

TRANSFORMER SERVICE

ABB Ability™ inspection for transformers – TXplore™

Oil-filled transformer internal inspection service



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01 Insertion of the TXplore™ system through a transformer opening

The need for understanding your asset condition

Power transformers are critical to moving electrical energy large distances. They have very long service lives, typically providing reliable energy transfer for many decades. To ensure a long service life, maintenance must be carried out as the transformer ages and issues arise. The largest transformers are typically filled with mineral oil, which acts as a coolant and provides electrical insulation for the high voltages the transformer must withstand. Both the mineral oil and cellulose insulation breakdown from the stresses of use and aging.

The challenges of traditional inspections

Non-invasive techniques of condition determination range from visual observations, oil sampling and component function tests to electrical testing of the insulation, current carrying capability and voltage transformation ability. At times, these observations and tests indicate a possible malfunction of an internal component or system critical to the transformer. In the past, to evaluate if a specific component or system required repairs it was necessary for someone to perform an internal inspection of the transformer. This requires bringing oil processing and storage equipment to the site and removing the oil from the transformer. An internal inspection expert then enters the transformer and performs the inspection. All of this causes a significant outage and considerable expense for the customer.

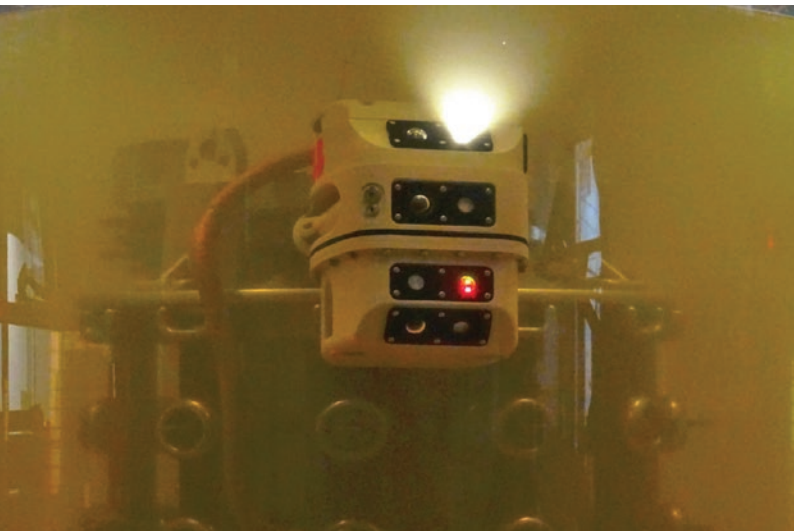
Use ABB’s inspection service to examine the internal structure of your transformer without the need to remove the oil and send an inspector into the confined space of a power transformer.

The internal inspection is quite challenging because spaces are tight and the environment is not human-friendly. It is also dangerous, as the confined space requires effort to ensure the air inside is breathable. The process can result in the need for extensive processing to remove gas, moisture and re-establish oil impregnation of the insulation material.

The ability to perform an internal inspection while the transformer is filled with oil

ABB has developed the robot to function as a remotely controlled inspection “submarine.” This allows an inspection of the transformer with minimal to no oil being removed from the transformer to insert the device through a manhole on the cover. This completely eliminates the need to put a human at risk and expose the transformer’s internal structure to external contaminants and potential damage from the weight of a human performing an inspection.

A small on-site team directs the robotic submarine using a wireless control system. The robot has multiple lighting systems and high-definition cameras that are able to provide photographs and real-time video during the inspection. With communication at the location and support through the ABB Ability™ platform, transformer experts and customers can watch inspections in real-time from remote locations. This feature allows ABB to bring the experts in to help with the evaluation. Also, the experts are able to direct the operators to look at specific areas in more detail, improving the ability to accurately identify the root cause of the problem.



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01 TXplore™ in demonstration tank

02 TXplore's perspective of transformer core support structure

TXplore™ inspection benefits

The ability to perform an inspection of a transformer filled with oil requires minimal disturbance of the transformer.

Safety

- Eliminate the need for a human to enter the harsh confined-space environment
- Can reach zones “inaccessible” to humans
- Inspection team works from outside the transformer

Speed

- Inspection can begin immediately after an outage,
- Significantly reduces outage time (potentially from a week to a day)

Simplicity

- Minimal oil is handled as the TXplore™ robot can enter through a manhole on the cover
- There is no need for a confined-space rescue team

Expert support

- Near real-time images are available to ABB experts
- As issues are identified, experts from around the world are able to support inspection as it happens
- ABB Ability™ platform utilized for remote expert support
- Customers receive a report with solutions to resolve issues identified by the TXplore™ system

Informed decisions

- The challenge of oil handling and entering the transformer can be a barrier to performing an inspection
- Guesswork is eliminated with the support of high-quality images and expert review



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Inspections can become more routine

The ABB TXplore™ can assist in emergency inspections of critical transformers when operational issues are detected. It can be deployed and inspecting as soon as the transformer is de-energized. This additional data supports a more accurate evaluation of the transformer's ability to continue to operate reliably. It can also become part of a routine periodic inspection, combined with typical oil samples analyzed for chemistry and dissolved gases and electrical tests, such as ratio, power factor, SFRA and others. This evaluation allows the transformer operator to confirm asset readiness/reliability and be part of the baseline data to use for future condition comparisons.

Get connected and make better decisions

ABB Ability™ TXplore™ inspection can be viewed by our experts via an internet connection. Experts can review information collected during the inspection and develop action plans to improve the reliability of the critical transformer asset.

ABB Ability™ TXplore™ service can be scheduled ahead of time to take advantage of a planned outage with little or no increase in the outage duration. ABB can also deploy a team to perform an inspection when unforeseen issues are encountered.