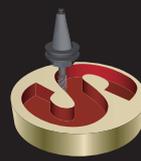


# Productive



# InventorCAM

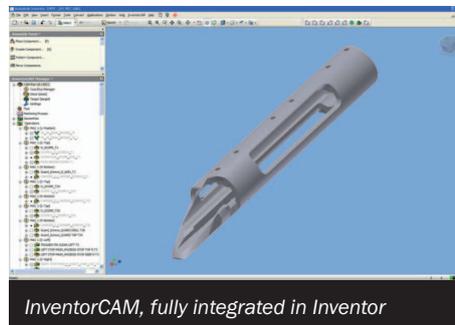
»I could never imagine a system that was not integrated at this level«

*Phoenix Machine Technologies is the rebirth (hence the name Phoenix – “rising from the ashes”) of a new and improved bolt action manufacturing company. Glen Harrison, founder and president of Phoenix Machine is well known for establishing Nesika Bay Precision of Poulsbo, Washington. From its humble beginnings as a one-man shop, Nesika grew to be a world renowned company valued for its precision machining and unparalleled accuracy.*

People often wonder what the secret is to running a successful company. In one company, Phoenix Machine in Columbia Falls, MT, [www.boltactions.net](http://www.boltactions.net), success is no secret. “Give customers choices to get exactly what they want, when they want it, and with quality and performance that surpasses their expectations”, says Glen Harrison, founder and president of Phoenix Machine that manufactures bolt actions for custom rifle builders all over the world. Glen has a personal philosophy that enables him to deliver these customer-centric services that are the key to Phoenix Machine’s Success. Glen’s personal philosophy is that, “anything can be improved upon”. Glen explains, “We continually challenge ourselves to ensure our customers receive only our very best effort. They have our assurances that we have a deep commitment to excellence in design, process and manufacturing.”

In real terms, this means customers requiring specific configured Bolt Actions for making Rifles can choose from an unbelievable number of variations and combinations of features to get the exact product they require, delivered exactly when they

figuration is requested, it will work with peak performance. Glen mentions, “There are other bolt action manufacturers out there, but no one else has our reputation for being able to deliver such a wide variety of products with unmatched quality, performance



*InventorCAM, fully integrated in Inventor*

and with flexible delivery schedules”. When a customer comes to us, we give them an extensive menu of features to choose from along with precise geometry specifications. Our number one competitive advantage or core competence is the flexibility of our manufacturing. We can make just the receiver or complete actions with an incredible array of options, over 21,000 in all.

opened, the spent shell casing is withdrawn and ejected, and finally a new round/shell (if available) is placed into the breech and the bolt closed. Bolt action firearms are most often rifles, but there are some bolt-action shotguns and a few handguns as well.

## Bolt action on a typical rifle

So how does a company accomplish this incredible level of flexible manufacturing? Glen explains the history of how they are able to deliver such a wide range of product variations. “I started in the business 17 years ago with a one man shop in Poulsbo Washington, making bolt actions for bench rest rifles. “I was shooting a lot of bench rest and wanted a better action than what was available on the market,” mentions Glen. Bench rest shooting is a sport in which very accurate rifles shoot at paper targets from a rest or bench from a sitting position. Bench rest shooters are notoriously detail-oriented and constantly trying to further the accuracy potential of the rifle through experimentation. Bench rest rifles are custom made, and many shooters do their own gunsmithing. Most bench rest shooters even hand-load their ammunition at the range, in order to tune it to their rifle. Glen’s philosophy of “anything can be improved upon”, resulted in the shop becoming widely known for bolt actions that were second to none in performance and quality with precision machining and unparalleled accuracy. This quickly snowballed into both hunting and tactical actions for long range rifles and even some pistols with bolt actions, all with very high accuracy. Glen’s reputation led to an opportunity to merge with another manufacturer of bolt actions. “We moved five families from WA to South Dakota” said Glen, “it was not something taken lightly”. Unfortunately corporate cultures sometimes do not merge and Glen ended up moving to Montana to open up Phoenix Machine. Out of the ashes of one situation, a new better company has emerged, hence the name “Phoenix”.



*Inventor and InventorCAM is the natural extension to do Phoenix Machine CAM*

need it, with machining quality that is top-notch. Many even private label Phoenix products with confidence that the product they deliver are the best available in the world. Customers specify what they want, but Phoenix does all the actual design and engineering, ensuring that whatever the con-

The term bolt action refers to a type of firearm action in which the weapon’s bolt is operated manually by the opening and closing of the breech with a small handle, most commonly placed on the right-hand side of the weapon (see figure above). As the handle is operated, the bolt is unlocked, the breech is



*Inventor is used to design customer products for many different industries.*

In terms of his design and manufacturing history, Glen started with early versions of AutoCAD for DOS. He then graduated to using Mechanical Desktop and within the last several years began using Inventor. With Inventor, Phoenix models and mockups assemblies are checked to see how all parts work together. This saves immeasurable money, time and effort as they evaluate form, fit and function in the virtual world long before any parts are actually made. "I've stayed with Autodesk products all my design life and they definitely do what I need them to".

In parallel to learning to design using Autodesk products, Glen learned how to program CNC machines as well. He bought a 4 axis Okuma and Fanuc Wire EDM never having run a CNC before. He had never even seen a Wire EDM. They hired a consulting company to do the programming. After six weeks, it became clear that they could not do the job, as no parts had been cut. Anxious to get production up and running, Glen took a yellow legal notepad and manually wrote line by line what everything did using sample code that came with the Okuma. After he was up to speed on the machine functions, Glen progressed to a rudimentary CAM program that works inside AutoCAD called AutoCode. He would draw every tool path in AutoCAD then cut and paste the G-code into a program. This was confined to 2D programs and was extremely labor intensive. As he progressed, he learned how to use variables and macros to handle all the variations in their parts. With this knowledge, Glen created the basis of the variable systems that they run today.

About a year and half ago, Glen decided to purchase InventorCAM. "With my previous experience using AutoCode inside AutoCAD, it seemed like a natural choice to go with a

CAM program that runs right inside Inventor like InventorCAM. The lead-time to learn the program really concerned me at first, as I did not have the time to go to classes. However, the learning curve was not steep at all. In fact, InventorCAM was extremely easy to learn. Especially with my Inventor experience, InventorCAM seemed like a natural extension of Inventor to do our CAM. I was actually generating code the first week, and this is on our five axis CNC machine. Not only was it easy to learn, but the programming time as well as the machining time it saved us was astonishing. We could finally take advantage of our 60 tool CNC machine and eliminate having to change tools between operations. The difference before and after InventorCAM is like night and day in terms of productivity".

The real story however is how Glen is leveraging Inventor and InventorCAM to automate his production process to handle the 21, 000 variations in the part family. Parts can vary in configuration per each run. One part could be a right hand tactical action and the next part could be a left hand hunter action. In fact, they make at least one unique part they have never made before every month. Some Parts may never be made twice. That kind of custom stuff is what keeps customers coming their way. In order to handle all these variations Glen has setup a system that he uses to define all the different features of the part by using a lookup table menu system to modify his designs, all while the CAM part is already running. He even setup his InventorCAM tool library specific to different materials. Once setup is complete, all he has to do is pick the material and it does all the laborious work while recalculating and reposting code specific to the material used. Additionally, using InventorCAM's full associativity, these setups automatically update his toolpaths without major modifications or starting over. This could be a completely new part that all they have to do is some menu picks in Inventor.

InventorCAM's advanced simulation features also plays a major roll in the automation. Being able to realistically see how the part program works before any metal is cut is invaluable. Rendered simulations in InventorCAM's "Solid Verify" ensures that what he picked was correct. With his

5-axis machine, the simulations also save him from crashing his machines, a potentially show stopping very expensive danger. Not only could he damage his machine tools, other machining parts are at risk. For example, if the cutting tool does not have enough length out of the holder, they risk crashing the holder into the stock and ruining the tool, the holder or the fixture. It even goes down to the level of surface finish. "You can change your process or cutting strategy and even see the result in the finish before wasting stock material." explains Glen.

Further pushing the leading edge of automation is the way Glen has incorporated touch probe and Post processor macros into his process to eliminate setup steps. "For example, we make three different length bolts, if we want to make a medium length bolt, we can go in and touch off on certain features on the part and locate where that feature is, it is setup inside InventorCAM with different work offsets based on the feature, so I don't have to tell it what length bolt I want to make. I just tell it what features we want on the bolt. We don't even have to have the stock centered in the fixture, as the touch off points let the Macro adjust for the positions, fixtures and offsets. It just machines it. It took a while to get here, but we really have enjoyed working with the SolidCAM support team to get the systems in place.

Glen continues, "I could never imagine a system that was not integrated at this level. A standalone system like MasterCAM or Gibbs would never give me the functionality to do our variations with the level of automation that makes our process successful. If I had to export a model from Inventor every time I made a change in it, it would be days to weeks overtime if we wanted to run something new. It would be a disaster that would greatly limit our company's success.

Not content to give up on his philosophy of, "anything can be improved upon", Glen continues to push the envelope of automation. "While things are working very well right now, it just seems natural to want it to work even better". In terms of Inventor and InventorCAM, "with all the functions and features they have, I just figure out a way to make them work to their fullest extent.