SIEMENS PLM SOFTWARE VELOCITY SERIES

A DEVELOP3D SUPPLEMENT

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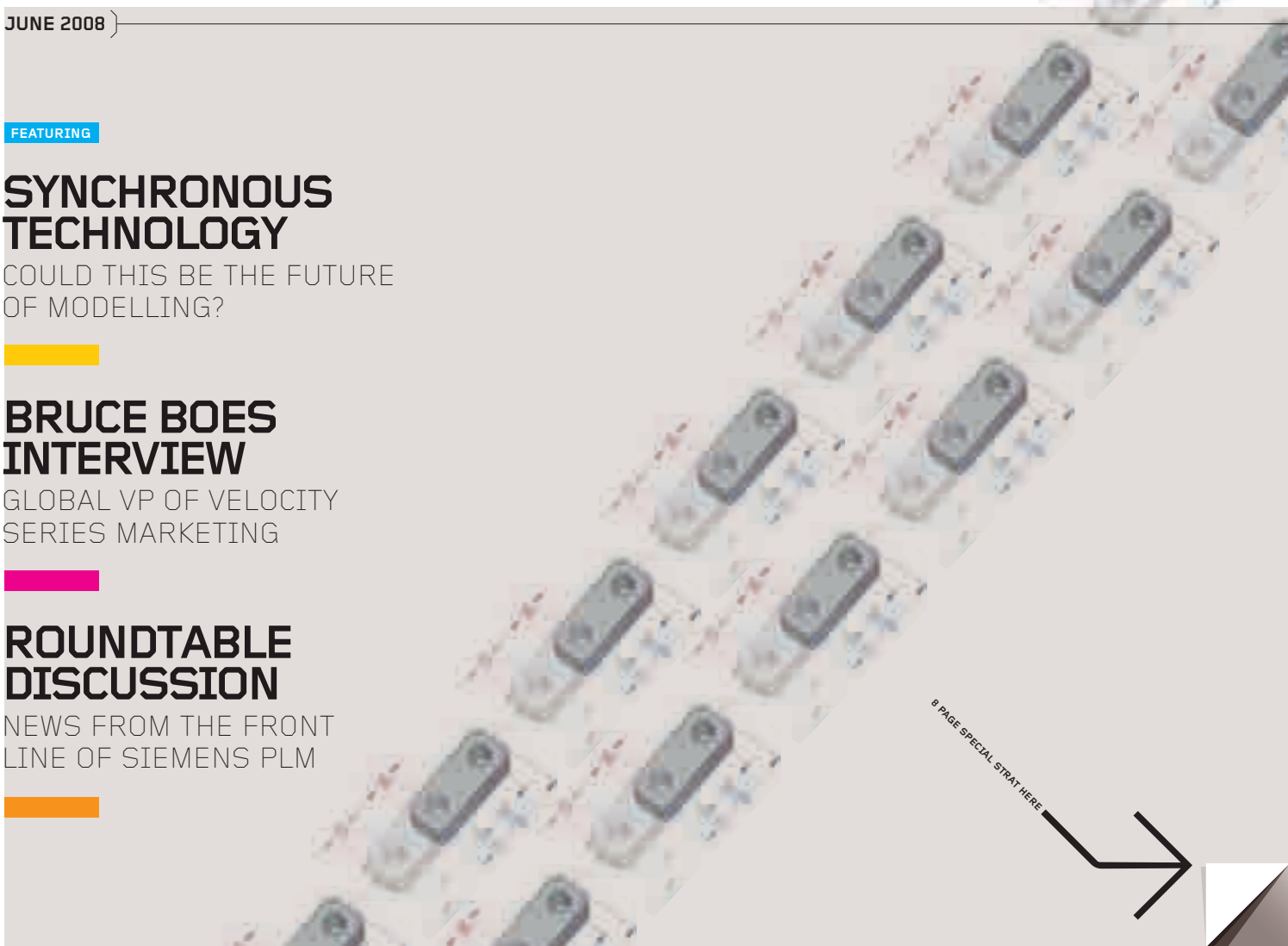
FEATURING

SYNCHRONOUS TECHNOLOGY
COULD THIS BE THE FUTURE OF MODELLING?

BRUCE BOES INTERVIEW
GLOBAL VP OF VELOCITY SERIES MARKETING

ROUNDTABLE DISCUSSION
NEWS FROM THE FRONT LINE OF SIEMENS PLM



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INTERVIEW

BRUCE BOES

WITH THE LAUNCH OF SYNCHRONOUS TECHNOLOGY AND A NEW RELEASE OF VELOCITY SERIES, NOW WAS THE PERFECT TIME TO CATCH UP WITH SIEMENS PLM SOFTWARE GLOBAL VP OF VELOCITY SERIES MARKETING, BRUCE BOES.

For the latest release of Teamcenter Express, Siemens PLM has implemented the Teamcenter 2007 platform in order to enhance scalability.

AL DEAN: The big news at the moment is Solid Edge and the launch of Synchronous Technology. If there was one thing that came out of the launch it was that many of the industry pundits are discussing the fact that the new modelling technologies coming on stream allow anyone to make edits to a 3D model. And as someone with a background and passion for design and engineering, that concerns me.

BRUCE BOES: OK – let's deal with that first. Just because people are able to make those changes and edits it doesn't necessarily make it right for them to be able to do so. But conversely it doesn't mean that the technology should be made difficult to constrain people. This is something that should be rationalised with the security capabilities within your software, whether that's through your PDM system or through your CAD system. This notion that we shouldn't make software accessible for people to use because they might foul something up is a fundamentally flawed argument.

The point I'm trying to make is that it should be easy enough for an occasional user to take advantage when appropriate. Take the example of an Engineering Manager conducting design review.You have a couple of choices. If you want him to make that change, but he's not a regular CAD user, why not allow him to be able to do it, to make the change. He's a qualified individual, but he may not be an expert on the CAD system.

The same thing goes for the guy on the shop floor. Maybe they aren't a design engineer, but a manufacturing engineer and they need to be able to drive changes for manufacturing purposes. Instead of understanding everything that's inside the model and how it's created, they just need to make a change and approve it or build something from scratch. Now they've got the capability to do that.

I don't want you to think we're encouraging that anyone should be able to make changes at anytime, without a business decision surrounding it: that's not the point. The point is that we're enabling qualified occasional users who are permitted to do so to make changes as part of the management and approval process in place. There's a big misconception around the whole issue.

AD: How does Synchronous Technology differ from other systems which are being lumped into the same category - both in terms of your competitor's tools, but also from the work you've done with Solid Edge to date?

BB: Direct Editing has an underlying fundamental flaw to it, which is that it often appends things to the end of the history tree. That's fine if you're tweaking a model, but later, when you come to make a root change, those features may or may not propagate. That's the dirty little secret behind direct editing.

What Synchronous Technology does is eliminate the history tree entirely, but retains the ability to make parametric changes, or dimension-driven changes, or constraint-driven changes (how ever you want to term it), while allowing you to interact directly with the model without the overhead of the history tree. That's the fundamental trick. This dovetails into the next comparison – where people are saying we're just like SpaceClaim or CoCreate.

The thing is that while those products interact directly with the geometry, they do not have the ability to maintain (persist) constraints, features or dimensions. So yes, you can go in and put a dimension on and you can drive it at a moment in time, but you can't keep it. It's not a feature and it's not persistent.

If you say that this dimension has to be 10mm, then they have no capability to stay 10mm and they won't necessarily retain and maintain it. What we've done is go in and say it's 10mm and do you want to this to be changeable or do you want to lock it down and say that's a rule.If so, the model will always hold 10mm. We retain that kind of information in what we call a feature collection – not a feature tree which executes specifically in order, but a feature collection.

So, that set of features can be anything that you can define in a parametric-driven system today. You can drive dimensions, features, functional features, constraints (such as parallelism), with tables, or equations– the same way you drive constraints at present, but without the overhead of recalculation. That's the big difference between CoCreate or SpaceClaim and what we do - to be able to modify, but also to be able to persist constraints.

AD: So, how does this differ from traditional history-based systems? If you're going to maintain all these features, how does that make it any different to SolidWorks or PTC or Solid Edge today? (Which brings us back to the history tree).

BB: The trick in Synchronous Technology is that without a history tree we don't have to go through the long re-execution times.We go in and work with the geometry and we don't have to recalculate the history tree. That's what makes it so darn fast.

Another benefit is that the size of the file is a fraction of what it was before. It sounds like a simple thing in these days of disk space, but when you start emailing these things around, download them across the web with PDM system or you try interacting with geometry and large assemblies, it makes a big difference. So when you boil this thing down, it's history free, feature-based modelling and a lot of people have dissed it off, but the real trick is that we've been able to do dimension or constraint based design combined with a history free system and that's the real root of what's going on here.

AD: Synchronous Technology is obviously the big ticket item for this Velocity Series release, but what about the other products?

BB: On the FEMAP side there are two key things. One is there's a new automatic surface and solid meshing capability that will provide higher quality, more complete meshes than we've been able to get to before and this means two things.

For the occasional user, it means they will get more complete and higher quality results without a whole lot of fiddling around. For the analyst, it means they'll get closer to a final solution and therefore save themselves more time than before.

In addition to that, we've implemented a number of other tools for refining the meshes in both common types of problems and some of the more specific kinds of ways to solve typical kinds of problems. For the analyst, it allows them to get to a finished, higher quality mesh and closer to the actual truth than he's ever been able to before.

Teamcenter Express really has three new key things. We have implemented the Teamcenter 2007 platform, which protects our scalability story. The biggest surprise for us hasn't just been Teamcenter Express sales, but also how it's fostered Teamcenter and Insight sales. It's certainly built an awareness of cPDM in the mid-market and customers are deciding whether they want to go simpler with a data manager (Insight) or in some cases, more complex and more robust capabilities with a full scale Teamcenter implementation. Again, the key point here is that the scalability from Insight, right up to Teamcenter is really key to the customers.

The second key thing is that we've introduced a new shop floor viewer which allows access to more people for a very reasonable cost. The third and final thing is that we've now added a Project Scheduling capability to the product, so if you look at the surveys about what people are buying and what they're looking for, program or project management pop up regularly in the top five lists of requirements. So we've now extracted that capability from Teamcenter and added it in a simple standardised out of the box manner for SMBs to be able to get up and running.

For CAM Express there are two substantial capabilities. One is that we've reworked the 3-axis milling capability to add more features for high speed machining, which is ultimately going to have a lot of impact on the mould and tool die guys as well as other folks using high speed 3 axis. Secondly we've taken the feature-based machining capability from Tecnomatix and incorporated that into CAM express and that's going to really bolster our 2- and 2.5-axis capability. Being fully associative with Solid Edge, this works out really well.

AD: There's obviously a huge noise surrounding Synchronous Technology and the changes to the core applications, but there are other products that are integral to the Velocity Series. Are the core principles still the same?

BB: If we look back over the last few years, not only have we been able to provide more global access and better certification through the resellers, but we now have a portfolio that includes integral PDM, embedded CAE and CAM tools that are associated with the 3D modelling system. That's a pretty robust portfolio at this point, all the while maintaining the fundamental Velocity Series tenets of being modular yet integrated, preconfigured with industry best practices, low total cost of ownership, easy to implement and use. These tenets are proving to be very successful overall and are obviously pleasing customers.

As we look forward to this next rev, all of the products are getting additional capability and continue to place the emphasis on preconfigured best practices and will maintain this notion of modularity and scalability.

www.siemens.co.uk/plm

"DIRECT EDITING HAS AN UNDERLYING FUNDAMENTAL FLAW TO IT, WHICH IS THAT IT OFTEN APPENDS THINGS TO THE END OF THE HISTORY TREE. THAT'S FINE IF YOU'RE TWEAKING A MODEL, BUT LATER, WHEN YOU COME TO MAKE A ROOT CHANGE, THOSE FEATURES AREN'T GOING TO PROPAGATE. THAT'S THE DIRTY LITTLE SECRET BEHIND DIRECT EDITING."

WHAT IS SYNCHRONOUS TECHNOLOGY?

THE CAD WORLD HAS BEEN TALKING AVIDLY ABOUT SYNCHRONOUS TECHNOLOGY EVER SINCE SIEMENS PLM SOFTWARE UNVEILED IT IN APRIL, BUT WHAT DOES IT MEAN FOR THE SOLID EDGE USER? AL DEAN DIGS A LITTLE DEEPER TO EXPLAIN THE FUNDAMENTALS.

Synchronous technology is being heralded by many as the new face of 3D product development. But to understand exacty what it is you need to consider the background of Feature and History-based modelling. When developed over 20 years ago 3D CAD systems weren't capable of solving both Geometry and Topology at the same time for a complete model - it was computationally too complex.

So, the developers compartmentalised the process, split it up into a list of features, which construct the model and are serially solved, one after the other. The hardware could compute each stage more easily and output the results.

Systems like IronCAD, CoCreate, SpaceClaim and Kubotek (formerly CADkey) differ in that they give you very powerful tools for editing geometry, but don't handle topology changes well, where faces disappear and are subsumed into other geometry.

So there you have the two common types of modelling systems, and never the twain shall meet? Well, not exactly.

Synchronous Technology solves Geometry and Topology at the same time, but added into this it also solves Features, Design Rules (or Live Rules) and Dimensions. This means that when editing a model's features or parameters it doesn't have such an impact on calculation times and as there's no history to replay, the system solves all these aspects pretty much instantly.

HISTORY VS EXPLICIT MODELLING

Synchronous Technology takes a different approach to modelling, but how does that change the way we design a product in 3D? The essential difference between Synchronous Technology and other systems out there that many are comparing it with (SpaceClaim, CoCreate and, to a less extent, IronCAD), is not so much the ability to interact directly with geometry, but rather the manner in which you add intelligence to your 3D product model.

When we design a product, we have two things in mind. Firstly form, in terms of aesthetic quality, but also in terms of fit and function. In the latter case rough dimensions just don't cut it; you need to be able to tie information down, lock it out and ensure that the geometry you create fulfils a need.

In traditional history-based systems, defining function is much easier, as you are creating geometry from a very root level. However, the fact that you often have to add excessive dimensions and constraints at a feature/sketch level, means that the process is counter intuitive. In other words, history-based modelling is too over burdened.

The upside is the ability to add a lot of intelligence, so design change can be automated, and dimensions and constraints interlink between sketches, features, parts and sub-assemblies. But the end result is a dataset that's horrendously complex and even a small change can result in a parametric nightmare that can take a herculean effort to resolve - and in many cases, users remodel from scratch just to avoid it.

Explicit Modelling applications (such as CoCreate and SpaceClaim) work from the other end, where you play with the geometry, and the constraints you apply (be they dynamically inputted or dragged and dropped) are not maintained and stored. You can add dimensions if you need to, but they can't be maintained and are commonly accessed at a later date.

THE SYNCHRONOUS DIFFERENCE

Siemens PLM Software has developed an architecture in which you can mix and match both. You can play with geometry to get it into shape and ensure that the rough state of your model is how you want it. You can also make changes very quickly indeed, by using inferred relationships, or dynamic detection of 'informal' topology relationships - such as concentricity, parallelism, perpendicularity (see Figures 1 and 2).

This not only enables you to edit the geometry and topology very quickly but when time comes to lock down feature size, dimensions, constraints, you can not only do this, BUT you can maintain them. Dimensions remain consistent, are stored and accessible, and features are maintained in respect to the dimensions, rules, and constraints you provide.But – and this point is key - these constraints are applied after the geometry has been built. You design and then you engineer.

For me, the most interesting illustration I could find is the one shown here in Figure 3. It's a model with parametric dimensions, and one that's fully constrained. The difference is that the only dimensions, parameters and constraints you create are the important ones – and that is the key to understanding what Siemens PLM Software has developed and what makes it so interesting.

It's a complex process to get your head round, particularly if you've cut your teeth with parametric, history-based modelling systems, but Siemens PLM Software has built a foundation on which its applications (Solid Edge, NX and others) are going to be based in the future. That future looks to combine the best of feature-based modelling with the freedom that history-less modelling brings – and finally, it seems that we're finally starting to get what the CAD vendors have promised for decades.

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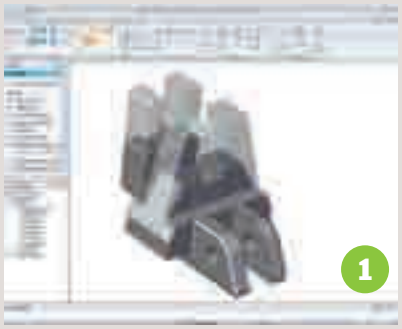


1 Synchronous Technology gives you a range of inferred constraints, allowing you to make edits to geometry and maintain the design intent. Here, you can see that the system has identified four co-planar faces and pulls them up with your edit. The fillets and draft are also maintained.

2 Here the system instantly finds co-axial holes, concentricity and the fillet radii – as you move the holes to the left, it calculates the inferred geometric relationships and adapts the geometry to maintain design intent.

3 This is the key illustration. The system has allowed you to create the geometry of the part very quickly, sketching and pushing and pulling faces. Only when you have it in the rough form that you need, do you begin to add dimensions, geometric constraints that you actually need to define the form of the part. And, you can also add parametric rules (referred to in Solid Edge as Live Rules) to automate design change and to add intelligence to your geometry.

ACCELERATING DESIGN

FMB OXFORD IS A WORLD LEADER IN SYNCHROTRON PARTICLE ACCELERATORS. WITH THE HELP OF SOLID EDGE IT IS ABLE TO BUILD COMPLEX ASSEMBLIES OF UP TO 25,000 COMPONENTS, A TASK THAT SIMPLY WOULD NOT HAVE BEEN POSSIBLE IN 2D.

Synchrotrons are particle accelerators that produce tightly focused beams of radiation ranging from infrared, through the visible light spectrum, to x-rays. Mirrors, slits and other optical devices are used to direct and focus the exceptionally bright light at a sample of material, enabling scientists to study the basic structure of anything from a virus to a piece of rock. The development of the synchrotron has been compared with the invention of the microscope because of its impact on scientific research and man's understanding of matter.

FMB Oxford serves the specialist synchrotron community worldwide through the design, production and installation of synchrotron beamlines and components. The company's business involves precision engineering; the manipulation of some very large, bespoke assemblies and the use of robust materials that withstand extreme force and high temperature.

THINKING BIG

FMB Oxford works on a variety of projects and timescales. A simple mirror system may take two to three weeks to design whereas a double crystal monochromator will be developed over several years. "Our remit is to deliver the highest function at the lowest cost," said Luke Thomson, one of the company's designers. "Vacuum technology requires we design the simplest mechanism to fulfill the specification, while carefully selecting the most appropriate materials. We are a small team and we all act as project engineers as well as designers. We need to work in 3D as opposed to 2D but we do not need to supply 3D information to our suppliers and do not need complex surfacing.

"Another consideration is that we generally make one-off prototypes, sometimes two copies, four or five at maximum. With such small volumes we do not require a CAM solution for programming of machine tools."

He says that the 3D capabilities of Solid Edge allow him to work much more quickly. "Solid Edge meets our needs perfectly. Using 3D we can visualise the properties of our designs. For example, we can animate our models and assemblies as an interference check to tell if components clash. This reduces our risk of error. A complete beamline can have upwards of twenty five thousand components. We certainly could not build such complex assemblies in 2D."

BEYOND DESIGN

FMB Oxford uses Ansys for finite element analysis. "We can drop Solid Edge data straight into Ansys without needing to convert it and, once we have assigned a material, we can simulate the thermal and structural loading. This type of simulation helps keep our risks low, as real world testing is unfeasible until we have a completed product."

Another time saver is the ability to import parts list from the Solid Edge model directly into FMB Oxford's purchasing system. Everything for the bill of materials (BOM) is automatically produced and items are arranged by preferred supplier.

Computers inevitably slow down when dealing with large assemblies and a 40 metre long synchrotron is not unusual for FMB Oxford. Thomson describes how he can edit into a sub assembly and make alterations, whilst still in the large assembly. "When we have a large beamline we can simply zone in on a sub assembly in order to review it without having to manipulate the whole assembly. We also use the simplification tool; for example we can temporarily take off all rounded edges or insides so these do not affect hardware performance. This makes designing much easier as we do not need to leave the assembly."

Pipes are an intrinsic feature of beamline design: synchrotrons components are often cooled by water or liquid nitrogen. FMB Oxford uses XpresRoute, the Solid Edge add-on for drawing tube and pipe profiles. "We use this module often," says Thomson. "It allows us to draw a line in 3D space, assign attributes and create a pipe around it. We can use the minimum bend radius feature to determine how tight we can bend a pipe round and whether we can squeeze it into available space. Using the standard tools to create such pipes would be a slow and laborious process."

Luke Thomson regards Solid Edge as the means to design with speed, freedom and precision. "Certainly it has cut the time it takes to establish a concept and get to initial design stage. I use Solid Edge as a sketching tool in 3D. I do not make the components first and then put them together in the traditional way. I put in a rough block and another block and I'll create a crude assembly, refining the assembly rather than the parts so that I know everything works together. Being able to edit down this way is really useful."

"Solid Edge saves an awful lot of time," he concludes. "There are certainly fewer mistakes than with 2D because we spot errors at a very early stage. We spend less time on administration because we have smooth, automatic processes. Solid Edge has the same functionality as more expensive packages and is an essential tool for the business."

Cutting Edge Solutions provides FMB Oxford with software and training
www.cuttingedge.co.uk

1 A 40m long synchrotron is not unusal for FMB Oxford

2 FMB Oxford uses XpresRoute for all of its pipes, which are an intrinsic feature of beamline design

3 FMB Oxford uses Ansys to simulate the thermal and structural loading on its components (pictured Cryo Cooler)

VAR ROUNDTABLE

IF YOU WANT TO KNOW HOW THE SIEMENS ACQUISITION HAS AFFECTED THE UK AND WHAT SYNCHRONOUS TECHNOLOGY WILL BRING TO OUR INDUSTRY A GOOD PLACE TO START IS WITH THE TROOPS ON THE FRONT LINE.

To get a feel for how a vendor and its products are performing it's essential to talk to the resellers. These guys are out there tending the proverbial fields and, with their fingers on the pulse of the market, have an excellent perspective on where it is locally and where they see the developments, products and future technology fitting into their customers working processes. Al Dean sat down with Steven Kane from TEAM Engineering and Trevor Stapleton of Majenta PLM, Siemens PLM Partners (more commonly known as Value Added Resellers (VARs)) shortly after the first public showing of Synchronous Technology.

AL DEAN: A good place to start is the Siemens acquisition. It's been over a year now, so how has it affected your business and how has it changed your customers' perception?
TREVOR STAPLETON, MAJENTA PLM: Very positively. Siemens is clearly a world-class company with a fantastic pedigree and heritage. It's a brand that everyone knows, a quality household name and to be associated with it can only be good. One never knows what the future holds, but if you listen to any of Helmuth Ludwig's(President, Siemens PLM Software) presentations, he's very passionate about this business and if anyone can take this company to the next level, then Siemens can.
STEVEN KANE, TEAM ENGINEERING: Again, if you're a director, and a letter lands on your desk and you see Siemens on it, you're more likely to read what it has to say; people want to hear what we have to say and it certainly gives us a lot of clout. UGS were not as financially stable, so some big corporates would think twice about investing but now, with Siemens behind it, that issue goes away.
TS: Siemens are in it for the long run, investment is there, and Siemens have 10 to 20 year business strategies. With its financial strength and stability, they can afford to invest if it's going to take them in the right direction. I liked this Helmuth Ludwig quote where he said "How do we deliver breakthrough innovations to a world that's moving faster and faster? Siemens realised that digital product development is key to delivering better innovations, faster."

As a leading global manufacturer, Siemens faces the same challenges as its customers. That's why they were so excited about what they saw within the UGS product portfolio. They realised with the right investment, this technology would revolutionise the way manufacturers designed products. Synchronous Technology offered what Siemens (and hence its own customers) were looking for so it decided to accelerate development and launch this ground breaking technology as soon as possible. As a result it's coming out now, in the summer of this year. I think the fact Siemens took what was already a good product, further invested in it and brought it to the market place very quickly, is going to set totally new standards.

Just a few weeks ago Steven and I were sat in Florida having a beer and saying "What's going to come along and shake up the CAD/CAM market?" Pro/Engineer, love or hate it, came along and shook up the industry. For the last ten years, probably 15, it's been pretty stagnant. There's been nothing since Parametric Technology came out, there have been no more major technology developments - all due respect to SolidWorks.

AD: If you track it, there's a seven year cycle between AutoCAD coming out, then Pro/Engineer, then SolidWorks, then there's a blip where the next seven year cycle was when the dotcom bubble burst, so technology investment was all bets off and now, 14 years later, we're here. Is this the first time that the company has been able to stand up and show some real leadership when it comes to technology innovation?
TS: For somebody that's been in this industry for the best part of 30 years, I really do think synchronous technology offers something that hasn't been thought of before.

AD: Is this the first time your company is in a position to go against your competition with something unique?
SK: We have only seen demonstrations at this stage, so it is difficult

Trevor Stapleton, Majenta PLM (left) and Steven Kane, Team Engineering.

to quantify just how good synchronous technology is. However what we know currently about this new technology is very exciting. We also need to evaluate if the new technology has enough business benefit to encourage users of alternative systems to consider changing.

TS: In the past, when SDRC and UGS brought out products we got the same small amount of coverage and marketing. It was the best-kept secret in the industry.

SK: Things are much different now and timing could be everything in respect to that. SolidWorks has done a fantastic job and Autodesk as well and PTC. Although the products are good, it's always about marketing, getting the name out there and getting the mindshare. I can't believe SolidWorks are doing the numbers that it was three or four years ago. Whether the revenue is there for it to compete with Siemens when we have something this revolutionary to say will be interesting. It's all key to how Siemens put the message across as much as how much it invests in the technology.

AD: What do you think Synchronous Technology is going to mean to the average engineer or designer?

SK: One of the problems that salesmen always have is constantly talking about product. If I'm a Technical Director, I am not interested in whether it is NX or Solid Edge. It's whether I can develop new products faster and better than my competitors. Organisations need to be convinced that they will dramatically reduce their product development times. At the moment you might be using a history-based system in which you always need to know where you're going before you start. It's pretty complex from the start and difficult to make changes. If there's no history, then those types of limitations disappear.

Bringing together parametric design with the ability to throw things down immediately and just start working on your ideas, should free up some minds and some time - and that'll have a huge influence.

Again, I think the situation that exists where design changes can't be made and parts remodelled can really affect the development process. I think the key point is that Synchronous Technology will allow users to get their ideas down in the system a lot quicker – that's a big plus.

AD: What about Velocity Series itself as a product offering? How is it seen in the marketplace? Is the message getting to the customers? Do you see it growing in strength compared to what it was? What are the elements that see most traction?

TS: As it stands without this new technology, it's a bunch of great products. You've got FEMAP, CAM express and Solid Edge. Then you've got Teamcenter Express, which I think is key to all of this - key to those companies that have CAD and a bit of data management but haven't gone the PLM route. Those that don't have workflow, change control, collaboration and visualisation tools, either locally or globally, I reckon this is a great opportunity to really go for it and re-launch Velocity Series in a much more positive way.

SK: I'd agree to a degree. We're coming at this from a slightly different perspective. If you compared the interfaces of Solid Edge and SolidWorks, you wouldn't be able to tell the difference – they're both very good systems. We have a head start with Synchronous Technology and we have to take full advantage of this leadership position.

AD: You mean that there's a window of opportunity?

SK: Exactly, there's a window of opportunity, there's no doubt that unlike SolidWorks and PTC, the one big thing that Siemens PLM Software has, that's recognised as a market leader, is Teamcenter.

You could walk into anywhere and say, "Well, everyone else is using it" – it's the one product in the portfolio that you can say that about. There's definitely an area where CAD independent data management is presenting a great opportunity.

My company focuses on simulation and I see FEMAP as a real opportunity with its integrated yet independent nature. FEMAP is well respected in its own right. FEMAP's other big advantage is breadth of capability, because with NX Nastran involved [again, an industry standard], there's nothing you can't do, flow, thermal, nonlinear – there's a fantastic opportunity there.

AD: How precious do you think people are about their 3D system? Are they willing to change? What makes them change? If you look at a lot of the big OEMs, it's a very difficult thing for them to justify a switch, but there are a lot of companies in the Small to Medium size, that have that potential to switch.

SK: It's always the fear of the unknown. Will it work? Will I be able to get the data in and out?

AD: But with Synchronous Technology, this suddenly isn't so much of an issue.

TS: Manufacturing organisations have to change. There's hardly an engineering or manufacturing company out there that hasn't got a CAD system of some description - there's not too many drawing boards left; but there are some pretty ancient CAD tools still being used. They will love Synchronous Technology.

SK: I actually think the OEMs are more ready to change than the SME, they can say "corporate policy is going to be this" and it's done. Look at Canon; it came across to Siemens. If Rolls Royce, Canon and JCB can change to Siemens PLM software, then it can be done.

TS: I probably shouldn't say this, but Synchronous Technology looks like it should deliver on what the industry has been promising for the last 20 years. Flexible, powerful, easy to use and most of all - fun. That's the one thing I noticed at the CAD/CAM shows of old is that this stuff is fun to use. There's a breed of engineers coming through now that are much younger than me, who play computer games and are into graphics in a big way and want the same sort of tools they are used to in these games when they're designing products. And from what I can see, this will appeal to them in a big way.

SK: Trevor and I were both ex-SDRC people, and I left SDRC 15 years ago and I remember when I was an Account Manager at that time. Modelling was like show business, it was "WOW" - because people hadn't seen solid modelling before.

AD: With your big metallic purple SGI indigo workstation – it was rock and roll.

SK: And £20K for that workstation. And people paid it too - happily.

AD: I just dumped an Octane at the recycling centre at the weekend – I nearly cried.

SK: That's a tragedy. This is the thing. Synchronous Technology could be something that we take back to people that are already used to and experienced in modelling and make them go "Wow." And these days, its much more affordable than it was 10 or 15 years ago.

www.majentaplm.com / www.team-eng.com

> "ONE OF THE PROBLEMS THAT SALESMEN ALWAYS HAVE IS CONSTANTLY TALKING ABOUT PRODUCT. IF I'M A TECHNICAL DIRECTOR, I AM NOT INTERESTED IN WHETHER IT IS NX OR SOLID EDGE. IT'S WHETHER I CAN DEVELOP NEW PRODUCTS FASTER AND BETTER THAN MY COMPETITORS."
>
> **STEVEN KANE, TEAM ENGINEERING**

Solid Edge with Synchronous Technology

» The latest release of Solid Edge now features Siemens PLM's brand new platform for modelling. But how does Synchronous technology affect existing workflows, and how can users benefit from using it right from the off? **Al Dean** reports

» **Product: Solid Edge**
» **Supplier: Siemens PLM Software**

Price on application

www.siemens.co.uk/plm

Synchronous Technology from Siemens PLM software has certainly been grabbing all the headlines, but what really matters is how it's implemented within the company's products and more specifically how it affects users of these products. To get to the heart of Synchronous Technology and how it works with Solid Edge we need to look at how Solid Edge has traditionally worked.

Solid Edge is a feature and history-based modelling system meaning each modelling operation is stored within a history tree. When edits are made, the system needs to recalculate each in turn to arrive at the final form. Within that, it also includes parametric design tools, allowing dimensions, constraints and other driven parameters to control the form of entities within each feature and to cross-link them. Parameters range from dimension and geometric constraints within a feature sketch, to parameters that define feature extents (such as extrude height or cut depth). The user can set-up parameters or constraints that link between features and geometry references using, for example, the "extrude to" option, or offset. Then parameters can be built in that are intelligently driven, referencing other dimensions or measurements.

These are the core components of any Solid Edge model – Features, History, Parameters and Constraints. To confuse things further, there are also a few Direct Editing tools. These allow users to make localised modifications to faces without having to edit the base feature that created that face. These are appended to the end of the history tree and should also be considered to be features (with history). So how does Synchronous Technology or ST (as we'll refer to it) change this state of affairs?

Siemens has taken the base technology (namely, Parasolid and D-cubed) within Solid Edge and created a layer on top of the core technologies to extend them. This is the essence of ST and it allows you to work in a much more efficient manner than has traditionally been the case with Solid Edge.

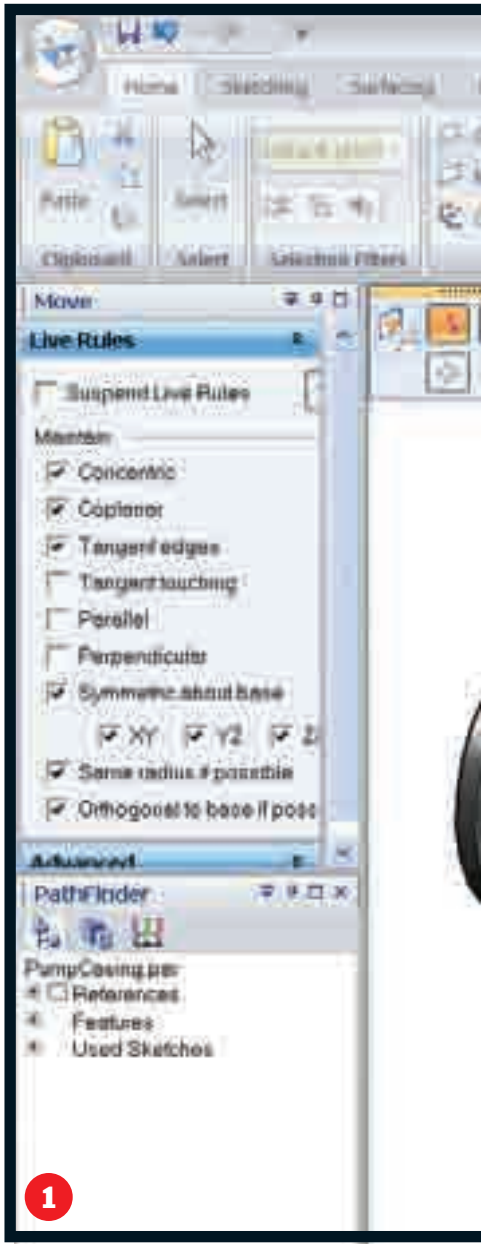
ST is a feature-based, but history free modelling technology. In other words, it allows you to work with features, enhances the current tools by freeing them from the need to recalculate the history after each edit and adds intelligence to the working process. Let's dig a little deeper and look at two specific cases – when modelling from scratch and, perhaps more critically, when working with existing data.

MODELLING FROM SCRATCH

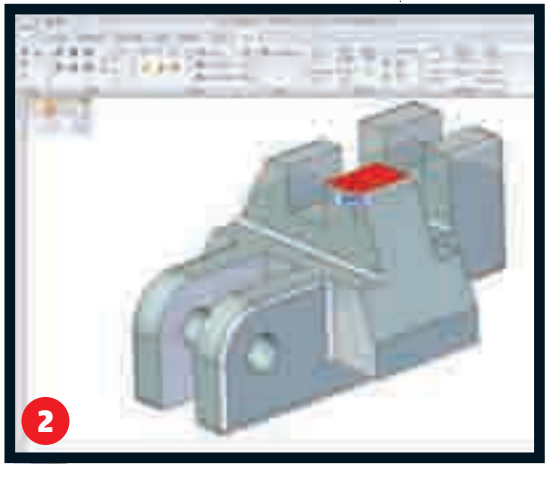
ST allows users to create parts in a very freeform manner. You can create a 2D sketch, and then use a set of commands to create the 3D geometry. At present ST is enabled in a select set of operations but the selection of Extrude, Revolve, Hole, Round, Draft, Pattern and Thin Wall (or Shell) is a little deceptive. It needs to be considered that each enables both the cutting and addition of material in a single feature, and the manner in which you interact and manipulate geometry means that they have much more potential in terms of the forms that can be created.

So, you create a sketch and the direction in which you drag the arrow defines whether material is added or removed. What enables the freedom is the fact that you are presented with a great deal of feedback about what you are doing. If you grab a face and move it, you can do it by eye or dial in a specific value - the same for rotation. References are created on the fly and the UI widget is useful for moving and rotating geometry in 3D space. Also, when faces are dragged and dropped, the system works with a set of selection assistants that add intelligence to the process. These are called Live Rules and infer relationships such as tangency, parallelism, concentricity, and perpendicularity, symmetry (around a define plane), and radii, between the geometry you select and that around it.

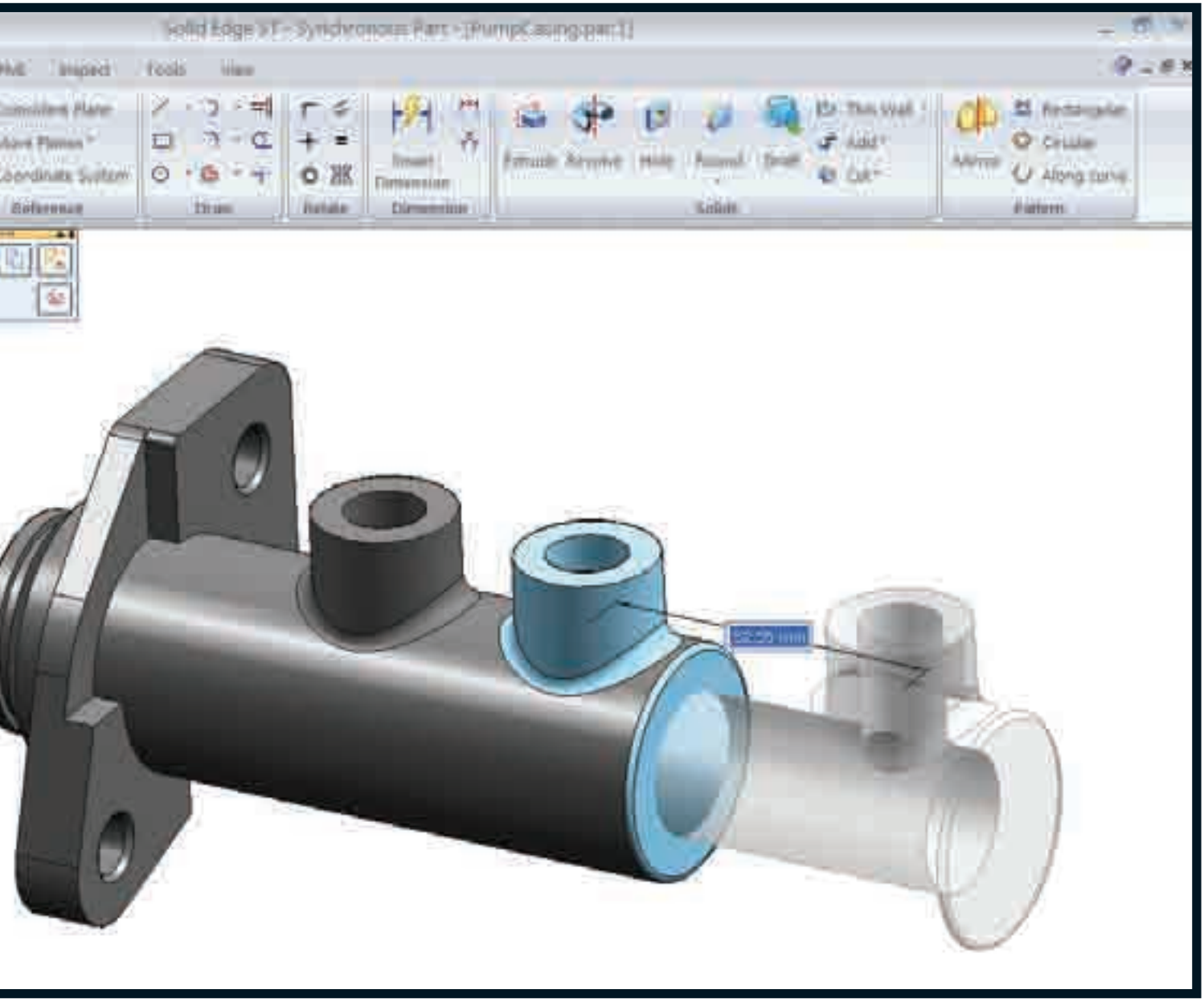
But while it's interesting to play with geometry to get a model into shape, within the design world you always need to be able to tie up specific dimensions and controlling factors – and this is what makes ST unique, for the time being at least. At any point, dimensions or constraints can be added,



1 Illustrates how the system works with multiple selections. By selecting the boss and the end face, you can stretch the part as you need to, rather than having to dive in and edit several features right back to the original extrude that created the pipe. What's absolutely key to note is that at no point are you editing features in a history - you make your edits and the system updates pretty much in real time.



2 Shows a face being pulled up and a value dialled in, but what's interesting to note is that the system also takes with it faces that are planar to that selected face (these, of course, can be overridden, so the system doesn't get too carried away). Also worth noting is that the system maintains the fillet/blend plus the draft angle that's applied to the outside of the part.



which can have specific values. These can be between faces, edges and other geometric features, they can be driven or driving, be linked using parametric equations and can reference each other. The point is that they only need to be applied when they're required and they are then maintained. The result is that your interaction with the geometry will respect those constraints and dimensions are maintained – and again, all without having to resolve a history tree with each edit. Figure 3 shows a dimension between the centre of a boss and the end of a fixture. As the you drag those features, the dimension is maintained, because you've defined it. Assemblies are worked with in a very similar manner, in that you grab, drag and drop, move and rotate faces in multiple parts and the system calculates the updates automatically. In addition, references can be made between separate parts, cross-referencing faces where required.

WORKING WITH EXISTING DATA

ST looks dammed interesting as a modelling technology, but the big question is how does it affect your existing data? Some organisations have been using Solid Edge for over ten years and built up a huge amount of live data, but how can they adopt this new way of working and still maintain that data? The answer is simple – leave it as it is. Solid Edge is now architected to work in two modes: Solid Edge, as standard, with the full range of features and functions that have made it one of the most impressive applications on the market, and then with ST enabled. But you need to be aware of a couple of things.

Firstly, when you open a new part, you have two options. You can either open the part to be built with the traditional feature- and history-based modelling tools – or you can use an ST enabled template, which switches on these new tools. More importantly though, what happens if you take an existing part built with a rich history of features that control its design and move it into the ST mode? The answer is thus: When a history-based traditional model is opened as a synchronous part, the system prunes out the history, but retains the information required to maintain the features in a Feature Collection. Siemens is referring to these as Procedural Features, covering things like chamfers, blends, patterns, and shells. This means they can be edited and the system will maintain the design intent stored within them. For example, even though a pattern is typically a history-based feature, the number of instances within an array can still be edited (see Figure 6) or the dimensions of a hole using standard hole definition terminology (such as counter sink – see Figure 7).

It's important to note that the part can't really be taken back into the traditional modelling environment once ST-based work has been included. If it is, then the system treats it as a dumb solid (and it's also worth noting that you can put ST parts in a

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traditional assembly and they will update as need be. These things are key to working out an adoption strategy.

ST is brand new. And while many of the components have been around for some time, this is the first time that the flexibility of explicit modelling tools, such as CoCreate, has been combined with the parametric- and feature-based tools within Solid Edge and many others. The fact that the system can solve and handle design change with such ease means many things, but the bottom line is this. If you can affect design change within a part or assembly without having to firstly work out the complex history that gets you to the end result and not have to wait to make those changes, then you're looking at a radically more efficient product development process.

CONCLUSION

ST has set tongues wagging across the 3D design world and many have tried to pull it apart. What's been missed to date is that this technology is at a formative stage in development, though it's certainly not beta code. While not everything has been 'Synchronous enabled', the fact is that if there's a task that can't be completed using the new tools, you can still use the more traditional modelling tools that have been in Solid Edge for years. And this is critical.

Within Solid Edge there are now two choices – to go Synchronous or not. The benefit to you is that if the ST enabled tools can't create what you need, there's still the last decade's worth of Solid Edge technology available to do things the traditional way.

In summary, ST can certainly make light work of modelling, but it's important to be aware of the limitations and the impact of moving existing data. The good news is that this technology has huge potential and even at this early stage, it's clear that Siemens has something unique on its hands.

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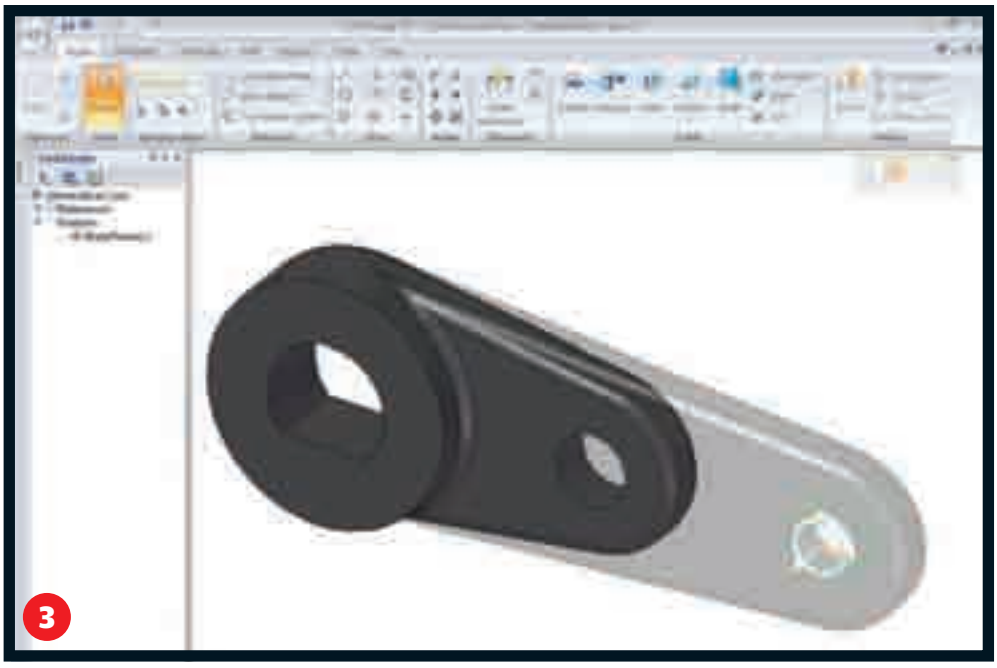

3 To work with concentricity and tangency you select the hole, use the onscreen widget to move it precisely, but because there is a concentric condition, the whole bracket stretches. The outer edge maintains its concentricity and the tangency of the swing arm is maintained. Of course, if you just wanted to move the hole, you'd simply toggle off concentricity and drag and drop it.

4 In this Solid Edge Synchronous Technology (ST) part dimensions have been placed after the design work has been done, in order to formalise the design intent and lock down dimensions. What's key is that you can also create the same parametric relationships between dimensions to drive design change as they would within a history and parametric modelling system.

5 Feature Collection – although it looks deceptively similar, this is NOT a history tree, but rather a collection of features, which when ported to the ST environment are maintained and remain editable.

6 This is a Radial Feature array that has been ported from a traditional Solid Edge part but remains associative and parametrically driven within the ST enabled environment.

7 A hole feature maintained from a traditional Solid Edge component – all of the design intent (in terms of bore size, thread information) is retained and editable.