



# X-ray inspection shifts a gear higher at SGC - SwitchGear Company!



*A line of medium voltage Switchgear cubicles.*



SGC - SwitchGear Company has installed a Microfocus CT system from Nikon Metrology to accelerate product development and to maintain high quality standards for incoming components from suppliers. The 225 kV X-ray equipment is installed on the production floor and is used to non-destructively inspect the quality of various components used in their medium voltage cubicles and the integrity of welded assemblies of SF<sub>6</sub> filled enclosures.

SGC - SwitchGear Company is a fast-growing, independent producer of medium voltage switchgear. With a history dating back over 35 years, SGC focuses on the design and production of medium voltage switchgear from 3kV to 36kV, suitable for both indoor and outdoor use, that excel in quality and safety. The SwitchGear cubicles can be compared to switchboards for domestic applications but operate at much higher voltage and currents. The products have a wide application range and are used in electrical distribution centers, transformer stations, wind turbines, production plants, etc. The driving forces for product development at SGC - SwitchGear Company are customer satisfaction, ease-of-use, safety and low environmental impact. SGC is a global player with headquarters in Belgium and a worldwide network of partners, e.g. in the US, Russia, Africa, China, Australia, etc. Exports have grown dramatically in recent years.

Patrick De Clercq, technical Project Manager at SGC explains, "SGC products are high standard and have a lifespan of more than 30 years. In order to guarantee this lifespan, product quality needs to be 100% under control."

The copper connectors for high power cables are sealed in an isolating epoxy material and reside in a pressurized, SF<sub>6</sub> filled enclosure (SF<sub>6</sub>

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*Patrick De Clercq, technical Project Manager at SGC*



*The X-ray XT H 225 ST system is installed on the shop floor and matches the brand colors of SGC, with Frederik Delobelle (right) and Patrick De Clercq (left)*

= sulphur hexafluoride, an inert gas used as insulating material in electrical systems). Porosity or air inclusions in the epoxy components need to be avoided at all costs, as these can cause internal arcs that can result in explosions and permanent damage to the equipment. SGC cubicles are also known for minimum loss of power throughout their lifetime. One of the critical elements here is the high quality welding of the enclosures around the connectors to avoid SF<sub>6</sub> leaks. As such, the quality control of these components and processes (e.g. the welding of the joints) is a crucial step in the production process.

### **Time-consuming destructive test methods**

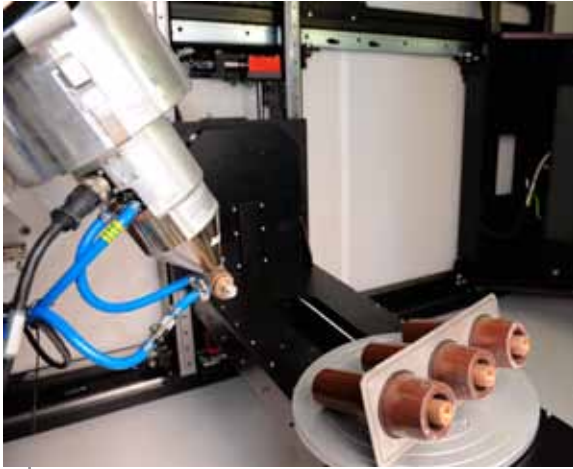
Until recently, SGC used destructive test methods to inspect these epoxy components for internal imperfections and to verify the perfect fit of the copper tube to the resin, where the part under test was sliced. Such tests were not only time-consuming, but it was also difficult to draw the right conclusions as to whether the imperfections were caused by the destructive tests or already present due to the production process. To gain better insight into the quality of the epoxy components, non-destructive X-ray inspection was considered as a benchmark. After consultancy work to solve some long-standing difficulties with one specific problematic component, SGC was convinced that X-rays were the right tool to investigate the problems in the connectors and defined a project to deploy an X-ray system.

### **Selection of the CT system**

Before deciding to invest in X-ray equipment, SGC performed several benchmarks with different X-ray/CT manufacturers. As the CT images of Nikon Metrology revealed what SGC expected to see in the components, a decision was easily made. Patrick De Clercq comments "We immediately were impressed with the X-ray results. The fact that Nikon Metrology also offered a 225 kV source while other vendors offered a 180 kV system was an important reason to decide in favor of the Nikon Metrology XT H 225 ST system." By applying a higher voltage, users can penetrate thicker materials or higher density materials. The 225 kV source can easily penetrate 12 cm epoxy. For metal parts, an even higher voltage can be necessary to irradiate the metals. For very specific X-ray scans, it is possible to use the 450 or 750 kV systems that Nikon Metrology has available in its technical demonstration center.

### **X-rays help to achieve high quality standards**

In the meantime, X-ray inspection and CT have proven highly effective in many applications. The recently installed system is used to inspect the quality of products delivered to SGC from external suppliers. For parts in series production, X-rays are used to verify quality by testing samples from the batch. As SGC is ISO 9001:2008 certified, it is important to constantly monitor product quality. Correction measures are implemented when shortcomings in the process occur.



Epoxy components filled with copper are ready for inspection in the CT system.



The X-ray images show the interior of the components.

For different parts, SGC was able to prove the presence of internal voids in components, or low quality seals for 100% sealed enclosures.

X-ray inspection also helps to accelerate product development. The SwitchGear cubicles consist of many parts including plastic injection molded components, rubber, and metal parts. As almost all components are engineered and designed in-house, X-ray inspection has accelerated the product development process by providing internal insight in the prototypes. Mr. Frederik Delobelle, R&D engineer comments, "With one specific component we had been looking for years for a solution to optimize the production of the part. Thanks to the X-ray and CT images it became clear what the real issue was, and corrective action was taken within a few weeks. Another important advantage of CT is that for assembled components, CT enables us to verify whether the assembly is accurate (e.g. if contacts are perfectly aligned) without having to destroy or dismantle the part."

### Future plans

SGC is currently deploying a completely new facility to assemble a new switchgear product. The X-ray system will play an important role in product engineering, incoming quality control and production improvement. Also for SGC customers it is re-assuring to know that SGC applies the most modern technology to guarantee the high quality standards and safety of its switchgear products.



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*Mr. Frederik Delobelle, R&D engineer at SGC*