Virginia Transformer Corp. is an engineering company that manufactures custom power transformers. In addition to our engineering and design strengths, we have the resources of 3 manufacturing facilities in North America. Building application specific units for over forty years, VTC has the product, process and people to meet any power transformer need. With the broadest product ranges available from one source, we serve a versatile market. From utilities to industrial to commercial markets, from 300 kVA to 100 MVA.

Virginia Transformer is world class in quality and service, we are “The Commitment Company”.
Headquartered in Roanoke, Virginia, Virginia Transformer is an engineering company designing and manufacturing power transformers for industrial and utility applications since 1971. Our 3 North American plants are each geared and equipped to manufacture power transformers across the full spectrum of size and voltage ratings. The company produces medium size units in Roanoke, VA, large size units in Pocatello, ID, and specialty units in our Chihuahua, MX plant. Additionally, our India operation provides design and IT services for all three facilities. Our employees are specialized in design and making transformers with a focus on customer service and quality. Measured by the combined MVA produced in all 3 plants, VTC is the 4th largest manufacturer of power transformers in North America. VT’s Industrial application range is the broadest of all manufacturers. From steel mills in Indiana to mines in Arizona; and from oil refineries in Texas to pipe lines in Canada; to a windfarm in Idaho, VTC has the solutions for all industrial applications.

Virginia Transformer has made over 12,000 designs for transformer applications, covering the industrial and utility markets.

The reliability of VT transformers is proven in New York City and for all substation and generator applications up to 230 KV in the utility markets. VT is the largest US exporter of power transformers to Central America and the Middle East. Our world class facilities are capable of producing from 300 KVA to 100 MVA, up to 230 KV class, oil filled transformers. We are leaders in the manufacturing of dry type transformers as well, with a range up to 20,000 KVA, including our UNICLAD® design for the very highest reliability. VT was one of the first companies to make transformers with biodegradable fluid in the late 1990’s. We are indeed a one stop shop for industrial and utility projects both at home and abroad.

Our products are UL and American Bureau of Ships (ABS) listed and our designs meet ANSI, CSA, and IEC (for the Middle East and Asia) standards. For additional information on our products and applications, please visit our web site www.vatransformer.com.
Virginia Transformer Corp was established in 1971 in Roanoke, VA to supply power transformers for the underground mining industries in the nearby Appalachian Mountains. These transformers needed a low profile construction with special dimensions, built to non-standard specifications in both liquid filled and dry type designs.

During the mid 1970's, VT expanded and diversified its customer base and product size to 5000 KVA. VT also developed transformer and reactor designs for use with rectifiers for transit applications and a variety of transformer designs for the coal and iron ore mining industries. With the elimination of PCB’s from the industry in 1977, VT began supplying retrofit liquid filled and dry type transformers built to special physical dimensions. In the 1980’s VT continued to expand product lines. Sales of industrial power transformers, commercial power distribution transformers, reactors and load tap-changing transformers increased steadily. Heavy mills, commercial buildings, airports and transit systems across the country became VTC customers. During the 1980’s, the company became the leading supplier to switch gear and OEM's such as Siemens, Cutler Hammer and GE. During this time VT developed additional products such as UNIClad®, a premium-duty air-cooled, resin encapsulated transformer with a unique sealed insulation system. The company sold its first LTC transformers in the late 1980’s, thus entering the utility market. In 1990, growth continued by moving into a new 120,000 sq. ft. facility in Roanoke, designed and built exclusively for producing custom transformers with an air-conditioned winding room. In 1995, operations expanded with the addition of a small power facility in Chihuahua, Mexico as the primary facility for the company’s unit substation applications. Today, the Mexico plant provides custom-made dry type and liquid filled transformers. In 1999, this facility expanded into a new building to make both liquid-filled and dry type units, manufactured on a production line with the shortest lead time in the industry. Moving into the 21st century, the product range continued to expand in all plants. In 2003, Virginia Transformer acquired a third manufacturing facility in Pocatello, Idaho. That facility, originally designed for transformer repairs, has been completely refurbished and now manufacturers VT’s larger liquid filled transformers. VT became established as a major supplier for utilities and engineering consulting (EPC) firms. The company expanded export operations, especially in Canada and the Latin American market. The engineering department started using CAD/CAE, and VT opened an office in Asia to design and procure materials and accessories throughout the world. An LAE core cutting machine was added in Roanoke; a Georg core cutting machine was also added at the Mexico facility. One meter wide core cutting line was added in the Pocatello plant in 2001. All three facilities are now ISO-9001-2008 certified. The company became more competitive in the loss evaluated utility market and achieved UL and ABS certification up to 30 MVA. Virginia Transformer continues to thrive, primarily due to its commitment to continuous improvement. In just the past five years, completely revamped training programs for both office and plant personnel have been put in place - staffs have been expanded to provide additional engineering expertise - quality control and field service have been significantly improved - dozens of new machines have been installed, providing increased automation and productivity -VT has established relationships with major project developers in the renewable energy market. And the end result has been a dramatic increase in sales, as more and more firms recognize the superior quality and service offered by Virginia Transformer.

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
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<tbody>
<tr>
<td>1971</td>
<td>VT established</td>
</tr>
<tr>
<td>1982</td>
<td>Current president assumes management</td>
</tr>
<tr>
<td>1989</td>
<td>Manufactures first LTC transformer</td>
</tr>
<tr>
<td>1995</td>
<td>Opened 2nd manufacturing facility in Chihuahua, Mexico</td>
</tr>
<tr>
<td>1997</td>
<td>Gained ISO 9001-2008 certification</td>
</tr>
<tr>
<td>1998</td>
<td>India office started for design and procurement</td>
</tr>
<tr>
<td>2003</td>
<td>Acquired power transformer facility, Pocatello, ID</td>
</tr>
<tr>
<td>2005</td>
<td>Testing facilities upgraded, enabling “front of wave” and “switching surge” testing</td>
</tr>
<tr>
<td>2009</td>
<td>Addition of Vapor Phase Drying</td>
</tr>
<tr>
<td>2011</td>
<td>VTC’s 40th Anniversary</td>
</tr>
<tr>
<td>2012</td>
<td>Introduction of VCM (Virginia Control Module)</td>
</tr>
</tbody>
</table>

VTC enters Wind and Solar GSU Padmount market.
VTC Roanoke, Virginia/Corporate Headquarters

Manufactures Liquid and Dry Type units. State of the art facility in winding, complete core cutting line, modern, fully equipped testing room.

Built in 1990, and constructed specifically for the production of power transformers, the 120,000 sq. ft. manufacturing facility located at our Roanoke, VA Corporate headquarters, is genuinely state-of-the-art. Of course, all of our operations are ISO certified, but Virginia Transformer goes well beyond such standards in an ongoing process of continuous improvement that all of our manufacturing facilities do with both premium efficiency and the highest possible quality control.

Our Roanoke plant produces Class 1 and Class II liquid-filled transformers up to 46 MVA, 115 kV class, 550 BIL – in configurations that include Load Tap Changing (LTC), Three Phase Regulators, Dual Voltage, with Nitrogen and Conservator systems, and a wide variety of options and special features that are specified by our customers. This plant also makes dry type transformers, up to 20 MVA, 35 kV class, 150 BIL, including our signature proprietary design UNICLAD®, which is the benchmark for encapsulated transformers for demanding applications. Totally Enclosed Non-Ventilated (TENV) dry type transformers are made up to 5000 kV for chemical or marine environments.

As with all three North American Facilities, the Roanoke plant makes continual innovations and improvements in its design and production processes. We seek the highest quality and efficiency in production through increased computer-aided automation, through improvements such as our Automatic Core Stacker (this simultaneously speeds up the stacking process while reducing damage and errors), our Automatic Paint System, our Automatic Welder, and the barcoding of Materials. In the areas of testing and quality control, the Roanoke plant has recently added a new Impulse generator, new Power Analyzer Meters, SFRA for field testing.

“Perfection of Processes” is an important goal at Virginia Transformer. We continuously work to optimize the layout of plant workstations to provide for maximum efficiency and to minimize errors, through workplace design and improved material handling equipment.

To accommodate expanded production, Roanoke recently installed new, high-capacity winding machines. All our state-of-the-art winding machines are in environmentally controlled, positive pressure winding rooms. The plant includes a complete core cutting line featuring computer aided technology, drying ovens and heated paint booths, vacuum in tank drying, automatic tank welding, and a humidity-controlled work chamber to ensure low power factor compliance. Our modern, fully equipped test room with complete diagnostic capabilities has the ability to run all transformer performance tests. Our painting operation offers a full spectrum of paint options for all environments and features sand-blasting, priming, and final coat finishing.

At Virginia Transformer, we are continuously working to improve our manufacturing processes and capabilities, reducing costs while enhancing quality and speed. By the time you read this, we will have no doubt added new equipment, streamlined a production process, and instituted better quality control procedures. Perhaps what makes Virginia Transformer truly unique is the advanced and ongoing training that we provide to all our plant personnel. Employees receive extensive training and periodic testing, with part of each work week dedicated to continuing training in new equipment and processes. Our expert winders are specialized in the specific winding designs, and receive regular training in the latest techniques and plant procedures. We are proud that our training process makes every one of our plant employees a genuine expert at their specific job functions.
VTU Pocatello, Idaho
Manufactures Liquid type to 300 MVA/230 kV, State of the art facility in winding, core cutting and test capability.

The Pocatello, Idaho plant of Virginia Transformer is strategically located to serve the fastest growing markets of the US and Canada. For freight considerations, our Pocatello plant is particularly beneficial for customers in the western half of the country. The plant is equipped to handle very large transformers and even has its own rail siding spur that goes directly into the plant. VT acquired the Pocatello plant in 2003. This plant is currently capable of producing transformers anywhere from 7.5 MVA all the way up to 300 MVA, 230 kV class, 900 BIL, including Load Tap Changers, Furnace/Rectifier transformers, Auto transformers, and GSUs. The Pocatello facility also offers complete repair and refurbishment services for transformers of all manufacturers. VT’s 14,400 sq. ft. facility in Pocatello is supported with state-of-the-art technology and equipment, essentially having been completely redesigned since its acquisition. It achieved ISO certification in 2007. Among its many impressive features are the following:

- A Vapor Phase Autoclave oven that assures complete dryness of the insulation
- A 1200 kV Impulse Generator
- New, computer controlled core cutting machine designed for low loss step lap cutting
- Winding rooms that are pressurized, climate and environment-controlled, as is the core cutting area
- All new brighter, high efficiency lighting throughout the plant
- Isolation of the fabrication and HV assembly areas
- Newly designed insulation cutting shop for quality control

With its unique capabilities for producing new transformers, along with transformer repair and refurbishment services, our Pocatello facility is indeed special. Like the Roanoke facility, Pocatello continues to expand to meet the increasing production demands of VT’s rapid growth over the past ten years, and has recently added additional winding machines. Following the lead of our headquarters office, the Pocatello facility is instituting new training programs for all its employees, designed to continually enhance their level of expertise and job skills.

1 This acquisition, with technology and the skill set to make 300 MVA transformers since 1989, gave VT the capability to provide the largest power units to our customer base.
VTCW Chihuahua, Mexico
Manufactures Liquid and Dry Type units. 10 MVA, 69 kV class, and dry type up to 5 MVA.

Virginia Transformer is particularly proud of our facility in Chihuahua, Mexico, and with good reason. At 44,000 square ft., this is the smallest of our manufacturing plants, and correspondingly handles primarily the smaller end of our product range, Chihuahua is one of the most modern transformer manufacturing plants in North America. Opened in 1995, VT constructed a new building in 1999, which was designed to be the “perfect” transformer manufacturing facility. While following the central corporate design manual, the Chihuahua plant has its own in-house expert Engineering Design staff. Chihuahua’s Engineering Department possesses particular expertise in the construction of VT’s proprietary design UNICLAD® transformers, our signature dry type transformer designed for harsh-environment applications.

Our Chihuahua plant is a vertically-integrated facility, with the entire winding application and manufacturing environment temperature-controlled in order to insure meeting the most exacting quality standards. It features tank and enclosure fabrication facility, automatic winding machines, and Georg core cutting equipment in a separate building. This facility recently was the test plant for our new robotic welding machinery that, as a result of its outstanding performance in Chihuahua, will soon be implemented and added to our list of efficiency improvements in both Roanoke and Pocatello. This computer aided, precision welding equipment was developed by the Engineering staff in Chihuahua for welding transformer tanks.

The automated test equipment with digital instrumentation meets design and performance tests in compliance with ANSI, IEEE, CSA, UL, ABS, and IEC standards, and recently added a high power 500 KV Impulse Generator and Automatic Test Data Acquisition equipment.

VT prides itself on having the shortest lead times in the industry, and being able to accommodate “emergency” needs of our customers. Our Chihuahua facility recently demonstrated this capability in remarkable fashion by designing, manufacturing, and shipping a 6 MVA transformer in only 2 weeks!

Like all our facilities, Chihuahua has a strong focus on employee training and skill improvement, and uses the latest interactive computer teaching technology. The highly experienced labor force boasts an average of 9 years experience, and that experience is evident in their superior craftsmanship. VT’s Chihuahua plant employees are very well-versed in their respective fields, and are continually working to increase their knowledge and expert skills. VT customers who have had the privilege of visiting our Chihuahua facility have come away impressed with every aspect of their operations.
Proven Results: through continuous improvements in process, people, automation, quality standards

One-Stop Shop: for any power transformer need

World Class: serving a global market

Engineering Company: Manufacturing Transformers

Reliable: Best lead times, Reduced costs, Technical support

• **PRODUCT**
  300 kVA – 300 MVA

• **PEOPLE**
  300 Years Engineering, Skilled Technical work force

• **PROCESS**
  Continuous Improvement

• **PERCEPTION**
  World Class Quality & Service
<table>
<thead>
<tr>
<th>LIQUID TYPE TRANSFORMERS</th>
<th>DRY TYPE TRANSFORMERS</th>
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<tbody>
<tr>
<td><strong>Ratings</strong></td>
<td><strong>VPI</strong> <em>(Vacuum Pressure Impregnated)</em></td>
</tr>
<tr>
<td>- 300 kVA to 100 MVA</td>
<td>- 300 kVA to 20 MVA</td>
</tr>
<tr>
<td>- Up to 230 kV Class</td>
<td>- Up to 35 kV Class</td>
</tr>
<tr>
<td><strong>Cooling Fluids</strong></td>
<td>- 220º Class Insulation</td>
</tr>
<tr>
<td>- Mineral Oil, Luminol,</td>
<td></td>
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<tr>
<td>Envirotemp (FR3), Beta, Silicone</td>
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<tr>
<td><strong>Fluid Preservation</strong></td>
<td></td>
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<tr>
<td>- Sealed Tank <em>(Standard)</em></td>
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<tr>
<td>- Automatic Nitrogen System</td>
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<tr>
<td>- Conservator</td>
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<tr>
<td><strong>LTC</strong></td>
<td><strong>UN/Clad® Encapsulated Coils</strong></td>
</tr>
<tr>
<td>- Up to 100 MVA</td>
<td>- 300 kVA to 15 MVA</td>
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<tr>
<td></td>
<td>- Up to 35 kV Class</td>
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<tr>
<td></td>
<td>- 220º Class Insulation</td>
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<tr>
<td></td>
<td><strong>Totally Enclosed Non-Ventilated</strong> <em>(TENV)</em></td>
</tr>
<tr>
<td></td>
<td>- Up to 5000 kVA</td>
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<td></td>
<td>- Up to 35 kV Class</td>
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<thead>
<tr>
<th>SPECIALTY TRANSFORMERS</th>
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<tr>
<td>- Neutral Deriving Transformers</td>
<td>- Scott T Transformers</td>
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<tr>
<td>- Drive Isolation Transformers</td>
<td>- Single Phase Transformers</td>
</tr>
<tr>
<td><em>(18/24/36 Pulse Available)</em></td>
<td>- Phase Changers</td>
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<tr>
<td>- Rectifier Duty Transformers</td>
<td>- Auto Transformers</td>
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<tr>
<td>- Furnace Transformers</td>
<td>- Inter-Phase Transformers</td>
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<tr>
<td>- Zig Zag Transformers</td>
<td>- Inter-Tie Transformers</td>
</tr>
<tr>
<td>- Three Phase Voltage Regulators</td>
<td>- Reconnectable Transformers</td>
</tr>
<tr>
<td><em>(Up to 69 kV, 50 MVA Throughput)</em></td>
<td></td>
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<tr>
<td>- Air Core Reactors</td>
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<tr>
<th>FIELD SERVICE OPTIONS</th>
<th></th>
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<tbody>
<tr>
<td>- Field Installation</td>
<td>- Crane Service/ Off-loading</td>
</tr>
<tr>
<td>- Crane Service/ Off-loading</td>
<td>- Assembly On Site</td>
</tr>
<tr>
<td>- Assembly On Site</td>
<td>- Field Testing</td>
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<tr>
<td>- Field Testing</td>
<td>- Hot Oil Vacuum Processing</td>
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<tr>
<td>- Hot Oil Vacuum Processing</td>
<td>- On Site Training</td>
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<tr>
<td>- On Site Training</td>
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</tbody>
</table>
# Markets / Applications

## Industrial
- Rectifier Duty
- Paper & Cement Mills
- Steel Mills
- Motor Start
- Fan, Pump & Compressor Operation
- Hoists
- Mining
- Drive Isolation - AC, DC
- Chemical Plants/Ethanol
- Oil & Gas; Refineries, Pipelines, Storage, etc.
- Zig-Zag Transformer
- Cycloconverter Application
- Dynamic Voltage Restorer
- Unit Substation
- Special Fluid Transformers - Silicone, Envirottemp (FR3), Beta Fluid
- Hazardous Environment - Class I, Division II, Group C & D
- Coastal Environment/Offshore

## Utility
- Substation
- Voltage Regulator
- Auto Transformer
- Grounding Transformer
- Sub Transmission

## Power Generation
- Generator Step Up (GSU)
- Unit Auxiliary Transformer (UAT)
- Station Service Transformer (SST)
- Excitation
- Solar Power
- Wind Power
- Geo Thermal
- Solar

## Switchgear Match-Up
- General Electric
- Cutler Hammer
- Siemens
- Square D
- Others

## Commercial/Institutional
- Hospitals
- Offices
- Universities
- Airports
- Hotels

## Transit & Large Drive
- Extra Heavy Duty Traction (RI9)
- ANSI Circuit 25, 26, 25 & 26, 31, 45
- Up to 5000 KVA Rectifier
- Up to 20,000 HP AC, DC Drives
- Liquid Filled - 55 or 65° C rise
- Dry Type - 80/115/150° C rise

## Qualifications
- Three ISO 9001-2008 Certified Manufacturing Plants
- UL Listed Dry Type up to 2500 kVA, 15 kV Class 220° Insulation System, NEMA 1 or 3R
- UL Listed Liquid Filled up to 100 MVA, 69 kV Class
- ANSI, CSA, IEC, ABS, NEMA

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**VT**

**International Organization for Standardization**

**ABS**

**UL**

**CSA**

**IEC**

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www.vatransformer.com

CORPORATE SALES OFFICE
ROANOKE, VIRGINIA
540.345.9892
sales@vatransformer.com
VT is an engineering company that manufactures transformers for power and specialty applications. In the early days of the company (the 1970’s), VT catered mostly to the mining industry in the Appalachian mountains, with an appropriately limited range and scope of products. Designs in those days were carried out using calculators.

For the last 30 years, VT has steadily increased its engineering strength in all aspects of transformer design and manufacturing. Though a transformer is viewed primarily as electrical equipment, in fact it encompasses many other disciplines of engineering. Apart from the design of the tank to withstand pressures during operation, the internal clamping structures have to be designed to withstand short-circuit forces, and then comes the mechanical engineering. The heat generated inside the transformer due to core loss and load losses needs to be carried away from inside of the transformer and dissipated to the atmosphere, and that requires thermal design. The knowledge of the properties of the different materials used, such as their dielectric (insulation), magnetic, thermal, chemical, mechanical, etc., are very vital for proper engineering of a large transformer. At VT, we have that multi-disciplinary knowledge base, and we apply it to all the transformers.

Our facility in Chihuahua was set up entirely with internal technical resources in 1995. In the beginning, the engineering in Chihuahua was supported from the Roanoke facility. A local engineering department was soon set up, with the engineers being trained in our headquarters office in Roanoke. Today, Chihuahua handles all of their own design work, using the Corporate Design manual. In 2003, VT acquired an existing transformer repair facility in Pocatello, Idaho. They had over 15 years learning on transformers made by Siemens, ABB, Waukesha, etc. and within a short time started designing and building new transformers there. The technical integration of this plant promoted cross-fertilization of knowledge and technically enriched the entire company.

Our three manufacturing plants each specialize in specific size ranges and have a local engineering group supported by the corporate engineering group. By locating an engineering group within the manufacturing location, we build expertise and ensure quick resolution of problems, maximum efficiency and short lead times. Corporate engineering controls and harmonizes the engineering practices and technical continuity throughout the corporation, and also directs the development work. All of our plants are connected with each other through modern audio/video/data links. Regular inter-plant discussions are held for disseminating knowledge from one facility to the others.

Virginia Transformer prides itself on the large number of very experienced engineers and senior engineers with several hundreds of years of cumulative transformer related experience up to 400 KV / 300 MVA range. These senior engineers are well supported by a team of extensively trained engineers.

**ELECTRICAL ENGINEERING:**
All engineers are equipped with a variety of special purpose software such as the following:

**TOOLS/EQUIPMENT/FACILITIES**
- Core & Coil optimization for the best performance at optimal cost
- No-load and Load Loss Optimization programs
- Impulse Voltage distribution
- Short circuit calculation and magnetic field calculation using Andersen’s FLD 12
- Thermal calculations including overloads
- Hot-spot temperature calculation for windings and core
- Pressure Ring and clamping structure strength calculation, etc.
- Computer programs for preparing drawings for the customers and the manufacturing shop
- Inventor (3D), Solidworks (3D) and AutoCad Electrical Development Tools

**DEVELOPMENT TOOLS**
- TVA, IR Camera

**MECHANICAL DESIGN TOOLS**
- FEA

**AUTOMATION:** The automation in engineering is integrated with the systems within the company, beginning with quotes, through order input, into various design processes, all the way to test results. This high degree of automation allows VT to be efficient in those areas where routine calculations and procedures can be accomplished by computers, while retaining control over critical functions where inputs from experienced engineers can enrich the designs. VT uses the principle of interactive automation, whereby we make use of vast man-years of engineering experience.
Processes / Qualification

Today, because of our extensive experience and maturity, VT’s engineering offers many advantages. A library archives more than 12,000 designs and test data, which is an excellent source of reference when preparing designs. The design manual is a repository of knowledge and a major vehicle for technical continuity. This is updated as part of VT’s technological progress. Over a period of the last 20 years, our design manual has grown from a one-volume book to six volumes, spanning a vast array of subjects related to all aspects of transformer engineering. Our engineers participate in professional and industry meetings and seminars to keep themselves abreast of the latest developments in their field. VT’s engineers have contributed and published technical papers in industry journals and magazines.

DESIGN REVIEWS: Under VT’s ISO 9001 certification process, every design undergoes a quality assurance process which involves a thorough checking and review process. During the design process, design reviews are carried out at various stages and levels. The first of such reviews takes place fairly early when the basic design of the core & coil is ready. This is conducted by the VP Engineering manager and with the local/online participation of the designers, through audio and video links. Experienced engineers/senior engineers always check all designs and packages. The next round of design review is performed by manufacturing technicians, before releasing drawings to the shop. If mistakes are found, they are followed up by suitable NCRs. The final round of design reviews is done when the test results are verified against the design, and the results are then archived for future reference.

Engineering at VT maintains its customer focus with timely submission of drawings, prepared in 3-D, which offers the customers a better visualization of the product. We supply transformers that comply with national and international standards such as ANSI/IEEE, IEC, CSA, UL, CUL, CE, ABS, etc. VT continues its ongoing initiative to build reliable, more efficient, environmentally friendly transformers, including offering FR3, a biodegradable high flash point fluid, as an alternative to mineral oil.

DIFFERENT APPLICATIONS:

DRIVE DUTY: Transformers required to feed AC Drives and DC Drives have to meet several special requirements, such as harmonics and the associated non-uniform heating, fluctuating loads and overloads, special impedance requirements, etc. These transformers have to be specially designed for the specific application, for which we have developed expertise through long experience. In order to reduce the magnitude of harmonics introduced into the system, higher numbers of pulses are required. This has given rise to 12, 18, 24 and 36 pulse transformers. We have been one of the pioneers in this type of multiple pulse transformers and have a long and successful experience in this field.

CYCLO-CONVERTERS: These are special purpose drives, particularly for low-speed, high-torque applications. The nature of the harmonics is quite different than the normal AC drives, and that requires special precautions to be taken in the transformer design.

RECTIFIER DUTY: Transformers with dedicated rectifier loads need to be specially designed and tested per IEEE C57.18.10. The concept of “de-rating” for rectifier application should not be adopted for transformers dedicated for rectifier applications. Harmonics and the associated non-uniform heating, special impedance requirements between windings, high currents, etc. are some of the special requirements.

TRACTION DUTY: VT is the leading manufacturer of traction duty transformers. Traction duty transformers are a special sub-class of rectifier transformers. Apart from some of the special requirements mentioned above, frequent and large overloads up to 450% are a common feature of these applications. Recognizing these aspects, a new IEEE standard is under preparation.

EXCITER DUTY: The large generators are fed from exciters which obtain DC from the transformer’s rectified outputs. In addition to the usual specialties of rectifier transformers, the exciter duty transformers are also required to handle the large voltage variations associated with such applications.

MOTOR-STARTING DUTY: Specially designed transformers for keeping the inrush currents under control are used to start large motors. These transformers have special taps and are often autotransformers. Attention also needs to be paid to the impedance in order to avoid excessive voltage drop during inrush currents and undesirable operation of the under-voltage relays.

VOLTAGE REGULATORS (3 Phase): Many critical applications require a more controlled voltage delivered at the terminals of the load. Three phase voltage regulators can perform this duty by employing a load tap changer, which is operated by sensing the load voltage. Normally about +/-10% voltage is required to be corrected and therefore employing an autotransformer configuration would result in ten times the throughput power for the same size of transformer. These regulators are built according to IEEE C57.15.

UNIT AUXILIARY TRANSFORMERS: UATs are designed in accordance with IEEE C57.116 rather than the typical C57.12.00. The UATs have to be able to withstand mechanical forces and thermal stresses resulting from any faults on the secondary side. They also have to be able to take a wider voltage swing and v/f variation particularly under fault recovery conditions, and a longer duration of short circuit.

POWER TRANSFORMERS: Power transformers are employed for transferring large amounts of power from one part
of the transmission circuits to another. These transformers may or may not have load tap changers for voltage control. Because of the high reliability expected from these transformers, they are built to the highest standards of design and manufacture.

**AUTOTRANSFORMERS:** In autotransformers, part of one winding is common to both the primary and secondary circuits. Because of this, an autotransformer can handle more throughput power for the same frame size. In other words, it is more economical. These are often used to tie two systems whose voltages do not differ greatly.

**GSU:** Generator step-up transformers serve very critical duty, as the entire output power of the generator passes through it. Very high reliability is needed from such transformers. In addition, these transformers are also subject to the v/f variation due to load throw-off condition. This is handled by proper choice of flux density in the core. The low voltage side is often connected via bus-ducts.

**REACTORS:** Reactors are used either for limiting fault currents (as in series reactors), or improving the power factor, or act as an inductor in various applications like filters (as for shunt reactors). Reactors can be air-core or Iron-core. The reactance of air core reactors has a linear relationship between voltage and current, but they consume more space and need bigger magnetic clearance around them. Iron-core reactors are more compact, but their reactance is not fully linear over a large range of current.

**GROUNDING TRANSFORMERS:** Grounding transformers are used to derive neutral for an ungrounded system where a neutral does not exist. These transformers are connected in zig-zag, thus producing high zero sequence impedance. These transformers draw a small amount of standing current and are capable of limiting the fault current within a desired limit, up to a certain time period.

**50 Hz TRANSFORMERS:** 50 Hz is the frequency in Asia and Europe. The core of a 50 Hz transformer is bigger than that of a similar 60 Hz unit. Special attention has to be paid to testing if done at 60 Hz. Due to traditional reasons, conservators/breathers are preferred in 50 Hz countries.

**DRY TYPE:** VT is a leading manufacturer of dry type transformers for a large number of applications. Apart from distribution and power transformers, VT produces dry type transformers for most of the above mentioned applications. Our transformers are based on 220C class insulation using Nomex (TM). We offer transformers with different types of processing (like VPI, VPE, Unidip and Uniclad™) depending on the application and the environment.

We provide different types of enclosures, including NEMA I, NEMA3R, Totally Enclosed Non-ventilated (TENV), stainless, etc. We have paint systems ranging from powder coating for panels to special paints for corrosive environments. We had our enclosures tested for ANSI C57.12.55 Type 103R, as well as UL.

We have supplied transformers suitable for hazardous location like class I, div I and div II, wherein special components and explosion-proof control boxes are used.

**DEVELOPMENT:** VT has at its disposal several tools for making developments. Model testing has been a powerful tool for development, as this technique allows verification of results through alteration of parameters and actual application of voltages, currents, heat, force etc. We have the complete equipment for carrying out transient voltage analysis using a recurrent surge generator. This is a scaled down version of an impulse generator which can produce the same response as a full magnitude impulse, but at a reduced magnitude. The results can be very useful when developing any new coil/winding/insulation arrangements and assessing its ability to withstand surge voltages.

In our effort to produce cost-competitive designs, we have developed sophisticated computer programs which run the design programs through optimization routines. Such programs take into account the material quantities, grades of materials, their rates, the required no-load and load losses, their evaluation rates, etc. and take a composite view, while arriving at the optimum designs.

To keep up-to-date, we subscribe to a large number of professional journals and magazines which are available to all employees. Also, we have a library of books on transformers and related subjects, the national and international standards, different code books like UL, ABS etc. various handbooks on electrical, mechanical, thermal, structural, etc. We also subscribe to online versions of important documents where updates are done frequently, and this allows us to remain up-to-date on all relevant subjects.
The fact that engineering expertise is the heart of Virginia Transformer also impacts our sales department. Our custom-designed transformers are made to serve a unique market, one in which details and variables are a crucial part of the products we provide. Providing this specialized market with exceptional service requires more than just sales skills. Therefore, VT does not just employ salespeople – We employ highly trained and educated, specialized Sales Engineers to service each of the numerous markets and applications where our transformers are utilized.

Each member of our sales department receives extensive and continuously updated training aimed at making them each genuine experts in their field of specialty, be it utilities, industrial, commercial, or any of a number of other markets. At VT, our sales staff has a thorough working knowledge and understanding of the entire complex process of designing and manufacturing a transformer. With the goal of making our sales staff the most “product knowledgeable” in the industry, our engineering team has developed a complete package of training programs and learning tools.

Our Sales Engineers are further assisted by a complete staff of Application Engineers, each of whom has also received extensive specialized training. Whatever the specific application you require a transformer for, we have an Application Engineer specifically trained in efficiently meeting the particular requirements of that application. All special needs of an application are considered and taken into account – space, temperature and other environmental concerns, vibration, elevation, potential short-circuit overload – every aspect of an application is planned for, and nothing is left to chance.

The bottom line is that at Virginia Transformer, true expertise in transformer design and manufacturing is layered throughout our corporate systems. Our sales staff is populated only with genuine professionals in the power transformer industry – highly educated when they arrive at VT, and specially trained thereafter. When you’re talking with a salesperson from Virginia Transformer, you’re talking with someone who really knows and understands your business needs. Engineering expertise, application expertise, sales expertise... That’s what you get from Virginia Transformer.

Customer Service Center

The Customer Service Center at VT is another aspect of world class service. The trained, competent staff literally has their fingers on the pulse of every job that we build. They become a liaison to the customer. They know the status of each job at every stage of production, from start to finish. They are the point of contact once an order is entered until it is shipped. It is the detail oriented staff of the Customer Service Center that closes contracts, establishes agreements and coordinates all the logistics of a custom built transformer. With the same diligent VT quality standard, the Customer Service Center scrutinizes every detail to make sure our customers are satisfied. Any questions regarding an order a client may have at any time, will always be answered. From drawings to delivery, our Project Coordinators keep clients updated and informed. When it is time for shipment of a unit, our Business Center will coordinate any Field Service needs you may have. That open communication remains, even after delivery. World Class Customer Service is our goal.
Continuous Improvement is our Culture
Virginia Transformer is committed to continuously raising its standards of quality and customer service. Business process and practices are reviewed on an on-going basis to achieve excellence in customer satisfaction and product. VTC modeled its quality process after the ISO: 9001 quality management system and obtained its first ISO: 9001 quality system management certification in 1997. Today, all three plants have earned ISO: 9001 quality management system certification.

Having adopted the guiding principles of ISO: 9001 quality management in its day to day operations, Virginia Transformer has achieved business process excellence. This assures the customer the highest level of quality and reliability in our products. Our quality system has enabled us to reduce defects and to exponentially decrease the rate of field complaints during the last decade in all three plants. Process Improvement has been achieved in office functions such as sales, HR, engineering and in materials as much as in manufacturing which have helped lead to a more rapid defect reduction.

Ten (10) parameters VTC measures cover quality, customer service, productivity, on time performance, cost of quality, vendor performance, customer satisfaction, preventative quality, customer complaints and safety.

PRODUCT EXCELLENCE
We benchmark the performance of each of the three plants against each other and then install the best new processes and equipment to produce the best results possible in each plant. Virginia Transformers in-process controls and measurement system ensures that each product manufactured at any of our three manufacturing facility is defect free and exceeds customer expectation with respect to their specifications and compliance with relevant standards.

Supplier Excellence
Virginia Transformer sets the standards for the raw material purchased and partners with suppliers to enhance the quality of the raw materials, accessories and components purchased. Our supplier quality audit system ensures the reliability of quality and the on time delivery of component purchased. The supplier’s quality system Is audited on a periodic basis.

Employee Excellence
Virginia Transformer’s employees are the main component of our quality system. Virginia Transformer strives to improve the skills of our employees through regular training on personal development and job skill enhancements. Our “Take it to the People” – using a bottoms up approach of sharing the customer feedbacks in real time with employees empowers them with the evaluation information needed to perform their job better.

Customer Service Excellence
Virginia Transformer is the best in the industry in its responsiveness to customer needs. Our quality programs underscore our dedication to the customer satisfaction. Our transformers are performing in more than 45 countries worldwide for a wide range of customers including steel mills, oil refineries, industrial drives, traction, mining industries and utilities. Our dedicated knowledgeable customer service team is available around the clock to provide the service our customers deserve and have come to expect.

Result
Our continuous improvement results are seen across the board in the company. The defects per unit produced are driven down every year, the field defects are reduced every year, the customer service and the productivity increases every year.
Continuous improvement is an on-going effort at VT, whether it’s training, equipment, or process and procedure. These improvements help VT maintain its standard of quality. Through various improvements, production times have been greatly improved and lead times have been reduced significantly. Through automation, materials costs and defects have been greatly reduced. Expansion of the facilities has allowed a smoother, cleaner production floor and space for additional equipment.

Virginia Transformer’s Roanoke, Virginia facility builds Class I and II liquid filled transformers, and dry type transformers to 25 MVA, 35 kV class. The plant has more than a dozen electronically monitored winding machines in a fully enclosed, environmentally controlled, positive pressure winding room. A complete core cutting line is housed in an air conditioned room. In addition, man lifts, for safety and efficiency, plus pneumatic/battery tools are being used. Several drying ovens, paint booths, sand blasting, tank welding and metal fabrication are isolated from the assembly operation. VT’s painting operation has the capability for epoxy, polyurethane, water or oil based, with baking ovens. The floors are seal and an automatic oil handling system is used.

VT’s Pocatello, Idaho facility was acquired in 2003. VTCU produces liquid filled transformers from 7.5 MVA to 300 MVA, up to 230 kV. This includes LTC units, furnace/rectifier transformers, GSU’s, auto transformers and complete refurbishment capabilities to repair all makes of transformers. VTCU also utilizes VPD, Vapor Phase Drying process that assures complete dryness of the coils and insulation. The facility has sealed floors and utilizes man lifts. To increase efficiency, pneumatic/battery operated tools are deployed throughout the facility. Also, an automatic oil handling system has been deployed.

VT’s Chihuahua plant manufactures liquid type units up to 10 MVA, 69 kV class and dry type units up to 5 MVA. The entire environment is temperature-controlled in order to insure the most exacting quality standards. Tank and enclosure fabrication, automatic winding machines, and Georg core cutting equipment are located in separate buildings. This facility recently was the test plant for our new robotic welding machinery. This computer guided welding equipment is now being implemented in our other plants. Automated test equipment with digital instrumentation meets design and performance tests in compliance with ANSI, IEEE, CSA, UL, ABS, and IEC standards. Chihuahua also has a high power Impulse Generator and Automatic Test Data Acquisition equipment.
Virginia Transformer’s Field Service and Product Support Team is fully capable of providing complete installation and maintenance support for transformers that are manufactured in any of our facilities. And they are equally effective in assisting customers in the support and maintenance of their pre-existing transformers and associated equipment.

Field Service offers the following services on all manufactured transformers:
- Installation Services (including);
- Assembly, Oil filling, Pre-Commissioning Testing
- Repair Services
- Replacement Parts
- Oil Handling and Oil Testing Services
- Transformer Testing Services
- Periodic Inspection Services
- Technical support

Our Field Service is rated the best in the industry by our customers.

Available services and capabilities:

Installation Services
- Unit assembly to enable electrical operation
- Vacuum Processing, oil handling, oil filling
- Pre-commissioning testing, standard de-energized electrical acceptance testing and special customer request testing

Repair and Maintenance Services
- Physical external servicing of the transformer and associated components
- Internal inspection and trouble shooting
- Preventative maintenance to insure long life

Oil Handling and Oil Testing
- Transformer vacuum processing and oil filling
- Hot oil processing (dehydration, filtering, de-gasification)
- Oil integrity testing (dielectric strength, dissolved gas analysis, moisture content, physical properties)

Replacement Parts
- Complete parts and component support for equipment manufactured by Virginia Transformer Corporation
- Next day shipment for common parts

Transformer Testing Services
- Ratio
- Insulation Resistance
- Core Meggar
- Power Factor
- Resistance
- Oil Dielectric
- DGA Sampling
- DC Resistance
- Thermal Imaging
- Bushing Test (Hot Collar, Bushing Power Factor)
- Control Wiring Verification
- Doble Power Factor
- Doble SFRA
- Infrared Imaging
- Leakage Reactance
- Excitation
- TTR
- Arrestor Testing
- CT Testing

Inspection Services
- Pre commissioning
- Operational conditioning and status

Technical Support
- Full Engineering support
- Advisory capacity at any level before and during electrical operation
- Operational problem and trouble resolution
- Test data analysis and recommendation

Virginia Transformer also offers repair and refurbishment.

VT incorporates redesigns utilizing our latest developments in electrical standards and design technologies, materials and manufacturing processes. Your transformer can be refurbished to like-new condition.

24 Hour Emergency Response (540.589.1383)
Most manufacturers of VPI dry type transformers make the same unit over and over, not understanding the concept of achieving peak performance through customization. We get it. That is why we custom design and manufacture a full range of VPI dry type transformers up to 20 MVA, 35 kV for all applications: industrial, commercial, institutional, indoor, outdoor, power distribution, drive/rectifier, even for heavy-duty traction.

VT is committed to answering your needs with a high-quality, custom designed transformer and we do it while maintaining the shortest lead times in the industry. We can easily meet a variety of diverse requirements such as drive isolation and harmonic loads, overloads of up to 450 percent, multiple motor starts and lighting and heating. In fact, our VPI dry type transformers up to 3000 kVA, 15 kV class are UL® listed. We provide the technology to offer dry type alternative solutions that may greatly benefit your business. Because our dry type transformer can be located closer to the electrical load than liquid transformers, we reduce the length of costly low voltage cabling. Our transformers weigh less than equivalent liquid filled transformers, so installation and craning costs are reduced. Downtime for maintenance and inspection is reduced and there are no annual fluid testing or gasket replacements.

These units are non-flammable and self-extinguishing. They pose less risk of fire due to materials used in construction and require no drainage areas or retaining walls since there is no risk of oil leaks or ground water contamination (please refer to the ‘Why Dry?’ bulletin posted on our website). With our shorter lead times - as little as eight weeks from time of order - we help meet your most critical schedule needs. We also offer a wide variety of termination arrangements to match every major switchgear manufacturer in the U.S.

Transformer Features:
- Range: Up to 20 MVA, 35 kV voltage class, 170 kV BIL
- Loading: Designed to deliver rated current and MVA in all tap positions
- Service: Indoor or outdoor UL listed, TENV offered for corrosive environments
- Impedance: Per ANSI standard
- Coils: Aluminum or copper conductor, circular or rectangular construction, disc or barrel wound
- Coil Sealing: Vacuum Pressure Impregnated (VPI), Unidip
- Insulation: 220º C Insulation system
- Enclosure: NEMA 1, complete panel breakdown, crowned roof for water shedding, base suitable for lifting, jacking and skidding
- Paint: ANSI 61 epoxy powdered coatings, other paints available
- Nameplate: Engraved stainless steel for outdoor use, metallized Mylar for indoor application
- Accessories: Temperature gauge, HV disconnect
- 12/18-month standard warranty

In order to provide for the specific requirements of different applications, our engineers search over 1,000 designs to work closely with you to determine the best features: Coil shape, winding type, conductor material, impedance, K-factor, core type, enclosure and especially coil processing.

Typical Applications:
- Metro subways and trolleys
- Hospitals, Hotels and Schools
- Substations and Power Plants
- Chemical Plants
- Mining
- Paper and Steel Mills
- Oil and Gas Refineries, platforms
- Office and Shopping Complexes
- Manufacturing Plants
- Airport Terminals
- Water Treatment Plants
- Research Facilities

Routine in-house tests per ANSI C57.12.91 include:
- Ratio
- Polarity and Phase Relation
- Resistance Measurement
- Excitation Current and No-Load Loss
- Impedance and Load Loss
- Applied Potential
- Induced Potential
- Partial Discharge

Witness testing is offered and arranged according to your schedule.
In 1983 Virginia Transformer developed a superior encapsulated dry type transformer designed to withstand the very toughest and most challenging environments. The UNIClad® system offers unmatched design integrity and strength compared to traditional cast coil products and it is simply the best choice for applications with high humidity, contaminated conditions, short-circuit loading, or impact loading.

VT custom designs all UNIClad® units, resulting in significant reductions in size and weight. We know that one design cannot fit every customer’s specific needs. One-size-fits-all product offerings often force you to “size-up” a unit, wasting money and taking up extra space. With UNIClad®, you only pay for what you really need, and you can expect delivery of your UNIClad® system in about half the time usually required for standard cast coil units. With VT, you never overbuy - we work with you to design the precise solution you need.

VT unveiled UNIClad® to address the growing need for a product that could outperform traditional systems. Standard cast coil construction can withstand short-circuit forces, but its brittle epoxy construction is prone to cracking from thermal, mechanical and electrical forces. This cracking allows moisture and corrosion to attack the coil, causing failure.

UNIClad® coils withstand thermal cycling forces, short-circuit shock and operating vibration without cracking, thanks to our unique encapsulation and sealing process. We completely seal UNIClad® coils with a 220°C-rated, flexible polyester resin applied under vacuum and pressure. This tough, flexible cladding material is also highly chemical and moisture resistant. We use NOMEX for primary insulation in UNIClad® coils in order to ensure a self-extinguishing insulation system and the highest thermal rating for long life. UNIClad® can even withstand total water immersion for 24 hours with no change in seal integrity.

By filling the coils with low-viscosity, 100 percent solid polyester resin under vacuum and pressure, VT assures void-free coils. UNIClad® coils exhibit very low partial discharge levels, which means longer life and a reduction in the possibility of internal dielectric failure. We seal the coil ends using an evacuated resin system formulated to match the coefficient of thermal expansion of the coil.

UNIClad® 220°C insulation system and 115°C temperature rise design provides a continuous overload capability of approximately 15 percent. Even under overload conditions UNIClad® will maintain temperatures within the insulation rating. The solid filling of our coils improves thermal conductivity, allowing the coils to run cooler and resulting in longer unit life. On average, the life expectancy of a UNIClad® is 40 years at a constant rated load, subject to proper application, protection, maintenance and duty cycle. UNIClad® is the premium encapsulated dry type transformer:

- Epoxy sealed coil (top and bottom) evacuated resin system formulated to match the coefficient of thermal expansion of the coil
- Flexible polyester insulation system allows coils to withstand mechanical and thermal shocks
- UL listed 220º rated insulation system for turn and layer protection
- Vacuum and pressure processed coils reduce operating temperature and corona level
- Tough, flexible polyester cladding assures reliable operation in contaminated and humid environments
- Circular coil construction for best short-circuit and impact-loading strength

Independent environmental testing of UNIClad® coils was conducted for 5 areas. The conclusion for each area as stated in the report are:

- Mechanical stress - “successfully withstood mechanical stress tests for vibration and random drop”
- Thermal shock - “successfully withstood the stress imposed due thermal shock without any damage.”
- Moisture resistance - “fully capable of withstanding exposure to 100% humidity.”
- Immersion test - “successfully withstood water immersion for 24 hours.”
- Internal arcing - “is free from hazards of internal arcing, a characteristic achieved by the judicious selection of proportions of varnish, insulation materials and winding conductor in its construction.”

1 This is the case with cast coils using molds.
Providing successful solutions means Virginia Transformer has the right selection of products that perfectly fit your needs. Not only do we offer a wide range of products, we offer the ability to customize each one so that it effortlessly meets and exceeds your expectations.

With over a century of a proven track record, liquid filled transformers continue to be the most commonly used transformer system for a variety of applications. VT has gained a solid reputation for custom designed liquid filled transformers. We know our customers expect our transformers to meet demanding system specifications such as space constraint, special voltage configurations and tough environmental conditions. Our ability to find the solutions that meet and exceed our client’s custom requirements is a major component in our continued success.

VT offers liquid filled transformers from 300 kVA to 100 MVA up to 230 kV class with or without load tap changing (LTC). We can custom design units for special losses, high impedance, high secondary currents, minimized footprint and other special requirements. We also offer all the options and accessories you may need for system protection, reliability and hassle-free maintenance.

With VT as your supplier, you receive the fastest delivery time in the industry. Liquid filled transformers ship in as little as 12 weeks. Larger power transformers are ready for installation in fewer than 32 weeks. Outline drawings can be submitted in a few weeks with our AutoCAD® design system. Throughout the design and manufacturing process, customers can rely on direct, timely contact with our application and design engineers. Post-installation service is literally at your fingertips 24 hours a day, 7 days a week with a call to our dedicated toll-free service hotline.

Transformer Features:
- Range: 300 kVA to 100 MVA up to 230 kV class
- Loading: Designed to deliver rated current and MVA in all tap positions
- Service: Outdoor or Indoor
- Basic Impulse Level (BIL): Per ANSI standard
- Impedance: ANSI standard
- Coils: copper conductor and aluminum conductor available, circular construction, continuous or helical disc, or barrel wound
- Cooling Fluid: Type II mineral oil, or less flammable oils including biodegradeable oil
- Fluid Preservation System: Sealed tank, conservator with bladder
- Cooling Radiators: Plate type
- Gauges and Accessories: Liquid temperature, liquid level gauge, vacuum pressure gauge
- Drain Valves
- Filter press connection (top and bottom)
- Automatic pressure relief device
- Control wiring in flexible or rigid conduit
- Other accessories available
- Paint: ANSI 61 epoxy, polyurethane, high performance paint on sandblasted surface, other colors available
- Nameplate: Stainless steel, engraved
- Bushings: Cover or side mounted in air chamber
- Other: Welded top cover, 19-in manhole covers, provisions on base for skidding, transformer lifting lugs and stainless steel ground pads
LTC
When you choose VT as your supplier for Automatic Load Tap Changing (LTC) transformers and regulators, you will receive a product that is expertly designed, manufactured, installed and serviced. Developing individualized solutions for your needs are what we take the most pride in doing, and we do it on time and to your schedule. We have been designing and manufacturing LTC transformers since 1987 with unparalleled turnaround times in the industry.

Optional Features:
- Nitrogen supply for oil preservation
- Reconnectable windings
- Regulating windings on either HV or LV
- 65°C/55°C Winding temperature rise
- Non-standard impedance up to 25%
- High performance paint in your choice of color
- Demountable radiators with isolation valves
- Stainless steel radiators
- Galvanized radiators
- Terminal throats and chambers
- Explosion proof control box
- Sloping roof
- Multi-stage fan cooling for increased MVA
- Loss evaluation
- Other gauges and accessories
- 75°C temperature rise insulation system
- Shock indicator
- Customer-specific controls and relays
- Stainless Junction Box

Transformer Types:
- Distribution
- Substation
- Excitation
- GSU
- Auto
- Y-Y
- Regulator
- LTC
- Rectifier
- 3 Winding
- Dual Voltage
- High Current
- Motor Starting
- Zig-zag Grounding
- Furnace

Developing individualized solutions for your needs is what we pride ourselves most in doing, and we do it within schedule.
Virginia Transformer Corp began supplying power and distribution transformers to the Utility markets more than 25 years ago. Our customer base includes prominent Investor Owned Utilities (IOU’s), Rural Electric Cooperatives, and Municipalities throughout the United States as well as Canada, Mexico, and Central America. In 1982, we built our first 2500 kVA/35 kV unit for this market. Today, we are supplying units up to 100 MVA/230 kV rated for a variety of applications: GSU’s, Unit Auxilliary, Sub-station Service, and Distribution. As a result of downsizing, many of the Utilities now work through Engineering Consulting firms to design and procure transformers for their substation installations. VT has established ongoing relationships with more than eighty percent of these consultants, and is recognized today as a leading supplier of custom power transformers throughout the United States.

IOU’s typically have a defined specification, and our engineering library contains a “Customer Profile” for each of the major companies that we serve, insuring that each and every transformer is built both to exacting standards and to the specific requirements of the customer. VT is also currently on the RUS listing of approved manufacturers for three-phase transformers up to 138 kV. This means that those Co-ops who take advantage of federal loans to purchase equipment can source all of their needs within our product scope range, a one-stop shopping advantage, saving valuable time and costs. Municipalities, most of whom only purchase occasionally, also utilize the services of Engineering Consultants and value the relationships that VT has established with these companies. Quality is their most important consideration, as thousands of customers rely on a consistent and unimpeded source of power daily.

Virginia Transformer’s extensive range of transformers, from 300 kVA to 20 MVA dry type, and 300 kVA to 300 MVA liquid filled, offer our customers a diversity of products unmatched by other suppliers. This is in addition to the many options available from our experienced engineering team. More than 70% of our utility customers ask for LTC’s, and we also supply re-connectable primary voltage units and units with tertiary windings, conservator tanks, nitrogen systems, three-phase regulators, zig-zag grounding units. The new emphasis today is focused on alternative energy, and in keeping with that, VT has expanded its operations to supply numerous wind farm and solar power installations across North America.
With the most extensive array of custom power transformers of any manufacturer in North America, Virginia Transformer has been supplying industrial requirements for reliable power transmission and distribution for 40 years. The industrial market has a growing need for custom equipment, and VT has met this challenge by producing transformers for thousands of unique applications, especially as we work with worldwide engineering procurement and consulting firms whose specifications are very extensive.

**History and growth:**
VT supplied its first transformers to the mining industry and to GE for drives in steel mill applications in the early 1970’s. Our quality performance for such firms as Bethlehem Steel and Exxon led to a rapid expansion in both our customer base and product offerings. We began manufacturing dry type transformers in the early 1980’s to provide more comprehensive solutions for industrial applications, including HV switches and LV breakers combined with our transformers to supply complete installations. We added reactors to our production line in the mid 1980’s for current limiting and current smoothing applications in the steel and chemical industries.

**Product range and applications:**
Today, we provide dry type transformers for indoor and outdoor applications from 300 kVA to 20,000 kVA, 35 kV class. We offer VPI construction processed under vacuum and UNIClad® construction for cyclical and high overload conditions and contaminated environments. In liquid-filled transformers, we offer 300 kVA to 100 MVA, 230 kV class, including arc furnace transformers for the metals industry.

**Product features:**
VT offers
- Stainless Steel enclosures for corrosive environments
- Four customized paint finishes to suit a range of environments from dry indoor ones to oil refineries and marine.
- A totally enclosed non-ventilated enclosure (TENV) for gaseous contamination environments
- UNIClad® technology – a sealed coil dry type unit used in demanding critical applications
- Conservator liquid-filled units offer compensation to accommodate extreme temperature variations
Industrial Markets

Virginia Transformer provides motor and drive isolation transformers for both AC and DC variable speed drives in the following industries:

- Paper
- Cement
- Pharmaceuticals
- Fans, pumps, compressor drives
- Marine
- Hoists
- Mining
- Drives
- Chemical
- Oil and Gas - production, refining and pipe line
- Microchip manufacturing

Qualifications/Certifications:
VT meets all ANSI standards for North America, IEC for Europe and Asia, and CSA for Canada; Division II Group C and D for hazardous locations in oil and gas applications, UL listing up to 100 MVA, 69 kV class, CE certification for Europe; and ABS certification for Marine applications. All manufacturing locations are ISO 9001 quality certified.

- Resistors for grounding the neutral with controlled current flow
- Zig-zag transformers to produce grounding on a delta winding
- Scott T connected windings to convert two phase from a three phase supply
- Integrated transformers with an HV switch and LV breaker
- Dynamic voltage stabilizer for critical processes
- High altitude designs up to 10,000 ft
- Integration with all major switch gear manufacturers
  - GE
  - Cutler Hammer
  - Square D
  - Powell
  - Meyer
  - Siemens
Since 1975, VT transformers are working with one hundred percent reliability in every part of the world. That is the quality VT exports today to more than 40 countries worldwide. VT engineers work with our international customers to understand their needs, applications, and standards, and to provide the customized solution with the shortest delivery cycle. VT has developed the design capability and the technical skill to manufacture transformers per ANSI, CSA, CEI and IEC, as well as any further standards of the individual country.

Whether it is a bone-chilling -50° C at Nova Chemicals in Red Deer, Alberta, Canada or a scorching 55° C at a desalination plant in Saudi Arabia, VT transformers are performing 24 hours a day to full expectations. Even in the tropical, humid conditions at PREPA in Puerto Rico or the sugar mills throughout South America, our transformers still operate at peak performance.

VT’s international customers now find one source for all their needs – power or distribution transformers, motor starting transformers, drive or rectifier duty transformers, LTC transformers or voltage regulators, grounding transformers or dry type transformers. Virginia Transformer has ample capacity with three manufacturing plants located in North America to meet all of our customers’ needs both now and in the future.

The Ho Chi Minh City water works in Vietnam is powered by four VT transformers that have been performing flawlessly for more than 10 years. VT supplied 30 transformers of different ranges from 2000 kVA up to 25 MVA to the Iraq RIO (Restoration Iraq Oil) Project. Working closely with other suppliers, VT had the distinction of supplying more than 20 dry type transformers for the prestigious Gus Lasfar project in Morocco. In 2005, we supplied 16 2000 kVA dry type transformers for Phase II of the Dubai Chiller plant.

Recently, VT has engaged with various engineering and consulting companies in Canada for the Oil Sands Projects in Alberta. In 2007, we received orders for more than 25 medium power transformers, predominantly compressor/motor starting for pumping stations moving heavy oil to U.S. refineries. The low impedance requirement for these transformers increases the fault current and therefore it was critical to supply the customer with a custom-designed transformer to accommodate the upstream breakers.

In the Middle East markets, various organizations, such as Aramco and Sabic in Saudi Arabia, are responsible for the approval of new products. In Dubai, Kuwait and Jordan, local consulting engineers are responsible for the approvals.

Virginia Transformer has met with approval from all of these groups. In the African countries of Nigeria, Angola, Guinea and now Libya, Bechtel-Chevron is engaged in numerous oil exploration projects. These projects are sometimes very large, involving multiple transformers worth millions of dollars. Each country has unique methods of conducting business. Again, Virginia Transformer satisfied the requirements of all the various individuals and organizations involved in these complex projects.

- When international countries talk about local content and the orders are routed through local contractors, VT can offer services through U.S. banks, EXIM and other sources of credit.
- After-the-sale service and installation assistance can be arranged.
- VT assigns Project Managers to each major international installation to assure that all aspects of the job are monitored and that any issues are resolved quickly.
From extra heavy duty traction applications to drive isolation transformers for heavy industrial applications requiring 24 pulse rectification; from power quality solutions with dynamic voltage restorer and distribution static compensator to induction furnace power; from excitation for power generators to very large motor-start transformers; to severe shock duty transformers for car-crushing; up to 20% impedance transformers for limiting short circuit currents in high energy circuits and air core reactors for limiting current; short circuit testing transformers with multiple voltages for electrical equipment testing – Virginia Transformer has the power transformer for your application.

VT builds multiple winding transformers to include:
- Drive Isolation transformers to reduce the harmonics reflected on the utility line
- Variable V/Hz output transformers to connect the output of the VFD to the motor in the LCI drives
- 15,000 kVA transformers with 20% impedance for regenerative front end duty in PWM converters
- 20,000 kVA T4 duty transformers for a steel mill motor drives
- 27,000 kVA transformer for motor starting application
- 12,000 kVA transformer for a wind tunnel motor for NASA
- High voltage transformers to charge the magnets for the electron accelerator at Fermi Lab
- 20,000 kVA transformer with core and coils withstanding severe shocks in car crushing applications
- 10,000 kVA transformer for a utility cooling tower fan
- Liquid filled transformers which are supplied for arc furnace duty applications that subject transformers to short circuit conditions regularly
- High current transformers with multiple bushings for 600 volt motor loads found in processing plants

VT provides stainless steel enclosures/tanks for specialized environments to reduce degradation:
- Liquid filled transformer with a stainless steel tank and radiators for corrosive environments
- Dry type transformer in a stainless steel enclosure, completely sealed for marine environments

We build dry type transformers with circular coils for large specialty applications; the UNIClad® is the preferred transformer for transit, data center, and hospital applications in North America.

**A FEW VT CUSTOMERS:**
- US Steel, California Steel,
- SeverCorr, Nucor Steel,
- International Paper,
- Intel Manufacturing,
- JP Morgan Chase, Air Products,
- ABP Induction, Cemex,
- GE Energy,
- New York City Transit, New Jersey Transit, LA Transit, San Francisco Transit,
- Portland Transit, Dallas Transit, and Washington Metro
- all operate day to day with VT transformers.

Other OEM customers include
- TMEIC – GE, Siemens, S&C,
- Converteam and ABB
Oil & Gas

Virginia Transformer is a major contributor supplying transformers and power distribution to one of the most significant sectors of industry in the world today, Oil & Gas. From drive specialty units to offshore platforms, VT has the ingenuity, expertise and experience to provide solutions for the diverse and demanding conditions in all areas of this industry. We’ve been part of LNG plants as well as pumping and compression substations. VT has been moving forward to become a leading supplier of power transformers, worldwide.

Innovations continue at VT that expand our capabilities beyond other suppliers in all areas of the manufacturing process.

The standard of quality begins with engineering at VT. We are an engineering company manufacturing transformers. Through improvements in the automation processes, lead times are revolutionized. Our abilities to retrofit and meet size constraints are unmatched. VT has evolved this process for nearly 40 years and today has more to offer the oil & gas industries than ever before. Virginia Transformer has been part of many specialized projects for the oil & gas industry, from refineries to pipelines. We’ve supplied multiple units for many of these projects. Whatever the requirements, Virginia Transformer has a sufficiently broad product range that enables us to offer the best custom transformer.

After all, Virginia Transformer got it’s start providing power for the underground mining industry nearly 40 years ago.

There are different uses for transformers in the mining industry, so both liquid-filled and dry type are used. Depending on the application, there are some performance advantages that have been accepted. Liquid-Filled units have a greater overload capacity, are better at reducing hot-spot coil temperatures and because of their thermal dissipation, have lower losses. Dry Type transformers are usually used for lower ratings and they are usually used indoors. Dry types generally are enclosed with louvers or are sealed. These use almost no flammable materials, so pose no fire hazard when used in coal and other mines. Virginia Transformer also offers TENV (Totally Enclosed, Non-Ventilated Dry Type) transformers, and for indoor operation supplies Dry Type up to 5000 kV.

Virginia Transformer has the engineering expertise and refined manufacturing processes to build some of the most dependable, longest lasting units available. For the mining industry, VT offers transformers for drag lines, blast hole drilling and shovels (mil 167). All of VT’s transformers are custom built to client specifications.

Marine Duty

Virginia Transformer has been providing transformers for marine and offshore oil exploration projects for many years. When your business takes you to offshore or deep sea water, you can count on Virginia Transformer to meet all your electrical power needs. VT has a dedicated staff to design marine application projects. We provide transformers to power ship propulsion systems which includes motors for tunnel thrusters, paddle wheels and dredgers. Our multi-secondary rectifier duty transformers are used by OEMs and system integrators to power large drives which in turn power large motors. Virginia Transformer also provides large generator transformers, medium voltage distribution transformers, and DC link reactors in this specialized market as well as Liquid-filled transformers for large, offshore platform applications.

A majority of the end users in this market require the transformer manufacturers to have their ABS (American Bureau of Shipping) certification current. VT is pleased to confirm we meet or exceed ABS specs on Mobile Offshore Drilling Units (MODU) as well as facilities on fixed and floating offshore petroleum installations in Class 1, Div 1 & 2 locations. We build transformers that comply with leading international specs, namely ANSI/IEEE/CSA or IEC. In the Oil & Gas industry, the popular transformer specification recommended by Process Industry Practices (PIP ELSTR01) is very common and VT has supplied numerous transformers meeting this specification.
When Tidewater, one of the largest ship owners in the world, decided to revamp some of their older ships with the new “stabilizing” technology, they trusted Virginia Transformer to provide numerous VPI dry type transformers. The Yantai Raffles shipyard in China, which undertook the upgrading of these older ships, used our transformers for applications including main drive propulsion, winch drive, thruster drive and ship’s service.

We have also supplied transformers for Chevron’s Tahiti Spar facility in the deepwater Gulf of Mexico Project.

Utilities

Virginia Transformer has been supplying power and distribution transformers to the utility market for over a quarter of a century. Our clients include prominent municipalities, investor-owned-utilities, and rural electric cooperatives throughout North and Central America. We supply units rated up to 100 MVA, 230 kV class, with the capability to offer units rated up to 300 MVA, for a broad variety of applications – GSU’s, Substation Service, Distribution, Unit Auxiliary Transformers and Grounding Transformers.

VT has long-established relationships with many of the major engineering-consulting firms throughout the U.S. that design and procure substation equipment for utilities, and is recognized as the fourth largest supplier of power transformers in the US. VT is known for its extensive in-house engineering staff, and respected as a custom designer and manufacturer of transformers. This fact is of critical importance to our clients with the responsibility to provide dependable, uninterrupted power to hundreds of thousands of customers.

Our engineering library now contains over 12,000 custom designs and test archives, providing us the foundation to insure that each and every transformer is built to the precise standards and specifications of each of our customers. VT is on the RUS-approved list for manufacturers of three-phase transformers up to 138 kv. This means any of our clients who take advantage of federal loans to help them purchase equipment can source all of their needs from Virginia Transformer – We provide a “one stop shop” for power transformers, saving precious time and reducing costs.

We provide custom transformers with Load Tap Changers, re-connectable voltages, tertiary windings, conservator tanks, nitrogen systems, three-phase regulators, zig-zag grounding configurations, alternative fluids and more. In addition to traditional electrical systems, VT is also heavily involved in supplying numerous unit substations for wind and solar power installations throughout North America.

Government Facilities

Virginia Transformer has proudly participated in numerous government facility projects. Our quality standards and capable engineering background are a big advantage, and our product range and custom design abilities allow us to offer options that often exceed the requirements for a project. VT takes a “Can Do” approach, every detail is looked at in order to produce the very best results.

We have a dedicated team to handle government facility projects, that is focused and trained in this specialty market. No matter what requirements are needed, VT has the technical ingenuity to meet the task.

We built an LTC with an all stainless steel tank for an Air Force base in California. We can build units that are water cooled as opposed to using radiators, which was a perfect solution for the Army Corps of Engineers and The Dalles Dam.

And it was quite a compliment to the reliability of our products that NASA was impressed enough with VT’s workmanship and specialized design, they selected us to build two 15MVA units to power their supercomputing facility.

Our success comes from a solid reputation for high quality workmanship, our extensive product range and outstanding customer service.

See what VT can do for you and your power transformer needs.

Data Centers

In this electronic age, storage, back-up, and retrieval of data is invaluable. From megabytes to terabytes, saving information securely is a basic requirement. Data Centers are a popular solution, providing ample space and service to house volumes of electronic information.

In order to maintain consistent, reliable service, they rely on a consistent reliable source of power. Virginia Transformer is that source.

Using nearly 40 years of experience and expertise, VT has the know-how to manufacture around-the-clock, reliable power that will last for decades.

Meeting the requirements of the application is the first consideration. All aspects of the transformer are given full, thorough analysis, everything from size restrictions, electrical impulses, to expectations of everyday service of the unit. With a library of designs to pull from, every project is customized accordingly. VT maintains a rigid standard of quality throughout the process.

Simply put, our engineers and designers will develop the best transformer for the job with the best quality, and the very best service.
As a manufacturer of custom power transformer solutions, Virginia Transformer has developed significant expertise during the past 40 years in applying the latest technologies to meet customer’s specific applications. This expertise and experience is what differentiates VT from most other manufacturers. Based on this knowledge, we can custom design the most efficient and cost effective transformer for your needs.

The following features and equipment options are another example of the broad experience that Virginia Transformer brings to you, our customer.

*Bushings:* VT offers both oil filled condenser and porcelain/apparatus bushings for HV and LV connection. These can be mounted vertically or inclined.

*Radiators:* Most radiators today are demountable for ease of transportation and maintenance. VT’s standard offering is flow coated with epoxy paint. We can also provide galvanized and stainless steel radiators.

*Pressure Relief Devices:* A variety of pressure relief devices and alarms are available to permit venting of oil and gases in case of over pressure, avoiding transformer tank damage or explosion.

*Load Tap Changers:* Used to regulate voltages automatically, they can be mounted on either HV or LV, depending on transformer ratings and customer preference.

*Oil Temperature Indicator:* This device displays the temperature of the oil inside of the transformer.

*Conservator Tanks:* Custom designed for the specific applications, they are primarily used where extreme variations in ambient temperatures prevail, most often in severe cold climate winters.

*Simulated Winding Temperature Gauge:* Used for monitoring temperatures within the coils.

*Liquid Level Gauge:* Indicates the liquid level in the transformer.

*Junction Box or Controls Cabinet:* Offered in both painted steel and stainless steel for corrosive environments. In addition, VT offers an explosion-proof option for extremely hazardous conditions available with various locking mechanisms.

*Lightning Arrestors:* Used to discharge voltage surges to ground for protecting transformer windings and insulation.

*Pressure Vacuum Gauge:* Shows the pressure in the gas blanket above the oil.

*Fiber Optic:* Used instead of metal wires because the signals travel with less loss and are immune to electromagnetic interference.

*Hydran:* Monitors dissolved gas levels in oil.

*Nitrogen Regulator Systems:* Maintains a constant pressure of the inert gas nitrogen blanket for preservation of the unit.

*SCADA Monitoring (Supervisory Control & Data Acquisition) System:* Used to monitor and control components in a substation.

*Auxiliary Heaters:* Used for control cabinets and LTC’s in colder climates.

*Air Terminal Chambers:* Full or half height for line-in connections. Encloses the bushings for protection from animals and the elements.

These and many other special feature options are available from Virginia Transformer to meet your custom design requirements.
Lightning Arrestors
Accessories
HV Bushings & Arrestors (Shipped demounted)
Side Mounted LV Bushings
Electronic Temperature Monitor
Load Tap Changer
Liquid Level Gauge
Throat for Non-Segregated Bus
Nitrogen Preservation System
LTC Controls
CT's (Bushing mounted internally)
Potential Transformer
Transformer
Control Cabinet
Radiator Mounted Fans
Dual Voltage Switch
How Transformers Work For You...