Product Design and Manufacturing
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Lecture – 29c
Software demonstration: Plant Simulation (Part 2 of 3)

Welcome to the course

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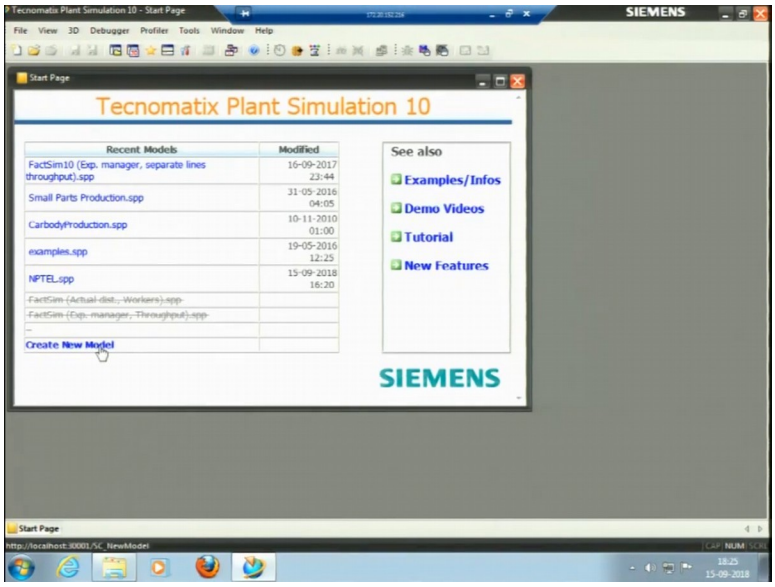

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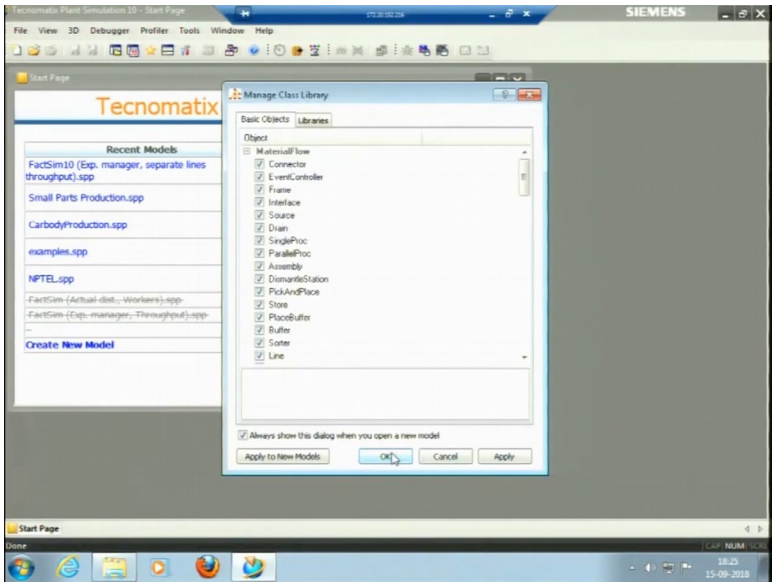

- We first go to the Start page in View Tab and select create new model.

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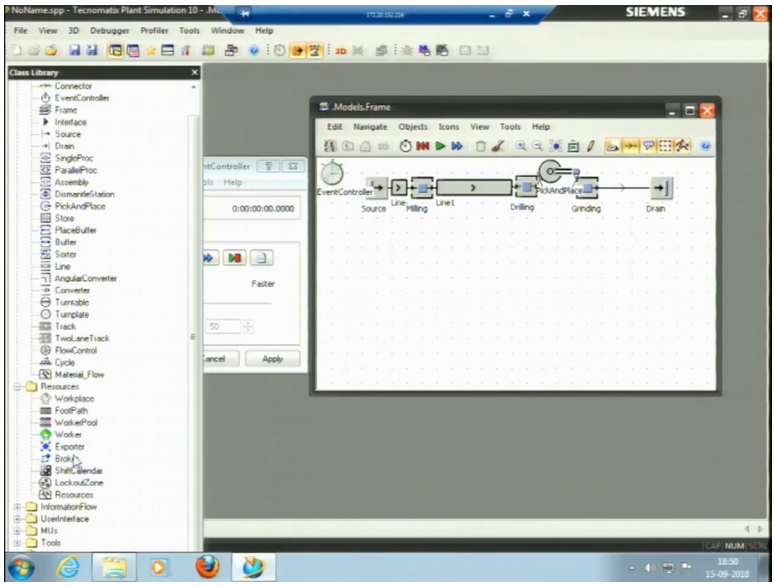

This is the model that I will be trying to generate .

- I will just open the Class Library and then open the Material Flow. There are certain objects here such as Connector, Event Controller, Frame, Interface etcetera, all these objects are present here. These objects have specific meaning, for instance, this is Model Frame, Frame I can say a kind of a room, one room in a factory. One room in a factory means factory in which one kind of specific process is happening and I can move to another frame to another room using

Interface.

- I will try to first tell you what are these objects, Frame as I said you create your simulation models in a frame. We create a simulation model then frame it as one frame, and it is located in the Folder Models in the Class Library. Generally frame is located here(in models) and also other additional models, it is actually the primary location of an object, but it has been kept here for sometime because, if we need to add a new frame we can add it from the Material Flow which is the most used Class Library.

The frames are for the grouping of objects to build a radically structured models by inserting any of the built in objects or any object that we can design because, we can design our own objects in the software as well by writing the code.

Whenever we use frame with Connectors, or Plant Simulation, it opens the dialogue Select Interface, Interface means from which frame to which other frame you want to work in, Interface is kind of a room, I will just put the source here. Source is to produce the part of the sequence which we specify in a sequence table. Source is a starting point or the Entry Gate, Entry point from where the parcel is coming. If the parcel coming in, it has to go out so that is the Drain. Source and Drain has to be there whenever we design any layout. Similar to source we have Drain, the Drain has a single processing station, it moves the mobile units. Mobile units from installation after setting up and after processing , it moves it away. where does it take it? we can put an interface here and take it to the other room.

One important object here is a Single Process. What is single process? Single processing unit receives and processes a single mobile unit, it is known as MU (mobile unit). So, a single process is one process, in the cellular layout, different operating for processing units over there. Tool processing units can be called as Single Processes.

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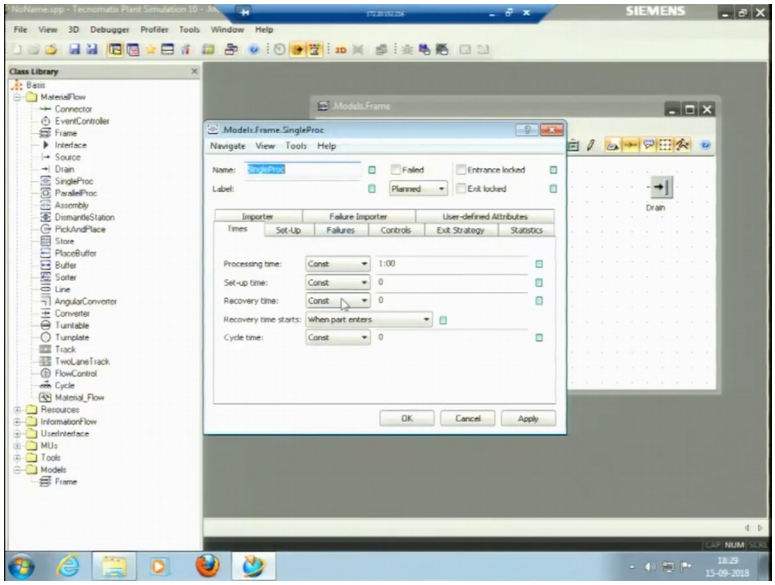

If I right click it and open it, this new window is the single process. I can change the name of the single process; let me say the single process may be Milling, processing time is also there. We can select any of the distribution like the Probability Distributions, Frequency Distribution based upon certain past data that a specific flow follows, with a specific kind of a process follows. The constant mean we will take as 1 minute. The constant format is as such, it is Days, Hours, Months, Seconds and Microseconds Processing time is 1 minute the default time. If I pick a distribution Uniform Distribution which is also known as Rectangular Distribution,

It will ask us to put it in this formats; Stream, Start and Stop. Let me first pick any Processing time, Setup time, Recovery time and Cycle time, these times can be put

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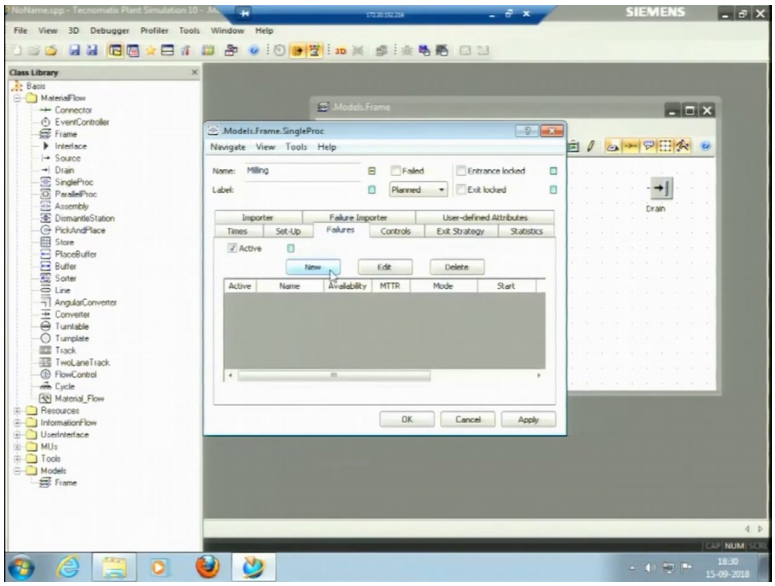

Then also we have the availability.

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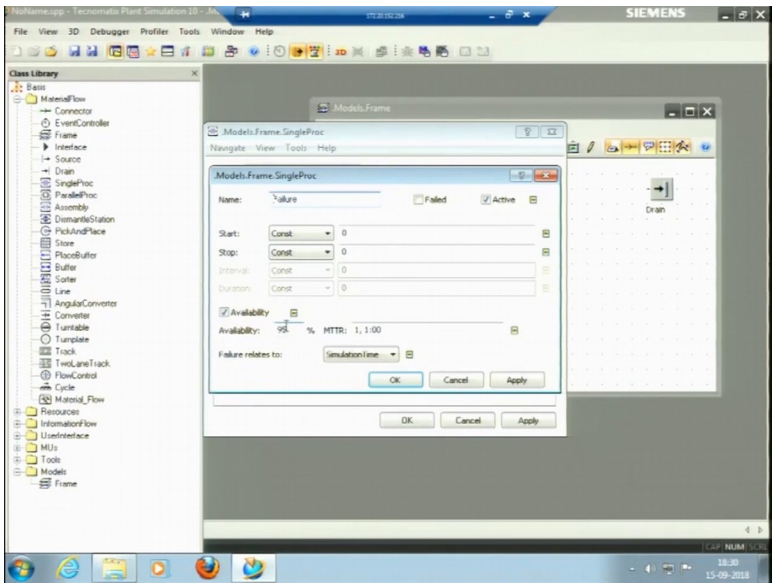

Availability of this process is 95% that is for the 5% of the time it would fail because in actual conditions for 100% of the time, the things are not available, for the 5% of time it might fail, we can change the availability depending upon the process we are working on. For instance it is an Automated machine, Automated machine can be available for the 99% of the time. And if it is some manual operation where Humans are involved; for instance, it is a Counter, at the Entry Counter where the person is there, person has to take some time off.

Or it has to take some time such as he takes tea while working or something like conversation between people. So we can say that during Actual situation the availability of the person is not 100%, but for the 90% of the time it can be available so we can vary this as well. Let me kept it default to 95 only and I will just try to run a simple model. We can have anything, any process or any object on model frame . If we need to find the flow, which flow does it follow? Whether it is a straight line u, s, whatever the flow it has to follow it has to be connected using a Connector. The very first object here is Connector. So, Connector is used to connect 'n' object to the other objects. I have connected source to a single process and direction arrows showing the flow ok.

Now, an important point here is Event Controller. whenever we need to model something we need Event controller. So, I can add Event Controller here from the tab. Event Controller, what does it do?

when your modeling needs require it, you can select settings for controlling the simulation run on the tab.

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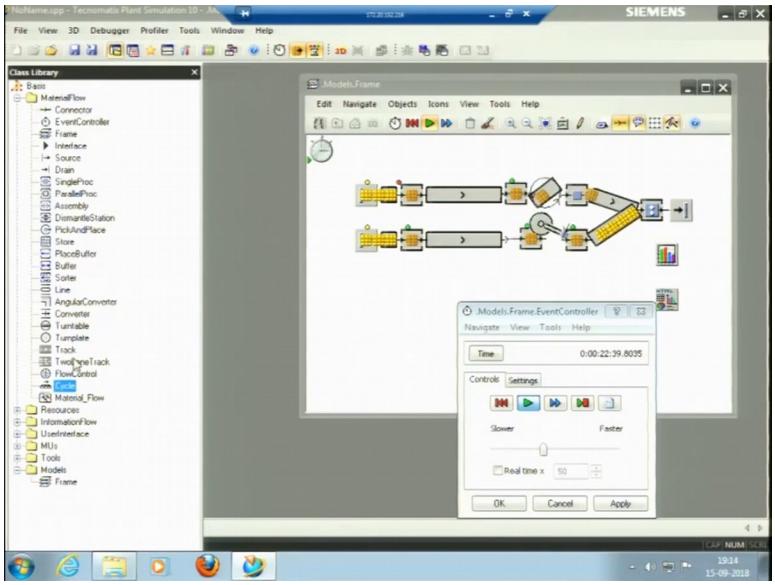

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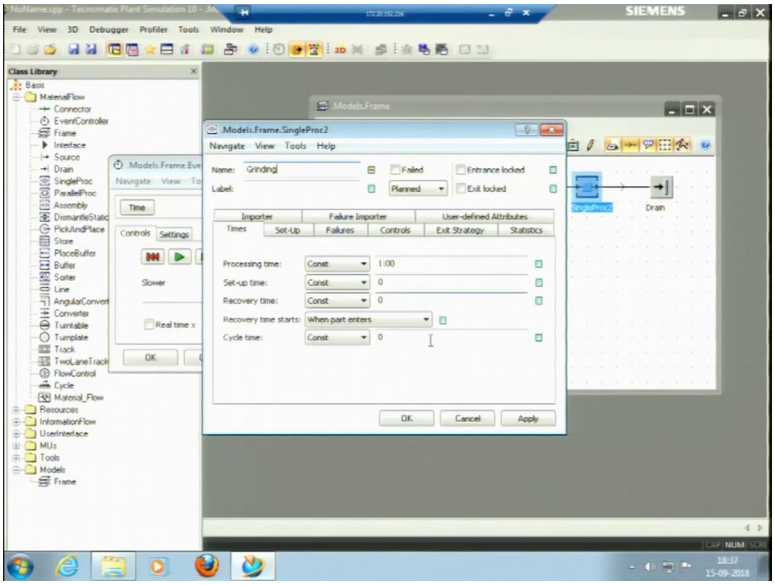

And this event controller for instance, in the settings we can select ,when would the process end.

If we do not use event controller, the process would go for infinite time. Let me try to just put another source here or note another single process here. Let me consider there

are 2-3 processes.

I will use connector to connect them, these are now connected, If I now run this using my Event Controller by using Play Button. Play button for the Start or Resetting the simulation, fast forward is also there, if I run this, it is running at the fastest speed and can check time on top of it . it is in 200-300 and many more days, these many hours. It is running at the fastest speed. If I stop it here, it has run for 566 days based upon the constant processing time, it was 1 minute for single process 1. And for single process 2 it is 1 minute, for single process 3 again it is 1 minute

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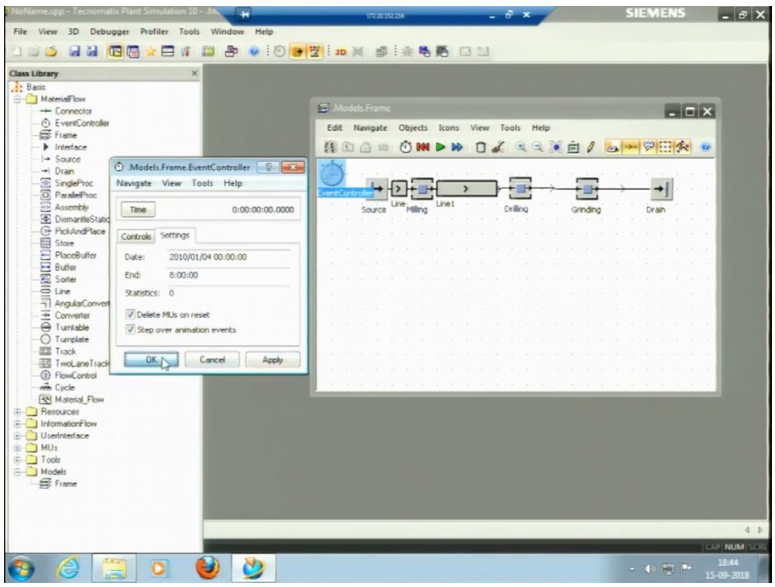

I can see my throughput here in the Type Statistics tab. It has produced 1440 pieces throughput per hour is also given. Throughput complete for 566 days, it has produced 816350 these many number of pieces, there is a big flaw in this flow line, we have just connected, one thing is we have placed the Drain and Process 1 at almost same position. By counting the number of dots, we can calculate distance between objects . It is kept at about 3 meters away from this.

When we put the machines in a workshop, there is a Span(space), for instance in your laboratory when people are sitting, in an office there is span. One cabin and another cabin there is a space designated for that cabin, minimum space this comes under Ergonomics. You know if we talk about plant layout, this is called as Work Study.

What is the minimum space that has to be kept? In case of manufacturing, this space,

the distance between 2 machines not considering the width of the machine, is generally kept from 0.8 meter even more than that.

So, that the workers can move in between. This is the space in between the machines. I have just kept it that random. Now, it is not taking any time for the material to travel, travel from the single process 0 to single process 1. I will name them, call it process milling, so this is my single process. I can pick drilling for second process and grinding for third process.

what is it doing? It is trying to move from milling to drilling in no time. The time taken in between, here the time taken by this connector is 0, again the time taken by second connector is 0 and correct method to do this is to use some material handling system, you know there are certain material handling systems here. We have Turn Table, Line , is kind of conveyer, then we have a Pick and Place Robot. I will try to use them and teach you that how do we use them. I will just pick line which is a conveyer and put it on milling machine.

We can shorten the distance, but we have to make sure that this is connected. Line is connected to process 1, but not connected to process 2 . It can be deleted by just selecting it and pressing delete button, this connector is deleted. We again connect them. Now, if I right click on line icon on model window and open, I can see length of the line is 1 meter and the speed is 1 meter again. What is this speed?

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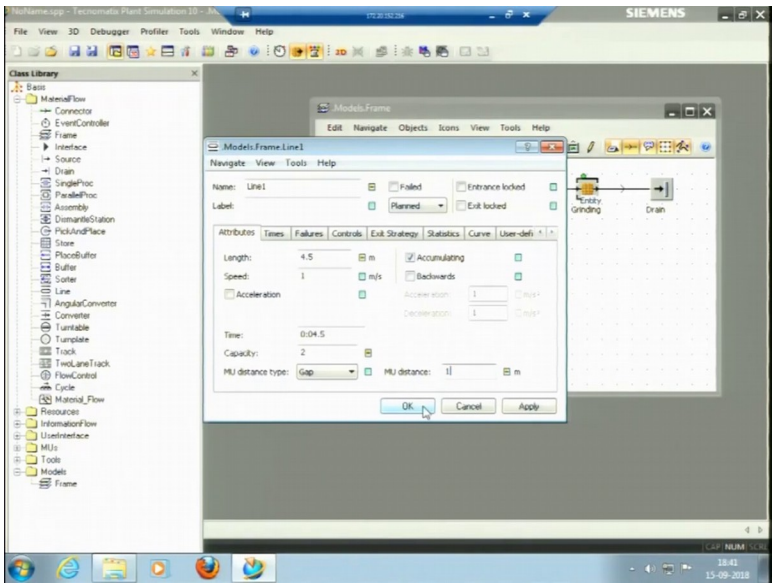

Now, if I right click here and open I can see the length of the line is 1 meter. Length of the line is 1 meter that is and the speed is 1 meter again. What is this speed I will just

let you know; if I put another line here, line is my conveyor ok. I will take this connector off first this connector, I am taking off, delete, yes, put another line here. This is connected by itself. I will extend this line or I can specifically put the length. Let me say the length of the conveyor is 4.5 meters. The grid is on, because the grid is on it will just snap, it will just snap at the specific point, if the grid is taken off now, I can move it at any point but we are keeping the grid on to just to see this. It will take my mobile units; the units which we you can see here, the entities. This entity is a mobile unit that is 1 unit is being moved from 1 point to another. This mobile unit is moved in a speed that is mentioned on my Line (on my conveyor).

The speed is 1 m/s. If I try to see this at a lower speed using event controller. Let me say I like to just see that how a simulation running at 1 m/s or I can just do this in real time, I will put a real time into 10 times. Then apply back now enter real time into 10 times. So, in place of 1 minute it is taking 6 seconds because 6 seconds, it has moved at a speed of 1 m/s into 10 times, it has moved at a 10

m/s. The capacity of the line is only one piece here. If the Capacity is put negative, means not more than one piece. I can put the capacity as may be this line can carry two pieces and distance between the mobile units. Mobile unit can be just kept like as shown, I can put the distance as 1 meter again, Apply, then back, and again run , you can see 2 pieces can come on this line. So, this is the capabilities of the software, if the processing is happening. The green colour here means, you can see the dots, here this is yellow dot, this is green dot.Green colour means processing is happening and Yellow colour means it is being blocked. Block means that the successive process is doing something, successive conveyor is completely filled and the predecessor that is our source here. Or the Entry line 1, is blocked because, the successor is waiting, successor is completely full filled and it cannot transmit material from its own point to the forward process. If this capacity is 2 now. I can just click restart button , remove this Line. And I add another line, because I have to change all the dimensions, I will just try to pick the default values which are there and connected using a connector.In the event controller, in the settings, I can put the End time to indicate when would my process end here. The format is first 0 is days, second 0 is hours, then minutes, then seconds. So, I can put in an 8 hour a day, it should be 08:00:00. Now, my simulation would end at an 8 hour a day, if I put apply.

Here.

Now, let us run, it is running, capacity is one, it is running at the speed that is mentioned here. Real time into 50,

Speed=real time*50

you can see in the real time into 50, it is running or let me try to run it in the fastest pace. If I need to see it in a fastest way, I will just apply. So, let me start, it ran for 8 hours at the fastest speed.I can now see the throughput here.

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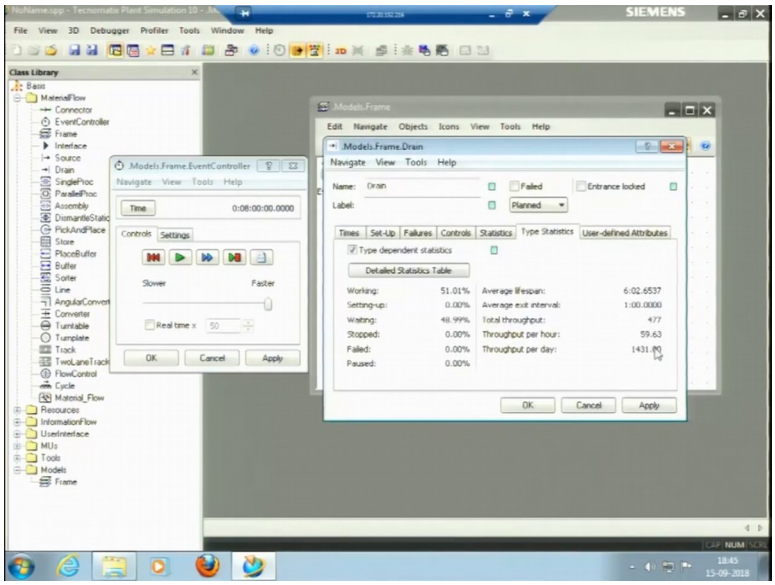

. Open,

Total Pieces=1431

Total throughput is= 477

Throughput per hour is= 59 and

Throughput per day= 1431

For per day it is considering 24 hours in a day. I can see all these throughput and I can even see the reports, I can see various charts as well like at for how much percentage of time the process is blocked, for how much percent of time for the complete 8 hour day, for how much time my process is plot or waiting or actually processing.

Or for how much time the failure has happened and in which process because you know failure is 95 % , at some point of time failure could also happen. All these things can be seen. For that I need to use Resources and also we have not placed anything between Drilling and Grinding.

There is no material handling system between drilling and grinding. I would put Pick and Place Robot,

Now Pick and Place Robot would just pick the material from the predecessor, that is drilling in this case and put it to the successor that is grinding.

How does this work?

Let us reduce the speed first so that we would be apple to understand the simulation. The processing is happening, it will now Pick and Place; we can see its working operation in simualtion.

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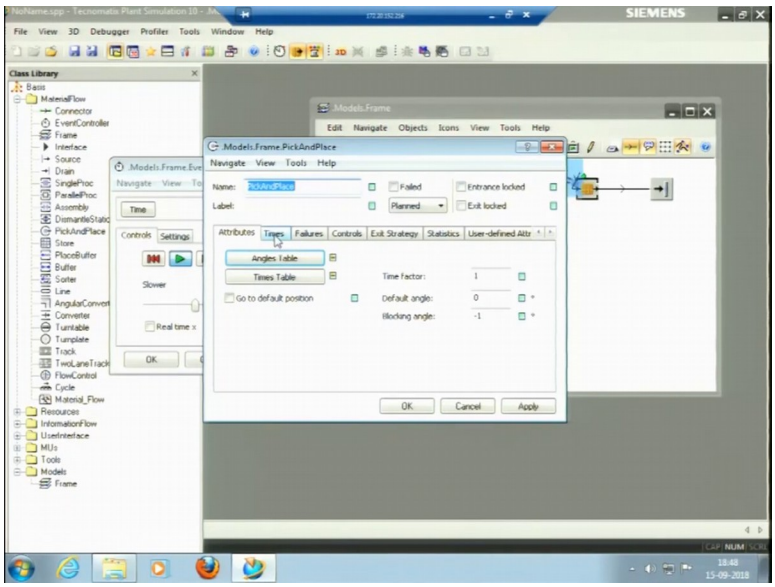

For pick and place robot also, we have this speed control feature; entry-exit

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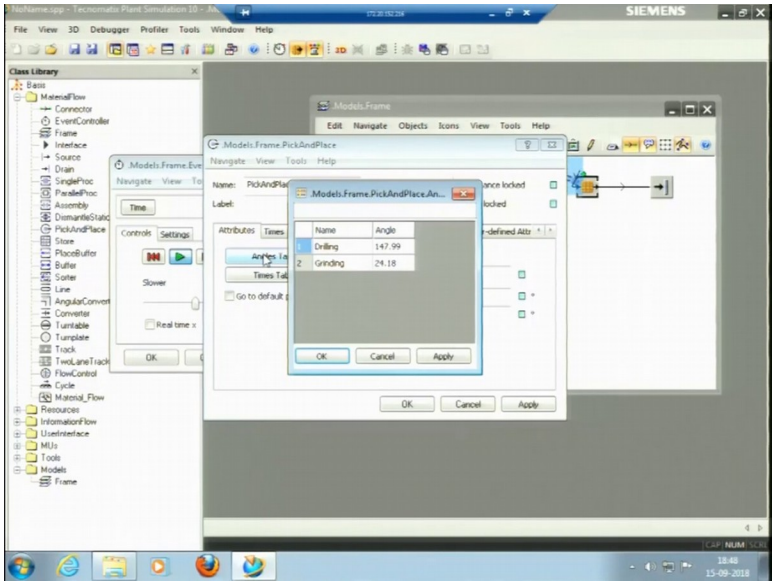

What are the angles? We can also consider the Angles between drilling and grinding also various Times and Failures.

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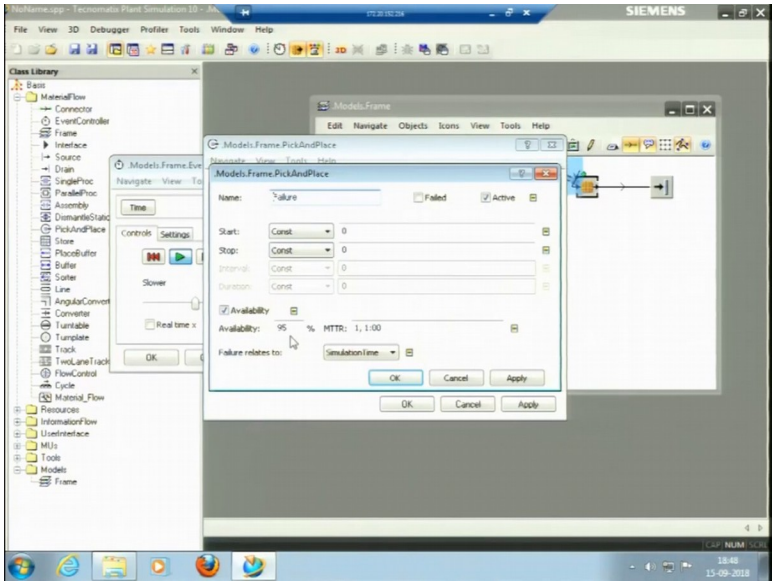

The failure is 99% and MTTR is Mean Time To Repair, This topic is of Reliability engineering. In Reliability Engineering, we have Mean Time to failure, Mean Time between Failure and Mean Time to Repair, if failure happens , it stops, it takes about 1 minute to repair that. So, these attributes we can select.

I will keep it default only beacause it is still running, it runs for 18 minutes and 28 seconds , this is Pick and Place Robot. Let me put this on grid.

Sometime, We can use some resources like the worker and the Broker is there; who was trying to distribute the work to the workers. Workplace is there, Footpath , Work Pool is there. The information specifically has to be defined sometimes, then generator. Let me first try to show you a simple flow line under the User Interface, I have a chart, I will put a report and a chart on model frame screen.

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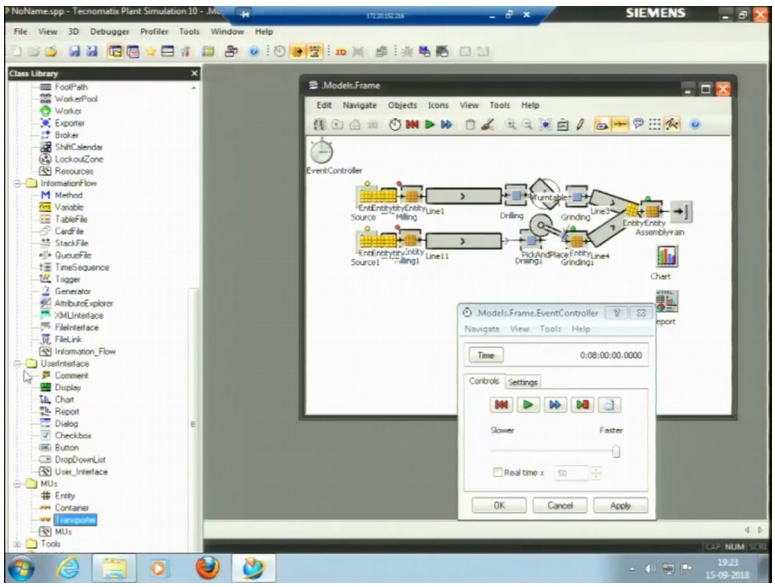

User interface means, its anything that the user could see after the process has run for one time. I have a chart here and I try to just drag my processes-Milling, Drilling over the chart. Now when I run my process it will show this chart.

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You can see this chart it is of different colours, colours are there for Working, Setting up, Waiting, Blocked, Failed, Stopped, Paused, Unplanned ; all these times are there. So, when I run it ,for the 8 hour day.Based upon the time which are put the process, milling. Milling is working for about more than 95% of time and for the rest of time it is just blocked because the next process , drilling or the next conveyor or Line, the Line which was kind of a conveyor, which transforms a material from one point to another point on other machine. that is trying to block milling, 5% is also

block in drilling, but grinding is not blocked, it is waiting for the material to come. It these are working,I can see the exact time; The graph, which is just showing this calibrated graph on right hand side. I can see the exact time using these processes by right clicking and then open.

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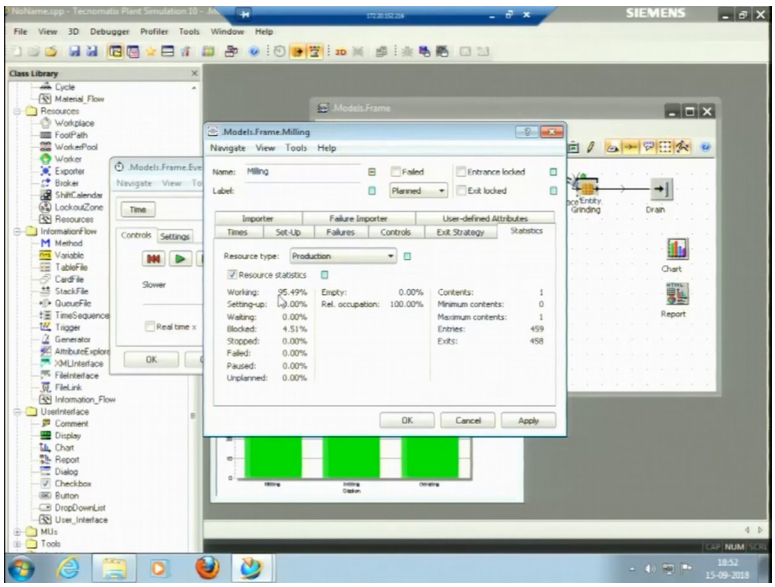

If i open the milling process. Now I can just see the statistics in this process I can see that for 95% of time machine is working and this block for that about 5% which is 95.5% working and 4.5% block, which is represented in this graph as well. Let me try to change the failure rate of milling

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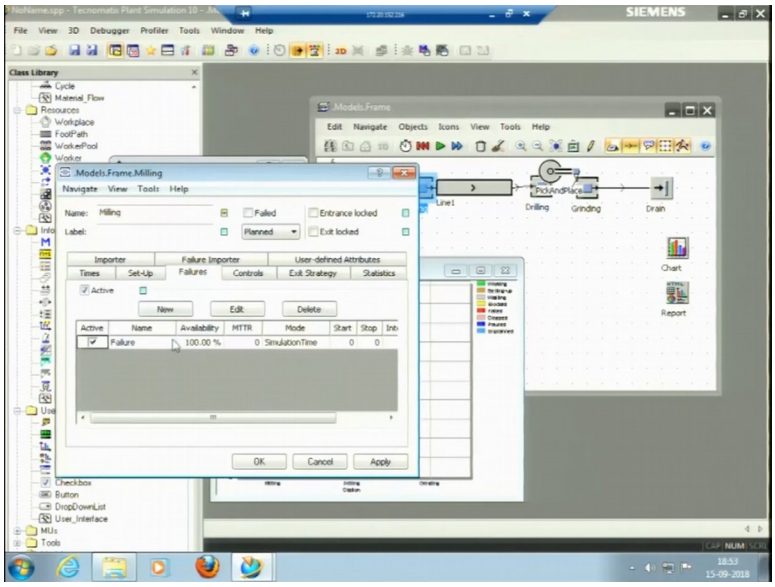

Failures, it is working and available for the 100% of time so I will just change this.

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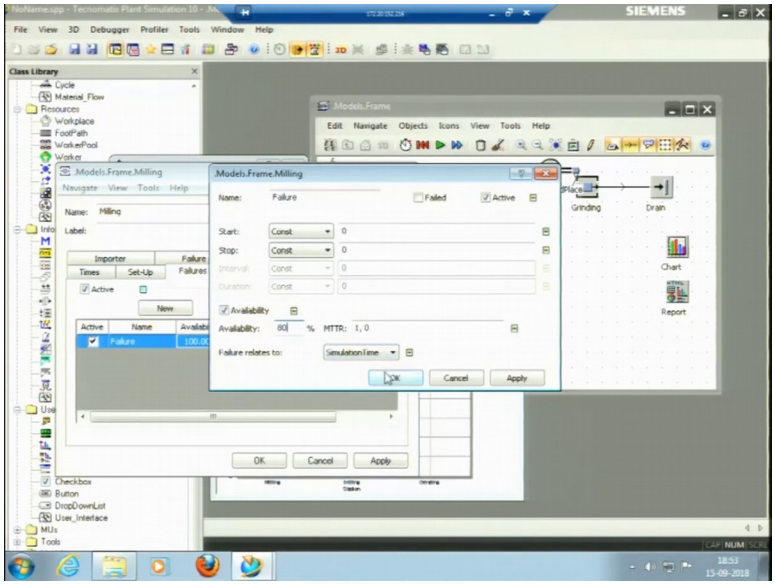

It is written, that is why none of the failures happened, I am changing it to 80 percent. So, 80% of time it is available and for 20% of time, it might fail. Let me apply the changes and again run for 8hours in a day.

What is the statistics?

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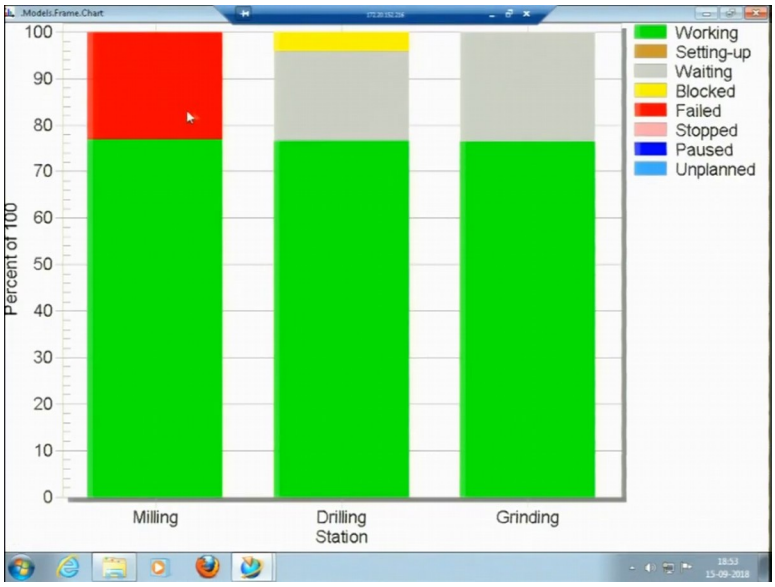

You know for the 20% of the time, this process has failed, you can see the red colour here. You know, had the failure not been there it was working for about 95 percent of time but now 20 % is the failure.

It worked completely for 80% of the time and in the previous process, it was blocked but now actually this drilling process is blocked for 5%, because grinding process was not able to receive that and it is waiting, this grey colour is waiting because it is not receiving anything from the predecessor that is from the milling and drilling is not receiving anything from milling. I can see the statistics here.

You know how much % it is working for, you can see the graph as well here. It is working for 76.60% of time and waiting for 19.34% of time and it is blocked for about 4.06% of time.

This is how we can use Information Flow and also various kind of material flow, how the simulation can happen.

This is just one flow line, I have just picked 3 processes only. This was a very you can say trivial example, but in actual processing , we can use the simulation even we can use simulation experiment.

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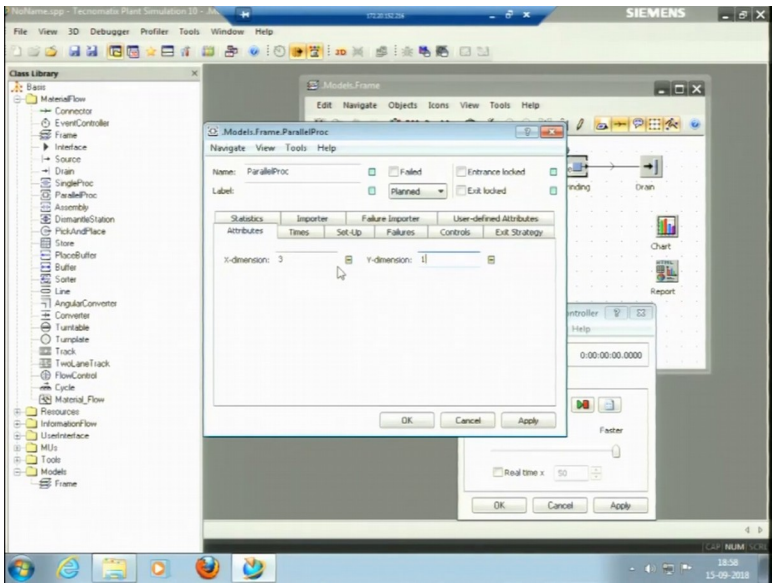

We have done Connector, Event Controller, Frame, Interface, Source, Drain, Single Process is done.

Parallel process(PP), if I put Parallel Process and right click and open, Parallel Process is when we have exactly same machines.

For instance we have 4 drilling machines of same make, which is having same processing time and same setup time and we need not put the 4 machines in parallel specifically 4 single process is in parallel. We can pick one parallel process because other parameters are same, the attributes of this specific process is same. I can pick one parallel process and put there ,it is shown in the form of a matrix here; this is X dimension and Y dimension .

Here, 2*2=4 machines and the times are exactly same, processing time through all the 4 machine is constant i.e., 1 minute. It is the matrix, actually if I put 3 in first, it would not make it 5. We can make it 6 machine as 3*2 , it will make a matrix 3 into 2, 6 machines. What if I need to have the odd number of machines?

For instance we need to have 3 machines, to have 3 machines, what I will do I will put it 3*1=3.

Now, we will understand Parallel Process by an example. For instance; there is one process that is being blocked for 40% of the time; that means, the next process is taking more time for its processing. It is taking an extended time so the other machine has to wait.

what we can do? We can put it by the technical Aspects Management aspects. If we can put another machine or we can double the capacity of the successive machine.

It was waiting for the 40% of the time, if we put 2 machines here as a successive point. Now this 40% of time will get reduced to 0, because now the processing is doubled here. In that case we can think of putting Parallel Processes. Now what will happen, when there is a waiting, when there is a blocking, we can think of adding new machines, we can think of then taking the few machines off and if there is a lot of waiting times, sometime we can even think of doing some other processes like, I said in

case of the process layout,we have a specific set of machines in one section and other set of machines in different section.

Example:

If we see the overall machines time and we see in the specific ,this section for the 30% of time; there is a blockage or for waiting, I would say for the 30 percent of there is a waiting. And we must consider that since 30% of time it is waiting. We can give them some other job, which is the kind of a process layout, it would be kind of a batch production and job production.

In case of Batch Production another batch could enter so that there is no idle time but minimum idle time is there. The machines are completely working for the full capacity if possible. So, we can do this things in simulation before actually doing them in the Scheduling, then routing, all those things, that we will learn in the production planning and control that can all be done using the simulation. So, this was just an example of I have just picked a parallel process ,I will just delete it. So, assembly is that when we have 2 lines, for instance this is 1 line, I can just pick it directly. I have selected everything control+C and control+V(copy and paste) . Now if they are 2 flow lines as shown, I am deleting the drain, suppose I am manufacturing nuts and bolts and I need to assemble them. Nuts are manufactured in flow line 1 and bolts are manufactured in flow line 2 , now we are assembling them. We can use assembly in this

case so, I can pick assembly and put it here, ok let me take this off assembly. We use connector to connect them.

Now, it is run for the 8 hour day and 2 processes, 2 units are being manufactured. First one is flow line 1 and lower one is flow line 2 and these are being assembled here. Similar to assembly we have Dismantle Section, Dismantle section is when something is manufactured or parts coming from drain . We have to dismantle that, for instance; a set of screws come from the source which are just screwed on some component and we have to dismantle them and then we have to use them for some other purpose. So, that we can dismantle.

This is Assembly and Dismantle, I have just showed 2 flow lines here, but we can have multiple flow lines where different material coming for maybe 10 flow lines and those are being assembled. Like in the car body manufacturing example that we saw they were trying to assemble or they were actually trying to put the mirror on the side mirror, and the they were trying to tighten the nuts of the wheels; so those processing was being done so, this is dismantle section.

Next is pick and place, pick and place is a kind of a Robot, it picks and place from one place. So, it picks a part up at one station and places on to another station. So, next is store, a store ,stores the MU's, they are Mobile Units. You can define the size of the store by specifying its X and Y dimension. Like how many pieces, for instance this is the store in between. We can also add the Buffer in between for instance there is a big blockage of the materials in one side we can add a buffer in between. If it does not have the product, process does not have to wai,t it can put a buffer having capacity let me say 100 pieces in a day. So, whenever the next process is free to pick a piece from here, it can pick the piece from the buffer so that buffer can be used here. So, just after store, we can place buffer. Store is kind of a long time storage. This is the capacity 3*3=9 pieces can be stored here. I can just change the capacity to the number which is actually required in the process, we can delete this store.

what is place buffer? This command place buffer, place buffer lines a several processing units of the same kind one after the other. The processing units are connected and the mobile units have to be processed at each station thus they cannot pass each other. So, a mobile unit may only leave the place buffer after it has reach the processing station with the highest number.

To model a buffer with the great capacity that requires high performance, we can use buffer. So, place buffer is a smaller thing , big buffer is a buffer placed between 2 plant component that certain purposes. It temporarily hold parts when the following components fail, when the successor is not able to receive the component. So, it passes the path, the second function it does is an important function, it passes the path on, when the preceding components stop working, it slows down dimensions of a buffer with a large enough capacity for covering all failures is to complete, decoupling of the plant and the other attributes as well. Next is sorter; sorter as the name suggest, a sorter arranges the Mobile Unit by sorting the criteria we define.

We can define the criteria for instance if I am having the nut and bolt assembly. Then nut we manufacture and bolt we manufacture and on 1 bolt I am trying to assemble 2 nuts on it, So, what sorter can do is , it can pick 1 nut where from the bolt line, it can pick 1 bolt or it can sort it to the different lines. So, a sorter we have to define a criteria it can do that. So, line is a kind of a conveyor, to draw this straight line with active drawing colour. Then it is Angular Converter;

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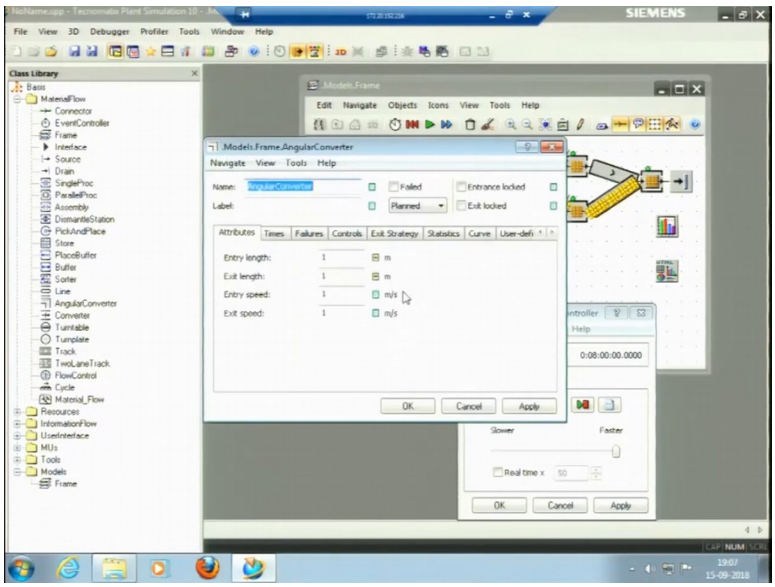

So, you can say Entry length, Exit length, Entry speed, Exit speed. It is of 90 degree for instance if we need to have the kind of a U type of layout. U type of layout would be like this. We need to have turn, we can use this Angular Converter, it will convert from one line to the cross size. You know this direction is 90 degree here. So, angular converter move the parts to its successor within the flow of measurements like, it

moves the part on to the first length of angular converter.

When the booking point length has reached the entrance. then angular converter,the part drives along the Entry length, Entry speed, Exit point all those things we can control. I just showed attributes of this specific object. The next is Convertor. Now what is convertor? Convertors intended for modeling, material handling equipment when the part moves onto convertor it either passes straight through the conveying direction. Or it is lifted on to a laterally moving transport level, by lifting mechanism and then conveyer laterally to the left or laterally to the right.

Angular convertor was just one thing, it is just convert direction from one direction like 90 degree. A convertor can decide(we pick) whether to go straight or whether to change a direction so it can work in that end. Turn Tables here for modeling, a rotating platform. It is rotating platform which turns a part around and moves on to the several connecting material, similar to turn table we can have turn plate.
I will just try to put a turn table here, I will delete this pick and place Robot and try to put a turn table here, now how does this turn table work? I need to put the connector I need to put the connector here. It is now moving at some speed that is defined now processing would happen. Now turntable would take it from one place and turn it to the other place.

Now, what happens sometimes we have to swap the work pieces, this work piece on this side, other workpiece on opposite side. It just pick the pieces from this point and then swap them. Similar to turntable we can have turn plate, we can just put one piece on each direction in turntable, it is a single direction turntable that is being shown in the screen. In Turn plate we can have one plate or we can have multiple work pieces put on the origin. It is like kind of a rotating dining table that we have, we put the dishes over there and we can rotate it, we can pick whatever we want to pick.

Next is track so, track can be used to model a part of a transport line with or without automated Routing, on which the transporter moves, the part for example, you replace both the Automated Aided Vehicle System and for the model we can use this track. So, the distance which the transporter has to travel on the track is defined by tracks length. The tracks length can be defined then the transporter Mobile unit length can be defined, the speed can be defined. So, the maximum capacity unit track is defined by

its length and the lengths on the individual transporter moving on it can also be defined that is the track that is 3 meters long, accepts 3 transporters of 1 meter each.

So, we can have certain kinds of track, such as the turned track or two lane track. One lane track is one which with only one direction, in two lane track ,it can go in one direction and come back from the other side(direction). It is kind of a two way road like we have two way track can be put in, then flow control.

What is flow control? Flow control allows the model common strategies for splitting up and for bringing together the flow of materials. It is important to note that the flow control does not possess the mobile units. It only distributes them among the objects that it's succeeded in the sequence stations. Flow control is like it does not store any Mobile Unit, flow control is for instance I am having a central O here and O kind of layout and there certain lines here .

So, flow control can do, it can just control at different positions, It can just control the flow whatever line, this is my ' O' ,there are lines external to this.if we use flow control it can control flow by providing to differernt external lines.

after that We have cycle. So, I just cannot show you the actual demonstration for all the objects here.

I am just giving you important objects information, I will come to resources here. Resource is actually work place if we need to work with the workers we need to put the work place, For instance in place of this line, I can use workers to transfer the material from process milling to process drilling. So, where the worker has to work would be the work place.

If some worker simulation has to be induced some work is there ,that is we have just taking the processing time. The machine is automated it is taking 1 minute processing time, we are just considering it here. If the worker has to work here and the , Still the worker capacity, the ideal worker time and the normal worker time those things are to be considered, then this workplace is to be put there, between the workplace, we need to put footpath, you can see the footpath from Class Library and I am picking footpath from Class Library and putting it on the Model Frame. Workers have to travel through this footpath, to model with worker, we need.

to have a Broker, who would distribute the work to the workers, then we need to have Exporter as well. So, we can work with the workers as well.

Some important points method, card file, stack file. This is the information flow all the information will flow through , we can define the attributes here and see how all the information could flow. Some of the information flow object would be method like variable, variable is when we can work on the source code, I can if I am saying that we can make our own objects, if we can understand the code; so there we can add a variable. In variable we can declare a local variable anywhere within the source code. then we can start to declare our own variable with the keyword, let me say the one of the variable sum is known as may be integer or track 1, track 2, we can name them anything we like. Then we have table file, table file is a list of list with two or more columns, it is a kind of a table like normal table we have. So, we can access the individual cells by employing their index that is by their positions, for instance, the cell number 3 -1, cell number 3- 2 , these can be accessed.

Then we have card file, card file is the list with one column providing random access to the contents of the individual cells using the position i.e., row number, or imagine the card file, as a file card box. Next we have User Interface, in user interface we can have comment, we can put some comments. We can have Chart, Report , when we run the computer simulation we can publish the report of the simulation as well. In report we can publish the complete report, in the complete report we can have the list of these diefferent machines.

If I just show my comments here the machines-milling, milling1 all the chart that are the same, those can be put in there. The time for which the machines were working, those can be seen in the report, these things can be produced. These mobile units are there, mobile units are the units which were being used as an entity.

This mean this yellow pieces, there are entity. So, similar to entity we have a container. Container has a capacity, for instance from the conveyor we are not taking one mobile unit; if conveyor is taking a container which is containing a few mobile units or

few entities actually. Entity is shown as a block, a kind of box. The entity can be the car that we have just saw in the car body simulation model. Transporter is there so, in place of container the transporter, sometime the conveyor is fixed . The transporter is kind of a small trolley.

Small trolley which has some capacity, in this we can just put the pieces and take them along. So, then we have Tools here, Tools are Bottleneck analyser, some bottleneck analyser like we have just visualized, the bottleneck in the charts, in the example that we have just seen here. But bottleneck analyser is also that will show this is the primary bottle neck and this is another bottleneck.

Then experiment manager; so, I will pick one of these bottleneck. I will pick experiment manager, I will try to explain you certain simulation

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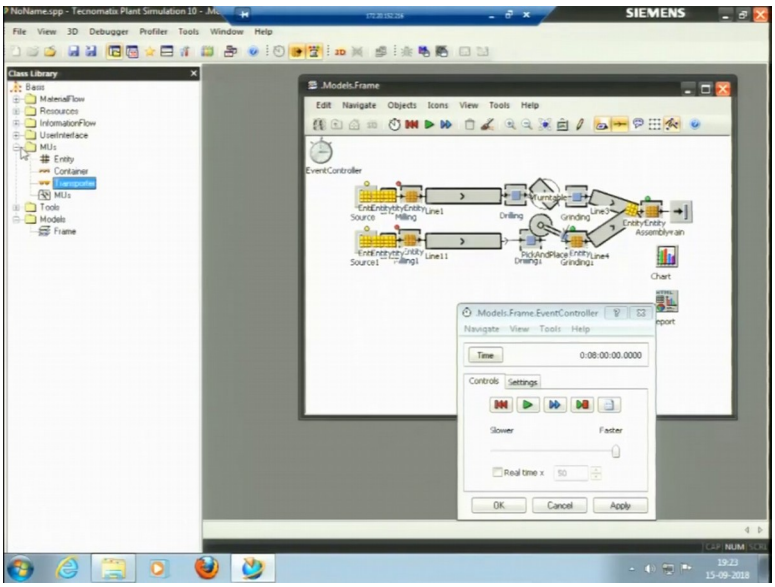

So, these are the some of the tools which are used in this software, there are some of the objects.

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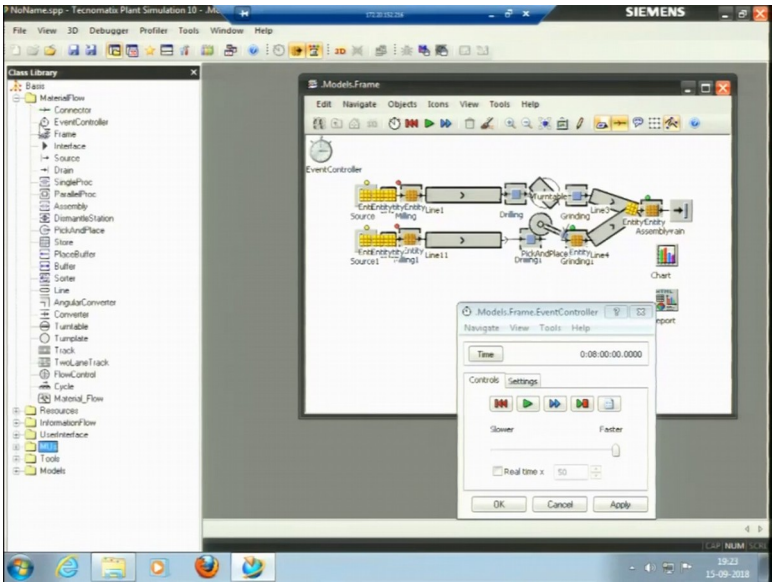

So, now I will try to pick some examples and try to explain you how do we use certain tools. These tools are just to design the process. The material flow tool is just to design the layout.

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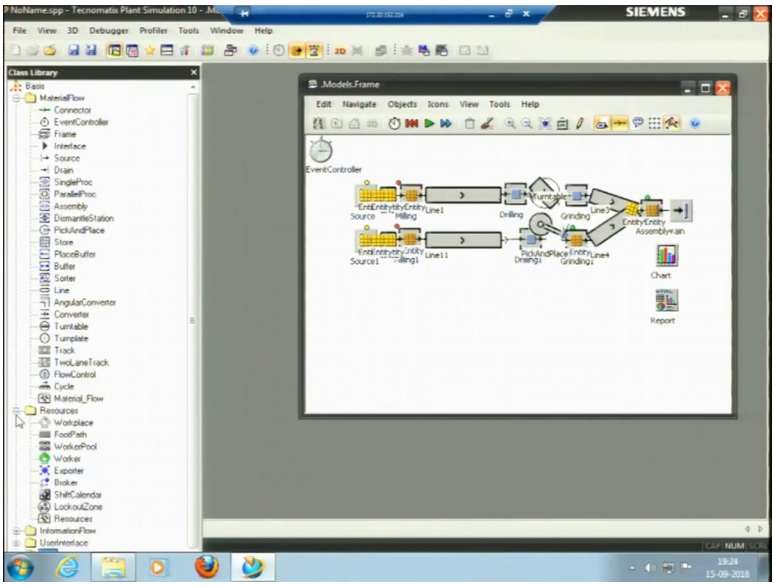

Then important tools resources have just tell you resources are just the workers or exporter broker which are used.

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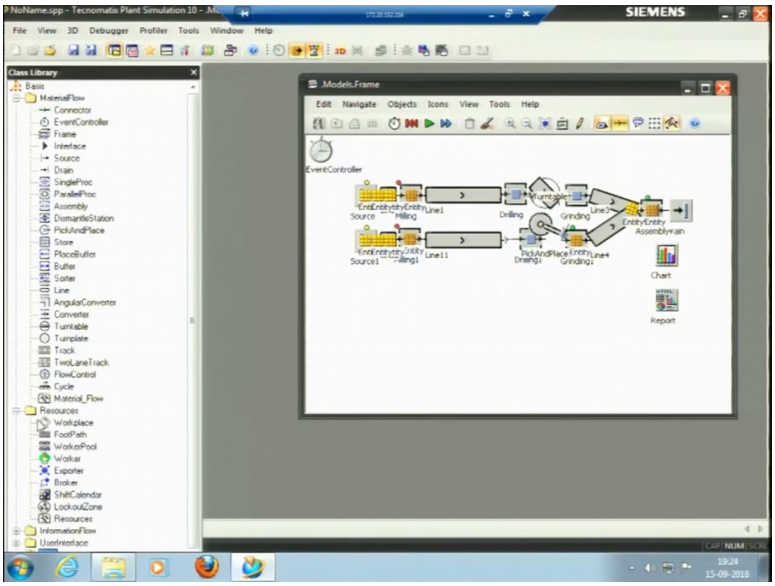

The information flow, how do we use the information?

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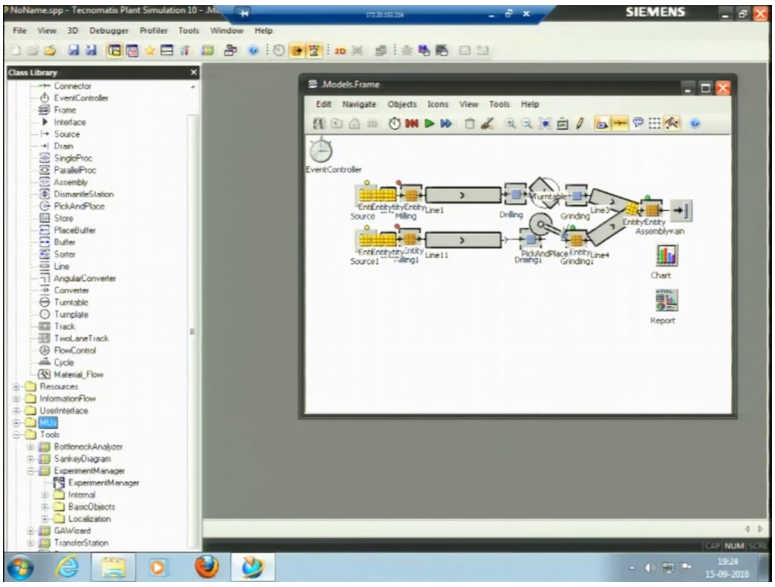

then the tool, Experiment manager, what does experiment manager do? It can simulate the specific process, the various box plots or we can have the simulation and the depth of simulation, those things all could be done .So, I will have to stop here and thank you for being in the course. So, we will meet next time.

Thank you.