2014

CHIPMAKER CHALLENGE

cONTROL Your Future

PITCH YOUR PLAN. WIN A MACHINE

Finalist

DKS Machining
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Washington

Chipmaker Challenge Essay

My name is Dakota Sodergren and I ‘am the proud owner/founder/sole employee of DKS Machining. I’m 24 years old and have had a passion for making things since day one, from Lego’s to Landing Gear parts, manufacturing is my calling. The dream of starting my own manufacturing company who built things stems back to the 2nd grade when I had an idea, a business name and a business card in my briefcase. The idea was a neoprene CD player cover that would protect them in case of a fall, since I just lost one that way, necessity is the mother of all invention. I made a crude prototype, but then the reality of taking something from prototype to production, marketing and distribution sank in. This was a steep mountain for a 2nd grader with no money or connections to climb. As my skills progressed through the years so did my projects, by the time I was 18 I decided I needed a milling machine. I had found my calling in manufacturing, specifically machining. As my shop and machine collection grew my book collection grew exponentially teaching myself everything I could about machining, but machining cannot be completely self taught, so I went back to school. I flourished in a local technical college and in no time earned an Associates degree in Manufacturing Technology (machining). Before graduation I was asked to work at the college full time helping to teach machining, which I did for almost a year before I decided to move on. I landed a dream job after many interviews and offers, at one of the finest machine shops in Washington State, as a Machinist/CNC Programmer. I progressed quickly and moved into the additional role of project manager/estimator. DKS was always my plan for the future and a little over a year ago I made it official, getting my business license. I have continued to work full time at my current job along with having the privilege and honor to be Machinist Apprenticeship Instructor one night a week for our local Apprenticeship organization, A.J.A.C. (Aerospace Joint Apprenticeship Committee), in my free time working on building DKS. Teaching in the Apprenticeship program helps the entire local industry by training the next wave of skilled Machinists, but specifically will be a great asset to DKS in the future by already having a relationship with many prospective future employees. My apprenticeship students are extremely valuable not just as future employees, but as they move up the chain in many local companies it gives me more business connections that I already have a relationship with.

DKS is currently a small job shop with all manual machines. The shop includes a manual knee mill, a manual engine lathe, a 2-axis hydraulic surface grinder, vertical and horizontal band saws, drill press, welder, presses, CAD/CAM software, small climate controlled inspection department with its own set of inspection tools separate from the shop and of course an enormous amount of tooling for all the equipment. As a job shop DKS makes everything that comes through the door so to speak, except for a large majority of the work I have had to turn down due to no CNC capability. The features on the parts I regularly have to turn down are too difficult to make on a manual machine such as 3D contoured surfaces, even on some simpler shapes it's not possible to be competitive against another company with a CNC. The parts we have made range widely, everything from basic Bushings, Screws and Shafts, to Helical Gears for Transmissions, Pump Components, Drill Jigs, Trim Fixtures and Mold Components. Our current specialty is fixture and jig work for a variety of industries but especially composites industry. Composite parts usually require cut outs and holes cut into them that cannot be conventionally molded in. The usual approach is to build Trim Fixtures and Drill Jigs or have the part features CNC cut. Using Fixtures and Jigs is usually a more cost effective route for medium to high production parts. My current customer base is small with one main repeating customer, a composites manufacturer, and quite a few that we have only done one or a few jobs for. The one time customers can sometimes repeat, but usually they are after one certain part for their application or repair. We specialize in making one part but welcome all sizes of production runs. DKS offers complete design and engineering services and can provide 3D models in all standard formats and or 2D engineering drawings. Along with the engineering side we also offer CNC programming services for 2 and 3 axis mill and lathe programs to simultaneous 4 and 5-axis milling, and Mill-Turn programs. From the simplest to the most complex parts we program it all and provide the necessary documentation and support to run them. We offer welding services and can complete assemblies in house for finished delivery. We have precision grinding and lapping capability and can grind to within .0001" on size, parallelism and squareness. The DKS business philosophy is second to none, "Always exceeding customer expectations through dedication and innovation". 100% inspection is normal not the exception. True dedication to quality and precision is just one of the many ways DKS stands out from the crowd.

Why DKS Machining? This is one of the single most important questions in business in my opinion, because if you don't have an edge, why compete? One of our greatest advantages is our size and flexibility, to be dynamic in planning and adapting to new work and demands, not being tied down to old ways, processes and thinking. Another strong edge is our expertise in CAD modeling and CNC programming, taking on projects and complex assemblies. This continues to become more important by the day as the industry continues moving heavily into 3D models, assemblies and Model Based Definition. I have detailed plans for making a standardized cutting tool library and tool load based on machine type. The most commonly used tools will stay setup in holders, not necessarily in the machine, but organized and labeled for quick loading into the machine. The library on the shop floor will match in my programming software and in the tool information stored in the machine control. This procedure will streamline both programming and setup, two of the most time consuming processes when making only one or a few parts. Hurco controls will be a perfect match to this tool procedure utilizing the practically unlimited tool numbers (1-9,999,999) and large memory for tool data storage. The ease of assigning a tool number to an empty pot is also a breeze on the Hurco control. By having tool data matched acrossed all the shop systems and in the control, conversational programming will be even faster at the machine when making only one part or fixturing. Machine setups follow the same lines as tools, using standard sub-plates mounted to the machine table with a bolt and dowel pin hole grid. The holes in the sub-plate are in a known and repeatable position so all tooling will be made to drop on the sub-plate including vises, 4^{th} axis, tailstock, fixture plates and so on. For more open tolerance work this allows just dropping the fixturing and stock on the table and hitting cycle start without ever picking up offsets. For more precise work the part offsets can be picked up conventionally or using a spindle probe, using the right probing macro the offsets can be picked up without ever having to manually jog the machine on the right shaped part. I have standard fixture plate designs and program templates to streamline the process when fixtures are required. The blanks for the fixtures can already be cut with the mounting hole pattern and machined to standard sizes that match the program templates, so all that's required is customizing the program then machining in the needed features for the specific part. My tooling philosophy is to use as much standard off the shelf and modular tooling as possible since it's reusable and much more cost effective than manufacturing custom tooling in house, one of my favorite sayings when it comes to a lot of components is "If

someone else already makes it, buy it, they probably make it cheaper and better". That saying might be a little strange coming from a company whose specialty is fixtures and jigs, but it's the truth when it comes to one off parts in business. I will utilize a spindle and tool probe for all my machines since they both allow for faster, more consistent and automated setup and in-process checking such as probing a tool before cutting a tight tolerance feature, a blended surface and broken tool detection. I plan to use the spindle probe in many ways including measuring part features and automatically adjusting the tool offset on larger part runs for lights out operation and measuring tight tolerance or difficult to manually measure part features. I will make full use of all existing probing macros and will create my own when needed to do special operations, such as adjusting the tool offset and rerunning it if required on larger production runs. The Hurco control will be a large advantage in the probing arena since it can run all the Renishaw and custom probing macros out of the box, there are certain machines out there that will not work with the probe manufacturers probing macros and require either the factory or end user to make them. I will also use the spindle probe as a CMM, since I do not yet have one, but that's to come. Using the probe as a CMM I can measure features difficult to impossible to measure with conventional manual inspection techniques and equipment, such as swarfed and 3D contoured surfaces. By keeping the machine regularly calibrated for positioning and geometry (squareness of all the axis) it will meet aerospace standards for calibrated measuring equipment. As I once heard said "anyone can buy a CNC machine, its how you set it up and run it that sets you apart".

DKS Machining keeps all critical inspection equipment calibrated and has a complete set of tools solely for inspection in a climate controlled environment. As previously stated, DKS's quality system and dedication to it is one of the many factors that makes us stand out from the competition, and a requirement for the types of parts and industries DKS is moving towards. The most vital component to our quality system, just as the rest of the company, is it is a continuously improving system. We always strive to improve processes and equipment searching for greater efficiency, precision and value added features. Another strong advantage is the quoting system I have developed and I'm constantly expanding and refining it. To be a profitable business nothing is more important, or difficult, as quoting accurately. The system is quite diverse; it has both a manual and CNC side to it. There is standard setup times for a whole list of common operations that

include tool setup, loading a vise, fixture making and the extra time needed to prove out a first run program. The run times are very accurate based on material, size of tool, and type of operation such as facing, pocketing, drilling, etc. The run time for that particular operation is calculated based on metal removal rate of a given volume or area depending on type of operation. The time includes tool change time, rapid traverse and finishing. The numbers are based on a middle of the road machine and can be scaled up or down depending on the machine the part is being estimated for. The process takes time but it can be very accurate if done right and there is nothing worse in my book than a bad quote. The manufacturer can lose and so can the customer depending on which way the quote went, too high or too low. For me overpricing a part is not the way I look to make a profit. Rather an accurate time estimate, with my profit margin added on top, 25% estimated on most jobs and 30% on short lead time or extremely difficult job. My shop rate is based upon machine, I have developed sheets and formulas for calculating shop rate based on machining center, it accounts for many variables such as machine cost, life of machine, resell value at end of life, maintenance, tooling, consumables, labor, shop overhead and so on. On the manual side it is a generic shop rate for all work, but on the CNC side it will be based on specific machining center. This is my preferred method, it is more work than one flat rate, but for instance would you charge the same rate for a $100,000 VMC as you would a $500,000 5-axis? The quoting system is one of DKS's greatest advantages both for the company and our customers across all industries, whether it's one part or ten thousand.

One of the toughest manufacturing challenges we face and expect to face, as do most machine shops, is keeping and completing work on time with ever shortening lead times. The world of manufacturing is constantly accelerating; companies want it faster, higher quality and cheaper. The Aerospace industry is one of the toughest in this realm. Large Aerospace manufacturers extensively practice J.I.T. (Just In Time) and have special fast turnaround orders for A.O.G. (Aircraft On Ground). They commonly place small orders more often to prevent having excessive inventory, resulting in less money sitting in warehouses. Production tooling for many companies is much the same as they have tight timelines to get the tools and fixtures in place and running production. My solution to this challenge is many faceted. Step one in the manufacturing process is where my strategy starts, quoting the parts, which using my system not only provides pricing but almost as important giving an accurate lead time. Secondly the

programming process for the CNC side takes a lot of time, reducing programming time is a constant goal of mine. Using standard part templates helps greatly for similar parts but a larger edge is the standard tool and fixturing library. For simple parts that do not require complicated programming or fixturing I plan to utilize Hurco's excellent conversational programming at the machine. I have seen how incredibly fast it can be to create the program, check it with Hurco's 3D graphic verify and start making chips with great confidence in the program. The Hurco VMX42I with its dual screen control allows me to even program on the machine while it is running, I can also merge sections of programs created conversationally on the control with sections from my CAM software getting the program finished even quicker using the best of both worlds. The next step is the setup of the machine and execution of the program, the standard tool library comes heavily into play here with many of the tools already built and their information in the control, all I have to do is assign it to a pot and load it in the machine. If tools that are not in the library are needed the Hurco control makes it a breeze to enter in the information and probe the tool. Executing the program on the Hurco control is as easy as the pushing of two buttons. The dynamic look ahead and Ultimotion will aid in reducing the cycle time as I use high speed machining (HSM) techniques extensively, especially in hard metals. This multi-edged approach is how I will meet/continue to meet the ever shortening lead times while still maintaining the highest levels of quality.

One of the greatest business challenges for DKS is keeping the company busy and growing with consistent profitable work. My approach to this is multi faceted; my first way of getting work that I currently use is word of mouth and keeping in touch with my business contacts, that I have made and continue to make at many places including school, AJAC, work, trade shows. Advertising though the internet via a company website, is on the strongest marketing methods and a good way to keep current and prospective customers informed of current capabilities and future growth. A company website will also provide an avenue for customers to upload drawings and RFQ's (Request For Quote) easily. Trade shows are another extremely valuable marketing resource and I try to attend as many as possible to network and get the DKS Machining name out there along with our current and future capabilities. Lastly, the classic sales approach of cold calling is still a great technique in my opinion, cold calling local manufacturers and other machine shops and setting up meetings to get DKS Machining and our services on their radar and

hopefully work together. These four key strategies are the core of DKS's marketing system.

The future for DKS is a great source of excitement for me. DKS will continue to grow, explosively once I get a vertical machining center (VMC). I plan to constantly invest in the company, as I currently do, every extra penny. Over the next 5 years after getting a VMC I plan to buy a conversational CNC Lathe, a CNC Turning Center, a DCC CMM, a 5-Axis Vertical, a large 50-Taper VMC, a CNC Sinker EDM, a Water Jet, a 500mm or 630mm Pallet Horizontal Machining Center with a pallet changer and possibly a pallet pool system. During that time also upgrading the manual machines and adding a cylindrical OD/ID grinder and a larger surface grinder. Over that 5 year period I plan to change locations for a larger and completely temperature controlled facility, become ISO certified, have 4-8 (or more) employees and start an in-house training program. During that 5 year period the most important growth will be in our customer base. I will continue building my customer base through my marketing strategies outlined earlier. I will continue to add services and diversify my customers and industries we serve during this time for faster growth and stability, and of course keep our current customers happy. The 10 year mark will really be something for DKS, we will continue to grow and diversify our customer base for continued growth and stability while growing the shop. We will continue our core competencies in traditional machining while adding more specialized services such as CNC Jig Grinding and Wire EDM. I plan to have 25-50 or more employees performing a wide range of jobs at the company. The Hurco VMX42I that I won at IMTS 2014 will still be there making tight tolerance parts everyday along with many more Hurco's alongside it. I plan on having approximately 6 more VMC's for 8 in total, a CNC Jig Grinder, Several 5-axis verticals, large CNC Horizontal Boring Mill, large CNC Vertical Turning Lathe, 5-axis head Gantry mill, 4-6 Turning centers, 2 40-taper cells systems with pallet pools and 2 machines each, 2 50-taper horizontal cell systems with pallet pools and 2 machines each, 3 DCC CMM's, Vision measuring systems and portable CMM's. Our manual machine department will still be there to support the CNC operations. The in-house training program will be dialed in turning out high level machinists to meet our need for skilled machinists to run our new machines. Over the years I foresee the company growing steadily as new customers and contracts come along. With proper management and decision making the world is DKS's for the making. As you can see the VMX42I is a

perfect fit for DKS's first VMC, I was actually at my local Hurco dealer (Rosco Precision) talking to them about a VMX42I when I found out about the Chipmaker Challenge, and it is the machine I need to take DKS to the next stage I have planned, putting it's spindle to work as soon as it's hooked up to power. Winning the VMX42I would be one of the greatest honors I have ever received and I look forward to meeting all of you in person at IMTS.

Thank you for your time and consideration

Dakota Sodergren

Owner – DKS Machining

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