

A photograph of two men in a factory or industrial setting. The man on the left, Dr. Pradeep Bhattad, is wearing safety glasses and a grey polo shirt. The man on the right has a beard, safety glasses, and is wearing a dark blue shirt with a red and white logo. They are both looking towards the left, with the man on the right pointing his finger. The background shows industrial equipment and metal shelving.

Interview with Dr. Pradeep Bhattad, Director of Innovation at North Star Imaging

Automation isn't complexity - it's capability

Automation does not add complexity - it unlocks capability. In this conversation, Pradeep Bhattad explains how process automation in X-ray and CT inspection delivers higher precision, repeatability, and throughput once the workflow is configured correctly. Together, North Star Imaging and Comet show how robotics, integrated software, and MesoFocus technology turn advanced inspection into a controlled, reliable production process.

c•met
x-ray

NSI
NORTH STAR IMAGING

Automation simplifies precision Inspection

When people hear "automation," they often think "complexity." In your experience, does automation make inspections harder to manage, or does it unlock new possibilities for your customers?

"Automation unlocks many new possibilities for our customers. It can be harder to set up initially, but that's where NSI accelerates, we help configure the automated workflow, so it becomes almost a turnkey solution."

Once implemented, the workflow is easier to execute in a controlled, reliable, and repeatable way. From the customer's perspective, automation improves satisfaction and confidence by making inspection more consistent and predictable."

How do you overcome the challenges that come with automation?

"Depending on the part and inspection requirements, we offer tailored solutions. We assist

customers with technique development and fixture design or provide robotic systems that automate handling and positioning for high repeatability."

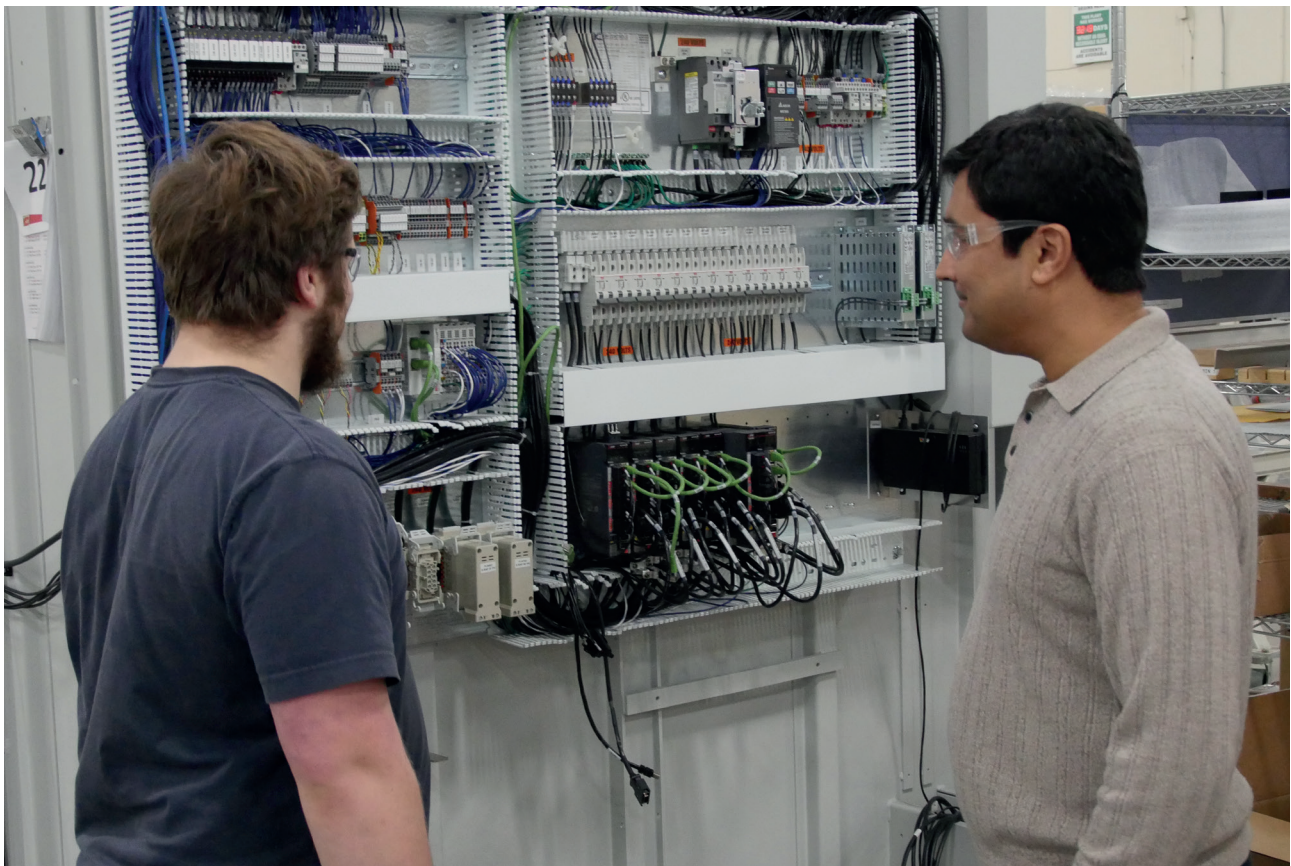
Rising complexity drives automation

Why are more customers asking for automation in their inspection workflows today?

"More parts are being inspected with X-rays as the technology becomes faster, more accessible, and better understood. Advances in GPUs, detectors, and reconstruction algorithms have made both DR and CT significantly quicker and more efficient. Previously, customers used three or four different tools to inspect one part, for dimensional accuracy, porosity, or inclusions, each with its own limitations. Now, a single CT scan can provide almost all the answers."

At the same time, parts have become far more complex, especially castings with internal cooling or components made by additive manufacturing.

Automation precision strengthened by Comet's stable, high power X ray performance.



These are difficult to inspect using traditional technologies, but X-ray inspection handles them with ease.

From a repeatability standpoint, part handling is crucial. Automating not just the inspection but also how parts are presented ensures every scan is identical, improving post-processing and overall reliability. Robotics and precise fixturing play a major role in achieving this level of consistency."

Robotics meets reliable inspection

How is NSI integrating automation, advanced cabinets, and 3D CT to deliver greater precision and reliability — and what impact does this have for customers?

"NSI integrates automation in several ways. For single parts, our motion control programming automates the full inspection, allowing customers to manually load the next part while maintaining identical results. We also provide barcoding and a production module that manages part loading, motion programming, and ADR results.

For customers running larger volumes of parts or continuous operations, we offer both internal and external robots for part loading and manipulation. Robots inside our radiation-safe cabinets position parts directly in front of the X-ray, while a dual-robot setup, one for the detector and one for the tube, enables inspection of very large, complex components.

Automation typically delivers about a 30% gain in efficiency and throughput, as shown in a study by

"The automation we provide is not only highly repeatable but also simple to use."

Dr. Pradeep Bhattad, NSI

my colleague, which also demonstrated 97% repeatability in results. Much of that efficiency comes from reducing handling time, no need to open and close doors or ramp the tube up and down between scans. This not only speeds inspection but also reduces wear on the system, minimizing maintenance and downtime."

Can you give an example of where this automation has made a difference?

"While I can't name the company, one example would be aerospace manufacturers inspecting complex castings with internal cooling channels. Parts are loaded inside the cabinet, and the system picks and scans them one by one, similar to handling a tray of fins or blades.

We also apply these automated CT solutions to smaller components in medical and automotive applications, where precision and repeatability are equally critical."

Imaging & Technology

Comet's MesoFocus is key to enabling high-quality 3D CT in automated environments. What makes it especially well-suited for this?

"Comet's MesoFocus fills a critical gap. Around 450 kV, we typically use mini focus tubes; at lower voltages, micro focus tubes, but MesoFocus bridges the two, offering both high power and high resolution. This flexibility is vital when automating workflows, since inspection needs can vary widely.

For dense parts like turbine blades made of Inconel, which require high energy and fine detail, MesoFocus delivers the best of both worlds. It also minimizes downtime, since sealed tubes require far less maintenance than open micro sources.

Production environments aren't clean rooms, so durability matters. The sealed design keeps the system running reliably in less-than-ideal conditions and can even be mounted on a robot arm — something much harder to achieve with large & heavier tubes."

From your perspective, how does Comet's source reliability and stability contribute to automation success?

"When switching between modalities, we don't need recalibration, which saves time. The sealed design also means faster ramp-up and ramp-down, so operation resumes almost instantly after door cycles."

Performance remains stable for long, high-resolution scans, and the circular focal spot ensures excellent image quality. Unlike open micro sources, there's no need for drift correction — the beam remains steady, which is especially beneficial in long CT inspections."

How closely do NSI and Comet collaborate to ensure seamless integration between software, mechanics, and X-ray performance?

"Integration is straightforward with MesoFocus tubes, but NSI's implementation required additional

features for our workflow. We worked closely with Comet so that our customers could use MesoFocus within NSI's environment seamlessly. Comet was very responsive, enabling specific calibration functions for our needs and ensuring full compatibility."

Customer Value & Impact

What kinds of benefits do your customers see after introducing automation, in terms of precision, repeatability, or throughput?

"Automation shines when customers inspect similar parts repeatedly. Once the recipe is set, automation delivers consistent image quality and repeatable results. If the tube output remains stable and the focal spot doesn't drift, the system produces reliable, high-quality images every time."

Using imaging setups and tube-detector robots ensures that parts are positioned identically for every scan, which is critical for precision and consistency. MesoFocus plays a big role in achieving that reliability."

Seamless NSI Comet integration for stable, production ready automated imaging.



How does automation change customer confidence in inspection and quality outcomes?

"The automation we provide is not only highly repeatable but also simple to use. Unlike competitors relying on third-party software, NSI's robotic workflow is integrated in-house, making setup and adjustments straightforward.

Customers can introduce new parts or modify workflows themselves without needing to return to NSI, which is a major advantage. Our approach is designed around the customer's process, supported by decades of experience and expert guidance across industries."

Next steps in automation - predictive, intelligent and reliable

Looking ahead, where do you see automation taking the inspection industry next?

"Inspection is getting smarter with AI. Customers now expect not only repeatable workflows but also systems that can plan maintenance proactively. Comet's BLOX platform is a great step in that

direction — enabling predictive and preventive maintenance that minimizes downtime.

That's where I see the next leap: smarter, more self-aware systems. Robots will continue to evolve, but predictive service and smaller, higher-power focal spots will make the biggest difference. Currently, most automation is focused on DR workflows, handling complex castings, performing fast CT scans, and processing data through ADR to reach automated decisions. That's where we'll see the biggest impact next."

Are you expecting AI to qualify 3D volumes in the future?

"AI is already being used to qualify 3D volumes in battery inspection, though results are mixed. The challenge now is generalizing that success across other industries. In batteries, scan and processing times are only a few seconds, but the process is tightly controlled. Extending that level of automation to broader applications will be the next major step. Pradeep, thank you for your time."



Dr. Pradeep Bhattad at his desk in the NSI offices

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