We Care About Detail

Headquarters & Billing
110 Commerce Circle
Sacramento, CA 95815

Shipping and Receiving
150 Commerce Circle
Sacramento, CA 95815

Phone: (916) 925-6100
Fax: (916) 925-6111
www.VPEI.com

Care to the Finest Detail

INNOVATION

The VPE engineering team embraces exploration and experimentation, always striving to be leaders in technological innovation. It is based on the strong roots of technological creativity and the ability to achieve innovative, specialized coatings, advanced materials processing and unique assembly methods.

Cutting Edge: Creative, Cost-Effective.

With Malicious Attention to Detail VPE Specialize in:

- Vacuum brazing
- Diffusion bonding
- Ultrasonic bonding
- Induction brazing
- Miscellaneous metal coatings
- Dry-tube brazing
- Turbine production
- Fused-silica vacuum extrusion
evacuation assembly
Since 1976, Vacuum Process Engineering (VPE) has offered high caliber, science and engineering based thermal processing services. Capabilities include precision brazing, diffusion bonding, critical heating treating, thin film coatings and other specialized assembly and materials joining processes.

VPE's experienced staff can tackle any project with vision and unmatched technical excellence whether it's research and development work, large capacity production or complete turnkey fabrication. We have over 35 years of experience in applied materials science, problem analysis, production methodology and design-for-fabrication.

Our people believe that driving to be the best in their work, their relationships, their ideas and practices is the best demonstration of VPE’s commitment to customer satisfaction. They are expected to be held accountable and to hold others accountable for the best results.

VPE cares and develops the latest state-of-the-art technologies to guarantee the highest performance possible. VPE is deeply committed to providing the highest quality products and services at consistently strives to understand and exceed the requirements of its customers. With an unshakable commitment to precision performance, VPE will continue to build customer trust and loyalty.

VPE provides world-class products and services that enhance customer satisfaction - every day.

Our people believe that driving to be the best in their work, their relationships, their ideas and practices is the best demonstration of VPE’s commitment to customer satisfaction. They are expected to be held accountable and to hold others accountable for the best results.

VPE cares and develops the latest state-of-the-art technologies to guarantee the highest performance possible. VPE is deeply committed to providing the highest quality products and services at consistently strives to understand and exceed the requirements of its customers. With an unshakable commitment to precision performance, VPE will continue to build customer trust and loyalty.

VPE provides world-class products and services that enhance customer satisfaction - every day.

INTEGRITY
People with Values

VPE seeks to build long-term relationships with its customers and its suppliers by being open and fair, accepting responsibility and by keeping its promises. At the core of VPE are values of sound communication and treating each other with respect and courtesy. It compels people who follow through with their commitments and hold themselves accountable to achieve results. Staff members share information, provide feedback and genuinely listen to each other. Recognizing that attitudes are contagious, VPE aims to maintain a positive attitude and give others the benefit of the doubt and while taking responsibility pride in its work.

VPE HAS ONLY ONE STANDARD: EXCELLENCE EVERYDAY

ASSURANCE
Standard & Certifications

Company philosophy demands, and VPE strives through inspection, that every product and service exceed compliance and industry standards. Itsstrict quality assurance program has been accepted by the most discriminating of corporations, national laboratories and independent auditors.

As a result, VPE has a proud history of meeting and exceeding the quality certification demands of the market.

To view VPE’s current compliance certificates, visit www.vpe.com
In diffusion bonding parent materials are positioned together under an applied force and heated in vacuum, causing atoms from each part to diffuse across and finally eliminate the original interface. Dynamic loads to one million pounds, temperatures greater than 1500°C and closely controlled furnace dwell times are utilized. With TLP (Transient Liquid Phase) bonding, an extremely thin "activation layer" is used to create a short-lived liquid interface at the parent materials being joined.
Several diffusion bonding techniques have been developed as VPE specialties since the company started in 1976. VPE has always been the most experienced and the best equipped commercial facility in North America for these processes. VPE’s cost efficient diffusion bonding processes address critical parameters.

Assembly weights to 10,000 pounds, sizes up to 52 inches in diameter and parent materials as thin as 0.0002 inches are bonded routinely.

**Critical Diffusion Bonding Parameters**
- Temperature profile design
- Interfacial features
- Component flatness
- Surface roughness
- Surface chemistry and metallurgy
- Load application profile
- Suitability of product design for bonding
- Service environment
- Strain-based processing
- Production tooling design

**Example Diffusion Bonding Applications**
- NASA – bonding parameter development for mars lander
- Aerojet – space shuttle valve assemblies
- Schilling - robotic assemblies for submarines used in offshore oil industry
- Major medical device corporation – artificial heart implant components
- Microchannel devices for fuel cells, reactors, reformers and heat exchangers

**Other Joining Processes**
- Precision brazing
- Electroforming
- Low temperature hermetic sealing
- Press seals
- Thin film coatings
- Hermetic ceramic-to-metal seals
- Soldering

**Overall Capabilities of VPE**
- Contract R&D, prototyping, and turnkey product design and production
- ISO 9001-2008 certified manufacturing and processing services

**Parent Material Capabilities**
- Copper
- Molybdenum
- Gildcop™
- Titanium
- Nickel
- Aluminum oxide
- Inconel™ alloys
- Magnesium
- Haynes™ alloys
- Platinum
- Stainless steel
- Silver
- Aluminum
- Gold

**VPE’s Diffusion Bonding Process Capabilities**
- Vacuum-based
- Induction-based
- Controlled atmosphere
- Transient Liquid Phase (TLP)
- Low temperature
- Long cycle, minimal strain
- High production
- Reactive interface
- Interface-assisted
Based on Strong Materials Science Expertise and Long Production Experience

Based on High Temperature, B
d o
n H
t e
n P
r

VPE has been continually developing and optimizing precision brazing processes since the company was founded in 1976. Our reputation for brazing excellence has come from applying strong engineering solutions and project management skills to complete many challenging R&D projects and to provide long-term volume production runs for critical applications.

Shipping and Receiving
150 Commerce Circle
Sacramento, CA 95815
Phone: (916) 925-6100
Fax: (916) 925-6111
www.vpel.com

110 Commerce Circle
Sacramento, CA 95815

Headquarters & Billing

VPE has been continually developing and optimizing precision brazing processes since the company was founded in 1976. Our reputation for brazing excellence has come from applying strong engineering solutions and project management skills to complete many challenging R&D projects and to provide long-term volume production runs for critical applications.

Shipping and Receiving
150 Commerce Circle
Sacramento, CA 95815
Phone: (916) 925-6100
Fax: (916) 925-6111
www.vpel.com

110 Commerce Circle
Sacramento, CA 95815

Headquarters & Billing
Successful precision brazing results in lower production costs, higher production yields and more robust end-use performance. For VPE, precision brazing means using a materials science-based approach to ensure that the process parameters are correctly designed and implemented.

**Critical Process Parameters for Precision Brazing Include**
- Joint design
- Joint volume control
- Temperature profile design
- Selective enabling or limiting capillary action
- Interface chemistry
- Filler alloy metallurgy
- Service environment
- Production tooling design

**Examples of Precision Brazing Applications**
- NASA – space exploration and lander programs
- Aerojet – rocket thruster nozzles
- Major aerospace contractor – engine fire sensors
- Major medical device corporation – ceramic-to-metal heater assemblies
- Fortune 10 corporation – reactor and gas turbine components
- Several markets – microchannel devices such as heat exchangers

**Other Joining Processes Utilized by VPE**
- Diffusion bonding
- Transient Liquid Phase (TLP) bonding
- Electroforming
- Low temperature
- Press seals
- Thin film
- Solder
- Hermetic

**Parent Materials Braze by VPE Include**
- Copper
- Glidcop™
- Aluminum
- Nickel
- Inconel™ alloys
- Kovar™
- Invar™ alloys
- Havar™
- Haynes alloys
- Stainless steel
- Aluminum oxide
- Tungsten
- Titanium
- Aluminum nitride
- Tantalum
- Ceramics
- Composites
- Silver
- Tungsten carbide
- Vanadium
- Reactive materials

**Overall Capabilities of VPE**
- Contract R&D, prototyping, turnkey product design
- ISO 9001-2008 certified manufacturing and processing services
- Many joining processes, including diffusion bonding and vacuum baking
- Thin film coating, heat treating, comprehensive analysis and testing lab, clean room processing

**Vacuum**
- Induction
- Hydrogen
- Aluminum
- Retort
- Controlled dewpoint

**Diffusion**
- Pressure assisted
- Quartz lamp
- Controlled atmosphere

**Pressure assisted**
- Ultra fast
- Controlled atmosphere

**Ultra fast**
- Controlled atmosphere

**Thin Film**
- Solder
- Hermetic

**Solder**
- Hermetic

**Hermetic**
- Copper
- Glidcop™
- Aluminum
- Nickel
- Inconel™ alloys
- Kovar™
- Invar™ alloys
- Havar™
- Haynes alloys
- Stainless steel
- Aluminum oxide
- Tungsten
- Titanium
- Aluminum nitride
- Tantalum
- Ceramics
- Composites
- Silver
- Tungsten carbide
- Vanadium
- Reactive materials

**Vacuum**
- Induction
- Hydrogen
- Aluminum
- Retort
- Controlled dewpoint

**Diffusion**
- Pressure assisted
- Quartz lamp
- Controlled atmosphere

**Pressure assisted**
- Ultra fast
- Controlled atmosphere

**Ultra fast**
- Controlled atmosphere

**Thin Film**
- Solder
- Hermetic

**Solder**
- Hermetic

**Hermetic**
- Copper
- Glidcop™
- Aluminum
- Nickel
- Inconel™ alloys
- Kovar™
- Invar™ alloys
- Havar™
- Haynes alloys
- Stainless steel
- Aluminum oxide
- Tungsten
- Titanium
- Aluminum nitride
- Tantalum
- Ceramics
- Composites
- Silver
- Tungsten carbide
- Vanadium
- Reactive materials
From Specific Tasks to Turnkey Long-Term Production

• High volume, medium and low volume production and fabrication
• Specific process or assembly tasks
• Problem solving - product design and production issues
• Testing, analysis and quality assurance
• Material and subcontractor sourcing, qualifying and supervision
• Design and set up of production line with all tooling
• Production equipment development
• Turnkey product design, prototyping and production
• Turnkey production from drawings and specifications
A UNIQUE COMBINATION OF CAPABILITIES

- Metallurgical expertise for both R&D and production
- Production-oriented for efficiency, low costs and high quality
- Highly efficient use of R&D and prototyping budgets
- Processes, parts, assemblies, complete products
- One-off to volume production
- Advanced testing and analysis equipment
- ISO 9001-2008, plus customer-specific QA standards
- Well qualified materials suppliers & subcontractors

A UNIQUE COMBINATION OF CAPABILITIES

- Brazing furnaces for: vacuum, partial pressure, hydrogen and argon
- Systems and furnaces for diffusion bonding and induction brazing
- Thin film coating by electron beam, ion plating, sputtering
- Heat treating – many specialized processes
- GTAW welding and capacitor welding stations
- Cleanrooms, cleaning cells, flow benches
- Metallurgical testing and analysis
- Wet lab, metrology, variety of inspection equipment
- 60,000 sq ft of design, lab, QA and production space

QUALITY ASSURANCE

- ISO 9001-2008 certified
- Extensive in-house capabilities for production, testing and analysis
- Meet many exacting certification requirements, specific to applications or customers:
  - Medical
  - Aerospace
  - Electronics
  - Nuclear
  - Defense

- Advanced testing and analysis equipment
- ISO 9001-2008, plus customer-specific QA standards
- Well qualified materials suppliers & subcontractors

QUALITY ASSURANCE

- ISO 9001-2008 certifi ed manufacturing and processing services

EXPERTISE AND TRACK RECORD

- Reputation as solver of difficult problems and as a long-term, high quality and reliable production supplier
- People – project management specialists; materials scientists; materials, mechanical and electrical engineers; specialized technologists and experienced assembly and test personnel
- Many specialized suppliers and subcontractors
- Track record since 1976 with high customer retention

EXPERTISE AND TRACK RECORD

- Aerojet – reactive metal thermal processing
- Schilling - robotic assemblies for submarines used in offshore oil industry
- NASA – space exploration and lander programs
- Major aerospace contractor – engine fire sensors
- Major medical device corporation – ceramic-to-metal heater assemblies
- Fortune 10 corporation – homeland security assemblies

OVERALL CAPABILITIES OF VPE

- Contract production of critical assemblies
- Contract R&D, prototyping, turnkey product design
- Many joining processes, including precision brazing and diffusion bonding
- Thin film coating, heat treating, comprehensive analysis and testing lab
- ISO 9001-2008 certifi ed manufacturing and processing services

OVERALL CAPABILITIES OF VPE

- Production for demanding specifications and mission-critical applications
Highly Efficient Use of R&D and Prototyping Budgets

VPE Technical Specialties

- Processes for metal joining, thin film coating, heat treating and fabrication
- Design of experiments – for processes and assembly fabrication
- Assemblies and devices having high temperature applications
- Use of and joining of exotic metals and ceramics
- Brazing – vacuum, hydrogen, induction, fast ramp heating
- Diffusion bonding, TLP (Transient Liquid Phase) bonding
- Design for efficiency and quality in production
  - Complex assembly techniques and fixturing
  - Microchannel device processing and assembly
- Testing and analysis

Headquarters & Billing
110 Commerce Circle
Sacramento, CA 95815

Shipping and Receiving
150 Commerce Circle
Sacramento, CA 95815

Phone: (916) 925-6100
Fax: (916) 925-6111
www.vpei.com
**R&D FOR DEMANDING CUSTOMERS AND MISSION-CRITICAL APPLICATIONS**

- Fortune 50 conglomerate – development of implantable battery seals
- Aerojet – development of cleaning processes for reactive metals
- LLNL – development of pulse purge cleaning technology
- GE – development of a ruggedized sapphire window for harsh environments

**IN-HOUSE TESTING AND ANALYSIS SERVICES**

- Advanced testing and analysis services to support both in-house R&D and production QA and also offered as an external service to customers
- ISO 9001-2008 certified
- Examples
  - Metallography
  - Laboratory analysis
  - Residual gas analysis
  - Helium leak detection
  - Pressure testing
  - Strength of materials
  - Failure analysis

**OVERALL CAPABILITIES OF VPE**

- Contract R&D, prototyping, and turnkey product design
- ISO 9001-2008 certified manufacturing and processing services
- Many joining processes, including precision brazing and diffusion bonding
- Thin film coating, heat treating, comprehensive analysis and testing lab

**RANGE OF R&D SERVICES**

- Component, subassembly or turnkey product development
- Contract research services
- R&D preceding production by either customer or by VPE
- Prototyping, proof-of-concept demonstrations
- Design of Experiment (DOE)
- Specific process development or problem solving
- Technology transfer programs
- Production equipment, production line development
- Complete R&D solutions using both in-house and subcontractor expertise

**PROCESSES, EQUIPMENT, FACILITIES**

- Techniques for fabrication of complex fixturing and assemblies
- GTA welding and capacitor welding stations
- Cleanrooms, cleaning cells, flow benches
- Metallurgical testing and analysis
- Wet lab, metrology, variety of inspection equipment
- 60,000 sq ft of design, lab, QA and production space

**WORKING WITH VPE**

- Minimize R&D, prototyping, production costs, and time-to-market through innovation
- In-house metallurgical expertise to solve difficult problems as they arise
- Complete solutions – using both in-house resources and well qualified subcontractors
- Contract flexibility - from cost-plus to partnering
- Highly responsive technical interaction with prospects and customers – engineer-to-engineer

**IN-HOUSE TESTING AND ANALYSIS SERVICES**

- Advanced testing and analysis services to support both in-house R&D and production QA and also offered as an external service to customers
- ISO 9001-2008 certified
- Examples
  - Metallography
  - Laboratory analysis
  - Residual gas analysis
  - Helium leak detection
  - Pressure testing
  - Strength of materials
  - Failure analysis

**OVERALL CAPABILITIES OF VPE**

- Contract R&D, prototyping, and turnkey product design
- ISO 9001-2008 certified manufacturing and processing services
- Many joining processes, including precision brazing and diffusion bonding
- Thin film coating, heat treating, comprehensive analysis and testing lab

**RANGE OF R&D SERVICES**

- Component, subassembly or turnkey product development
- Contract research services
- R&D preceding production by either customer or by VPE
- Prototyping, proof-of-concept demonstrations
- Design of Experiment (DOE)
- Specific process development or problem solving
- Technology transfer programs
- Production equipment, production line development
- Complete R&D solutions using both in-house and subcontractor expertise

**PROCESSES, EQUIPMENT, FACILITIES**

- Techniques for fabrication of complex fixturing and assemblies
- GTA welding and capacitor welding stations
- Cleanrooms, cleaning cells, flow benches
- Metallurgical testing and analysis
- Wet lab, metrology, variety of inspection equipment
- 60,000 sq ft of design, lab, QA and production space

**WORKING WITH VPE**

- Minimize R&D, prototyping, production costs, and time-to-market through innovation
- In-house metallurgical expertise to solve difficult problems as they arise
- Complete solutions – using both in-house resources and well qualified subcontractors
- Contract flexibility - from cost-plus to partnering
- Highly responsive technical interaction with prospects and customers – engineer-to-engineer

**IN-HOUSE TESTING AND ANALYSIS SERVICES**

- Advanced testing and analysis services to support both in-house R&D and production QA and also offered as an external service to customers
- ISO 9001-2008 certified
- Examples
  - Metallography
  - Laboratory analysis
  - Residual gas analysis
  - Helium leak detection
  - Pressure testing
  - Strength of materials
  - Failure analysis

**OVERALL CAPABILITIES OF VPE**

- Contract R&D, prototyping, and turnkey product design
- ISO 9001-2008 certified manufacturing and processing services
- Many joining processes, including precision brazing and diffusion bonding
- Thin film coating, heat treating, comprehensive analysis and testing lab