SOUTHWEST RESEARCH INSTITUTE®

# nSPCT™

## n-variable Statistical Process Control Tool

nSPCT™

Engineers at Southwest Research Institute® (SwRI®) have developed the n-variable Statistical Process Control Tool (nSPCT™), a software tool providing automated, multivariate statistical process control capabilities that improves anomaly detection, reduces analysis time and system downtime, and increases the cost-effectiveness of complex systems. nSPCT makes excellent use of data currently available to legacy systems without incurring the cost and delays of installing additional sensors in the target system.

nSPCT is an application of multivariate statistical process control theory and incorporates newly developed statistical techniques that increase its effectiveness. nSPCT is based on, but significantly different from, conventional statistical process control techniques due to its high degree of automation.

nSPCT employs advances in multivariate statistical process control theory, including:

- Detection of mean and variance shifts, and distinguishing between the two
- Pattern recognition algorithms
- Rapid decompositions

## Capabilities

nSPCT can help solve common problems for complex systems, including:

- Systems fail without warning
- Data are collected but not analyzed
- Current analysis tools are ineffective
- Data access is limited by third-party vendors
- Reason for failure or location of failed part is unclear
- Diagnosis by experts is required

nSPCT provides even the novice user with easy identification of performance anomalies and identifies the parameters or sensors where the anomaly occurred. With tailoring, nSPCT can indicate which component of a specific system is contributing to the anomalous behavior.

The flexible algorithms in nSPCT provide alerts for predefined faults common to a system, which increases the diagnostic capability and ease of use for the end user by automating the early diagnostic steps.

## Applications

nSPCT can be applied to most complex data sets that are difficult to interpret, even by subject matter experts. Applications can be found in manufacturing, test and operations.

Industries expected to benefit from nSPCT include:

- Marine transportation
- Ground transportation
- Oil and gas production and delivery
- Power generation
- Commercial and military aviation

## Benefits

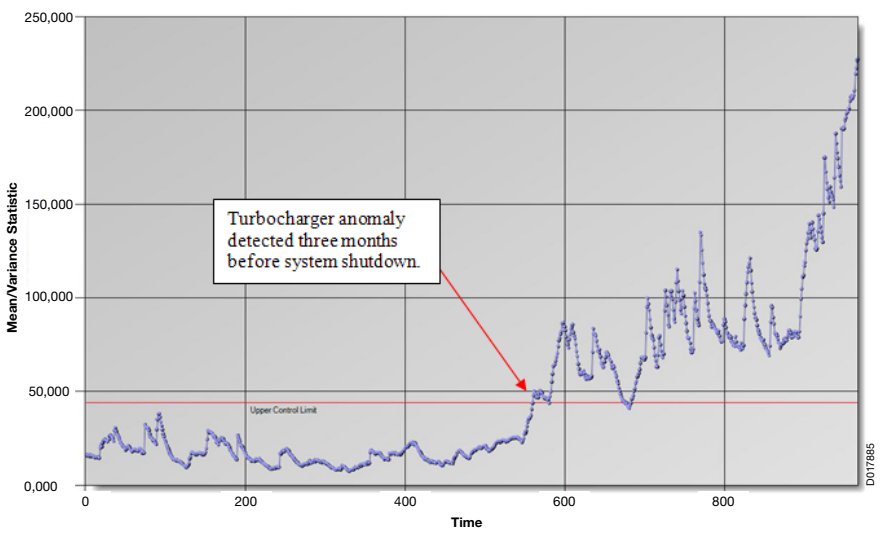
nSPCT provides the following automated analysis benefits:

- Reduced analysis man-hours
- Fewer catastrophic failures/losses
- Fewer non-catastrophic failures/losses such as unexpected equipment shutdowns and unscheduled maintenance

nSPCT can provide a substantial return on investment by focusing the efforts of system maintainers on the cause of the failure rather than on complex and repetitive data analysis steps.

Automating the multivariate statistical analysis process also allows for the rapid deployment of new algorithms tailored to specific system types and/or failure modes, which greatly reduces development and implementation costs.

The implementation of nSPCT will result in smarter, more effective maintenance practices, reduced downtime and increased safety.




*In this retrospective analysis, a turbocharger failure on a natural gas compressor had gone unnoticed by the system's fault codes, but nSPCT detected it automatically and three months prior to the system shutting down.*

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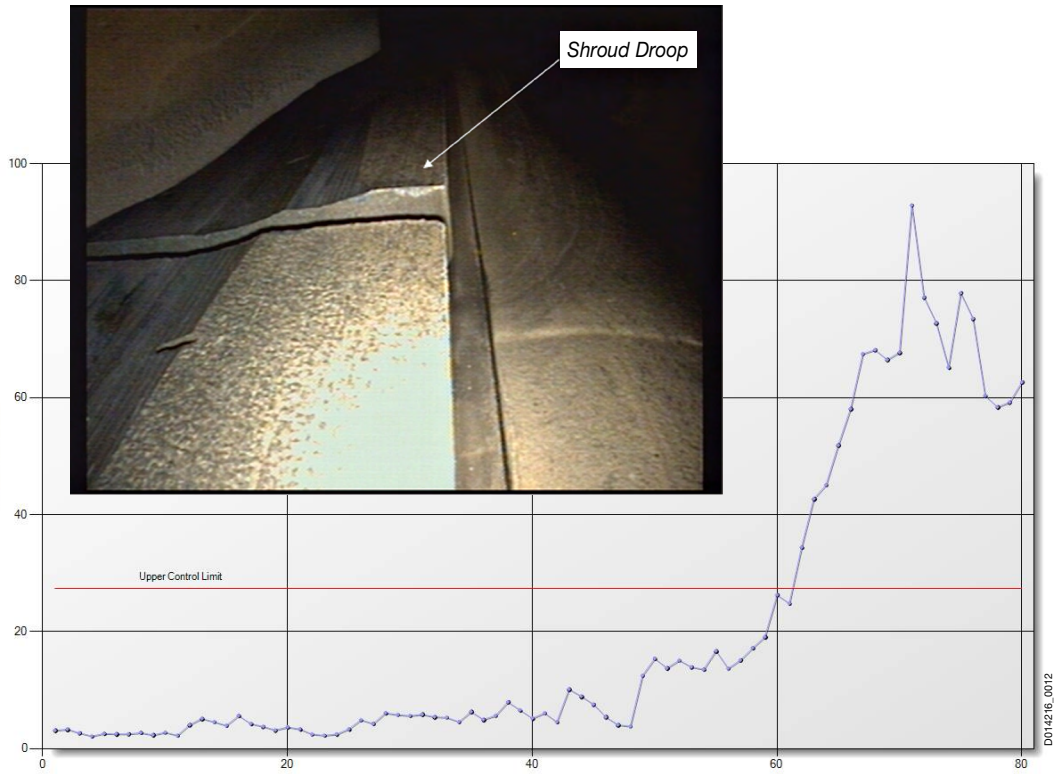


*nSPCT algorithms detect and diagnose anomalous behavior in complex data sets. In this example, an F108 turbine shroud droop had gone unnoticed, but nSPCT detected it automatically and earlier than any other tools available to the Air Force.*

*Southwest Research Institute is an independent, nonprofit, applied engineering and physical sciences research and development organization using multidisciplinary approaches to problem solving. The Institute occupies 1,200 acres in San Antonio, Texas, and provides more than 2 million square feet of laboratories, test facilities, workshops and offices for more than 3,000 employees who perform contract work for industry and government clients.*

**We welcome your inquiries.**
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