FROM REACTIVE TO PROACTIVE — A FIELD CASE

Anomaly detection and quality optimization in *polymer after-treatment*, with Seeq.

PRESENTED BY
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ORGANIZATION
KANEKA NORTH AMERICA · HOUSTON, TX

NOTICE
DATA MASKED FOR CONFIDENTIALITY

WHO'S PRESENTING

Process Data Scientists on Kaneka's Digital Transformation team — building the analytics foundation behind a multi-year shift from reactive troubleshooting to proactive process intelligence.

Chiru Botre

Sr. Process Data Scientist

Digital Transformation · Kaneka NA

Ziyan Sheriff

Sr. Process Data Scientist

Digital Transformation · Kaneka NA

KANEKA MANUFACTURING ANALYTICS

- Lead business transformation with digitalization efforts at Kaneka North America
- Drive initiatives in process monitoring, anomaly detection, improve reliability & efficiency
- Focus on boosting efficiency and reducing manual tasks through data
- Collaborate to automate processes and foster continuous improvement

ABOUT KANEKA

Materials science, *at global scale.*

A Japanese multinational manufacturer of resins, pharmaceutical intermediates, polymers, fine chemicals, biotech, electronics, and more — meeting customer needs across thirteen countries.

FOUNDED

1949

Headquartered in Osaka, Japan

GLOBAL REVENUE

$5B

Across the full chemicals portfolio

EMPLOYEES

8,400

Serving customers on every continent

US FOOTPRINT SINCE

1982

Manufacturing in Houston, Texas

COUNTRIES OF OPERATION

Japan | United States | Belgium | Germany | Singapore | Malaysia | Australia | China | Vietnam | India | Taiwan | South Korea

OUR DIGITAL TRANSFORMATION PHILOSOPHY

Outcome-first. *Reverse engineered* from the value, not the tool.

PHASE 01

Think big.

Define the desired business outcome and the value it must deliver. Pain point first; technology second.

PHASE 02

Implement small.

Reverse-engineer the smallest implementation that proves the insight is real and the action is feasible.

PHASE 03

Scale fast.

Multiply across grades, lines, and sites. Operationalize. Move from a pilot to a standing capability.

PEOPLE FIRST · DIGITAL TOOLS SECOND

Seeq fits the strategy because it collapses the path from question to answer — and that speed is what separates reactive analytics from proactive intelligence.

What we'll *cover.*

01	Problem background	CONTEXT
02	Data integration	FOUNDATION
03	Root cause discovery	FINDING
04	Statistical quality analysis	RIGOR
05	Proactive anomaly detection	FUTURE
06	Results & impact **~10% AFT rate improvement, sustained across grades — and a scalable foundation for what's next.**	OUTCOME

CHAPTER 01

Troubleshooting *AFT rates.*

> For several years AFT rates had been drifting downward across multiple polymer grades — small enough each quarter to be explained away, large enough in aggregate to matter.

WHY CONVENTIONAL MONITORING MISSED IT

A. Grade variability masked the underlying degradation signal.

B. Single-tag trending could not detect multivariate drift across dozens of correlated variables.

C. Quality data (LIMS), process data (PI / DataPARC) and recipe context (Excel) lived in separate silos.

D. Year-over-year comparisons were prohibitively slow to construct manually for each grade.

E. No automated mechanism correlated batch-level quality with continuous process conditions.

Duration

Years

Of slow declining AFT rates without a confirmed root cause

Scope

Multiple grades

Affected simultaneously, masking the common cause

Data sources

3 silos

LIMS · PI / DataPARC · Excel — required integration

THREE SILOS, ONE WORKBENCH

Quality, process and recipe — *finally on the same canvas.*

SOURCE A

LIMS

LABORATORY INFORMATION MANAGEMENT

Batch-level quality test results, per-grade specification limits, and historical Cpk by parameter.

SOURCE B

PI / DataPARC

PROCESS HISTORIAN

Continuous sensor data, real-time process conditions, equipment performance metrics across the line.

SOURCE C

Excel

MANUFACTURING ANALYTICS

Grade-specific operating recipes, batch context, production transitions and changeover data.

PLATFORM

Seeq *Advanced Analytics.*

- Grade-specific rapid analysis
- Direct year-over-year historical comparison
- Multivariate process monitoring
- PCA-based anomaly detection
- Automated reporting workflows
- Real-time SPC monitoring

DATA MASKED FOR CONFIDENTIALITY

FAULT TREE — LOW AFT RATE

INCREASE AFT RATE

RESULTS OF SEEQ ANALYSIS

Dry air flows and performance were lower than in *Previous years* *

Convex dryer & heater section → air gaps at multiple duct connections.

* Comparison — same grade, same production rate, same quality parameters— revealed a clear pattern.

PA-92 · 3.5 MT/H · Quality Parameter 31%

PARAMETER	FY2019	FY2024
Total Air Flow (ft³/s)	640	599
1st Dryer Air (ft³/s)	307	344
2nd Dryer Air (ft³/min)	20000	15321
FB Zone1 (ft³/min)	9709	8471

M-210 · 3.0 MT/H · Quality Parameter 45%

PARAMETER	FY2019	FY2024
Total Air Flow (ft³/s)	685	585
1st Dryer Air (ft³/s)	359	347
2nd Dryer Air (ft³/min)	19553	14315
FB Zone1 (ft³/min)	7235	9339

FM-41 · 3.5 MT/H · Quality Parameter 41%

PARAMETER	FY2019	FY2024
Total Air Flow (ft³/s)	655	568
1st Dryer Air (ft³/s)	344	347
2nd Dryer Air (ft³/min)	18687	13258
FB Zone1 (ft³/min)	8002	8706

DATA MASKED

CORRECTIVE MAINTENANCE · OUTCOME

Seal the duct gaps. *The rate followed.*

Drying air flow recovered immediately after sealing. AFT rate followed within the same operating window — sustained across multiple polymer grades. The mechanical fix was simple. The visibility to find it was not.

~10%

AFT RATE IMPROVEMENT

Sustained across multiple grades following corrective maintenance — measured against the directly comparable pre-fix operating envelope.

FIELD EVIDENCE · ROOT CAUSE

Degraded duct seals / gaps found on blower-to-dryer air lines.

REACTIVE · TROUBLESHOOTING — PROACTIVE · MONITORING

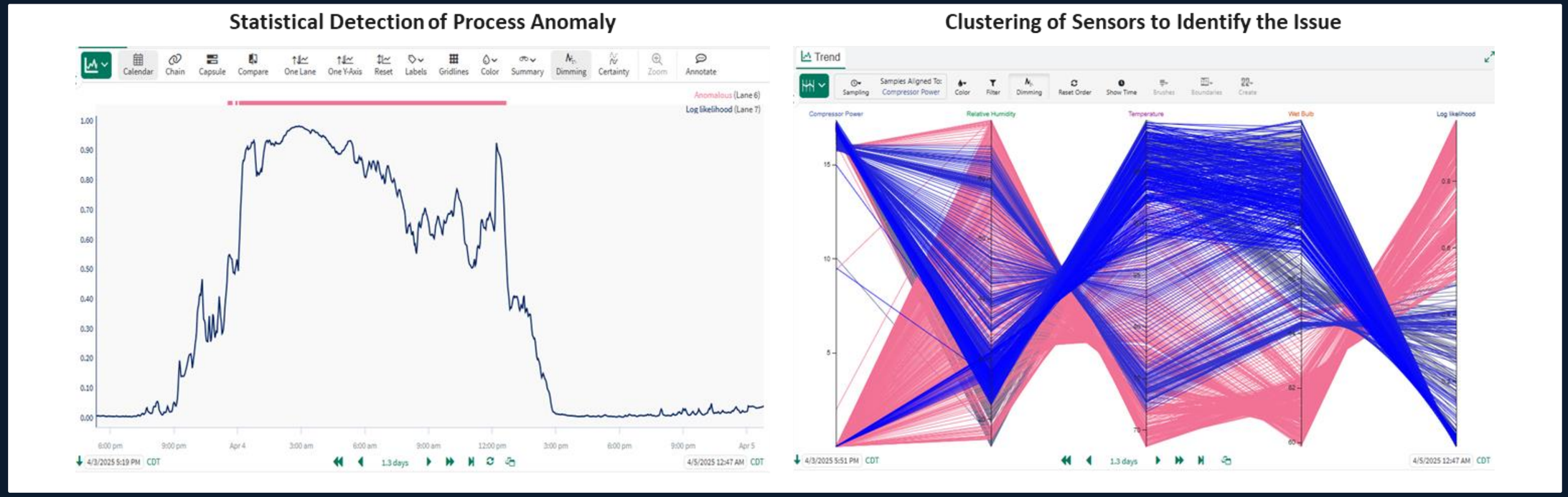
Grade-specific PCA, *watching everything at once.*

Principal-component models learn each grade's normal multivariate envelope. In production, deviations are flagged early — before any single tag breaches its limit — and clustering surfaces the parameter family driving the signal.

PCA · LIVE ANOMALY DETECTION

DATA MASKED

Statistical detection of process anomaly · Sensor clustering to root cause



10 · ANOMALY DETECTION FRAMEWORK

PCA · PER GRADE · CONTINUOUS

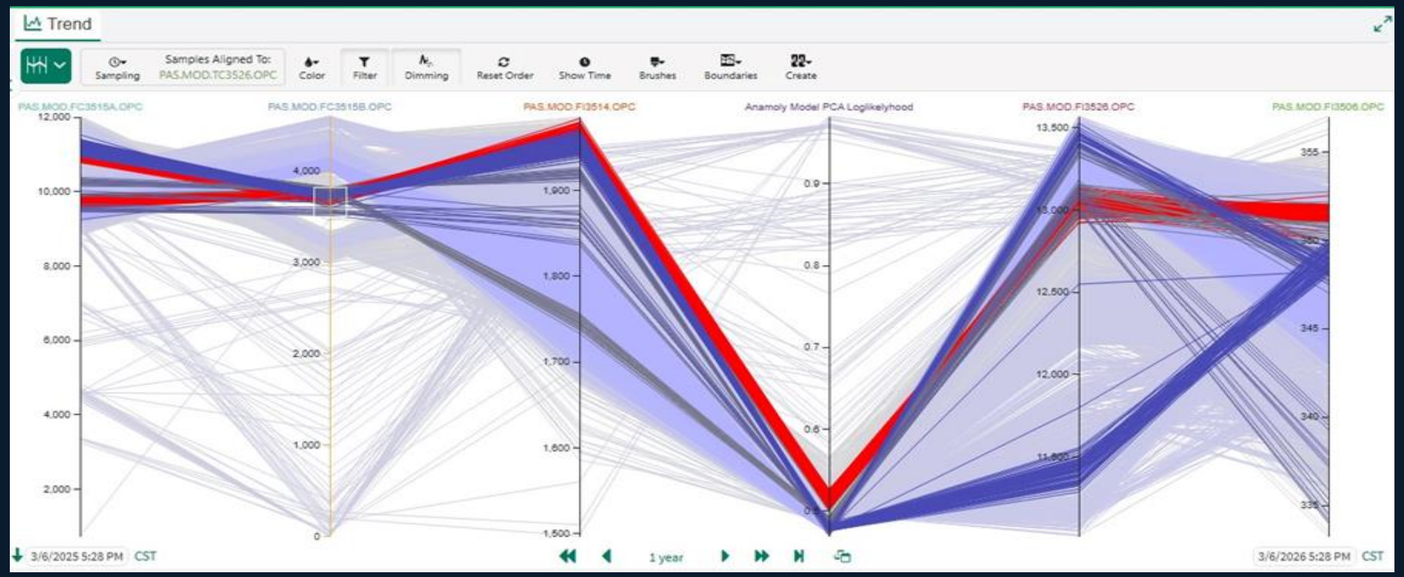
LEFT: LOG-LIKELIHOOD ANOMALY LANE · RIGHT: PARALLEL COORDINATES OF CONTRIBUTING SENSORS

From *"what happened?"* to *"what's happening now?"*

A live multivariate watch over AFT/DRY — flagging drift early, with clustered evidence about which parameters are responsible.

PARALLEL COORDINATE TREND · ALIGNED BY GRADE

DATA MASKED



— NORMAL ENVELOPE — ANOMALY CLUSTER

WHAT WE WANT

Proactive, in production, by default.

A. Continuously monitor the AFT / DRY process in real-time.

B. Detect abnormal multivariate behavior early — before single-tag limits trip.

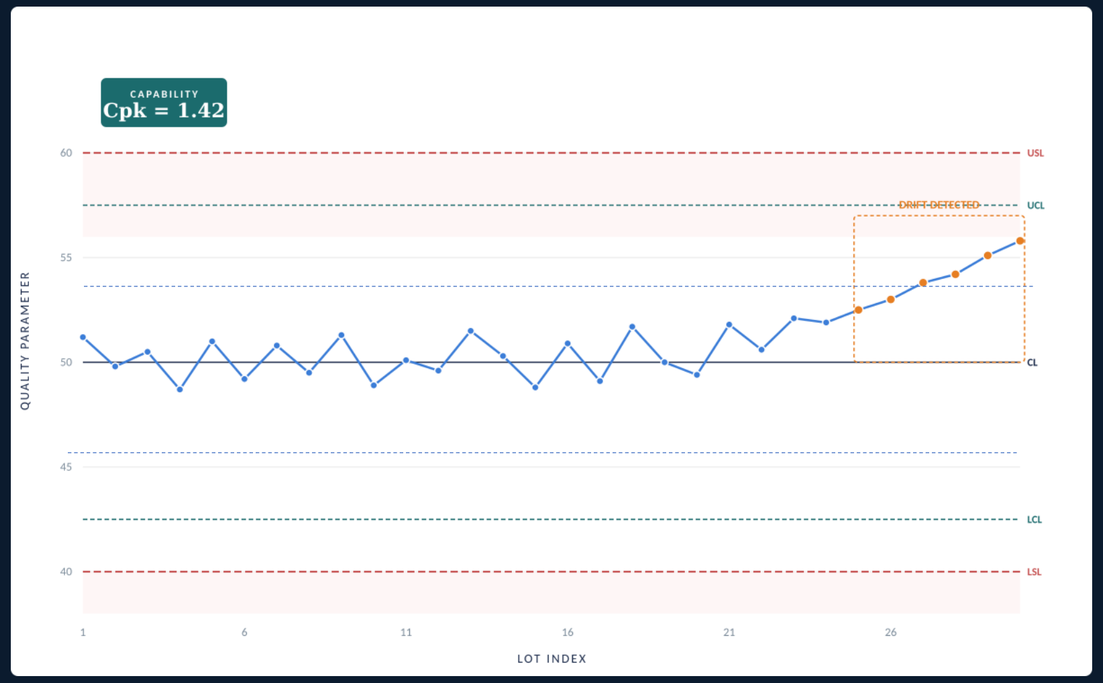
C. Alert operators before quality or rate is impacted.

D. Enable immediate, targeted corrective action with parameter-level evidence.

E. Prevent any future multi-year degradation event from accumulating undetected.

Operationalizing Quality Data Analysis Across Kaneka

Standardized capability, SPC and spec-limit studies — generated automatically, applicable to every grade and unit for quality data analysis.



STATISTICAL PROCESS CONTROL · SPEC LIMITS · CAPABILITY INDEX · AUTOMATED PER GRADE

VALUE FOR KANEKA

HOURS BACK

Automated capability reports

Cpk · Ppk · SPC generated per grade — no more weekend Excel.

QA/QC Reporting

Statistical Analysis

Assist in root cause analysis. QA/QC reporting

EARLY ACTION

Drift detected before breach

Alerts when a parameter trends toward limits, not after.

CROSS-UNIT

One standard, every plant

Same method for other units and final product quality.

WHERE IT PAYS OFF

Auto Monitoring · early detection of SPC violation · faster grade Cpk calculation · assist in QC reporting.

CPK · PPK · SPC · DATA MASKED

CPK, CAPABILITY & SPECIFICATION STUDIES

Spec limits, *renegotiated with evidence.*

A statistical quality framework inside Seeq generates grade-specific capability reports — and lets us evaluate proposed spec changes against years of historical data, with customers in the room.

TODAY

Multi-grade statistical reports for key quality parameters

Spec-limit studies across grade variants

Customer collaboration on proposed SPEC changes

Ppk / Cpk evaluated under old & new SPEC Limits

ROADMAP

Auto-calculation of Cpk per grade

Real-time SPC monitoring on key parameters

Automated alerts on drift toward limits

Standing dashboards for SPEC · SPC · Cpk

QUALITY PARAMETER DISTRIBUTION · SPEC CONFIGURATIONS

DATA MASKED

New Spec (2yr) vs Old Spec (10yr) vs New Spec (10yr) | Data masked for confidentiality

Statistic	Value	Statistic	Value	Statistic	Value
Descriptive Statistics		**Descriptive Statistics**		**Descriptive Statistics**	
Average	0.3574	Average	0.3255	Average	0.3255
Count	69	Count	266	Count	266
Maximum	1.105	Maximum	2.133	Maximum	2.133
Minimum	0.1	Minimum	0.1	Minimum	0.1
Standard Deviation	0.1893	Standard Deviation	0.2442	Standard Deviation	0.2442
Distribution		**Distribution**		**Distribution**	
Normal Distribution p-value	0	Normal Distribution p-value	0	Normal Distribution p-value	0
Quartiles		**Quartiles**		**Quartiles**	
Min Whisker	0.1	Min Whisker	0.1	Min Whisker	0.1
Quartile 1 (Q1)	0.218	Quartile 1 (Q1)	0.1975	Quartile 1 (Q1)	0.1975
Median	0.327	Median	0.264	Median	0.264
Quartile 3 (Q3)	0.467	Quartile 3 (Q3)	0.3672	Quartile 3 (Q3)	0.3672
Max Whisker	0.8405	Max Whisker	0.6219	Max Whisker	0.6219
Capability & Performance		**Capability & Performance**		**Capability & Performance**	
Ppk	0.0292	Ppk	0.2381	Ppk	0.4443

Descriptive Statistics & Ppk Comparison Across Spec Configurations

From a single fix *to a standing capability.*

Year of unexplained yield decline, resolved — and the analytics scaffolding underneath will do the watching.

~10 %

THE HEADLINE · SUSTAINED ACROSS GRADES

AFT rate recovered *and held* after corrective maintenance.

Measured across multiple polymer grades following the duct-seal repair. The yield number is the visible win — the durable win is everything that made finding it possible.

PILLAR 01

Reactive → Proactive

From after-the-fact troubleshooting to continuous multivariate monitoring — with parameter-level evidence at the moment of detection.

PILLAR 02

Scalable framework

Grade-specific PCA models deployable across product lines without rebuilding the analytics scaffolding from scratch.

PILLAR 03

Automated intelligence

Cpk auto-calculation and SPC alerts being operationalized inside Seeq today — a standing capability, not a one-time project.

QUESTIONS · DISCUSSION · THANK YOU

Thank *you.*

Faster root-cause identification. Measurable yield improvement. *A scalable path* toward proactive manufacturing intelligence.

PRESENTERS

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SUBJECT

Anomaly Detection & Quality Optimization

Polymer After-Treatment · CONEQT 2026 · Data masked for confidentiality