Micalastic insulation
For high voltage hydro generators
Micalastic insulation

Voith Hydro is a global leader in hydropower equipment and services for both new and modernization projects. The Canadian Mississauga location has been a market leader in providing generator modernization services within North America having supplied coils for the modernization of over 450 generators located in 340 different generating stations over thirty-five year history of the facility. This represents over one gigawatt of modernization services incorporating coils produced in Mississauga.

Through-out its’ history, Voith Hydro in Canada has set new quality and performance standards and by continuously upgrading the engineering and manufacturing resources has consistently delivered best-in-class solutions for the hydro power modernization market. The result is an industry leading reputation for excellence in engineered reliability, world-class solutions and products.

In a globalized world, the generation of sustainable emission-free electricity is more important than ever. Hydro power is well positioned as a major contributor within the renewable energy production. With our long history in hydropower products and services, and excellent processes and tools for engineering and manufacturing, we offer responsive, creative and cost effective solutions in the execution of new or modernization projects.

Leading-edge in coil manufacturing

Voith Hydro Canada has always pursued a technological leadership approach to the hydro power industry in both its design and manufacturing philosophy.

This is demonstrated by the significant investment in new leading-edge coil manufacturing equipment now installed in Mississauga.

This new equipment consists of an:
- Automated coil forming machine
- Automated electric press of coils
- Six-axis auto-taping machine
- Micalastic vacuum pressure impregnation (VPI) system

One of the key improvements of the winding manufacturing process is the introduction of six-axis controlled taping of coils. The taping machine wraps the fine mica tape with a consistent overlap and tension around the straight section and end-winding portions of the coils, thus ensuring uniform thickness over the full length of the coil. This Insulation process in combination with specialized and sophisticated VPI technology, ensures a void free, high dielectric insulation system.

Benefits of this new coil manufacturing equipment to our customers are:
- Best-in-class delivery cycle times driving shorter manufacturing cycles
- 50% less handling of coils in production
- Unprecedented repeatability and reproducibility of coil dimensions

Another key advantage of the new equipment is realized in the design phase for both new and existing generators being modernized. The high precision of the new coil equipment allows the design engineers at Voith Hydro to further optimize the amount of copper in the design which in turn will provide machines that have higher output, efficiencies and lower losses.
Micalastic in high-voltage hydro generators

The common characteristics shared by all types of Micalastic insulation are the use of inorganic fine mica tape as a base material, and heat-curing synthetic epoxy resins as a bonding material. This, coupled with state-of-the-art manufacturing techniques provides a high dielectric breakdown strength, long-term resistance to electrical stress, and a low power factor (tan δ). The mechanical properties of the tape and resin combination also provide excellent resistance to mechanical and thermal stress. The Micalastic insulation system is based on Vacuum Pressure Impregnation technology and meets Thermal Class 155 (IEC)/Class F (IEEE) standards.

Process control

Six sigma tools are used as a standard to monitor the coil manufacturing process and collect data on an ongoing basis. This allows direct comparison of product performance across all location using the standard process. This commitment to best practice and continuous improvement ensures the products being manufactured in the Voith worldwide network are consistently produced using excellent processes.

Design

Computerized design tools allow modeling of the performance of the whole generator. Based on extensive test results on completed projects, the calibrated calculation allows the winding performance to be optimized and guaranteed. The range of applicability for multi-turn coil winding is up to 200 MVA and voltages up to 18 kV.

Voith Hydro’s approach has always been to provide customers with the best engineered solution for their unique applications. Micalastic offers technological advantages that will benefit customers in many ways:

- Leading-edge technology in insulation will ensure continuation of the best engineered insulation systems for customer applications.

Micalastic insulation system for field assembly

The Micalastic insulation system has been developed for the field assembly of the winding components. A combination of fine mica tape, epoxy resin and a room-temperature curing agent provide good dielectric properties and mechanical resistance.

Components insulated in the field:
- Connection between coils and circuit ring
- Circuit ring
- Jumper between coils
- Connection between coils

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Power Plants with Micalastic Multi-turn coils

Costa Rica:
- Sandillal: 2 units
  17.64 MVA, 13.8 kV, 300 RPM, 50 Hz

Europe:
- Rånsåsfoss III
  Akershus Energi
  Norway - 6 units
  45.36 MVA, 13.8 kV, 25 RPM, 50 Hz

- Tiefencastel
  Shettisham, US Army Corps of Engineers,
  Alaska - 2 units
  34.5 MVA, 13.8 kV, 60 RPM, 60 Hz

- Fossvatn
  Micalastic Multi-turn coils
  Norway - 6 units
  14.6 MVA, 13.2 kV, 40 RPM, 50 Hz

- Uluabat
  Akenerji Elektrik Uretim A.S.
  Turkey - 1 unit
  55 MVA, 13.8 kV, 600 RPM, 50 Hz

- Toeging
  Germany - 6 units
  8.5 MVA, 10.5 kV, 214.3 RPM, 50 Hz

- Vohburg
  Germany - 3 units
  12 MVA, 6.6 kV, 90.9 RPM, 50 Hz

- Goegegau
  Switzerland - 4 units
  12.5 MVA, 10 kV, 142.9 RPM, 50 Hz

North America:
- Gaston
  Dominion Generation
  Virginia - 1 unit
  55.6 MVA, 14.4 kV, 100 RPM, 60 Hz

- Ohio Falls
  Louisville Gas & Electric
  Kentucky - 5 units
  14.68 MVA, 14.0 kV, 100 RPM, 60 Hz

- Corra Linn
  FortisBC
  British Columbia - 2 units
  20 MVA, 7.2 kV, 85.7 RPM, 60 Hz

- Spray
  TransAlta Generation Partnership, Alberta - 1 unit
  62.2 MVA, 13.8 kV, 450 RPM, 60 Hz

- Bay D’Espoir
  Nalcor Energy
  Newfoundland and Labrador - 4 units
  85 MVA, 13.8 kV, 300 RPM, 60 Hz

South America:
- Santa Clara
  Chile - 3 units
  21 MVA, 13.8 kV, 257.1 RPM, 50 Hz

- Rio de Peixe
  Brazil - 2 units
  5.5 MVA, 6.6 kV, 720 RPM, 50 Hz

- Pinhal
  Brazil - 1 unit
  4 MVA, 6.9 kV, 257.1 RPM, 50 Hz

- Elroy Chaves
  Brazil - 1 unit
  11 MVA, 6.9 kV, 360 RPM, 50 Hz

Africa:
- Gige Gibe II
  EEPCO Ethiopian Electric Power Corp.
  Ethiopia - 4 units
  125 MVA, 15 kV, 333.3 RPM, 50 Hz

- Dardanella, U S Army Corps of Engineers,
  Arkansas - 4 units
  32.63 MVA, 13.8 kV, 75 RPM, 60 Hz

- Pensacola
  Grand River Dam Authority
  Oklahoma - 6 units
  19.85 / 22.6 MVA, 13.8 kV, 150 RPM, 60 Hz

- High Falls
  Great Lakes Power
  Canada - 2 units
  25.0 MVA, 12.0 kV, 276.9 RPM, 60 Hz