FORCON
INTERNATIONAL

CARL F. HORNIG, P.E., CFEI

SUMMARY

Over 40 years of engineering experience pertaining to mechanical engineering, materials, metallurgy, electronic components, and failure analysis. Specialized expertise includes SMT and through-hole printed circuit board fabrication, SMT and through-hole assembly, backplane systems, electroforming, electroplating, system interconnect, quality control, and explosive bonding. Forensic experience includes commercial marina facilities, mechanical and electrical components, machinery, plumbing, residential public utility components, HVAC systems and air-handlers, dry and wet fire suppression systems, automobile fire investigation and mechanical safety features and commercial and residential fire investigation.

FORENSIC INVESTIGATION AND EXPERTISE

- Marina Facilities
- Mechanical Components and Machinery
- Weld and Weldment Failure and Analysis
- Cause and Origin Evaluation
- Automotive Engine Fires and Mechanical Failure Analysis
- Hot-Water Tank Failure and Explosion
- Health Care Facility Medical Gas and Vacuum Plumbing
- Residential and Commercial Dry and Wet Fire Suppression Systems
- Plumbing Fixture and Components
- HVAC Air Handler Heating and DX Cooling Coils
- Appliance Mechanical Plumbing
- Metallurgy and Corrosion
- Electronic Component Failure and Manufacturing Process Control (Through Hole and SMT)
- Printed Circuit Board Fabrication and Assembly (Surface Mount and Through Hole)

EDUCATION

Master of Science - Metallurgy and Material Science, Lehigh University, Bethlehem, PA

Bachelor of Science - Mechanical Engineering, Johns Hopkins University, Baltimore, MD

CONTINUING EDUCATION

Courses and Certifications completed in the following areas:

- NAFI Advanced Fire Arson & Explosive Investigation, July 2019
- International Building Code, April 2019
- ASME Professional Ethics, September 2018
- National Electrical Code, December 2017
- Cold Climate Heat Pumps, March 2017
- High Performance Building Envelopes, January 2017
- Precast Concrete Parking Structure, Design, and Garage Restoration Maintenance and Repair, February 2016
- National Fire, Arson & Explosive Training, March 2015
- National Gas Claims and Litigation Association Conference, 2014
- Maryland Engineering Law, April 2014
- Solar Electric and Hydronic Systems, March 2014
- Structural Forensic Engineering, July 2013
- Quality Assurance and Design Control, October 2012

REGISTRATIONS & CERTIFICATIONS

Registered Professional Engineer, in the following States:
- Maryland, 1993
- New Hampshire, 1974 (Not Active)

Certified Fire and Explosion Investigator, NAFI, 2017-2020

PROFESSIONAL ASSOCIATIONS

National Association of Fire Investigators

American Society of Mechanical Engineers

CAREER HISTORY

FORCON International – Materials & Mechanical Engineer, Independent Consultant
Provide forensic engineering and expert witness services in his fields of expertise including mechanical equipment and systems, plumbing/piping systems and components, materials/metallurgical failures, and electronic assembly and quality procedures.

Rothfuss Engineering Company - Provided residential and marina forensic investigative services pertaining to electrical failure, fire and explosion, and structural, machinery, and mechanical failure. Safety and accident investigation associated with commercial, industrial, residential facilities, public utilities, vehicle collision, and marine and marina insurance claims.

Consultant Engineer
- Provided analysis and engineering investigative services pertaining to public utilities, commercial and residential, electronic equipment failure and fire including printed circuit board fabrication and component assembly, and marina damage associated with weather related insurance claims

SANMINA SCI CORPORATION - An integrated EMS supplier having an international presence providing printed circuit board fabrications, SMT system card assembly, backplane systems, and card cage cabinet solutions.

Technical Director US Eastern and European Regions
- Provided technical expertise and advised potential customer's engineer staff during design phase. This included identifying technical requirements commensurate with our capabilities and applying technical and managerial resources directed to achieving customer's objectives.
- Technical Seminars and design consultation directed to high speed signal integrity through multilayer PCB backplanes considering system geometry, interconnect components and trace routing, materials, manufacturability, and cost effectiveness.
- Established technical relationship with backplane customers providing storage systems and WAN products.
- Managed Rep Organizations, provided technical support, and developed pricing strategy directed to securing new business opportunities.
- Developed military customers providing both backplane assembly and PCB business.

Technical Director Central Region
- Focused on obtaining initial prototype builds and securing a working relationship with all levels of a customer's engineering and purchasing staff. Set price and margin objectives reflective of the customer's goals and market realities.
- Established Sanmina as a supplier and technical partner meeting customer's development goals and market objectives.
- Integrated our technical expertise and Rep Organizations to achieve strategic account dominance providing engineering support, quick turn assemblies, and production product.

- Provided signal integrity analysis focused on selective laminate construction, impedance, propagation delay, and attenuation. This resulted in our developing a strategic engineering partnership.
- Managed Program Management Organization and placed in effect operations standards governing backlog procedures and forecast objectives responsive to our customer's goals.

SYMTRON CORPORATION - Backplane interconnect system and printed circuit board manufacturer for the commercial market.

Product Manager

- Responsible for developing new opportunities, acquiring initial business, and expanding market share.
- Applied "Total Quality Management" (TQM) to assure conformance to customer's requirements.
- Identified target accounts and technical competence that provided a competitive sales advantage.
- Managed regional sales people, Rep Organizations and focused market intelligence converging internal technical developments and emerging customer requirements.
- Technical Adviser and Sale Management 1991 to 1992
- Provided technical support and market based pricing to field sales personnel.
- Integrated technical requirements and manufacturing capability to achieve cost effective solutions satisfying customer's prototype and production needs. Customer engineering and design consultation.

TERADYNE CONNECTION SYSTEMS - A worldwide backplane interconnect system manufacturer for the telecom, military, and computer industry.

Sales and Marketing Manager

- Establish price and profitability and provide direct sales support for $10 million in domestic and international business.
- Generated product lifetime revenues by penetrating and providing prototype sales closure for design ins with
- IBM, DSC Communications Corporation, Control Data Corporation, Sprint International, and Northern Telecom.
- Led interdisciplinary team which established price and profitability strategy to maximize competitive advantage.
- Directed sales calls and supported field sales people in account penetration and development of new business.
- Established with sales people, domestic and foreign, quarterly forecasts that prioritized manufacturing's technical and capacity projections.
- Integrated the actions of engineering, customer service, and manufacturing satisfying customer's business and technical requirements.
- Interfaced directly with customer and sales people to achieve technical and time to market needs.
- Identified sectors of opportunity and methodology to acquire business.
- Developed sales tools, including brochures, customer use documentation, and criteria depicting competitive electrical and mechanical advantages. Applications Engineering
- Consulted with customer to finalize system design and coordinate engineering actions to ensure manufacturability and conformance to customer's requirements.
- Established industry leadership connector system achieving customer electrical and signal integrity objectives.
- Wrote Backplane System Design Manual defining customer documentation package and manufacturing parameters.

Manager, PCB Prototype Operations

- Sales, profit, and loss responsibility for printed circuit board manufacturing and engineering.
- Interface directly with customer and sales organization to design specialized solutions to customers' needs and delivery requirements.
- Supervised twenty eight people operating two shifts.

- Increased revenue from $200,000 to $700,000 per year.

MIT LINCOLN LABORATORY - Research, development, evaluation, and prototype manufacturing center for the government and military.

Staff Engineering
- Converted printed circuit boards and microwave devices form design to prototype product.
- Directed the installation, computer aided fabrication, and work flow in support of system hardware and assembly.
- Restructured quality assurance organization improving workflow and interactions with other groups.
- Supervised PCB fabrication, electroforming, failure analysis, and quality control.
- Solar photovoltaic module evaluation efficiency and degradation.

CENTRONICS DATA COMPUTER CORPORATION - A manufacturer of printers and slot machines.

Staff Engineer
- Provided technical support to manufacturing, quality control, and purchasing.
- Achieved 40% cost reduction of print mechanism, providing several hundred thousand dollars in annual savings.
- Metallurgical evaluation, failure analysis, and authored material specifications encompassing solutions assuring conformance to requirements.

WESTERN ELECTRIC COMPANY - A manufacturer and installer of telephone communication equipment.

Development Engineer North Andover, MA - Merrimack Valley Works
- Provided a direct technical link between Western Electric's Merrimack Works and the Hopewell Research Center applying engineering experience and knowledge focused on materials and processes.
- Research directed to reducing gold thickness and the porosity associated with gold plating and an underlying electroplated diffusion barrier.
- Reducing the stress and improve production yields associated with hydrothermally growing single crystal quartz.
- Developed explosive bonding process repairing printed circuit board plated gold finger contacts.

Associate Member Technical Staff Hopewell, NJ - Engineering Research Center
- Attended Lehigh University and supported development and material evaluations associated with explosive bonding.
- Principal focus explosive bonding of protective and precious metal foils to base metals and surface hardening of various stainless steel alloys.
- Evaluating the effectiveness of explosive bonded foils as a diffusion barrier and the reduction of porosity in the electrodeposition of precious metals.

Engineer, Baltimore Works Baltimore, MD

Associate Engineer Service Division Cockeysville, MD

PATENTS

- Method of Forming a Laminate US Patent 3,998,374 (Explosive Bonding)
- Method of Forming a Laminate US Patent RE. 29,879
- Method of Hydrothermal Growing Quartz US Patent 4,030,966

PUBLICATIONS

- "*Predictability and Efficient Initial Backplane PCB Fabrication*" Printed Circuit Design and Fabrication/Circuits Assembly, January 2013
- "*Signal Integrity and PCB Physical Parameters*" Printed Circuit Design and Fabrication/Circuits Assembly, February 2012
- "*Printed Circuit Backplane, Design and Impedance Control*" Connector Symposium Proceedings, 1987
- "Printed Circuit Backplane Design Can Translate Into Cost-Effective Manufacturability" Electronic Packaging and Production, June 1985
- "*An Evaluation of High-Energy Bonding and PC Board Repair*" Interconnection, 1981
- "*Solar Photovoltaic Module Degradation From Electro-Migration*" Lincoln Laboratory, US Department of Energy Contract EY-76-C-02-4094
- "*The Corrosion of Worn Tin-Nickel and Gold-Coated Tin-Nickel Alloy Electrodeposits*" The Electrochemical Society Volume 124, No. 7, July 1977
- "*Electrodeposited Tin-Nickel Thermal Stability*" Scripta Metallurgica Volume 11, 1977
- "*The Corrosion Behavior of Single and Multiphase Tin-Nickel Alloy Electrodeposits*" Plating and Surface Finishing, July 1976.
- Electrical Contacts -1976 Proceeding, Holm Seminar, Chicago, IL.