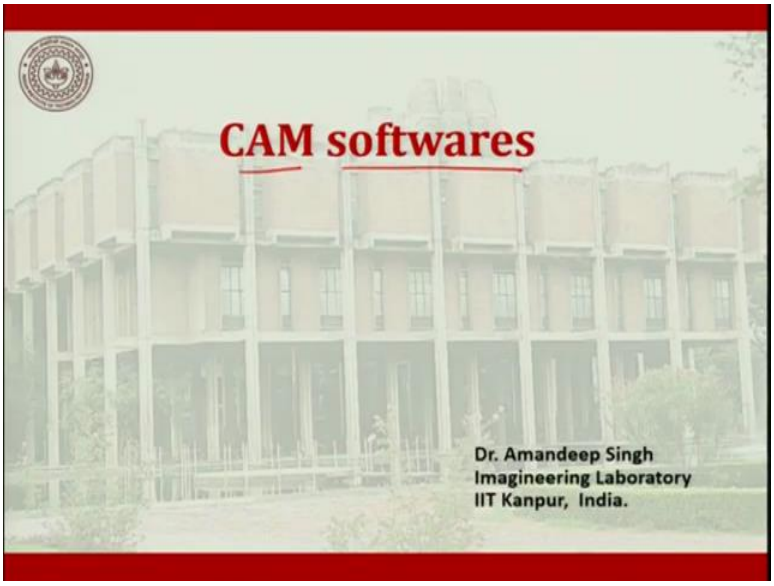
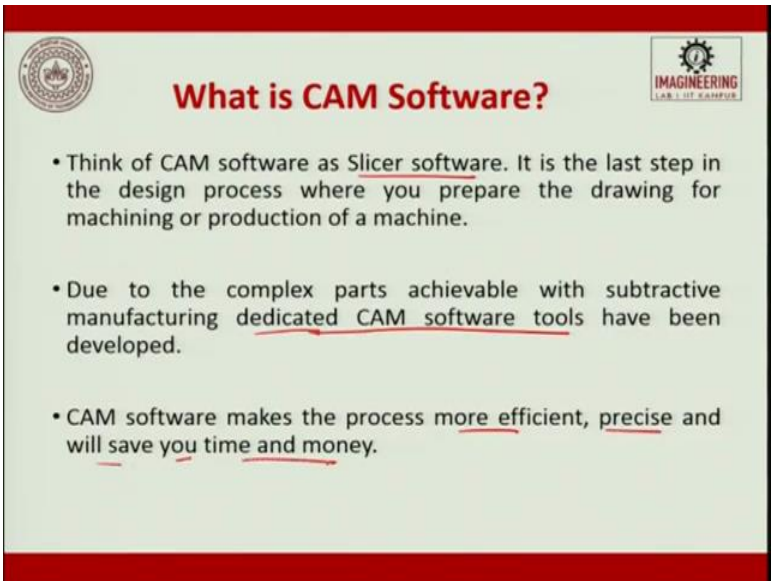
Computer Integrated Manufacturing
Dr. Amandeep Singh Oberoi
Imagineering Laboratory
Indian Institute of Technology, Kanpur

Lecture 25
CAM Softwares

Hello everybody, welcome back to the course on Computer Integrated Manufacturing. We had been discussing the CAD and CAM in the last few weeks. We had discussed Geometric modelling, Computer graphics then we have discussed about CNC machines. In this week we are discussing about the CAD and CAM softwares and demonstrations.

(Refer Slide Time: 00:39)





This lecture is specifically about the CAM softwares, Computer Aided Manufacturing softwares. The certain CAM softwares available in market I have just picked a hand full of them and try to tell you what is the difference between, what are general softwares very prominently used in the market.

So, first of all what is a CAM software? Think of it CAM software as a Slicer software as it is said. It is a last step in that design process where you prepare a drawing for machining or production of machine. So, what happens risk may be a milling machine, or may be a CD printer or so the CAM software actually brings your data into life that is an interaction between the model, that is CAD model that you have and the machine that is there.

So, it is very important thing to consider or to pick the right software like suppose, it all depend which software to use that will discuss at the end of this presentation. So, due to complex parts achievable with subtractive manufacturing dedicated CAM software tools have been developed. The different kinds of CAD softwares accordingly their certain CAM softwares which fit well on them.

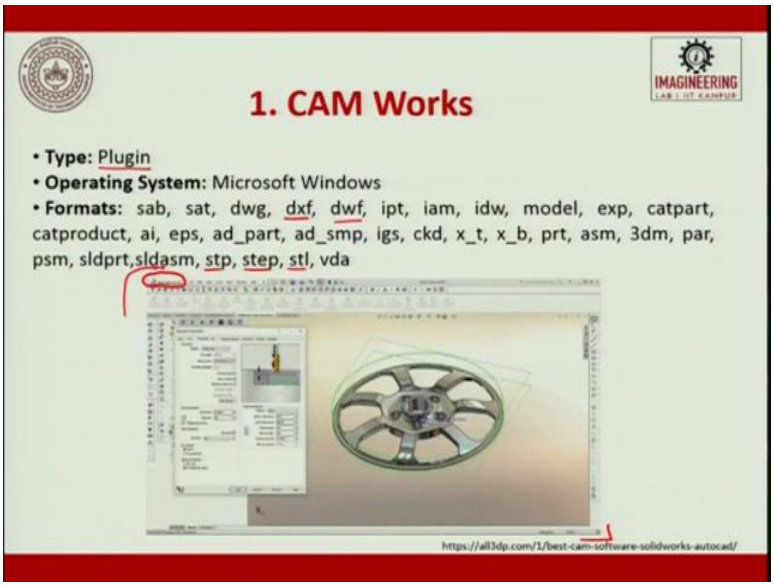
So, CAM software create precision complex parts with advanced CNC programming, they solve complex problems with dedicated CNC strategies sometime, they maximize CNC machine efficiency and part quality like automatically avoiding collisions, then simulating and verifying and optimizing the motion of CNC machines and industrial robots improving productivity with light-outs machining minimizing the lead of manual polishing and so on, there are so many

advantages because, of these different CAM softwares are there. So, they actually make the process more efficient, precise and will save you time and money.

(Refer Slide Time: 02:44)

Now, which CAM software to use that we will discuss. So, these are a few popular CAM softwares CAM Works, CATIA, Fusion 360, Master CAM, Power Mill, Siemens NX Cam and Solid CAM. Let us try to see the features of these one by one.

(Refer Slide Time: 03:04)



CAM Works the software type is Plugin. Now, there are three major types Plugin, Stand-alone and Built-in, what is a difference? Stand-alone software is separate software that you procure separately then any of the CAD software or any of the machines that is completely stand-alone software like Power Mill software that has been is stand-alone software when it was will Delcam.

Now, the power mill is taken over by Autodesk it has become a plugin now. And what is Built-in? Built-in suppose, you purchase CATIA, with CATIA you get the CATIA software as well, CATIA CAM software as well that is built-in the CAD software as well, built-in module in the CAD software as well.

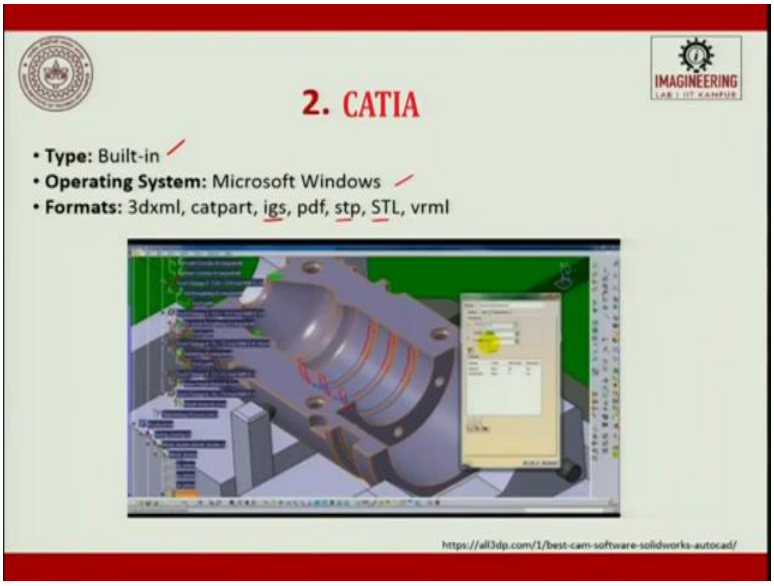
So, again built-in, plug-in and stand-alone, they are three types of the software. So, this software is actually plug-in the operating system is Microsoft Windows and the certain file formats that is supports. This file formats the major of them dxf, then stp, step, stl, these are the major file forms, so that are used just dwf, dwg is also majorly used.

So, there are certain software this is an interface of the software. Solid works drawings are very capable to be worked upon it is I can say it has an interface with Solid works that helps it to be very highly used in the market not able is the interface Solar works is there. So, CAM works is one of the own modules of the solid works it is way for solid works and Solid edge and it harnesses the same geometry to generate tool paths, this insures the path that you machines is the same path that you modeled.

So, another merit of the software if we say this is an integrated CAM software is that it changes to the design that are automatically translated to the tool paths, that any changes that is made through the design automatically tool paths gets changed this save you time and money to tools part to generate new NC code. So, CAM works supports automatically feature recognition, a time saving tool that enables scanning, identifying and itself creating machine able features from your design.

So, it can support up to five axis of simultaneous machining, then making the this makes the CAM software perfect fit for a wide variety of application, virtual machine is also there in the software that is the simulation tool that allows you to check the problems like the collisions, that might occurred to verify by the G code is written correctly or not.

(Refer Slide Time: 05:57)

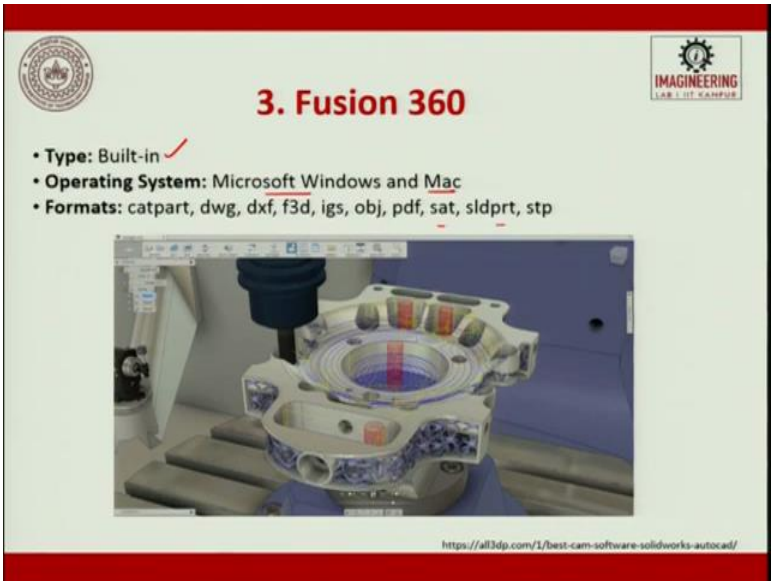


The similar one of the software is CATIA. CATIA is a built-in software operating system by Microsoft Windows it supports these many formats igs is major format that is used. This is a interface major interface of this software. This CATIA the full form for the CATIA if we say it is Computer Aided Three Dimensional Interactive Application.

This was basically designed for automotive ship building, industrial equipment and architecture. So, this is also multi-platform application that covers all the major fields of the manufacturing such as 3D CAD software, then computed engineering, software sit and highly advanced CAM. So, CATIA supports high speed machining operation, it also supports up to five axis of the machining and spiral milling, then Z level milling.

So, many different kind of machines are there that can be taken care by the software. The CATIA is the way to go actually it is developing so fast. So, CATIA is a very important software, CATIA is very suggestable software if, we are looking for an industrial manufacturing processes.

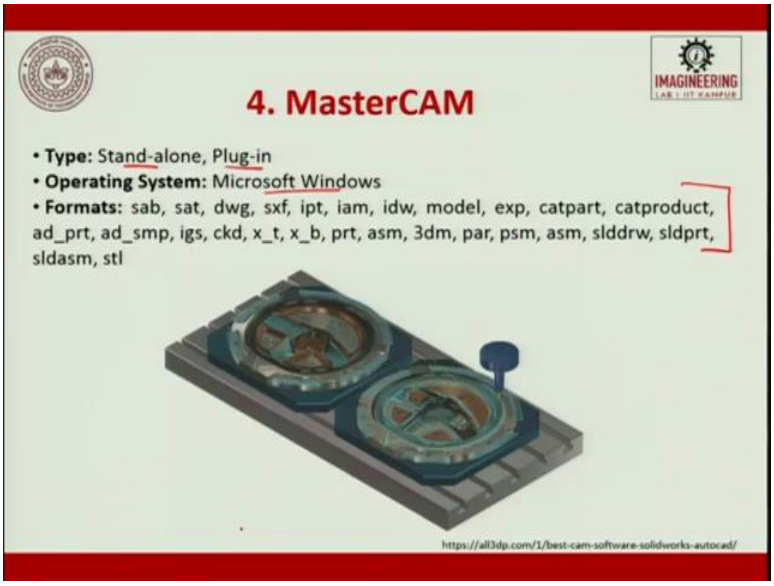
(Refer Slide Time: 07:11)



Now, next is Fusion 360 like Solar works upon the parts fusion 360 works upon the assembly is majorly. So, Fusion 360 is an assembly or a integrate with system this is a built-in CAM that is in fusion 360. So, it works with Microsoft Windows as well as Mac. So, certain formats are there that it supports.

So, it includes comprehensive CAM software tools integration of CAM into advanced CAD program effective link is an oral productivity. So, unlike other professional solid body 3-D modelling software, Fusion 360 is very strong in usability, it covers the whole process of planning, testing and executing a 3-D design, it is powerful parametric tools and analytic mesh tools that are well suited to the most challenges in the industrial design. So, also it is able to simulate both the construction of the components design as well as the stresses that these component would face once they are put into use.

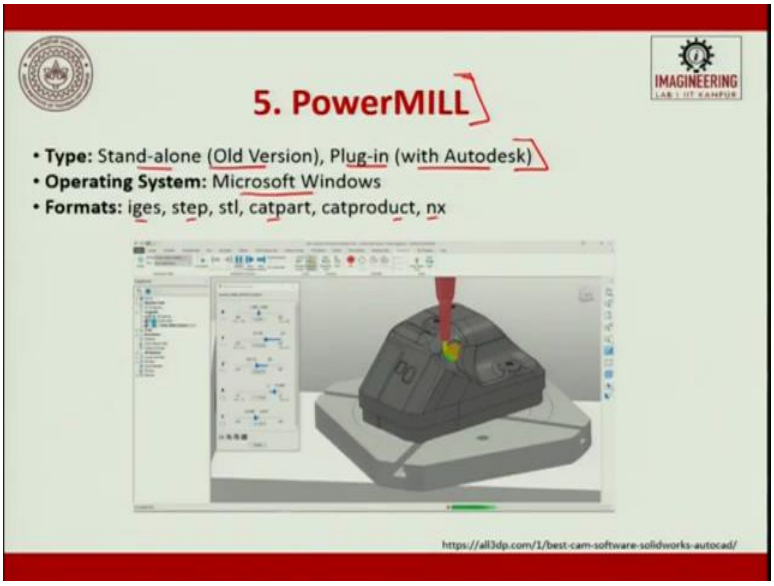
(Refer Slide Time: 08:15)



So, one of the very probably used software is Master CAM, this is both stand-alone and plug-in, operating system is Microsoft Windows there are so many platforms, so many file extensions that it supports. So, Master CAM is majorly known for its nesting, it can however do 3-D milling, nesting, engraving and all these things up to 5 access of machining.

So, nesting creates efficient interlocking parts that assure optimal material usage for the high possible needs it is feature based machining evaluates a path feature and automatically designs and effective machining strategy. So, this is also a stand-alone CAD CAM software the CAM portion is also available as a integrate CAM solution. There are so many applications are therefore the software, next is Power Mill.

(Refer Slide Time: 09:12)



Power mill is software for which we will also see the demonstration in the laboratory demonstration session in the next lecture. The Power Mill that we have in the laboratory is Dell CAM Power Mill that is a previous version of CAM power mill. Now, that was a stand-alone software that we have here in the laboratory.

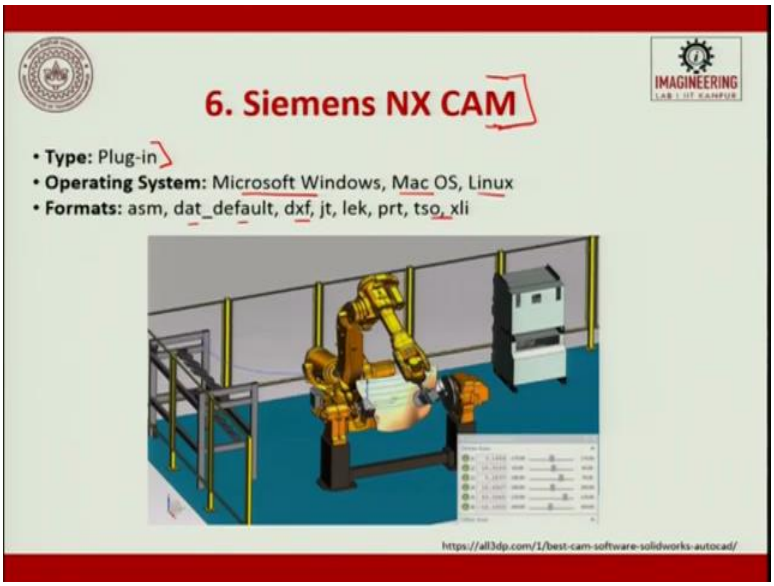
Now, the Power mill is plug-in software it is written old version stand-alone and the new version is plug-in when it is purchased by Autodesk, it works in Microsoft Windows and these are the platforms that it supports. So, Autodesk being the leader in the industry though they are specific application for which different kinds of software had been developed but yes AutoCAD is the one of the beginning softwares.

So, Autodesk is still taking care of so many things nowadays as well. So, Power Mill is one of the biggest software were one of the most used softwares in the history I would say and that is now taken by Autodesk. So, this CAM software also features in large library of post processing procedure for the most popular machines, it checks the motions of your tools in the details simulation to ensure that your equipment will not be damaged this we will see when will see the software demonstration in the next lecture.

In addition, Power Mill also brings comprehensive analytical tools to the table that allow for instance to identify un-machined stock that is not machined properly. So, one of the inignorable feature of the Power mill is that this count CAM software is native import of the third party file

format like Siemens, NX CAM or CATIA it preserves the association with this softwares as well. So, this means that you can change your design in one of these programs and a Power mill will be then update a tool paths accordingly.

(Refer Slide Time: 11:13)



So, as I just mentioned Siemens NX software this is a plug-in software it works in all the majorly available put-in systems like Windows, Mac and Linux. Siemens go way beyond just being a CAM software we will also discuss about the Siemens Plant Layout softwares. We will discuss about Siemens PLM, Siemens PLM includes everything, what is PLM Product Lifecycle Management.

Siemens PLM software includes the design, then manufacturing that is CAD, CAM then after the manufacturing is set manufacturing when I am saying here it is just about the machining it takes care of the machining or 3-D manufacturing or subtractive manufacturing or to say additive or subtractive.

Then it takes care about the layout for them affecting it as well factory then, it takes cares about the ERP Enterprise Resource Planning. So, all these modules that taken care by the Siemens. So, being a part of the biggest version or very big system or we better call it system of systems Siemens NX CAM becomes an icon.

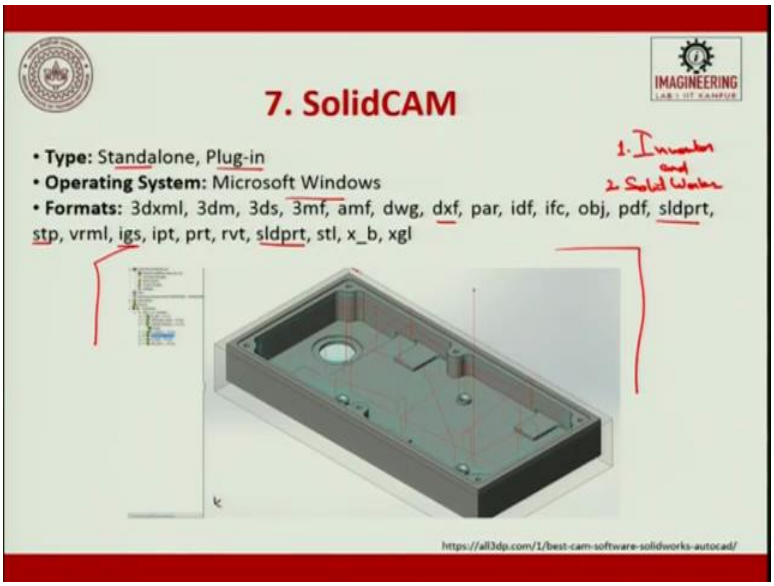
Siemens NX CAM can be used to setup and to control entire manufacturing cycles for milling or turning machines. For example, it provides a solution for automatic stamping dice and incorporate numerous industry best practices for automating the design and the sizing, validation and

accommodation of electrodes, so many things can happen some of the people who use this softwares they claim that it features based machining can dramatically reduce the programming time. So, this software can attain this by automatically recognizing and programming machine feature types.

So, it has so many things it can virtually simulate the physical step of the process this can allow you to discover physical conflicts between machine limits and collisions with a fixture like other softwares. So, there are so many things this software can do, also it can discovered the areas that are either underutilized or over utilized, under machined or over machined these many things it can do.

I will discussed during the plant simulation demonstration where we will discuss about the plant layout and computers in plant layout and smart manufacturing. We will discuss how does utilization factor is also discussed also taken care by Siemens, Siemens I would say that is note Siemens CAM that is Siemens plant simulation. So, that also we will discuss.

(Refer Slide Time: 13:44)



Now, the last software that I have picked to discuss here is Solid CAM. Solid CAM also comes in stand-alone and plug-in types the operating system is Windows. It supports the normally used formats these what I have underlined. So, this is an interface for the software Solid CAM, this integrate directly into Solidworks and Inventor as well inverter is also one of the CAM software, inverter and solid works. So, this does not mean that you can just programme to link paths from

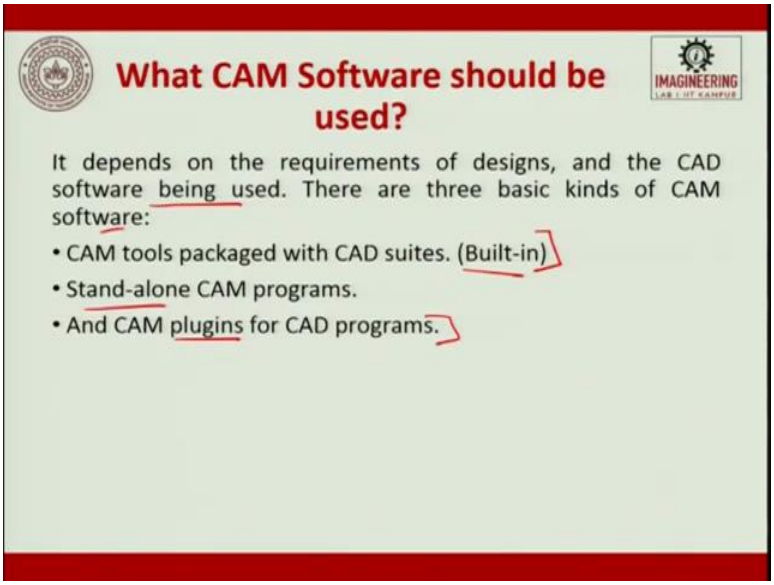
the comfort of the CAD software you know but it is also advantages in that all tool paths retain associated with the original CAD design.

So, in the simple word I could say any changes made to the CAD file will instantly be reflected in the updated tool paths, this again save your time and money. So, taking out the guess work in milling, turning another process by using Patented technology wizard. So, this software auto helps to automatically find tune your speeds, depth of cut, width of cuts, and so on all the cutting parameters.

This CAM softwares also buy itself recognizes the distinct geometrical features of your design and a science tool paths accordingly. So, this remains the need of the time consuming manual geometry definition the tool paths with this CAM software rely on advanced and patented mofing spiral that gradually conforms to the geometry of the feature being machine rather than old fashion simple spiral tool paths.

So, these are the major advantages. Now, which software to use, this is an important factor. See, I might be more comfortable with Solidworks, my students are there who are more comfortable with CATIA, they are to up people who are working with Fusion 360 it all depends which software do you use, which software, which CAD software are you using. Accordingly, the CAM software will more comfortable for you to use this is one of the factors.

(Refer Slide Time: 16:06)



It depends upon the requirements of the designs, and the CAD software being used. There are three basic kinds of CAM software. So, this is again this repeating this is built-in, stand-alone, and plug-in, three basic kinds of CAM softwares are there but which software to use. So, if it is a built-in software then it is certain that you would be definitely be more comfortable with the software that is integrated within your CAD suits.

So, if it is a plug-in then also it is comfortable in that now comes the part when the software is stand-alone. The stand-alone software are dedicated say CAM softwares they are capable of powerful CAM operations that allow creating complex geometries like free form geometry but, one of the flip sides is that they associativity is lost, when the native of the CAD software cannot be imported.

So, it is important that your CAM software and your CAD program support the same file formats like for instance if you pick igs, step, stl whatever you pick out of them it should support them, then these are more important. So, which software to use all depends upon your choice also depends upon the software that is available there.

So, it is expensive, yes the cost of the factors when we pick the software sometimes some machines are there, they come with a software those are provided by the manufactures itself, that the manufacture provides this much discount. Suppose, 50 percent discount on PowerMill is provided by a few manufactures as well. So, there are certain factor those matter. So, this was a short lecture on the CAM softwares we will meet in a next lecture and we will see how the PowerMill CAM software works. Thank You.