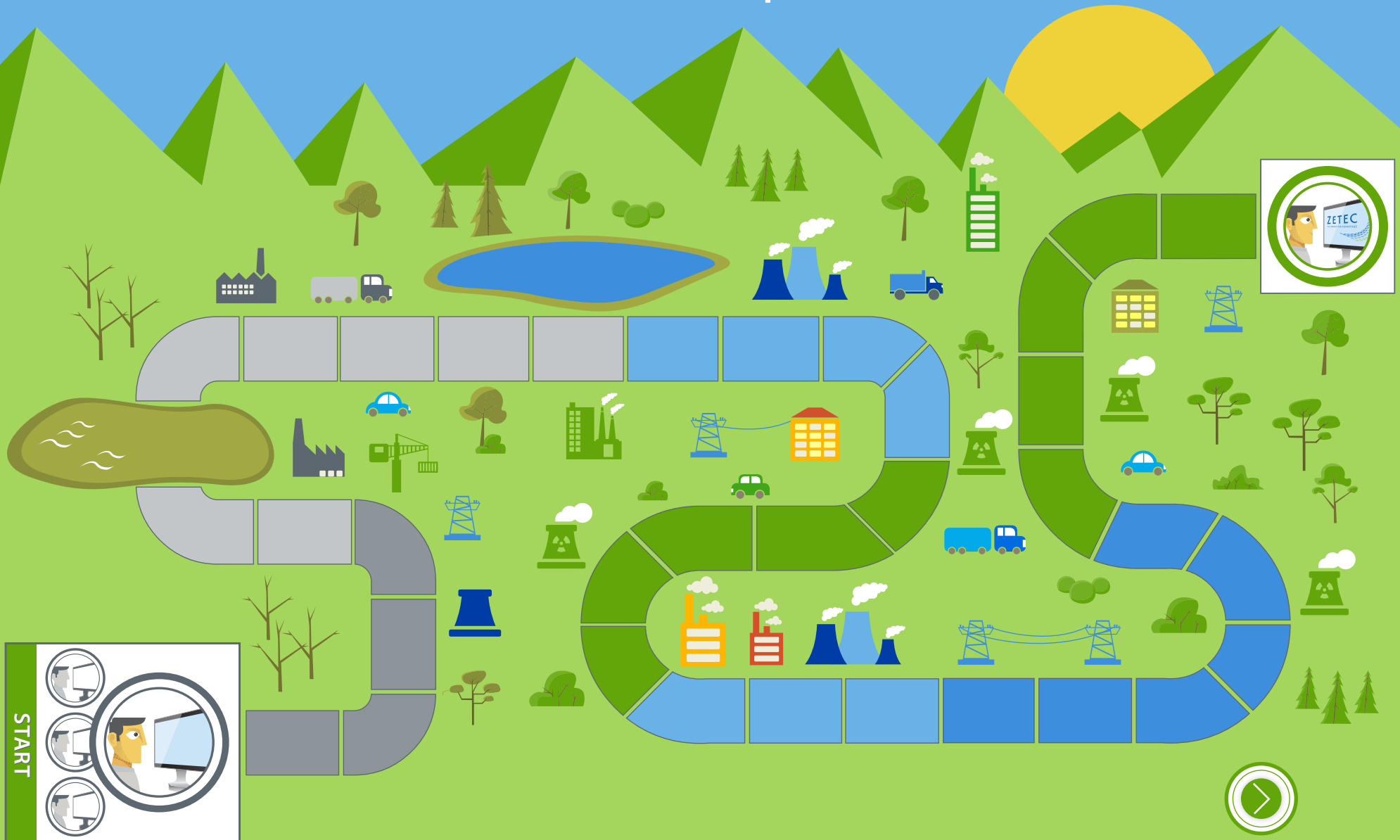


Take Control of Your Future

The Path to Independent Automated Analysis
of Nuclear Steam Generator Tube Inspection



Look Confidently Toward the Future

Confidence is a critical element of steam generator tube inspection analysis—confidence in the data, in the results, and in the final decision to return to power after inspection. But industry change brings uncertainty. Utilities are struggling to confidently manage the evolution from fully redundant, two-party manual analysis to combined manual and automated secondary analysis, and—when appropriate—to dual-pass or single-pass automated analysis. As you chart your path through this evolution, it's important to look at what's causing the changes and how you can control critical aspects to ensure safe plant operation.



Are these questions keeping you up at night?

- Have your inspections run over budget due to schedule slides or inspection scope expansions?
- Have you experienced an incident—or heard about one—and wondered if you've covered every base?
- Do you have full control of your data and the tools to analyze it?
- Are you locked into a provider contract that doesn't give you all the analysis options you'd like?
- Are you concerned about the continued erosion of the experienced analyst pool?
- Can your budget support the escalating prices for additional personnel?
- Are you prepared for the evolution to dual-pass or single-pass automated analysis?




Ultimately, are you confident that your current analysis approach is sustainable into the future?



Automated Analysis Adoption Is on the Rise

Traditional eddy current analysis relied on highly skilled analysts with decades of experience, performing repetitive data review of steam generator tubing data. But the shortage of qualified analysts has become more pronounced, and is impacting inspection schedules. At the same time, the assumption that manual analysis is safer than automated analysis is being challenged.

An illustration showing a person's hands holding a tablet. The tablet screen displays a data dashboard with a line graph showing trends from 2014 to 2018. The graph has three data series: 'Steam Generator' (36%), 'Eddy Current' (65%), and 'Tubing' (25%). There are also icons for 'Steam Generator', 'Eddy Current', and 'Tubing' on the screen. The person is pointing at the screen with their right hand. Surrounding the tablet are various icons: gears, a lightbulb, a pie chart, and a bar chart. The background is white with a blue header and footer.

The benefits of computer-automated analysis—including redundancy of multiple analysis algorithms, consistent performance, and lack of human fatigue—make auto-analysis systems the logical path forward for the industry. The addition of new technologies such as automated full-tube history comparison brings defense-in-depth to the inspection. This is the direction the industry is moving.

Data Confirms this Trend

Based on an EPRI market survey of nuclear plants around the world, presented at the 2015 EPRI Steam Generator Automated Data Analysis Workshop, the trend is for widespread use of automated analysis for secondary inspection, and rapid adoption of dual-pass and single-pass inspections.

Over 95% of plants surveyed use automated analysis for secondary inspection

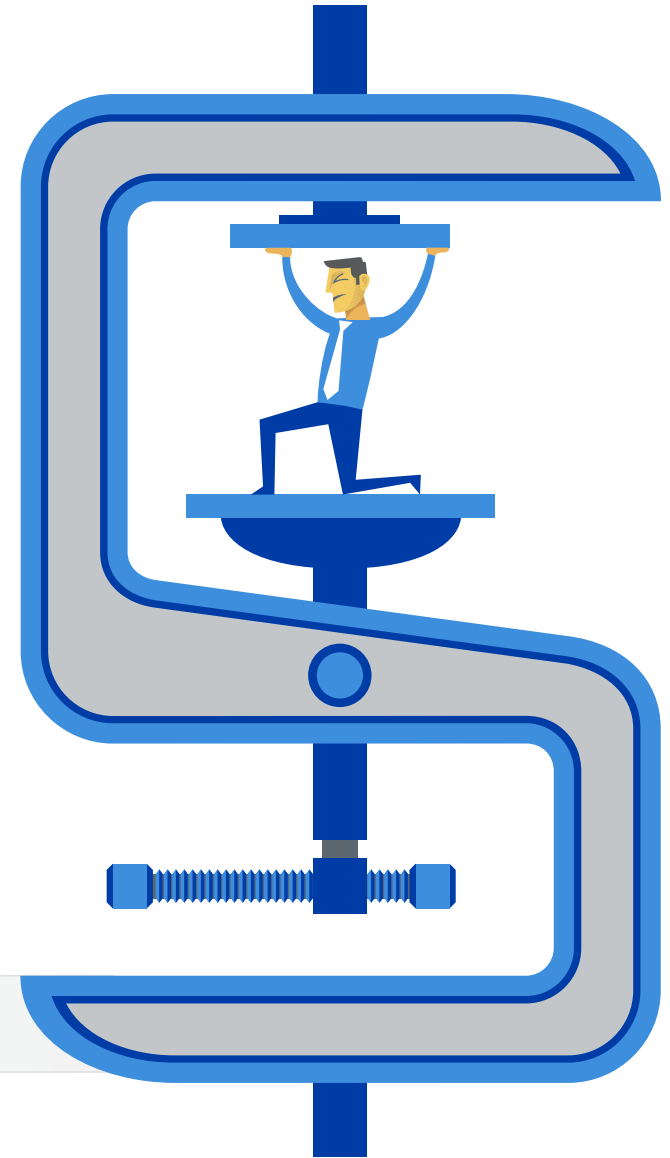


Adoption of automated analysis for primary or single-pass inspection is expected to grow by more than 30% within the next two inspection cycles.

WHAT'S DRIVING THE EVOLUTION?

Shortage of experienced analysts

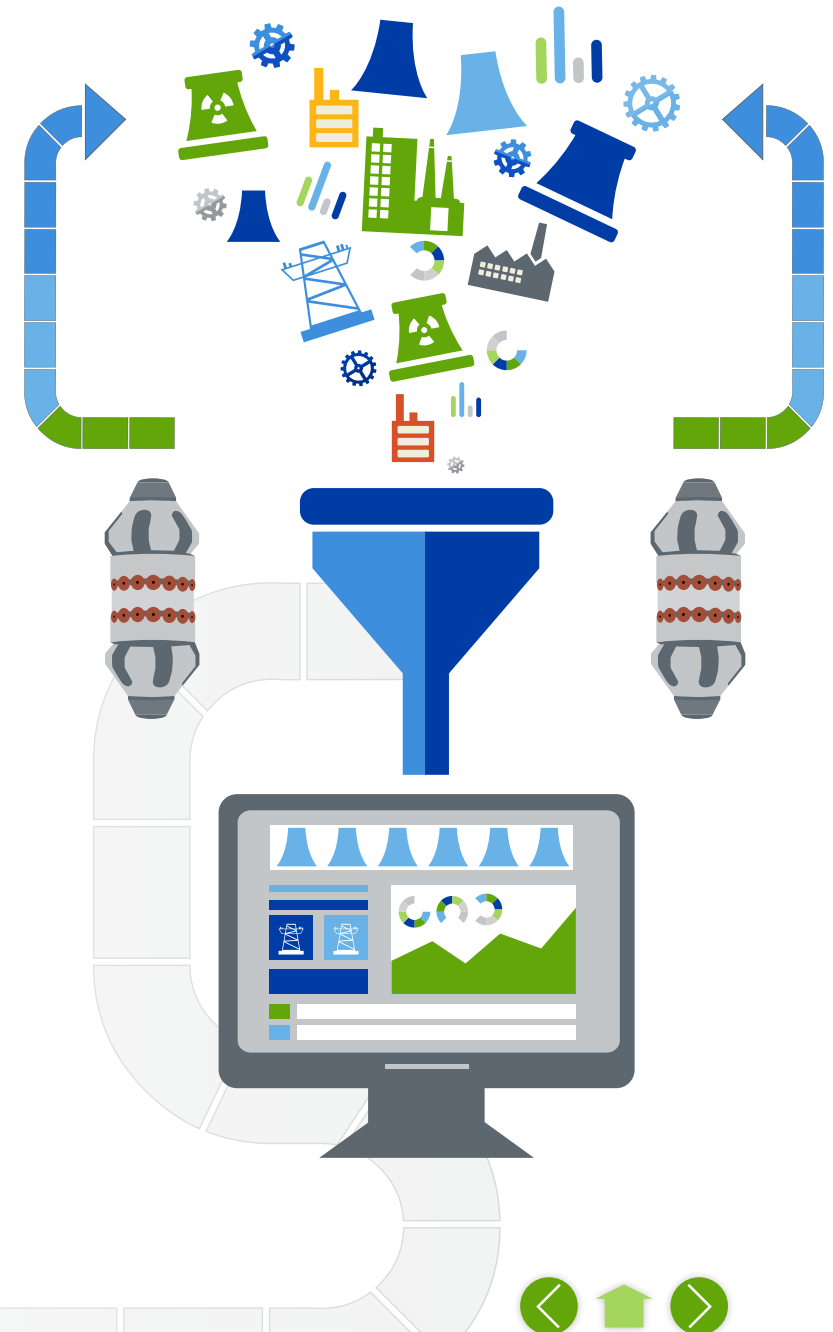
Historically, steam generator tube inspection has depended on human analysts who apply their instinct and experience-based expertise to interpret huge amounts of inspection data. But as the current population of experienced analysts ages out of a career that is highly repetitive and fatiguing—and that doesn't provide compelling opportunities for a new generation—the shortage of qualified analysts will approach critical levels.



WHAT'S DRIVING THE EVOLUTION?

Adoption of array probe technology

Array probes allow fast, one-pass inspections through the tube for considerable cost savings. In the process, array probes generate an order of magnitude more data than traditional bobbin probes, which improves the probability of detecting flaws, but makes manual analysis of the data unfeasible. There are many EPRI qualified X-Probe techniques for detection and sizing, and more continue to be added. The increased volume of data from these probes needs to be analyzed therefore the use of automated analysis becomes even more critical for efficient inspections.



WHAT'S DRIVING THE EVOLUTION?

Pressure to minimize inspection downtime

With pressure to minimize downtime for testing during the outage, inspection managers have been challenged to manage the widening gap between inspection requirements and available resources. To address this gap, one option is to moderate reportable criteria during the inspection based on trending results. However, this runs in direct conflict with inspectors' needs to anticipate or identify problem areas outside of those already pinpointed during the stressful and fatiguing inspection processes.



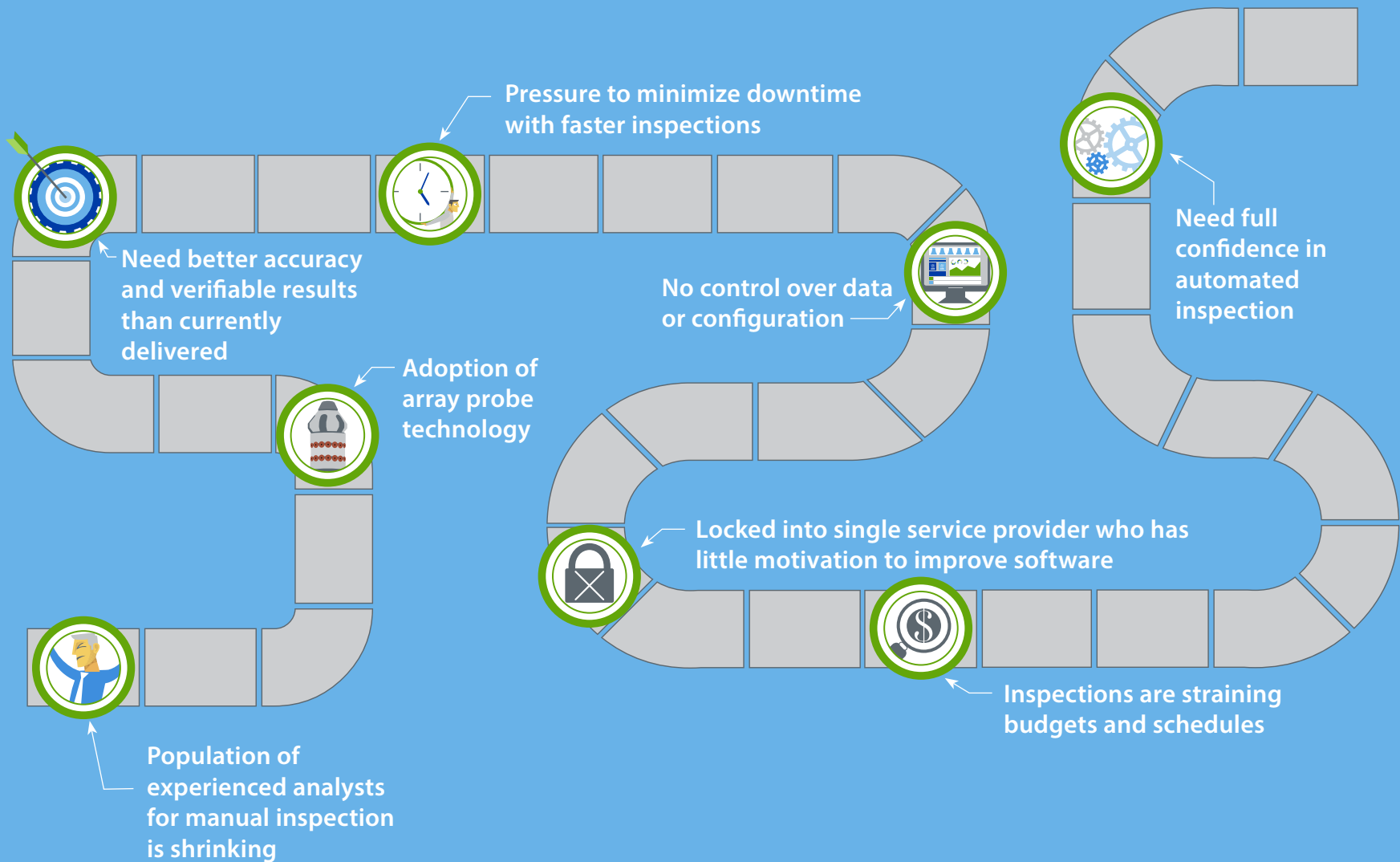
WHAT'S DRIVING THE EVOLUTION?

Need for faster inspections, with more accurate and verifiable results

Without scalable processing capabilities, most systems can't make multiple parallel analysis passes, using a range of algorithms and new technologies, within the utility's limited inspection timeframe. For example, single-threaded processing capacity limits the depth of automated analysis within the allotted inspection schedule, which leads to continuing dependence on human analysts to validate automated results. That means even a trusted inspection provider may not be able to provide full confidence for independent dual-pass automated analysis or defense-in-depth, single-pass automated inspection.



The Evolution of Steam Generator Tube Inspection

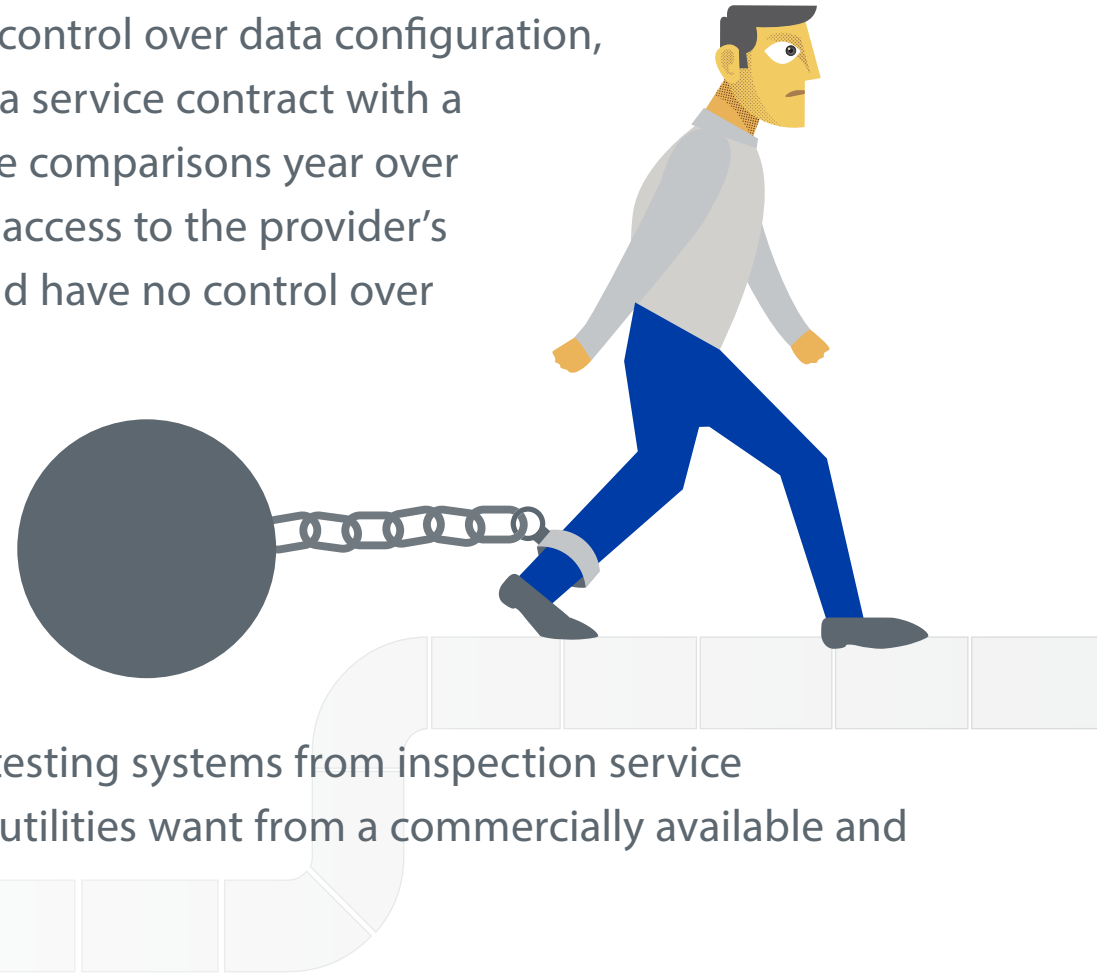


Existing service provider solutions—is ‘good enough’ good enough?

The choice of service provider and analysis system for tube inspections is typically out of the inspection manager’s control. With no control over data configuration, managers can find themselves locked into a service contract with a single provider in order to support accurate comparisons year over year. Inspection managers are left without access to the provider’s software or tools for additional analysis, and have no control over software or configuration changes.

What’s more, because software is not typically a differentiator for service providers, once they have a contract in hand they have little motivation to invest in technology improvements.

The home-grown, proprietary automated testing systems from inspection service providers may not provide the confidence utilities want from a commercially available and independently developed technology.



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Our customers told us they wanted to take ownership of the software used for their automated analysis of eddy current data, and that it must be enhanced to simplify workflow and reduce complexity. Providing utilities and service providers more control over their automated analysis process through ownership of the commercial software is an unprecedented shift in the industry.

~ Tom O'Dell,
RevospECT general manager

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The Path to the Future

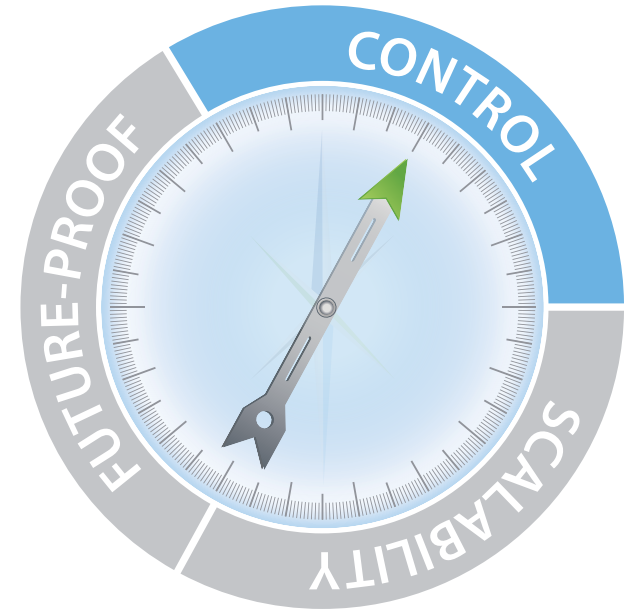
Today, Zetec provides the only path for independent automated analysis in the steam generator tube inspection industry. RevospECT Pro is the industry's first commercially available system for automated analysis of eddy current data with full defense-in-depth capabilities. It has a proven track record in the field and meets rigorous industry standards for flaw analysis from bobbin, rotating, and array inspection techniques.

RevospECT Pro software can perform multiple-path analysis in parallel, using industry-proven detection and classification algorithms that are packaged in user-modifiable capsules. Unique, custom configurations can contain any combination of probe technologies and analysis methodologies needed for any inspection. The software can be used by utilities or service providers for continuity between inspections and better visibility of the costs associated with analysis.



Control

RevospECT Pro is the only commercially available automated analysis software that utilities and service providers can purchase, own, and use with minimal training. The ability to lock-down user configuration guarantees control over reporting results year over year. Automated analysis cuts time and resources required for inspections, and parameter-based signal processing ensures consistent and repeatable accuracy. This is the most accurate and easy-to-use automated analysis system in the steam generator inspection industry.



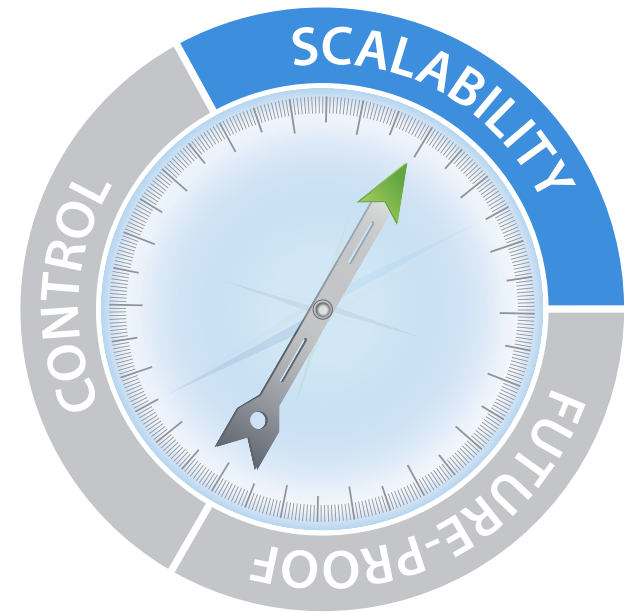
“With very little training I was able to run the RevospECT system, make calls, and edit results. Of immediate benefit was the ability to create separate unique reports (i.e., Dent and Sludge) separately from the degradation report, saving hundreds of post-outage man hours. It is an extremely powerful and scalable system and I plan to utilize even more of its capabilities on my next inspection.”

~ Mr. Lee, ASNT Level III, Taiwan Power Company



Scalability

RevospECT Pro offers unprecedented scalability with distributed processing that supports multiple paths of analysis without performance or schedule impact. RevospECT Pro often outpaces data acquisition rates and generates results that can be verified immediately by the reviewing data analyst. Custom configurations can process data through flaw detection and classification and noise monitoring, as well as additional reporting capabilities such as AVB mapping and wear, sludge, and deposit mapping. RevospECT Pro also offers seamless integration with historical data comparison technology, which auto-loads full-tube historical data files and applies rule-based logic to report change for full defense-in-depth with independence for the inspection. RevospECT Pro is a native Windows application that is designed to take advantage of each new generation of powerful hardware for ongoing performance improvements.



“RevospECT Pro allows us to offer the most comprehensive, highest performance analysis system—tuned to meet our customer’s exacting requirements. Having access to this state-of-the-art automation technology is a game changer for us and for the industry.”

~ **Marc Brown**, Principal Level III, and co-owner of NDE Technology



Future-Proof

Full, independent control over high-performance, scalable analysis software is the only way to future-proof steam generator tube inspection. With fully distributed processing and ownership of the configuration, utilities and service providers can be confident in the system's capabilities to take on future additional analysis needs by plugging in new algorithms as needed without impacting inspection schedules. And as new analysis technologies arise, full control of the data year over year provides access to these new capabilities.

Industry pressures necessitate the evolution from manual to automated steam generator tube inspections. Now there is a clear path for independent automated analysis and ultimately, comprehensive, single-pass automated analysis. The addition of intelligent, full-tube historical data comparison technology adds not only automated multi-inspection addressing of current to historical flaws, but also a powerful new method of detection based on change when historical data is available.



RevospECT Pro for Utilities & Service Providers



Eddy current analysis of nuclear steam generator tubing is a time- and resource-intensive process. Even though the industry is moving away from dependence on the manual analysis of the past, the path to the future has been unclear. Typical approaches include a mix of manual and automated inspection passes, but once the inspection is completed, plant managers can still find themselves with questions they can't answer. RevospECT Pro offers a future-proof approach for fast, efficient, powerful, and consistent automated analysis, which can be used in a primary or secondary role, dual-pass, or in a single-pass configuration, saving significant time and money during an inspection.

Utilities

Utilities can take control of the analysis system used on their steam generator inspection programs, with an independent commercially available software system that creates continuity between inspections and offers unprecedented visibility.

Service Providers

Service providers can now respond to any automated inspection scenario and technique requested by the utility with an independent analysis system that can be used on its own or to augment their own offerings.



For product questions or purchase inquiries, visit:
www.zetec.com/contact-us



Zetec holds ISO 9001
and ISO/IEC 17025
certifications

