

Power Generation Transformers

Deregulation in the electric utility industry has increased the opportunity to produce and sell excess power. Virginia Transformer Corp. (VTC) supplies high quality transformers for power generation applications.

VTC is a leader in the production of auxiliary and exciter transformers for generation and cogeneration applications, with a focus on nonstandard designs and requirements, including

- ◆ designs using ISO bus connections to the primary of the aux transformers;
- ◆ requirements for 10 percent over-voltage conditions on the HV bus; and
- ◆ exciter/rectifier designs used for support power.

Widely recognized firms, such as Westinghouse Power Generation Systems, Siemens Power Systems, General Electric, Black & Veatch, Raytheon Engineers, Bechtel, Duke Fluor Daniel, Enron and others, have chosen VTC to supply transformers for dozens of new generation and cogeneration plants. VTC supplied liquid-filled and Uniclad® encapsulated dry-type transformers ranging from 750 KVA to 15 MVA and also supplies transformers up to 50 MVA, 138 kV class for generator step-up applications. VTC transformers operate around the world in areas such as South America, Saudi Arabia, Mexico and Africa. In a unique installation in the Dominican Republic our Uniclad® transformers are located on barges to support an on-shore cogeneration plant.

Virginia Transformer supplied eleven transformers to the Bridgeport (Conn.) Harbor Project in early 1998. The project employs three generators in a combined cycle power plant to support base loading requirements. Two are gas turbine driven and the third is steam powered using steam heat supplied by one of the gas turbine units.



VTC transformers included:

- ◆ Four 1500 KVA, 4160/480V, one supplying a UPS system; two supplying battery chargers and the other supplying AC power for plant loads;
- ◆ two 2600 KVA, 4160/2500V used in the start-up mode supplying frequency converters;
- ◆ one 12/16 MVA, 16000/4160V unit auxiliary transformer supporting all plant loads after start-up;
- ◆ one 1600 KVA and two 900KVA exciter transformers; and
- ◆ one 12/16 MVA, 13800/4160V station service transformer taking its power from an isolated external system bus and supplying power to the generator during start-up.

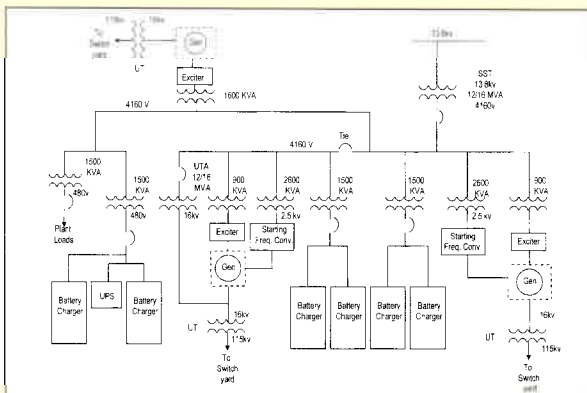
The **main unit transformer (UT)** transforms power from the generator output to match the transmission system voltage. The UT normally employs a wye connection on the high voltage side, offering economies in dielectric insulation for the neutral which is usually solidly grounded for voltages in excess of 115kV. The UT must operate at the highest transmission system voltage. ANSI C84.1-1982 and ANSI C92.2-1987 offer guidance for these voltage levels. The highest UT tap must not be more than 5 percent below the maxi-

imum transmission voltage. Typical low voltage ratings are 95 to 100 percent of the generator output rating while the high voltage side is usually 100 to 105 percent of the transmission rated system voltage. The actual voltage selection can be made using a load flow diagram.

Because cogeneration applications impose unique stresses on system components, particularly the **unit auxiliary transformers (UAT)**, the UATs are designed in accordance with IEEE C57.116-1989 rather than IEEE C57.12.00-1978, the standard for typical network transformer designs. Special mechanical structure and thermal design ensures the transformer withstands severe fault currents if a bolted fault occurs on the secondary. Units also are designed to handle ±10 percent voltage on the primary side.

The **station service transformer (SST)** supplies power during generation startup and is normally disconnected after start-up. When in start-up mode, the UAT secondary opens as the SST secondary closes. UAT and the SST phasing must be coordinated to accommodate two different source voltages.

The **exciter and starting frequency** transformers supplied by Virginia Transformer also require special design considerations based on rectifier and drive duty applications.



One-Line Diagram for Three-Generator Power System

UNICLAD® is a VTC registered trademark.



Virginia Transformer Corp.

220 Glade View Dr., Roanoke, VA 24012 USA
 ph: 540-345-9892, fax: 540-342-7694
 visit us at www.valtransformer.com

ISO 9001

Virginia Transformer Corp. can assist you in specifying all of your transformer needs for power generating operations whether they be unit auxiliary transformers or transformers for generation, excitation or distribution -- liquid or dry type. VTC can satisfy environmental or special mechanical requirements including matching to existing equipment. Our prices are competitive and no one can match our delivery, service and experience.

Virginia Transformer Corp.

Meeting transformer needs at home and around the world

Virginia Transformer Corp., headquartered in Roanoke, Va., USA, custom designs and manufactures liquid, dry, totally enclosed non-ventilated dry-type (TENV) and Uniclad® transformers, LTCs, voltage regulators, distribution control packages and reactors in the United States and Mexico. Since 1971 VTC has supplied transformers and other associated electrical equip-

ment for utilities, heavy industry, OEMs, construction, E&C firms, mass transit, drive isolation and export. ■ Custom designed transformers achieve the highest efficiency for a given set of conditions. The company's commitment to Team-Based Continuous Improvement is producing phenomenal success for Virginia Transformer and its customers.

PARTIAL LIST OF GENERATION PROJECTS

Capex III, Argentina	City of Cleburne, Texas
Las Flores II & III, Columbia	City of Robbins, Illinois
National Steel, Philippines	Proctor & Gamble, California
Sabah, Kenya	Florida Power, Florida
Empire II, Missouri	Sacramento, California
Pakistan I & II, Pakistan	Macintosh, Alabama
Darlington, South Carolina	American Iron, Louisiana
Santa Rosa, Peru	Exxon, Texas
Thermocentro, Columbia	Calpine, Texas
Inecel, Ecuador	Inland Steel, Illinois
Greys Ferry, Pennsylvania	St. Francis, Missouri
Themo Opon, Columbia	Bridgeport, Connecticut
Asir Saudi, Saudi Arabia	CFE, Mexico
Jizan, Saudi Arabia	Lakeland, Florida
Hermiston, Oregon	Oxychem, Texas
Puerto Plata, Dominican Republic	Fronteria, Texas

PRODUCT LINE

VPI Dry-type Transformers

Up to 10 MVA; 35 kV Class

Uniclad® Transformers

Air Cooled, Sealed Coils;
Up to 10 MVA; 35 kV Class

Liquid-filled Transformers

Up to 50 MVA; 138 kV Class

LTC Transformers

Up to 50 MVA; 138 kV Class

Voltage Regulators

Up to 46 kV Class

Drive-Isolation Transformers

Dry Type or Liquid Filled

Rectifier-Duty Transformers

Mass Transit
Process Applications

Distribution Control Packages

Transformers with Switches,
Breakers and Controls

Iron and Air Core Reactors

Indoor and Outdoor
Up to 15 kV class



**Virginia
Transformer
Corp.**

220 Glade View Dr.
Roanoke, VA 24012 USA
Phone 540-345-9892, ext. 203
Fax 540-342-7694
marketing@vatransformer.com
www.vatransformer.com