

# Clinkenbeard

## Case Study

**Speed to Market: How Clinkenbeard®'s Toolingless Process Allowed a New Aerospace Fuel Pump Casting to Go from Art to Part in Only Three Weeks**

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After superior quality and the meeting of exact specifications, the most critical standard of performance in rapid manufacturing today is time to market.

In fact, “time to market” as a phrase to reflect a measure of performance, is quickly becoming obsolete. It is rapidly being replaced by the term “speed to market,” which many customers who purchase the services of rapid manufacturing companies think more accurately reflects the process that truly governs today’s product or prototype development cycles. . .and gives rapid manufacturing companies a real competitive edge.

A recent press release disseminated by the Society of Manufacturing Engineers (SME), dated June 17, 2009, explained how attendees to the SME Rapid 2009 Conference & Exposition and 3D Imaging Conference (held May 12-14 in Schaumburg, Illinois) rated the learning of how to understand, apply and capitalize on speed to market issues as the primary reason many attendees took part in the events.

According to the release, which can be found on the SME’s website <http://tinyurl.com/mlrq2> , “Many (attendees) were there to address speed-to-market issues. One participant stated that the most important reason for learning new rapid manufacturing techniques/technologies is ‘to stay ahead of competition and speed up the product development cycle.’”

### **Situation**

Clinkenbeard, a Rockford, Illinois-based company engaged in rapid manufacturing [www.clinkenbeard.com](http://www.clinkenbeard.com) , is not new to speed to market issues. In fact, the company patented its Toolingless Process [www.clinkenbeard.com/downloads/clinkenbeardprocess.pdf](http://www.clinkenbeard.com/downloads/clinkenbeardprocess.pdf) in 1999, a process which can reduce lead time by up to 90 percent, a real factor in achieving speed to market success.

## **Clinkenbeard® Patented Toolingless Process Applied to New Aerospace Fuel Pump 2**

Hamilton Sundstrand Aerospace, located in Rockford Illinois, received a contract to develop a new fuel pump for the aerospace industry. **Hamilton Sundstrand contacted Clinkenbeard with an urgent request: Can you develop two identical castings of this new fuel pump for testing, and could you do this in three weeks time?**

The casting needed to be designed first so that external details associated with the new pump could be added at a later date.

“Clinkenbeard’s experience and knowledge of the sand casting process and tooling proved to be essential in the development design phase of this program. They came in and worked directly with our engineering group,” stated Hamilton Sundstrand Senior Engineering Specialist, Bob LaFurge.

But there was more.

Once the casting was complete, could Clinkenbeard also do the finish machining and inspection so the pump could actually be used on a test stand to gauge performance flow and determine if the new pump met all engineering goals. . .and can this be completed within the three week timeframe?

Clinkenbeard met all timeframe, machining and inspection goals.

### **Solution. . .and the Clinkenbeard® Patented Toolingless Process**

Once Clinkenbeard received the 3D model from Hamilton Sundstrand, it performed the engineering work required for the sand casting process. The fuel pump design incorporated a multiple core configuration, which Clinkenbeard split up so it could easily alter a single area of the casting, if changes occurred during testing and development.

Clinkenbeard chose to build a traditional “low volume rapid pattern” for the exterior. This allowed Clinkenbeard to include a gating system and easy-to-make modifications, if additional castings and iterations were required. The interior was produced utilizing the patented Clinkenbeard® Process, which, among other factors, allow for rapid changes to the part.

The patented Clinkenbeard® Toolingless Process involves the rapid production of cores and molds without the requirement to produce foundry tooling first.

According the Clinkenbeard President Ron Gustafson, “We developed this process when we realized American companies were going to Germany to obtain sand castings quickly from a process similar to Stereo lithography, which cured coated sand with a laser.

“We searched in the United States and could not find any companies that had any processes that could produce sand castings without producing tooling first. We decided we needed to come up with a method so we could retain our customer base and grow.”

### **Clinkenbeard® Patented Toolingless Process Applied to New Aerospace Fuel Pump 3**

Taking the process a step further, Ron Gustafson explained that, “Our goal was to develop a process where we could produce rapid sand castings that closely reflected the production process that would be used. We developed a process where we would first produce a block of sand for the molds and cores and then shape them in a subtractive method. Utilizing this method we are able to produce cores and molds using different sand binder systems.

Hamilton Sundstrand could have gone to another rapid manufacturer, who, more than likely, would have had to produce a complete set of foundry tooling to pour the castings. This would have lengthened the process and added cost.

“One feature of the Clinkenbeard® Process our customers appreciate,” Reg Gustafson stated, “is the fact we can easily use different sands and binder systems that will most closely reflect their production casting process. This greatly minimizes surprises that may come up once the project has made it into the production process.”

He explained other customer benefits and factors that result in “speedier to market timeframes” that can reduce lead times by 90 percent.

“Using traditional CNC methods of producing tooling requires the production of patterns and core boxes, rigging and gating for the foundry,” Reg Gustafson says. “Utilizing our Toolingless Process saves the upfront pattern production time. This allows the process to go straight to the production of cores and molds. The amount of time and money saved is directly related to the complexity of the part. By using this method we have actually seen a ninety percent reduction in lead time in the most extreme cases.”

This was the case with the new aerospace fuel pump. This project was an excellent candidate for the Clinkenbeard Process due to the complexity of the internal core passages. This complexity prevented the option of expediting the tooling to achieve the required desired date; “frankly” according to Reg Gustafson, “there just was not enough time in the day.”

Making sand cores using its Toolingless process was the only option Clinkenbeard had on the table to achieve the desired deliver dates. Machining the sand cores not only reduced the manufacturing time for the sand core; it also opened the door for engineering change implementation right up until the time that the sand core was physically cut in sand.

Applying the Clinkenbeard Toolingless Process and utilizing CNC processes of core making, foundry, and high speed machining allowed Clinkenbeard to produce the new fuel pump casting and complete the process in only three weeks, meeting all customer delivery and quality requirements.

Reg Gustafson added that being able to do all of the work in-house, with the exception of pouring the metal, assured Clinkenbeard was able to meet this customer’s speed to market requirement.

## **Clinkenbeard® Patented Toolingless Process Applied to New Aerospace Fuel Pump 4**

“At Clinkenbeard, we consistently operate within a corporate culture that is driven by a healthy sense of urgency,” Reg Gustafson said. “It used to be time to market, you know. Today it’s speed to market. Tomorrow, maybe rapid manufacturing to market, meaning rapid manufacturing parts made via RM and placed directly on the shelves.”

Bob LaFurge added, “Clinkenbeard’s ability to produce and machine these housings in such a rapid time frame and with excellent results provided Hamilton Sundstrand with a test bed pump that exceeded our expectations and that of our customer’s schedule.

“Being able to be first to market with a proven design enabled us to also be awarded the production version from our customer. This process has great benefits allowing the rapid sand casting process to be used for higher complexity parts that the RP process of investment cast process is not typically able to meet.”

“In many cases,” Reg Gustafson said, “I’ve heard about companies bringing product to market with prototypes; but then the product is not available to consumers until the manufacturing cycle catches up to the market demand, and that may cause some customer dissatisfaction. Best case scenario allows rapid manufacturing to act as a bridge to production, to avoid this dissatisfaction.”

Reg Gustafson closed by saying that, “‘Fasterestest’ is our company slogan. Our processes and employee expertise let us meet every expectation that our customers and prospects perceive when they hear that slogan. Our patented Toolingless Process, especially, lets us meet and in many cases exceed those perceptions, and we think set new standards and metrics of performance in the rapid manufacturing industry.”

### **Origin and History of the Patented Clinkenbeard® Process: Time to Compete Directly with Europe on the Issue of Speed to Market**

In his own words, according to Ron Gustafson, the origin of the patented Clinkenbeard Toolingless Process took this shape:

“The origin of the Clinkenbeard® Toolingless Process goes back to talking with some of our customers, after they returned from Europe. There they could purchase sand castings that were produced utilizing an electronic layering process that used a laser to bind coated sand together.

“After searching around the United States, we couldn’t find any companies from which we could purchase these kinds of ‘toolingless’ castings.

“Rather than force our customers to purchase castings in or from Europe so they could develop their products faster, we knew we had to develop a method to meet these customer needs. It was time to compete directly with Europe on this critical speed to market issue.

## **Clinkenbeard® Patented Toolingless Process Applied to New Aerospace Fuel Pump 5**

“I (Ron Gustafson Sr.) did the development work in conjunction with my partner Mickey Barlow, who did the CNC portion of the development.

“Our objective was to develop a very fast method to produce toolingless sand castings with the ability to reflect the production process that would be used later.

“Once we had the process successfully developed, we applied for a patent. During the patent application process, we needed to go through multiple iterations of the process before it was awarded. Due to the large amount of applications necessary, working with the United States Patent Office requires a lot of time. Our patent was awarded approximately two years in 2001 after the first application.”

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