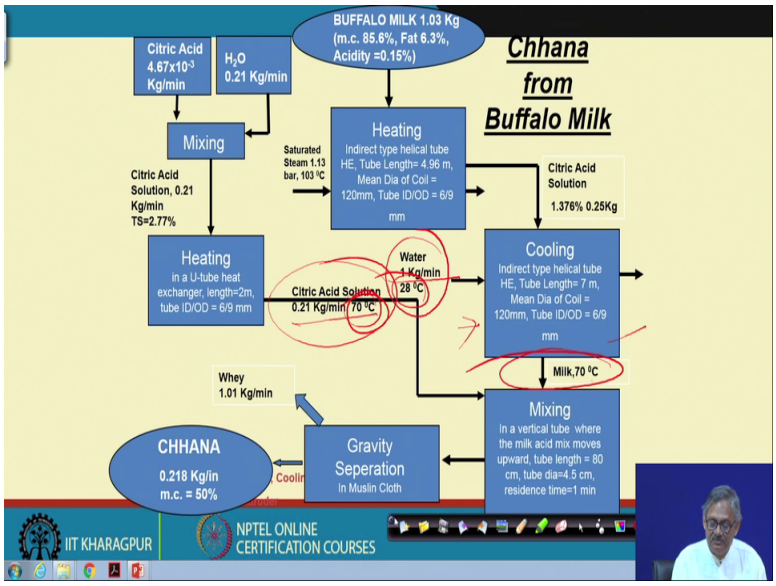

There it is being cooled by water, water at a rate of 1 kg per minute with temperature of 28 degree centigrade right. So, you got this cold milk and the temperature of the milk comes to 70 degree centigrade. So, you got 70 degree centigrade milk and citric acid solution at a rate of 0.21 kg per minute which is brought to 70 degree centigrade 1 to 70 degree centigrade.

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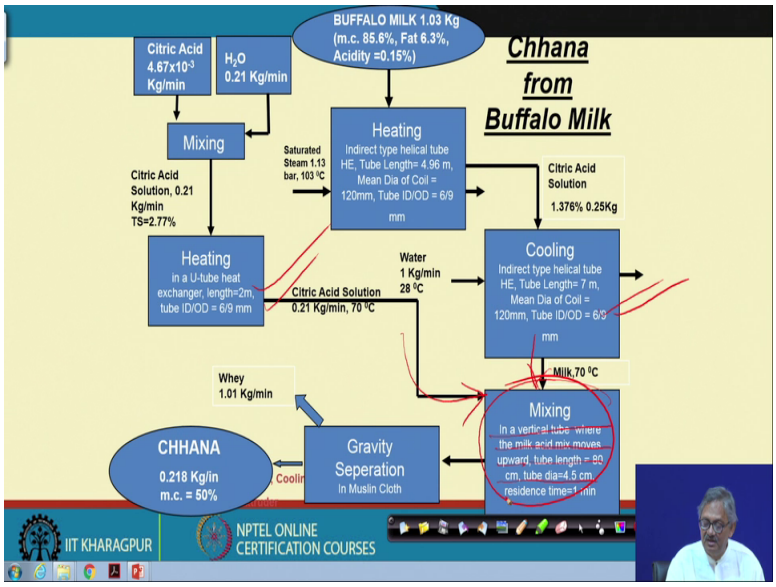

Because if it is not 70 degree, if it is 70 then again that heat will be either exchanged between them, that is not desirable. So, both are at 70 degree centigrade. And then they

are mixed the citric acid and the milk they are mixed in a vertical tube, where the milk is milk where milk acid mix moves upward tube length is 80 centimetre, tube diameter is 4.5 centimetre and the residence time is 1 minute right.

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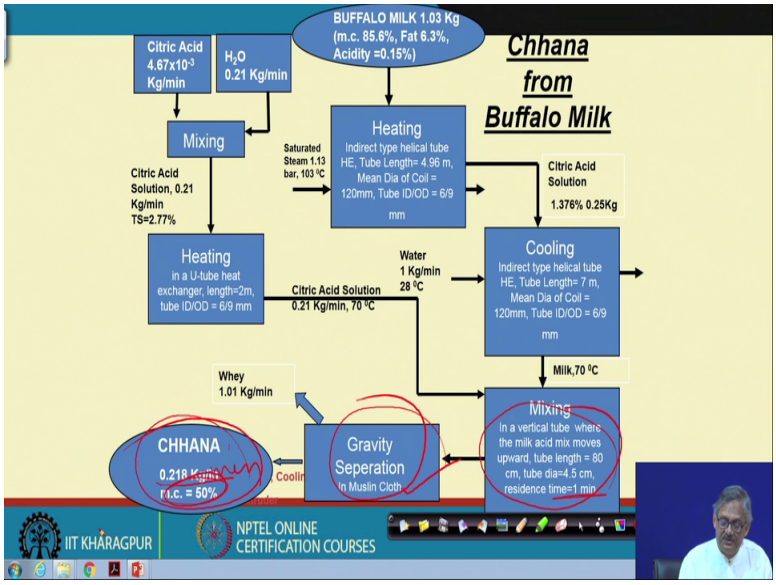

So, when we kept it then we is the milk gets precipitated or a milk gets curdled. So, there by gravity separation in a muslin cloth they are separated and we get that chhana to the tune of 0.218 kg per minute. This is minute 218 kg per minute having a moisture content of 50 percent.

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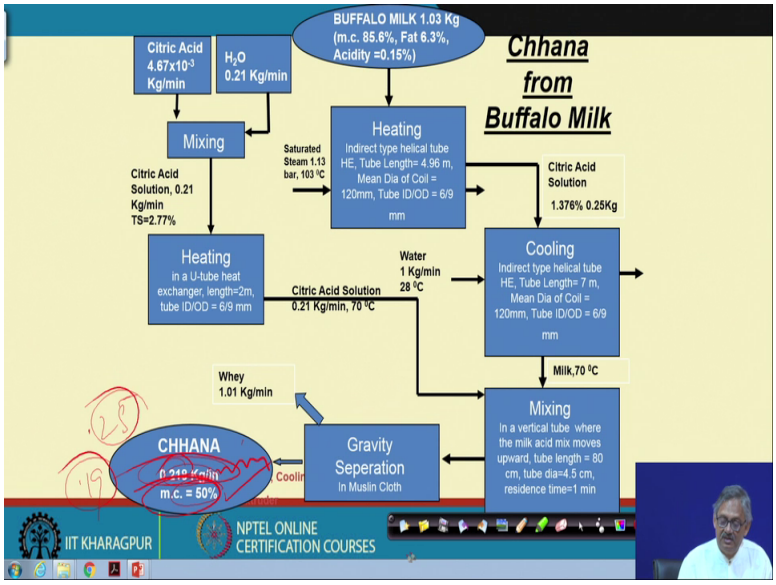

So, this is another thing which is required that this rate is 0.218 kg per minute not in this is minute. So, m got this is the you know deleted. So, 0.218 kg per minute with a moisture content of 50. So, this moisture content with we will tell whether it is 0.218 or 0.25 or 0.19. So, if it is less moisture then less total, it is more moisture more total; so, then that quantity will be dictated by the moisture content right.

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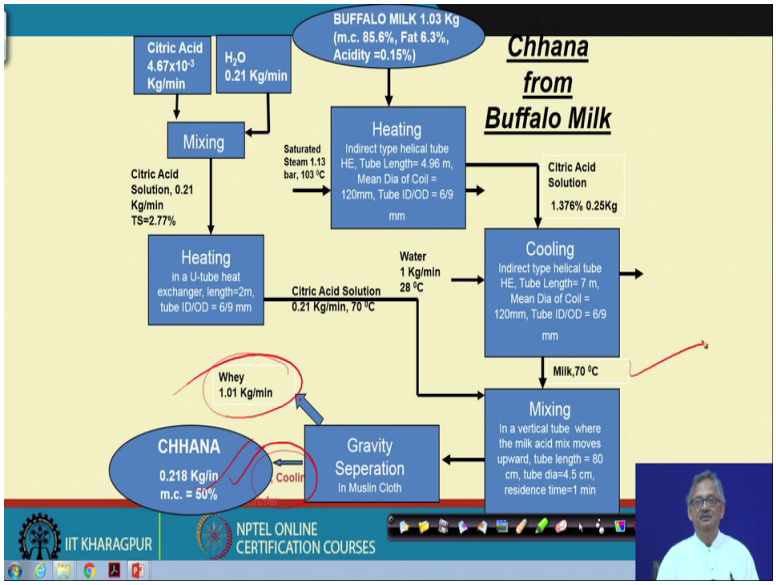

So, it is cold and this is separated and we get way 1.01 kg per minute right. So, this is how chhana is being made right. So, now let us look into another product that is paneer, paneer is made from again chhana or milk.

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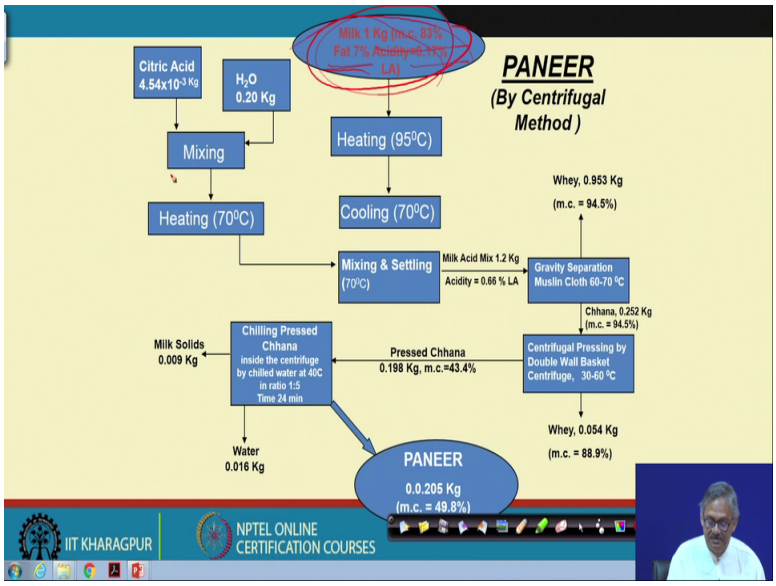

So, here we are taking milk 1 kg with a moisture content of 83 percent fat content of 7 percent acidity 0.17 percent lactic acid right, this is the starting material.

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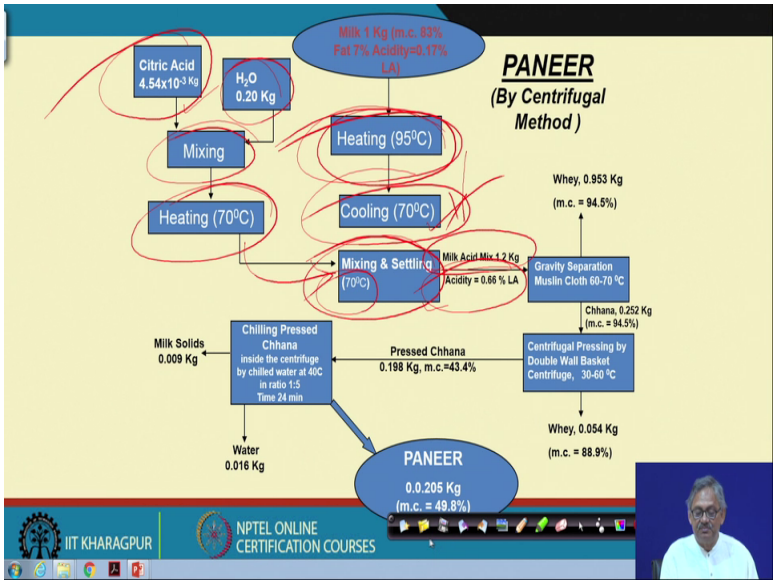

Then heated to 95 degree centigrade, the detailed we have shown in the previous one that how our heat exchangers are made. So, those we have kept now aside, but the similar things have been used. So, heating is 95 degree centigrade. Then cooled to 70 degree centigrade and this side we have taken citric acid 4.54 into 10 to the power minus 3 kg water 0.2 kg and they are mixed then heated to 70 degree centigrade.

So, this citric acid solution and milk heated milk both at 70 degree centigrade mixed and at 70 degree centigrade and it allowed to settle. Then milk acid mix of 1.2 kg with an acidity of 0.66 percent lactic acid is obtained.

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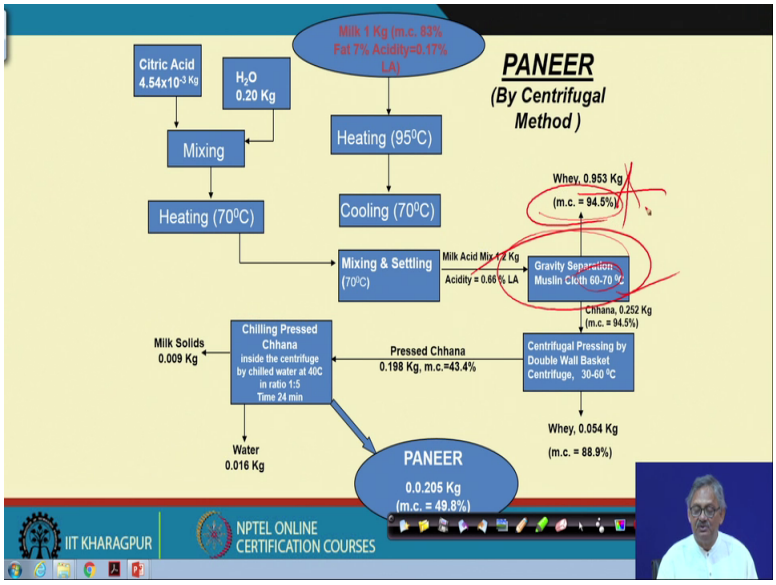

And we get its gravity separation through a muslin cloth at around 60 to 70 degree centigrade. So, way comes out around 0.953 kg with a moisture content of 94.5 percent.

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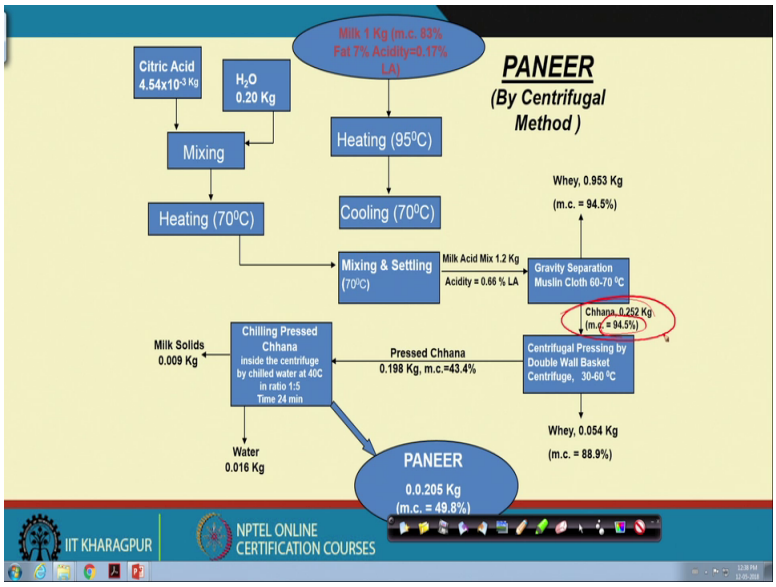

And we get chhana around 0.252 kg with a moisture content of 94.5 percent right. Earlier, I told you that the higher the moisture content more will be the quantity. So, here also you see that 0.252 kg we got with a moisture content of 94 percent right.

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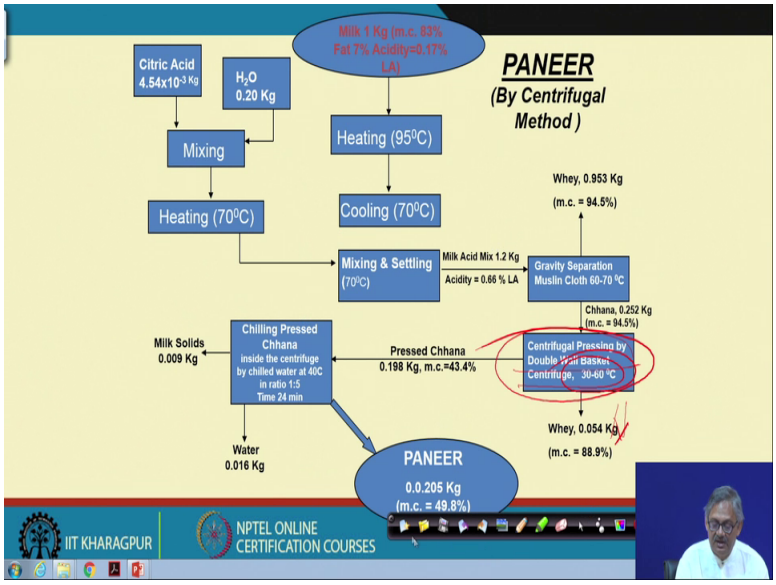

Then it is centrifugally separated, centrifugal pressing by double wall basket it is done and this centrifugation is done between 30 to 60 degree centigrade. Then we get whey out from by the centrifugation we get whey out, where we get 0.054 kg of whey, with the moisture content of 88.4 percent.

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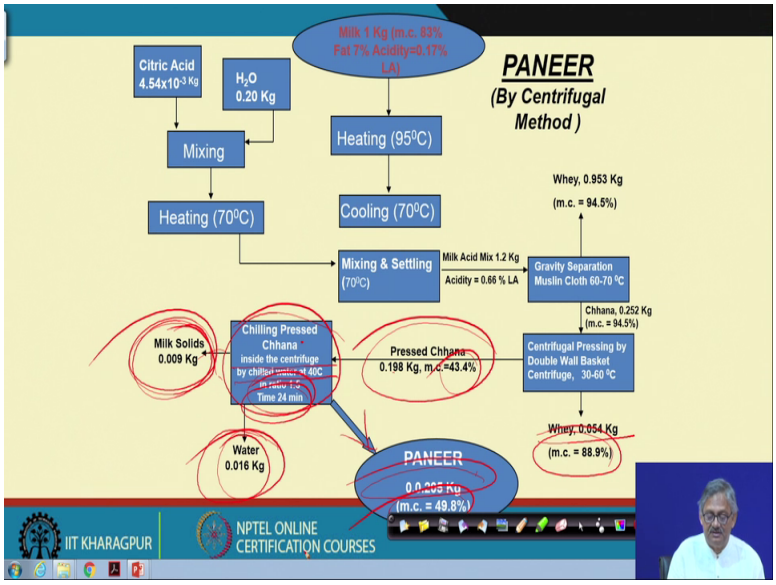

And we get pressed chhana 0.198 kg with a moisture content of 43 percent then it is chilled. So, chilling pressed chhana inside the centrifuge by chilled water at 40 degree centigrade in the ratio of 1 is to 5. That is 1 part of to chhana to 5 part of 40 degree centigrade water for a time period of 24 minute.

And we get some milk solids around 0.009 kg that is wasted and we get a rather that is one which you get rather milk solid whether rather gets wasted when it is going out with the water. And some water around point 0.016 kg that is also coming out, then we are while we are pressing that water comes out some solids comes out and all we get paneer around 0.0.205 kg with the moisture content of 49.8 percent right. So, this way you can make the paneer

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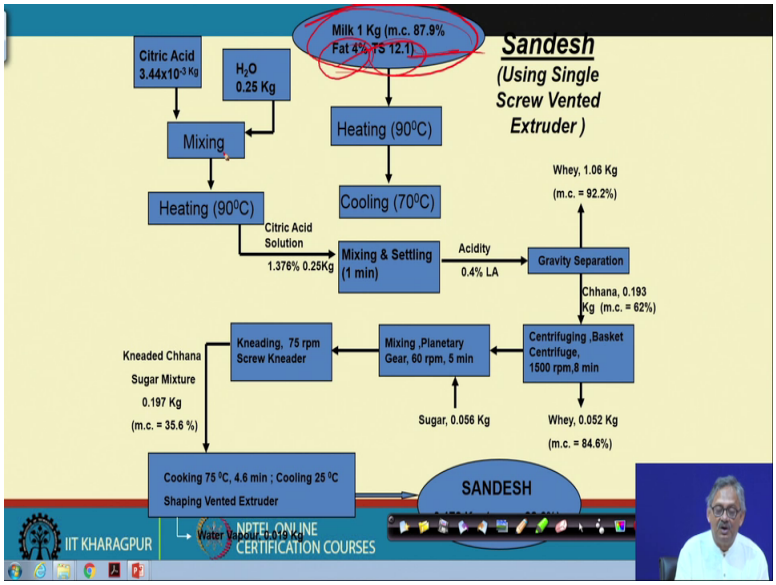

Then we come is another thing to another product called Sandesh. So, this is a very popular in Bengal, may be all over the country. Sandesh is one very popular product made from milk. So, Sandesh we are making milk taking 1 kg with a moisture content of 87.9 percent having fat 4 percent total solid 12.1 and this is heated to 90 degree centigrade cool to 70 degree centigrade; side by side citric acid taken 3.44 in to 10 to the power minus 3 kg with water up to 0.25 kg.

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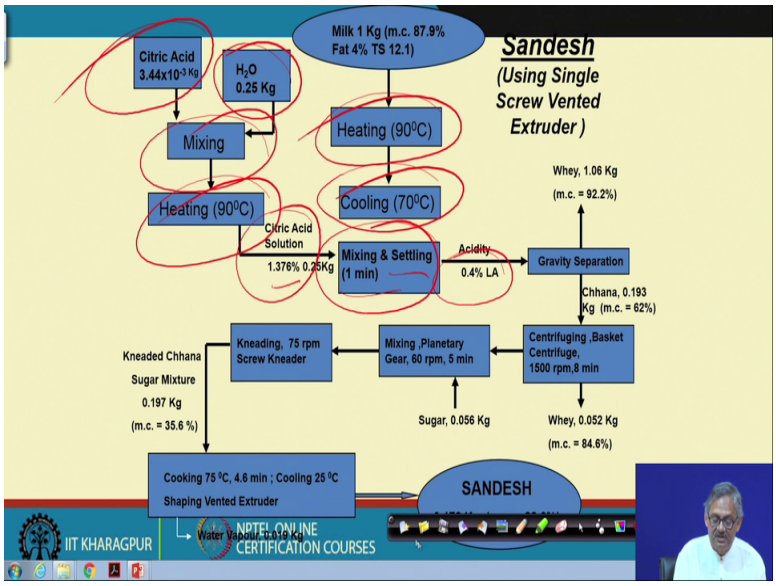

They are mixed heated to 90 degree centigrade then cooled to 70 degree centigrade citric acid solution of 1.376 percent and 0.25 kg right. And then they are mixed for a minute and settled at acidity of 0.4 percent lactic acid.

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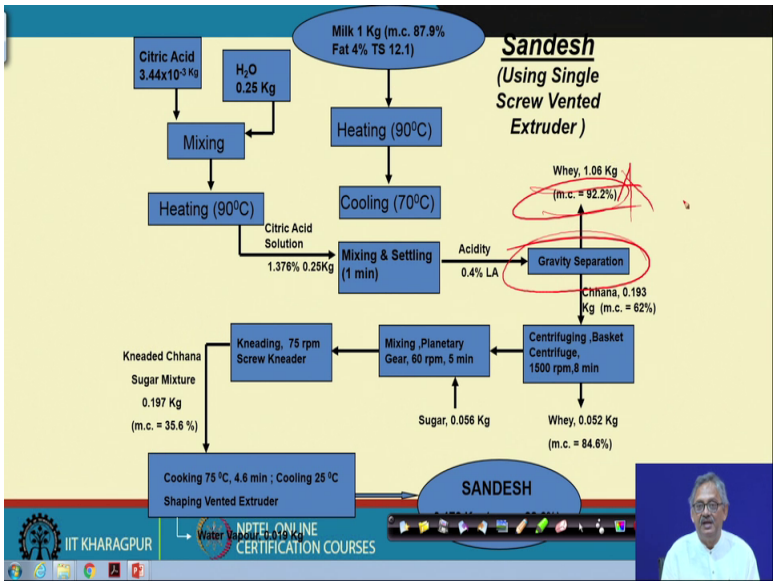

Then they are separated by gravity, by gravity separation we get whey of 1.06 kg having a moisture content of 92.2 percent.

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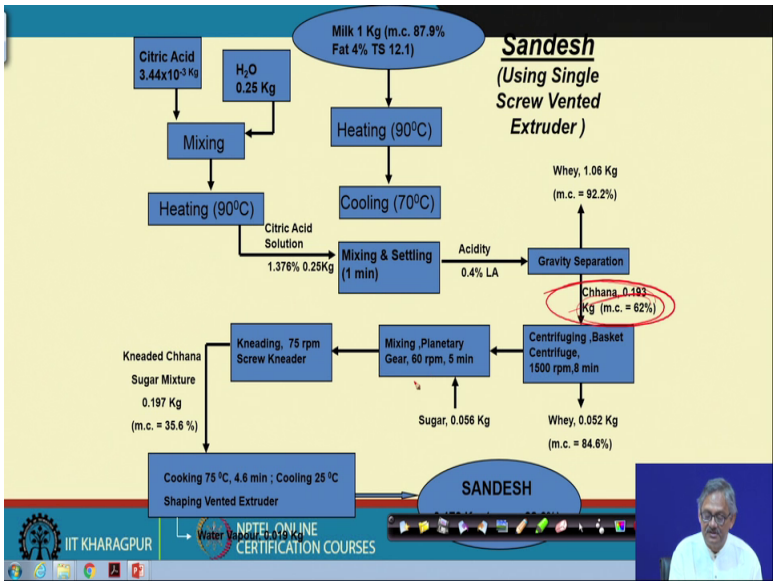

And we also get chhana of 0.193 kg with a moisture content of 62 percent.

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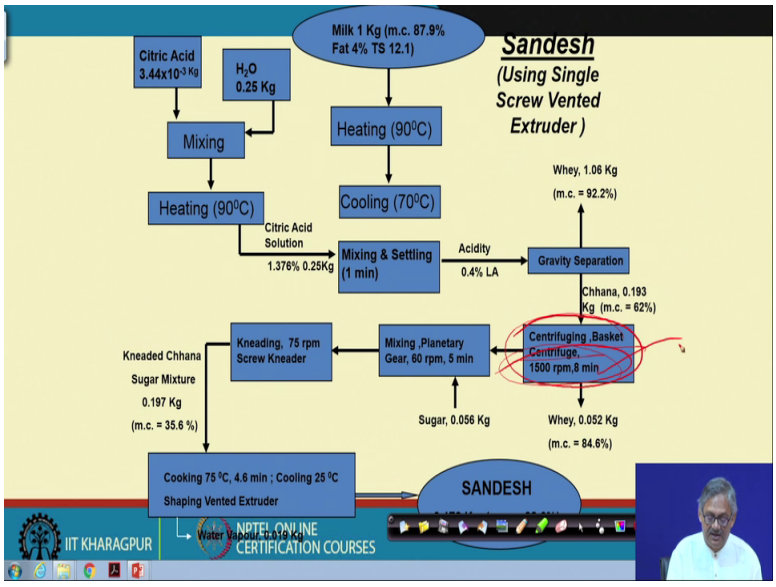

And then it is centrifuged, centrifugal separation is done by basket centrifuge at around 1500 rpm for 8 minute right. Earlier we did not mention rpm of the centrifuge, here we are mentioning that centrifuge is working at 1500 rpm.

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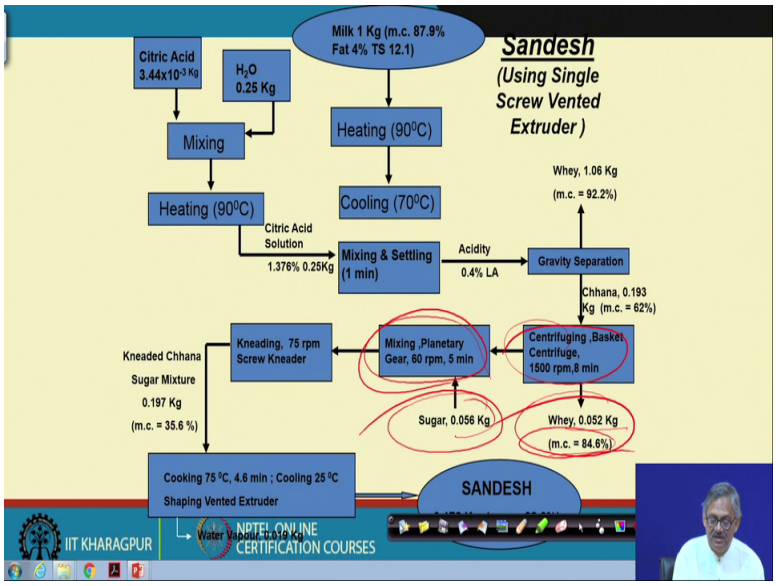

Then we get some whey also out around 0.052 kg with a moisture content of 84.6 kg. And we get the mixing planetary gear at 60 rpm for 5 minutes where, this mass and the sugar is added around 0.056 kg.

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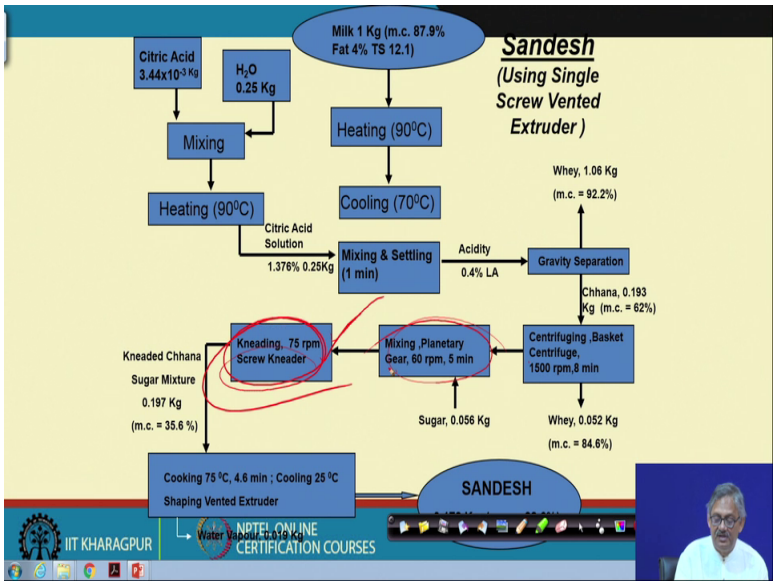

So, this sugar is added to this solid mass and mixing in a planetary gear for 60 at 60 rpm for 5 minutes. Then kneading is done, only this kneading is done no this was also done automatically, no manual all are done automatically in 75 rpm screw kneader right. This screw kneader also was developed at our place.

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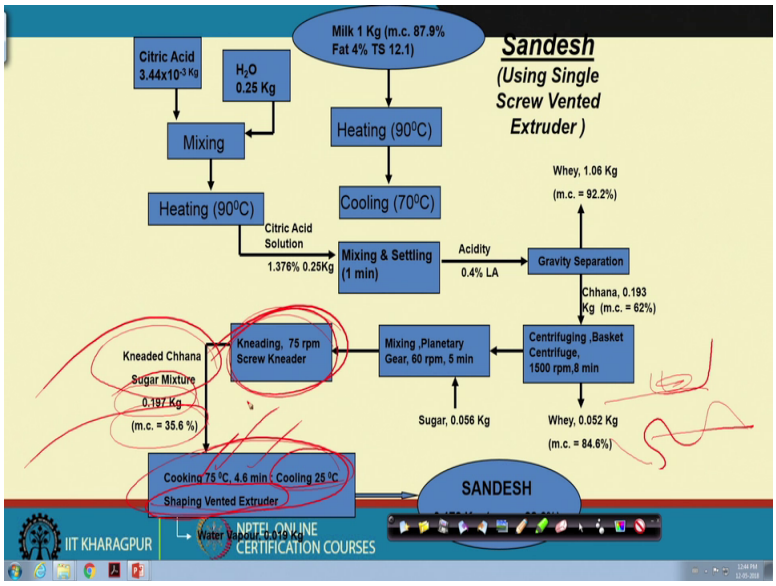

So, this screw kneader is kneading so kneading is one of the important step for making Sandesh. You might have seen in the confectionery that they are kneading it like the one which is done at home, when bread is being made so that is also being kneaded right. So, this kneading is done at 75 rpm in a screw kneader. And this kneaded chhana with sugar mixture we get 0.197 kg with a moisture content of 35.6 percent right.

Then it is cooked at 75 degree centigrade for 4.6 minute and then cooled to 25 degree centigrade and this is done in a shaping vented extruder, shaping vented extruder. The extruder was like this and the top is opened a part of the top is opened. So, that is the shaping vented extruder so, that the water for moisture can easily go out right.

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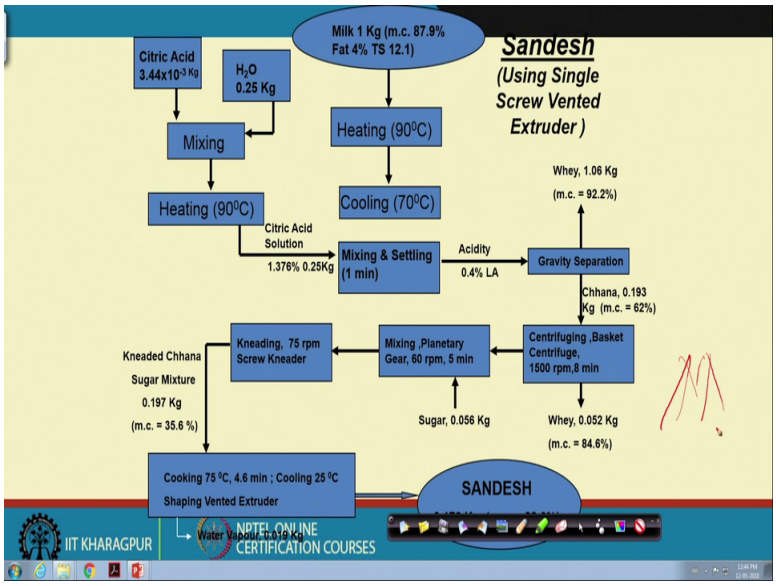

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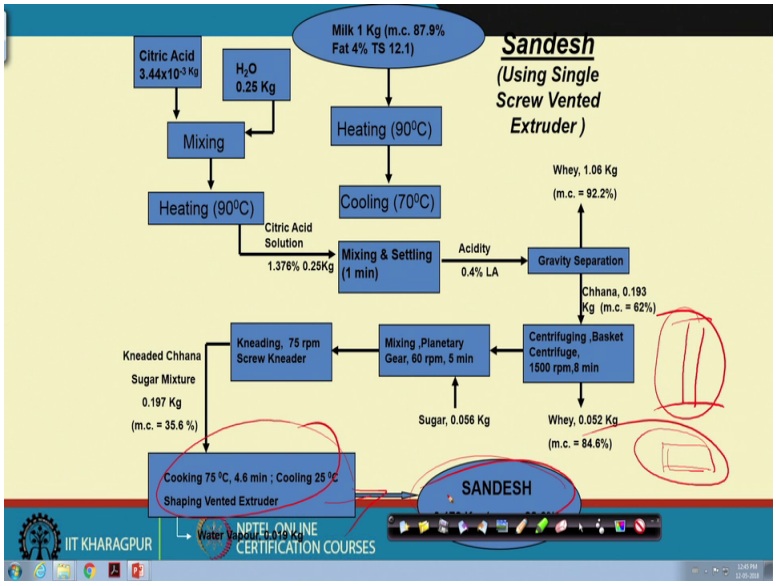

So, by this we get Sandesh, and this Sandesh since we did not have because Sandesh generally available in the market of different shape, different product, but different variety. But, ours one was a cylindrical shape because this from there when it is it was coming to a shaping machine that was so, only cylindrical in shape. So, small-small cylinders like this we got and the taste was same as it was available in the market, but the shape and size that was our only, that was our only drawback that it could not be like the one which is available in the market because, they make it in a mould by hand.

But here no hand was made, right from this top to this Sandesh preparation entire thing was automatic and no hand was put in between. And, that is why when we got the shaping we wanted to give the shape was a cylindrical shape and the taste was as good as the Sandesh. And a storability was also for couple of days, because moisture is very high a the sugar is very high right.

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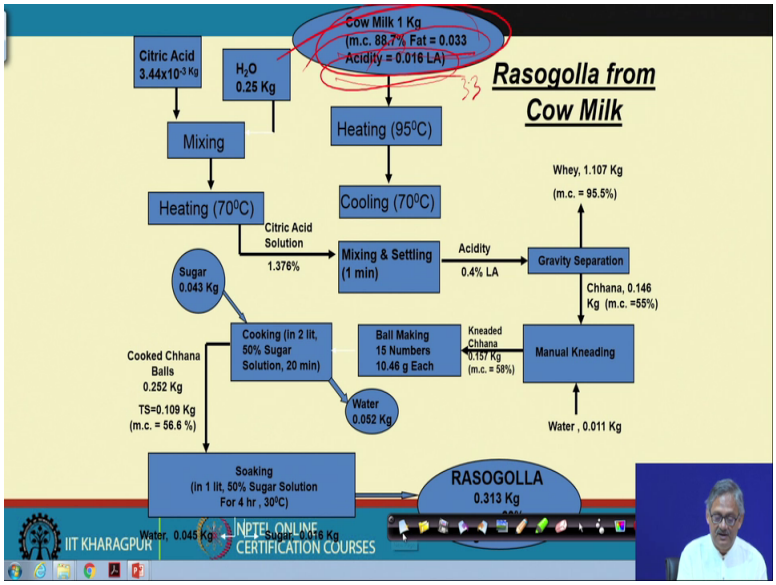

So, then we move quickly to another very very popular one that is called rasagulla making right. This rasagulla making is again from cow milk of 1 kg with a moisture content of 88.7 percent, and fat content of 0.0 point moisture content 88.7 percent, fat content 0.033. Acidity is 0.016 lactic acid. I think this made it is 1 kg. So, that is why it is made the 3.3 percent fat content is 3.3 percent right.

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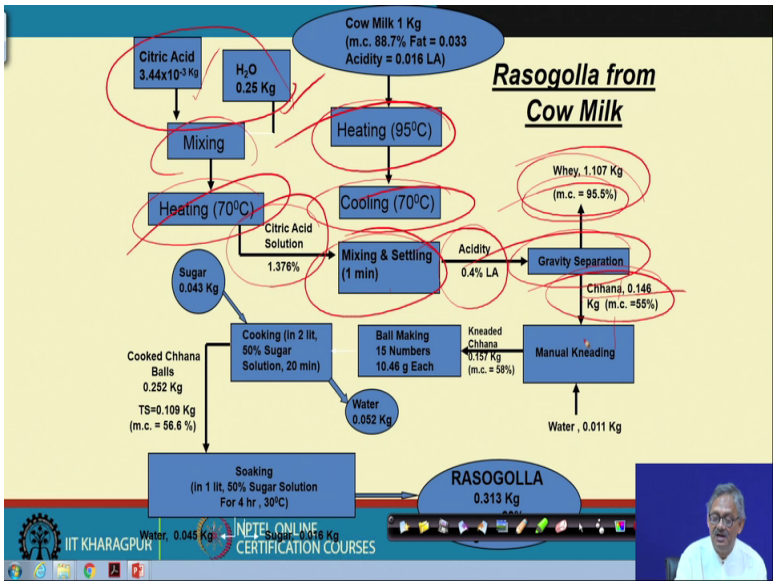

So, that is heated to 95 degree centigrade, cool to 70 degree centigrade, parallelly citric acid solution you have made citric acid 3.44 into 10 to the power minus 3. Water 0.25 mixed heated 70 to 70 degree centigrade, got the citric acid solution 1.376 percent. Then they are mixed and settled a for 1 minute acidity level is 0.4 percent. And you got the whey of 1.107 kg with a moisture of 95.5 percent; this is done through gravity separation. And after separation you got the chhana. Chhana is 0.146 percent 146 kg and moisture content is 55.5 percent 55 percent right.

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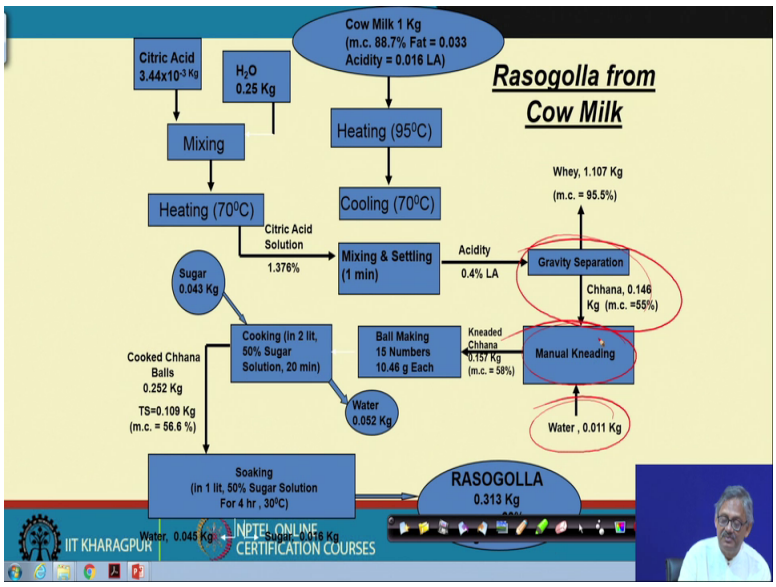

Then you got the basis that is the chhana and this is kneaded and little water is added around 0.011kg. So, that it becomes easy for kneading.

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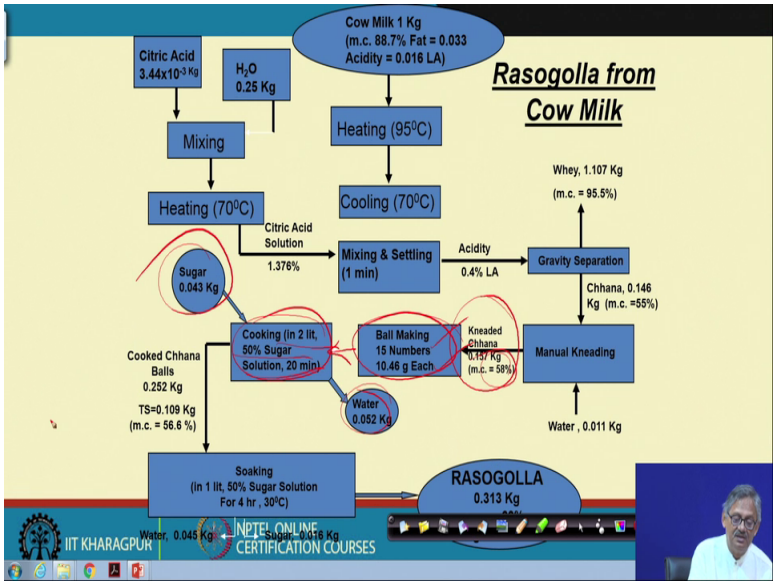

Then kneaded chhana of 0.157 kg with your moisture content of 58 percent is made to balls, is made to balls and this balls were made 15 numbers 10.46 gram each. And then little water this is there is an arrow a little water comes out during cooking. Cooking is done in 2 litre 50 percent sugar solution for 20 minutes sugar was added 0.043 kg and then you got cooked chhana balls, 0.252 kg total solid 0.109 kg with a moisture content of 56.6 percent.

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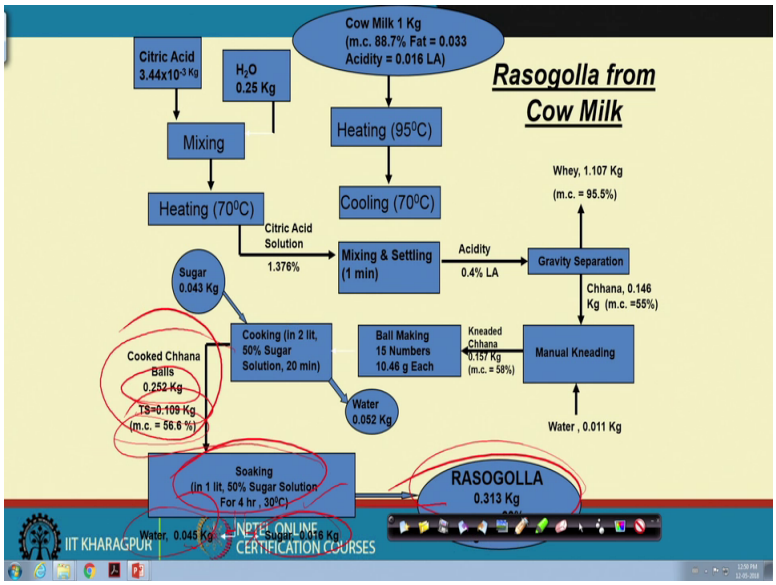

Then it is soaked in 1 litter 50 percent sugar solution for 4 hour at 30 degree centigrade right, for 4 hour at 30 degree centigrade. Then you got water out around 0.045 kg and you also got out a sugar 0.016 kg then you got rasagulla 0.313 kg right. This 0.313 kg rasagulla which you got that is very good in taste and that was rather very good in taste and the shape and size was also absolutely perfect right.

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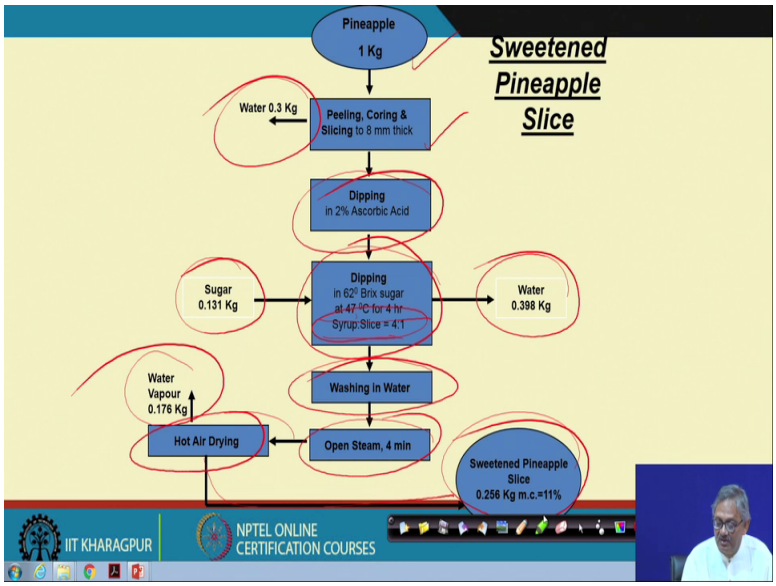

Then sweetened pineapple slice very quickly because, time is very limited. So, we pineapple 1 kg is taken, then peeling coring and slicing to 8 millimetre thick. Water goes

out 0.3 kg, then dipping in 2 percent ascorbic acid, then dipping in 62 brix sugar at 47 degree centigrade for 4 hour. Syrup slice in syrup is to slice is 4 is to 1 some water comes out around 0.398 kg.

Then washing in water open steam pour is given right. Then 4 minute then we it is hot air drying water vapour goes out, in this case sugar is also added before that water is coming out 0.176 kg. So, hot air drying you get sweetened pineapple slice 0.256 kg moisture content around 11 percent right.

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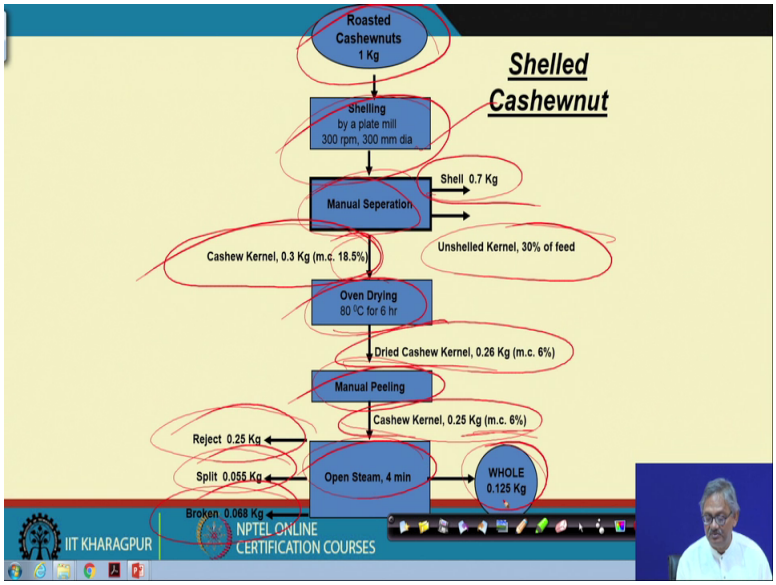

And then last is shelled cashew nut, that is roasted cashew nut a makhana is also there. So, roasted cashew nut is prepared roasted cashew nut 1 kg shelling by a plate mill 300 rpm, 300 millimetre diameter. Manually separated shell comes out 0.7 kg and unshelled kernel is 30 percent feed. And then cashew kernel 0.3 kg with a moisture content of 18.5 percent.

Then oven dried 80 degree centigrade for 6 hours, dried cashew nut kernel 0.26 kg. With a moisture content of 6 percent, then manual peeling is done. Cashew kernel with 0.25 kg having moisture content of 6 percent is been obtained, from there it is open steam is done made for 4 minutes. So, some rejected one is 0.25, split one is 0.055, and brokens one are 0.068 kg, but whole cashew you got 0.125 kg right.

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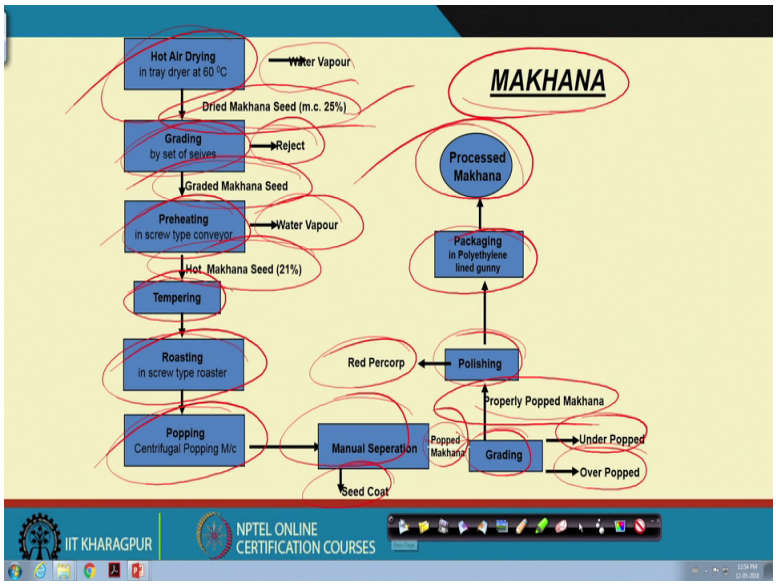

So, the last one which we have is makhana and makhana is a very popular in North Indian dishes. So, what you make that from hot air drying in tray dryer at 60 degree centigrade right. Some water vapour goes out dried makhana seed with a moisture content of 0.25 moisture content of 25 percent. Then grading by set of sieves, some are rejected graded makhana seed then preheating in screw type conveyer water vapour comes out.

The hot makhana seed of 21 percent is obtained then it is tempered, roasted in screw type roaster. Then popping is done in centrifugal popping machine then manually separated seed coat comes out then popped makhana is obtained. And this is then graded then you get under popped, over popped and properly popped makhana. Then that is polished some red percorp was obtained as my product then packaging in polyethylene lined gunny wax. And then this you get processed makhana right.

So, by this we come to the end. And one thing which I would like to share here with you that, whatever we have talk till now, we have tried our best. But please go through repeatedly and appear in the exam. So, this courses under MOOC is University approved, MHRD approved, AICT approved, EGC approved. So, you can compensate some courses at your place. And you can talk to your teachers or head of the departments or principal, so that these courses if you appear and give the exam get the certificate that

can compensate your normal course work right. So, all the best for future, hope you have enjoyed the classes.

Thank you.