Edward C. Owen 12345 Roosevelt Way NE, Apt 309, Seattle, WA 98125

Resume and Dossier

PROFILE

As a Product Architect, Designer, Mechanical Engineer and Processing Engineer with nearly four decades of experience I have developed many hundreds of successful consumers, medical and industrial products. I provide expert plastics design and processing, product architecture, system/feature integration, engineering and design, conceptual design and critical assessment skills.

Throughout my career, as both an FTE and business owner, I have assumed complete project and program management. I have expertise with budget and cost modelling and analysis, schedule development, resource planning, vendor liaison, sourcing and vendor capability analysis and management.

I have held positions ranging from Sr. Engineer (Safety 1st), Director of Engineering (S&H Diagnostics), Expert Engineer at HP Inc, Sr Manager of Hardware (Amazon) and Principal at Owen Design and Artisan-Visum llc.

I am a firm believer in holding to a high bar concerning all aspects of the work I am involved with. I practice and encourage an "engineering over design" method. I would self-classify as a product developer, the combination of years of varied experiences; artist, artisan, designer, and engineer.

I have bulleted key areas of expertise, these are not exclusive of my extensive knowledge in general management, engineering, or design but are meant to highlight areas of my deep knowledge.

SUMMARY OF EXPERTISE:

- Sr level program, project and team management, strategic planning, assessment and decision making
- Ability to work across disciplines to drive successful designs to market
- Communication and Presentation; business, technical, educational and training writing and presentation
- Strong problem solving/troubleshooting; deep imagination and conceptualization skills
- Extensive knowledge of design, manufacturing and QA standards including many ANSI\ASTM, ISO and MIL/SPEC
- Ability to elucidate and adapt to new industries and technologies

PLASTICS:

- Expert plastics product design and engineering for all major processes including Injection molding, GAIM, Blow molding, Structural foam, RIM, Thermoforming and Compression Molding.
- Expert injection molding processing knowledge, Process development and troubleshooting, Vendor Audit, and selection and development.
- Deep Materials knowledge with engineering and commodity plastics
- Tool design and engineering: specializing in providing innovative molding solutions for difficult to mold product

MECHANICAL ENGINEERING:

- Product Architecture and System Integration
- Analysis, FEA, mechanism design, mechanical and machine design, robotics, electronics packaging, fluid power systems
- Expert knowledge in manufacturing methods including rapid prototyping, sheet metal, die cast, sand cast, MIM, Machining, tool and fixtures.
- Extensive knowledge in manufacturing line design and development, TPS and Lean methods.

INDUSTRIAL DESIGN (PRODUCT DESIGN):

- Product design and definition, concept, feasibility, human factors (ergonomics), user experience
- Design of award winning Consumer products, Toys, Medical Devices and Instrumentation
- Sketching, rendering, model building, and prototyping

DESIGN AND ENGINEERING MODELING SOFTWARE EXPERTISE:

- Complex Surface and Solids Modeling, 2D/3D Animation, 2D Graphics, Photo-realistic Rendering
- ***CAD/CAE:*** *PTC Creo Direct, (Former experience with;* PTC CoCreate, PTC Pro/E (through WF4.0), SolidWorks (thru 2009), Autodesk products
- ***Plastic Processing:*** *Autodesk Moldflow Product Insight*
- ***Computational (FEA):*** PTC FEA, COSMOS/WORKS, Excel, MathCAD

RELATED SOFTWARE EXPERTISE

- 2D Animation: POSER, ZBRUSH, MOHO, Motion Artist and Adobe Products
- 3D Animation; POSER, ZBRUSH, MUDBOX, and Adobe Products
- Image and other; Adobe Products (Photoshop, Illustrator)

Tel (206) 383-4715 www.artisan-visum.com edo@artisan-visum.com

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EXPERIENCE: 1978 to Present, Company listing *(alphabetical listing)*

A complete listing with descriptions is contained in the work history section (dossier).

Acufex Microsurgical Inc., Acushnet Co., Amazon Go, American Biophysics Corp., Art Technology Group Inc., Arichell, Aseco Inc., AS&E Inc., Asahi-America Inc., Bay Audio Inc., Baxter Healthcare, Bose, Bostitch, Ciba-Corning Diagnostics (Bayer) ***(ISDA Medical Device Award Winner)***, Combimatrix, Cramer (Harbor Medical) ***(MDM Award Winner)***, Emerson & Cuming, EMC, Fax International Inc., Fishman Transducer Corp., Foster-Miller Inc., General Dynamics, GTE Government Systems, Hasbro Inc. (***Parents' Choice Award Winner***), Haemonetics, HP Inc, Instron Inc., Invision Products, Innov-X Systems, Knight Medical Inc., LTX Inc., Microsoft Corporation (XBOX) (***ISDA Gold, Silver and Bronze Winner***), Midas Vision Systems, Mira Inc., Niton Corporation, The Ocean Group, Packaging Industries Inc., Parker Nichols, Zenith Pump Div., **Safety 1st** ***(Parents Choice Award Winner)***, S&H Diagnostics, The Stilwell Group, Teledyne Rodney Metals, Tenebraex Inc., Texas Instruments Inc., Thermax Inc., TissueLink Medical, Valve Corporation.

EDUCATION:

1979-1982	Course study: Mechanical Engineering at Bristol Community College, Fall River, MA
	(Course work: Physics, Mathematics, Mechanics, Fluids, Stress Analysis, and Machine Design)
Certificate	Mold Flow (C-Mold 1996), Geometric Dimensioning & Tolerancing (GD&T) (1992)
Continuous	Independent subject study in engineering, design, plastics, PDP and other related topics

PROFESSIONAL DEVELOPMENT SERVICES:

I offer training in Product Design Methods, Best Practices, Plastics Design, Plastics Processing, and other topics. These can be found at Artisan-Visum.com.

- Advanced Plastics Training; Seminar and Webinar series
- Advanced Plastics Training; 8-week course. This course was last taught in two sessions at HP Vancouver to lab personnel.
- Product Design Methods; covering PDP and PPAP theory and Methods
- Idea Generation Methods; covering techniques to improve idea generation, getting out of the box.
- Leading Ideation and Design Reviews; conducting idea generation sessions and deep design reviews.
- Product and Design Reviews and assessments. Providing an unbiased deep review of the design, the assumptions, and other aspects of the design to assess whether the goals and intent have been met.

RELATED SKILLS:

I have a variety of design and related skills. Included is a brief listing and found at Artisan-Visum.com;

- Product Development Related: Sculpting, Model Making, Furniture Design and Fabrication, Structural and Finish Carpentry and General Construction.
- Engineering and Fabrication; CNC and Machine Tools, Blacksmithing, Whitesmithing, Heavy Equipment & Automotive repair.

ADDITIONAL INFORMATION:

Please feel free to inquire for more information and examples of my work.

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WORK HISTORY 1979 to Present

This listing outlines my work history defining the primary work I did and major areas of contributions. While not completely exhaustive, it is my hope that this provides a good review of my abilities and achievements over the last thirty years. Addition information and examples of my work can be found on my websites listed on my LinkedIn page.

This work is divided into to two sections. The first section is work performed through my design consultancy's OwenDesign and Artisan-Visum llc. Second is work performed either as a direct employee or as a contract engineer. I chose this layout to better reflect the level and type of work performed by me.

Section 1) OwenDesign and Artisan-Visum llc. *Principal Consultant, Owner*

OwenDesign and Artisan-Visum llc were my consulting businesses. I handled all aspects of the business including the marketing and business development, personnel management and project management. I formed Artisan-Visum llc, a Washington State llc, in 2014 to both re-establish my consulting and to be a vehicle for the development of several independent consumer products. Through Artisan-Visum I have refined my Product Architecture Processes and Plastics Processing program.

Both OwenDesign and Artisan-Visum llc are focused on;

- Product and Process Architectures
- Product Design (conceptual development, ideation, form and feature development, et al)
- Product Feasibility (Market, Cost, Engineering Feasibility, Concept Soundness, et al)
- Mechanical Engineering, Stress Analysis (FEA) and Thermal
- Failure Analysis (FMEA, RCA)
- Materials and Process Selection
- Vendor sourcing, selection and liaison

VALVE Inc. (2015) *Consultant (Artisan-Visum llc)*

For VALVE Inc. I have developed their Product Engineering program. I developed detail methods and processes to define their Phase-Gate process. Additionally, I developed their Plastic Process methods, ID and Cosmetics and Mechanical.

Formal Frog. (2015) *Consultant (Artisan-Visum llc)*

For Formal frog Inc. I mentored the owner for the development of their "Fort Board" Toy Building System. He had little direct knowledge in Injection Molding Product development. I helped him with the product design, tool design, Vendor selection and evaluation. This Company has gone on to win several product and business awards.

OwenDesign (From 1990- 2005) *Principal Consultant, Owner*

*Note: Many smaller products and projects have not been included in this listing. I have included only major projects or those with innovative qualities.

Edmund Britt & Company and Michael Cattafe and Associates

For these Industrial Design Firms, I provided ID, Mechanical Engineering and Plastics expertise over many projects. These services ranged from blue sky-concept to matter-of-fact implementation. Projects have included heart defibrillation equipment, Exercise Equipment for Trotter, Experimental Sports footwear for Converse, Industrial consoles and enclosures, and such.

American Biophysics Corp.

I developed the complete engineering documentation for the manufacture of their product lines. This involved the creation of the document system, Procedure formats and work instructions. Additionally, I provided design critique as the product was developed. This involved injection molding processing evaluation and improvement, ID, Mechanical design and UX improvements over their entire product line.

American Science and Engineering, Inc. (with Michael Cattafe & Associates)

I developed the initial concept work for this client's backscatter X-ray scanning equipment (the first equipment you now see in TSA stations). This involved the design of the structure and scanner lift mechanism. I also provided liaison and consultation during the final design phase.

Arichell (with Michael Cattafe & Associates)

I provided Mechanical Engineering to this client. Projects included verifying part and assembly design. Correcting part geometry for molding. Review and analysis of valve assemblies for correct function. I developed several of their fluid seal and valve designs used on touch less flushing systems.

Art Technology Group (ATG) (with B&B Design)

I designed a 5-axis robotic camera system for this company. This Project involved working closely with ID and the client to realize this system as a consumer level system. The client's goal was to introduce a product that small companies could use to import 3D models, especially architectural models, to CAD and Multimedia. This system involved the design of the entire cell including the gantry frame. This frame needed to remain stiff during use as not to impart jitter to the camera. Cost and ease of use were drivers in this product.

Asahi-America, Inc. (with Ed Britt & Co.)

This project involved the development of this company's new line of standard and ultrasonic flow meters. The product line covered over 100 various sizes and forms as well as several materials. This work involved the implementation of their research data to shape the metering surfaces. Also, the design of the form factor to meet various industry standards for general and high purity systems. The primary goal was to move Asahi's product line from machined to molded. This was made complicated by the low volumes for each style and the number of products. I developed a tool system using hand inserted cores to allow for a variety of product molding combinations with low cost to each.

Bay Audio Inc.

I provided the engineering and design for their entire new in-wall and cabinet speaker product lines. The primary fabrication method was the use of aluminum extrusions with IM plastic grills and components. I also provided mentoring to the product design staff and client in the strategic development of the product line.

Baxter Healthcare, Inc. (with Ed Britt & Co.)

I developed fluid collection systems for their blood separation system. This instrument system was already developed but their collection methods were not working. This blood collection component needed to be easy to use and set up, inexpensive and robust. I was part of the consultant team brought in to correct this.

Cramer (Harbor Medical) *(MDM Award Winner)*

I designed and engineered this innovative emergency fracture splint. This involved total project management responsibilities. Materials and structural issues were paramount with the successfulness of this product since this product is used to immobilize severely fractured limbs and hold them for transport to medical facilities.

Fax International (with Michael Cattafe & Associates)

I engineered this client's consumer fax/modem enclosure and components. I also provided manufacturing liaison and sourcing services for the product including IM tool design and molding.

Fishman Transducers Inc. (with Ed Britt & Co.)

I provided product design (ID) and engineering to the development of this companies new Pro-EQ Platinum preamp. Primary importance was the move from metal to plastics and the company's desire to maintain the highest product quality. I provided engineering support and liaison for the off-shore sourcing and molding of the product including tool design, process specification and machine selection. The engineering grade material used required special screw design and processing for success.

Hewlett-Packard (Scope) (with Michael Cattafe & Associates)

I was responsible for the engineering and analysis of their new line scope product. This involved end use, manufacturing and materials. Also, introduced new over-molding methods to this client.

Instron Inc.

I was responsible for the development of this client's new hardness indenter. This involved the packaging of in-house developed electronics, the fit to existing equipment, manufacturing methods selection and materials. Other projects included the development of precision drop weights. I also design several drop impact towers as part of their custom low-end product selections. These products were very cost sensitive since their use was in the laboratory environment.

Innov-X Systems Inc.

I was responsible for the failure analysis of this companies existing product. This product's plastic housing was failing in the field for unknown reasons. I research and defined the failure mechanism and resolved this issue. Additionally, I provided mechanical review for their product development team for several of their product lines. This work was done in conjunction with Michael Cattafe Associates (ID).

Invision Products

I designed and developed this company's line of a unique vacuum-based food storage technology. This new consumer product and related line was introduced into the market in 2002. This product involves complex stress analysis do to the pressures on the plastic vessel. I provided the Industrial Design for the entire product line involving over thirty different items. This involved the selection of materials, full engineering of the product for long term vacuum seal integrity in storage at room temperature, freezer, refrigeration and heated conditions. Materials and product were designed to be dishwasher safe and durable.

Midas Vision Systems (with Ed Britt & Co.)

I provided mechanical engineering for their vision inspection system. This included sheet metal design and mechanism design of the entire enclosure. This product required the development of a unique easy lid lift mechanism. This product was very cost sensitive. Also, sourced and provided liaison with their vendors.

Mira Inc. (with Michael Cattafe & Associates)

I engineered this client's next generation stereo ophthalmoscope. This involved the design of all the component features of the scope including the internal stereoscopic mechanism, the light source and focusing mechanisms. I worked closely with their optics specialist to develop this innovative design. I was responsible for management of prototype fabrication and testing. This product was designed to use IM and machined components in consideration of the tolerances and low production volumes required.

I also redesigned their current stereo ophthalmoscope for easier manufacture. This re-design used a combination of cast urethanes for the case parts and precision machined components for the optical system. This was a low volume product and there was cost sensitivity.

Niton Corporation *(Award Winner)* (with Michael Cattafe & Associates)

I provided mechanical engineering services to this client. Projects have included adding sophisticated internal mechanisms for control of the nuclear sources and safety features for their lead detectors. This involved using miniature DC motors as small as 4mm diameter and gear train design. Also, I developed several attachments for their products such as a pistol grip and pole extension. These attachments allowed more flexibility in the use of the product.

Tenebraex Inc.

I have developed many of this client's Kill-Flash product line of rifle scope anti-reflection devices (ARD) including their first product. I was involved in problem solving and idea generation for their most difficult product challenges.

- Ideation of the Product line, form, UX and solutions to attachment for all scopes and optics devices
- Materials selection: Nylons used for robustness by military personnel. Other materials developed for consumers such as PC and ABS.
- Process selection: Injection Molding and other proprietary manufacturing methods to produce the honeycomb ARD cores.
- Tool Design: Developed tooling methods for low volume production. This included complex hand inserted mold cores to obtain design features.

Section 2) Work Performed as a Direct Employee (FTE) or as a Contract Design Engineer (via a third-party firm)

Amazon Go, (2015-2016) *Sr. Manager of Hardware /* FTE

I joined the Amazon Go Machine Vision team as the Sr. Manager of Hardware for Mechanical and Optical systems. This work involved completing the development, manufacture and deployment of the camera systems used in the new Amazon Go "just walk out" store. Amazon Go is a new start up division and, therefore, lacked many mature processes particularly regarding engineering, Quality and production. This resulted in many errors and poor engineering practices. I resolved a number of these problems allowing for the successful deployment of the devices to both the test lab and test store.

- Refined PDP and engineering processes to capture best practices within the organization.
- Worked with the CM's to resolve manufacturing issues around fabrication and quality.
- Led resolution of sheet metal and finishing issues that were blocking progress. This involved correcting mistakes of design and knowledge held by the internal engineering team. Primarily with knowledge around zinc plating, powder coating and their interaction with ANSI Salt spray testing.
- Drove concepts for next generation including the ID and ME and general architecture.
- Managed the ME Machine Vision Team in all aspects including workloads, schedules, and career advancement

HP Inc., (2013-2015) *Expert Mechanical Engineer /* FTE

I joined the Vancouver Lab to provide senior level system architecture and plastics knowledge. My responsibility was to provide initial Architecture solutions involving system integration along with process selection to meet the product goals. After the Architecture phase, I was responsible to provide expert knowledge support to the design and manufacturing teams.

- Architect of an 8-inch control panel. I was responsible for the system integration of this module and its integration into the larger product. Brought capacitive touch over IR as the preferred input method.

- Architect of the scan-base. I was responsible for the introduction and use of large die-casting process to fulfill the ID and product goals. I provided expert die-cast knowledge in process and tool design to the implementation team.
- Architecture and System Integration influence for entire Printer design, including Paper Path and exterior panel designs.
- Expert Mechanical Engineer;
    - Beyond the specific deliverables mentioned I mentored the entire Lab development department, both Consumer and Office Products, with their Mechanical part designs.
    - Developed Ultrasonic Assembly process (USW). This proved to be a knowledge weakness within the current LAB.
    - Developed a Fastener DOE and selection to correct manufacturing issues with current screw selection. This involved extensive review and experimentation with the three leading plastic thread forms settling on corrected screw boss design and screw size selection.
- Expert Plastics Engineer;
    - I mentored the entire Lab development department, both Consumer and Office Products, with their Plastic part designs.
    - I reviewed and influenced Tool and Process design through the design review and DfM process. This involved advanced Autodesk Moldflow work.
    - I worked with the Vendors to correct tool designs for weaknesses in design and processing.

Valve Corporation (2012-2013) *Product Developer/* FTE

I joined as a product developer for the early formation of the Valve Hardware Team. I helped develop the early thinking around products Valve was interested in pursuing such as their console the steam box and their game controller.

Through Artisan-Visum, I provided development, Architecture and design review services.

XBOX Microsoft Corporation (2010-2012) *Plastics Process Architect* FTE

As Process Architect my task was to redefine and improve the molding and tool engineering for the XBOX Accessories Group. XBOX was experiencing IM processing issues with our CM base. I was chartered with developing a process method to address this and deploy this to our CM's.

- Architect of the entire processing program. Created the current program structure, elements and documentation. Responsible for the deployment of the program and its success in implementation with the CM base.
- Developed and defined tool engineering requirements, the design of polymer feed systems and thermal components.
- Authored the tool and processing documents for RFQ, SOW, Qualification methods and processing characterization.
- Developed test methods and specifications for plastic product including Trial DOE and PPAP.

As part of the XBOX Accessories Team, I am responsible for mentoring and contributing to the entire team across all products. I helped develop design solutions for the new products including the use of new materials and processes as well as the design of product features. I provide direction and input for product ID, ME, Manufacturing and Reliability both internal to MS and with our CM's.

XBOX Microsoft Corporation (2005-2010) *Sr. Mechanical Engineer* FTE

I developed many of the unique XBOX Accessories marketed since 2005. This work involved all aspects of both the ME program management and the Mechanical engineering. I provided the architecture for each product and developed all key features.

Brief listing of key products shipped for XBOX Accessories;

- Wired and Wireless Headsets, Big button controller, LIPS Microphone, IML Controllers, Cabot battery, Remotes and next generation RF Controllers.
- ME liaison for CRCI, ECO Approver, early ME lead in Team Center CAD architecture
- ME lead for accessories incubation efforts developing and integrating new technologies and materials both from inside Microsoft and Outside Vendors
- ME lead and author for instrumented impact testing, ME design processes for accessories
- Authored many of the process methods used by the department including design review methods, issue tracking, project scheduling methods, etc.

Tissue Link Medical (2001) *Product Engineer* Contractor

For this company, I was part of the development team for a new innovative surgical forceps based device. I was given two major program tasks, the first was to analyze and create an understanding of the company's out-sourced design that was not performing. This work involved a detailed understanding of the force system and the interaction of the components, the frictional and structural forces involved. This knowledge was needed to improve and move the design to a new marketable device.

After this work was completed, I was then asked to be responsible for the new direction of the force system and the components involved. This new system had to be less expensive and deliver more than four times the originals performance.

In addition to this, I developed the new product look and feel performing the Industrial Design tasks needed to satisfy this requirement.

- Critical stress analysis and engineering: end effector force requirement of 120 psi
- Product ID: generated the entire look and feel of the product
- Human Factors: developed the grip architecture for best use in the surgical theatre
- Materials selection: capable of surviving radiation sterilization methods
- Manufacturing methods selection: improved and simplified assembly requirements
- Vendor sourcing, selection and liaison

GTE Government Systems (now General Dynamics) (1997-1998) *Design Engineer* Contractor

I was responsible for the concept layout of the Marine Corps DTC/TDN Communications system. I designed the field shelters for this proposal. This involved the placement of equipment for best maintenance and human-factors involvement. This work involved the best placement of the different communications equipment (rack based), wire routing, over all shelter thermal control and structural robustness.

- Developed system layout- human factors, equipment access
- Structural analysis of shelters and related components

Additionally, I designed the Tactical Interface Adapter (TIA) as a stand-alone product. This involved introducing GTE to new design methodology to innovative their process.

- Introduced commercial/COTS methods to development
- Structural analysis- Munson Road and vibration testing
- Product ID

Safety 1st (1995-1996, 1998) *Sr. Product Engineer FTE*

I designed and developed over twenty-three top selling and award winning products in the Safety 1st line. Many of these products are still fulfilling strong market share such as their "Space Saver" line of products. I was responsible for the direct conceptual design of these products and input to support the industrial design group. I worked closely with the in-house industrial design and marketing groups to establish product goals.

Additionally, I pioneered new technologies for the company introducing their use of advanced CAD/CAE software and rapid prototyping methods including STL, SLS and LOM. I was responsible the implementing of these technologies in the development of all new products.

- Analysis and engineering of product
- Product design
- Materials and process selection
- Vendor sourcing, selection and liaison
- Introduced new engineering methods via Cad and RP applications

S&H Diagnostics (1997) *Director of Engineering FTE*

I was responsible for all the mechanical engineering for this Product Design office. I headed their CAD design group. Projects I was involved with include the engineering of medical instrumentation enclosures for Bayer of Tarrytown, NY, display units for the point of purchase market, and consumer sports eyewear that combined headphones with protective sun eye wear. I was also responsible for the input with the writing of patents applied for by this firm.

- Engineering and analysis of all products
- Materials and process selection
- Product ID (concept and refinement input)
- Vendor/Client sourcing, selection and liaison

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Ciba-Corning Diagnostics (Bayer) (1993-1995) *(ISDA Medical Device Award Winner) Sr Product Engineer*

I was involved in the conceptual design of most of the plastic components used in the system. This involved providing plastic process information to the R&D department. I worked closely with the industrial design and engineering staffs to maintain design intent. I engineered the instrument's sample input and waste output systems. This included researching materials that were capable of shedding blood waste. I developed an innovative bottle weighing system that was later adopted by another division.

- Developed unique sample weighting system
- Materials and process selection
- Product ID (concept and refinement input)

Foster-Miller (1991-1992) *Design Engineer* Contractor

I worked with the Special Machinery Group in developing a robotics system for the cleaning of nuclear reactor heat exchangers, CECIL System. I was co-developer of the basic overall design concept of the robot for customer (Navy) presentation. Then I was tasked with the design of the high-pressure spray system. This involved engineering a high-pressure nozzle capable of 5000psi and maintaining a coherent spray up to 60". This spray also could not damage the nuclear steam tube bundle while cleaning at 1" distance.

- Researched and developed unique high pressure spray system
- Developed foundation mechanical system design of robotic unit
- Developed initial proposals for US Navy

Hasbro Inc. (1985, 1986, 1989, 1991) *Design Engineer Contractor*

I was responsible for the design of consumer products, Toys, for this client. These products covered the juvenile and child age groups. Products include an infant folding bouncer, GI Joe products, Air Raiders and Fantastic Flowers Products as well as others.

- Structural design for product safety
- Materials and process selection
- Product ID (concept and refinement)

Aseco Inc. (1990-1991) *Design Engineer* Contractor

I was responsible for the design of an automated high-speed chip device loader. This unit was used on their new device testing product. This design involved the reduction of parts and simplification of design to reduce cost and increase quality.

Acufex Microsurgical Inc. (1990) *Product Designer Contractor*

I developed this company's line of plastic surgical containers. This involved designing the case line, vendor sourcing, and liaison between client and the selected vendors. These cases are used in the surgical environment and were required to withstand the associated rigors of repeated sterilizations. These cases were designed using a thermoforming process for Polyetherimide PIE- ULTEM). This is extremely challenging, only two vendors in the country have ability to fabricate this material.

Thermax Inc. (1988 to 1989) *Mechanical Designer FTE*

I developed engineering layouts for cryogenic super heaters. I was involved with the design of the steam, water and ambient air heat exchangers. This work involved the design of the aluminum extrusions, internal and external fin design, internal flow features, pressure vessel layout, flange design, bundle\baffle design, and structural frame design and site layout. This product line met ASME, CSA and European Pressure vessel standards. As part of my work I developed their CAD system and integrated their documentation system.

Teledyne Rodney Metals (1987-1988) *Manufacturing Engineer Contractor*

I was responsible for the engineering and design of three distinct process systems for this company. First was a wastewater recovery system involving all filters and the delivery system. Second was an oil filtration system for one of the steel rolling mills. This involved moving the system from below ground to above ground enhancing the ease of maintenance. Third was the design of a heat recovery system. This system allowed for the reclaiming of heat and its use to generate steam. These systems required gaining a working knowledge of the processes that they provided.

- Development of manufacturing processes
- Analysis and engineering
- Vendor sourcing, selection and liaison

Parker Nichols, Zenith Pump Div. (1988) *Tooling Engineer Contractor*

I developed a complete tooling system for the manufacture of tight tolerance metering pumps. This involved the selection of process equipment and the engineering of all needed tooling. Tools included Multi-spindle drill and reaming tools and grinding stations.

Bose Inc. (1987) *Product Designer Contractor*

I worked on the development of the Bose Cannon Speaker. I developed the RIM Flanges and the PVC Pipe sections. This was their first use of Reaction Injection Molding, RIM. The Flange design involved insert molding aluminum plates to meet the structural requirements. I worked with the Mold Maker to verify the design's moldability. Additionally, I worked on several other products including an early wave speaker.

Emerson & Cuming (1986 to 1987) *Mold Designer Contractor*

I designed syntactic foam molds for the manufacture of floatation devices for the US Navy 688 class fast attack subs. These molds are made from formed sheet steel shells with welded structure.

Texas Instruments Inc. (1985-1986) *Tool Designer Contractor*

I designed specialized tooling and equipment for the manufacture of electronic devices highlighted by the design of a 1000 piece per minute chip loading system. This was production line equipment used in their IC assembly line. I also developed several product testers for their bi-metal thermal sensors.

LTX Inc. (1983-1985) *Tooling Engineer* FTE

I was the primary tool engineer for this manufacturer of ATE systems. In this capacity, I developed entire tooling schemes for the manufacture of the companies' products. I was involved in the design and implementation of new processes and the design of new product manufacturing lines. This involved the development of manufacturing methods and the control of materials and processes. I developed the production line process for product assembly. This involved the line layout and specific station requirements.

Acushnet Co. (1981-1983) *Machine Designer Contractor*

I developed several robotic product-handling systems for this manufacturer. This involved the design of specialized robot and gripper systems, tray conveyor and stacking systems and the related support equipment for the work cell. These machines are still being used today after nearly twenty years of service.

- Foundation research in robotic elements including motion control and gripper design. Worked with Robert Brown on this.
- Vendor selection and liaison. Managed the outside machine shops for manufacture of components. I was also involved in the assembly and debug of each of the systems.
- System layout and design

Packaging Industries Inc. (1980 to 1981) *Machine Design Engineer* FTE

I developed a line of floppy disk jacket manufacturing machinery. I was involved in the design of all the process machines required for this product. This included die cutting tooling, lamination machines and jacket folders. I was also responsible for the manufacturing engineering support for the product. This included facilities design and layout, production schedule and personnel.

General Dynamics (1979 thru 1980) *Layout Draftsman/Mechanical Designer* FTE

I worked on various submarine systems for the trident program. These included weapons systems, propulsion systems and HVAC systems throughout the boat. I designed MARK 48 torpedo handling equipment including a hoist handling harness. I developed written procedures for the maintenance of the bow dome and propulsion shaft removed and replacement.