

SUBSTATIONS: THE CHALLENGES OF COMMISSIONING



Eric Cottens and Marcus Stenner share what their jobs entail

Utilities rely upon their installations working as flawlessly as possible. During commissioning, the foundations are laid for the future system security of the entire installation. With the CPC 100, OMICRON has a universal test set that can perform a wide variety of electrical tests on current and voltage transformers at its disposal. To find out exactly how commissioning is carried out and the challenges that have to be overcome, we spoke to two experts: Eric Cottens, Managing Director of Cottens & Badoux Energie Services SA (CESSA), and Marcus Stenner, Team Leader Engineering Services at OMICRON.

Why is an inspection necessary before commissioning substations?

Eric Cottens: Well, before current and voltage transformers are allowed to be put into operation in substations, the design needs to be verified. Not only does this enable installation errors to be detected early on, but it can also identify any design errors that may have occurred in the engineering process.

Which tests are performed during commissioning?

Marcus Stenner: First of all, the wiring and cable designations are checked to determine whether transformers and protective devices have been connected to one another correctly. We can see from the equipment plan whether the correct cables and cable cross-sections have been used. If everything is OK at this stage, various tests are then carried out to measure the loads, magnetization

characteristic, and internal resistance. The ratio is also checked. Measurements are also taken for the line and ground impedance as well as step and touch voltage measurements.

How have your jobs changed in recent years – aside from the technical developments?

Eric Cottens: There is an increasing number of people involved in the projects. That results in more interfaces and, in turn, more potential for errors that we have to take into consideration during testing. In general, project planning has

also changed. Fewer and fewer time buffers are planned in. Sometimes, we're called to commissioning assignments that actually needed to be completed the day before.

Marcus Stenner: That's true; many operators assume that their substations can simply be hooked up once they have been set up. It's clear that project management has definitely become more professional, but errors still occur time and again. That's why we have to continue to be very precise in everything we monitor and oversee – and that takes time. ▶

«You always have to assume errors will be found during commissioning. That's why we have to check that the entire engineering process is correct, step by step.»



Marcus Stenner
Team Leader Engineering Services,
OMICRON



What does a commissioning assignment usually involve? Do you carry out all the work on site?

Eric Cottens: We complete some preliminary work in the office beforehand. Using the diagrams at our disposal, we try as best as we can to determine how much time will be required and which tests will need to be carried out. That helps us plan the on-site work and organize it as efficiently as possible. We then perform the primary tests on site, as mentioned earlier, as well as the secondary tests, which are used to check the voltages for the consumers. We also calculate the parameters for the protection and metering transformers and then set them. Signal tests are another task that we perform.

Marcus Stenner: Essentially, it's very important for the customer to hand over their installation to us when we're on site. High voltages are present in substations, so areas in which we're working have to be shut down. For our own safety, we await the official approval, which we receive as soon as all of the relevant sections have been disconnected.

What are the main challenges during commissioning?

Eric Cottens: You need expansive process expertise, for example, on how the system works, how the assets are interconnected, and what the end state has to be. These are questions that we ask ourselves daily and also have to answer. It's also a challenge to always have to compare an actual state with the desired state. The

results must be the same. If there are any deviations, of course we have to find the fault. That could be anything from a defect in the transformer to an erroneous assumption that was made during the planning stage.

Marcus Stenner: Yes, that's right. You always have to assume errors will be found during commissioning. That's why we have to oversee the entire engineering process – from planning to construction – and ensure that it's correct, step by step. This involves really delving into the matter.

How does the CPC 100 prove itself in the field when used for commissioning?

Eric Cottens: The test set is very practical; when we need it, we simply place it on the case and work with



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Eric Cottens

Managing Director,
Cottens & Badoux Energie Services SA (CESSA)

it. Or, if it's raining, we leave it in the trailer or in the car and work from there. The device is very handy and therefore very versatile.

Marcus Stenner: When working with the CPC 100, it just needs to be near the site – whether that's in the car or outside, it doesn't matter. Its lightweight and its rugged design has proven its worth in this respect.

Has the CPC 100 made your work on site easier?

Marcus Stenner: Yes, of course. Before, we had to bring an adjustable transformer with us to the site, which was transported on a truck or trailer. By contrast, the CPC 100 is lightweight and can be operated without a laptop. The test procedure has also been simplified. For example, we

used to have to enter the determined values into an MS Excel® spreadsheet manually. The CPC 100 does this automatically, and also generates the test reports as required, which reduces our workload significantly.

Eric Cottens: Yes, it's a great benefit to us that the CPC 100 documents the tests immediately and creates reports automatically. That's a neat feature. The device is light, extremely user-friendly, and can perform a wide range of tests, which means we can really concentrate on the essential aspects of our work. Another advantage is that we can use the CPC 100 for several different tests. We also use it for transformer diagnostics or as a voltage source for partial discharge measurements.

What developments do you envision for the future of commissioning?

Eric Cottens: I think that commissioning will become more complicated on the primary side. We're coming across an increasing number of protocols that transfer signals via an interface. For example, "sampled values" in the IEC 61850 protocol. For commissioning, this means it takes more time and effort to check everything.

Marcus Stenner: Yes, if IEC 61850 is incorporated into the substations, we'll definitely have to carry out more tests. In this case, the values that were initially entered, need to be compared with the sampled values. This applies both to conventional and unconventional current and voltage transformers. ⚡