

Abbey Farm Equipment Autodesk® Inventor™ Software

Autodesk® Inventor™ Software for Digital Prototyping

Established over 110 years ago in Nenagh, Co. Tipperary, Abbey Farm Equipment is still a Cavanagh family-owned business involving descendants of the founder. It now manufactures agricultural machinery for farms throughout Ireland as well as export to the UK and other northern European markets, notably Germany and Denmark. It has a state-of-the-art 80,000 sq ft engineering facility employing over 100 people which is currently manufacturing almost 3,000 high specification farm machines annually.

There are seven broad categories of Abbey machinery, with between six and 10 models in each range and up to seven versions of each model to answer specific requirements such as regional variations. "We have a team of six people working on product design and development," explains Francis Merrigan, Abbey's senior design engineer. "About three of us work regularly with CAD, specifically Autodesk Inventor since 2002, with all of the upgrades since then. We had decided to move on to 3D design anyway and examined all of the CAD software options at that time. Inventor made sense for us because it had all of the capability we required and it also made for a smooth transition since we had been using AutoCAD® Mechanical software, Autodesk's 2D mechanical design and drafting software for about a decade before that."

Because Inventor could work with the Abbey's existing AutoCAD® data the design team were able to begin using it immediately. "This meant there was little disruption to our day to day work, which was of course important. On the other hand there was a steep enough learning curve, particularly for original design, but we were prepared for that and took full advantage of our investment in training."

Francis Merrigan points out also that Inventor proved to be particularly suitable for dealing with sheet metal design and the generation of machine instructions for cutting. "We tend to have complex sheet shapes with features such as slot patterns. So we have been able to work by using the specific sheet metal application in Inventor to export flat patterns to DXF to generate machine instructions, especially to our laser profile cutter." Abbey has subscribed to each software upgrade of Inventor that has come out since 2002, with a positive gain each time: "We have consistently found improvements in functionality and, more importantly, they were always steps forward that were of direct use in our work."

Abbey Farm Equipment has a policy of continuous product development and Francis Merrigan says that whole process has been notably speeded up since the company moved up to Inventor. "We used to draw up our ideas for improvement in 2D, produce drawings, cut the metal and make up a prototype, sometimes just in a scaled down version. That usually meant three or four attempts before we were happy with the new design and go into production. But with Inventor, we do almost all of that work on screen as digital prototyping. That means we can take the new design much further before we go to a prototype in reality, in full size and not always even requiring a second prototype before approval for production."

Historically, that re-design process took eight weeks or more, which Merrigan says has been consistently reduced to about four. "It is also much more complex than it might sound and very important to us, because we have about 400 products or versions all told, each with up to 200–300 components of which 70 or 80 would be fabricated parts." In this key area of fabrication, working with flat or formed panels, Abbey's traditional production method was welding followed by galvanising or painting. The use of Inventor in the design process led directly to the decision to commence replacing some welded seams with bolted assembly. "It has very positive implications for speed and quality control in production because parts can be prepared and galvanised in bulk. We are also seeing the emergence for the first time of standard parts and sub-assemblies, manufactured for stock and shared between a number of versions or even models."



Bolted assembly is made possible across the range of Abbey machinery because Inventor enables the precise placing and alignment of laser cut slots and drilled bolt holes. It also facilitates precision in marrying other components in the engineering design, for example such bought-in items as vacuum pumps, drivelines, hydraulic systems and gearboxes. "A key aspect of this transition is that we can model the assembly on-screen in Inventor, detect any clashes and revise the design and machining instructions. This is not possible in 2D, which is one reason why the transition to bolted assembly could not have happened until recently."

The demand for some Abbey products is still somewhat seasonal, Francis Merrigan explains, so the product design and revision cycle tends to match the typical market life of each product model, usually about seven to 10 years. Developments and improvements arise through feedback from users and Abbey agents as well as the company's own research and trials. "That accounts for the bulk of our CAD work, but we also of course have new product design from scratch. That design development phase could have taken almost any length of time using 2D tools. Something like a volume calculation, for example, essential in progressing many aspects of our designs, can now be done in minutes. Now that we are using Inventor, especially for digital prototyping, we have the new product development cycle down to three or four months from first on-screen sketch to full size production prototype."

The presentation capabilities of Inventor have been used increasingly in recent years. "We have not so far used visualisation for marketing, although it might well be valuable in say exhibitions or agricultural shows. It would require a big investment of time, however, but what we have been very usefully doing is on-screen visualisation and 3D simulation to discuss aspects of product design and performance with some key customers, business partners and our production staff."

"We are in fact looking forward to further improvements in both the efficiency and the quality of our product design and engineering manufacture through the use of Inventor, itself a regularly improving and comprehensive set of CAD tools," Francis Merrigan concludes. "We have fully embraced the digital age and can see more and more of the engineering process taking place virtually and on-screen, from initial design and prototyping all the way through to ever more computerised manufacturing."