

## Developments in Diagnosis of High Voltage Apparatus

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**Abstract:** Diagnosis, coming from the Greek word „diagnosis“ meaning decisive assessment or understanding, is to identify, to check and to classify characteristics with the goal to gain a general picture of the condition of something and to create the development of this condition. Therefore the Technical Diagnostic (TD) is the science from the recognition of the condition of technical systems and equipment. TD has the goal to gain relevant informations of the condition of technical systems and to deduce from these informations criteria. From these criteria existing conditions should be influenced and future conditions should be predicted. From this point the condition of essential components as well as their interactions are very important.

Technical Diagnostic is a tool within the framework of the supervision of insulation systems of high voltage equipment. This supervision consists in monitoring, analysis and diagnosis. The main function for choosing diagnostic methods is the great meaning of diagnostic equipment and the evaluation of their measurement characteristics.

The aim of diagnostic in high voltage engineering are: the proof of structural changes in used materials, the proof of humidity and contamination at components and apparatus, the proof of electrical discharges in systems and apparatus, the proof of mechanical vibrations of apparatus, the proof of over temperatures and local heatings at apparatus and the proof at mechanical damages at machines, switches, switch-gears and overhead lines. And the long-term objective of this development is the deduction of a connection “diagnostic value – lifetime – default risk”.

The most important diagnostic methods are the dielectric measurement of capacitance and loss factor by power frequency, partial discharge measurements, chemical analysis as well as optical and acoustic processes. But in the meantime new methods for the purpose of system qualities and dielectric diagnostic have won in meaning and importance considerably. Normally diagnostic measurement takes place in a high voltage test field, but increasingly on-site diagnostic will be carried out. Furthermore coming

up very strongly on-line diagnostic, especially at valuable and strategic important apparatus like great power transformers, rotating machines and transmission cables.

With new technologies in signal processing, computer-aided engineering, sensor technology and electronic new measurement equipment is coming up using physical processes for monitoring of quality parameters. Especially for on-site and on-line testing a great number of new measuring methods will be applied for diagnosis. There are new measurement techniques in the dielectric diagnostic as polarisation – depolarisation- current measurement or recovery voltage measurement as well as in the partial discharge detection like electromagnetic or acoustic methods. But also new optical technology (new light detectors) or chemical analysis (Furan analysis) are used. For the determining of system characteristic the behaviour of the impulse current, the characteristic of transfer functions, the measurement of frequency responses or reflectometry are important measurement techniques.

But in all these fields there is a need for standardization to be sure that for all measurements the same recommendations will be fulfilled. And there are checks according to regulations for the diagnostic apparatus and the test setup, that the users of such equipment can carry out correlations to recommended values. In this way these developments can help to prevent outages, increase the reliability of power equipment and save maintenance costs in the power industry.

### References

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