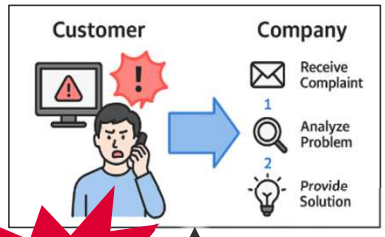
5. PoC Use case Lv.2 : Collaboration w/DNKI to realize Denso DX-Factory

Empowering instant action by creating a skill-less production future to reduce reliance on manual skills

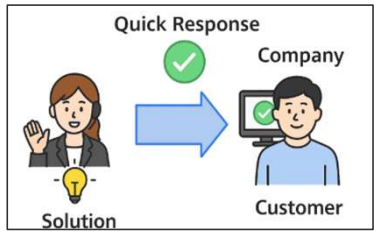


"Leak from HVAC"

Quick action in Real-Time

①Identify Problem → ②Analyze And Solution → ③Action and Verification → ④Evaluate Standardize

Skill Transfer by DX



❑ AI Agent

DNKI Real-World

Analysis and Countermeasure for HA443450-2620

One DB

❑ Traceability App.

❑ Aikyan

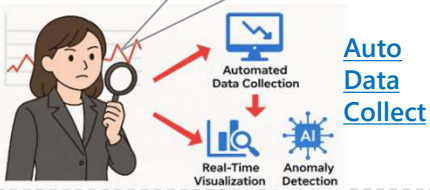
❑ Connect DX Line

❑ KPIs RMR

[Investigation Skill]

Scope and Identification

1 "Crimp Dim. NG @Crimping #2"



Auto Data Collect

[Analysis and Assumption Skill]

Comprehensive Analysis, Mechanism and Solutions

"Crimping Pressure Drop"

2 [STEP1] Root cause → [STEP2] Issue → [STEP3] Counter measure

Real-time Check
-5M1E,
-Q-Check,
-KAKOTORA,

Benchmarking 3

[Genba. Mgmt. Skill]

Follow-Up and Verify

"Daily Pressure Check& Confirm" 4

Real-time Genba Check

[Mgmt. Skill]

KPI Monitoring- Decision making

5

Auto KPIs Control
Summarize and Report

DNKI begins DX-Factory in Nov'25 — A bold step toward digital, shaping the future of skill-less manufacturing.

Claim Detail : from Customer

Problem Detail : Leakage from HVAC	
Part Name: HVAC Assy.(Heater Core)	Part no.: HA443450-2620
Batch Code: 6 Sep 24	Customer Part no.: 79020-31X-J512
Problem Information Date: 1 Nov 24	DNHA Receiving date: 7 Jan'25
Model: CAR	Total Quantity: 1
Frame no.: DG5-1031367 (Case 2)	

Leakage from HVAC, Customer Part no. HA443450-2620

1 🔍 Problem Identification

❑ **Traceability Application**

Step	Description	Data Source	AI Assistance and **Mock-up result**
1. Traceability Search	Filtered affected units by: • Customer Part no.:HA443450-2620 • Product Name: HVAC Assy. • Serial no.:KL233310-1980130908080725 • HVAC Manufacturing Date/Time: 26 Jun'24 21:51	BOM Items inventory **Traceability system**	AI Identify 1) Child part no. from BOM and clusters affected units and 2) common factors (e.g., same line, same material lot) **1) Identify Child part no.** • Heater Core Part no.:KL116140-4290 • Part Name : Heater Core • Model: SFA2 • Heater core lot date/Time: 25 Apr'24, 9:00 am 2) Relate Product no. and Quantity.
2. Defect Detection	• Heater Core Part no.:KL116140-4290 • Part Name : Heater Core • Model: SFA2 • Heater core lot date/Time: 25 Apr'24, 9:00 am	Quality inspection logs, SFA2 Helium **Traceability system**	AI flags a spike in Helium leak Data measurement over the past 7 days (18-04-2024 09:00～) 1) Helium Mark Presence (OK/NG Trend Ratio) 2) Core Dimension Trend

AI Insights Summary

- **Pattern Detected**: This part no. manufacturing on Line 2, using Heater Core Part No. KL116140-4290,
- **Relate Product 3 Part no.** (1)KL116140-4290=50 pcs, 2) KL116140-4291=70 pcs, 3) KL116140-4293=10 pcs,
- **Anomaly Detected**: Helium Leak Test NG ration trend increase.
- **Suggested Next Step**: Launch 5M1E root cause analysis focusing on Machine, Material, and Method.

2 🧩 5M1E Analysis – Core Heater Leak

❑ **Aikyan Application**

Category	Factor Description and Example	Data Source / Evidence	AI Insight example	Mock-up detail	
				HVAC 26 Jun24	Heater Core 25 Apr 24
Man	No New Operator used/unskilled	**Aikyan , Change details** 5M1E change report log.	AI detected higher leak rate during shifts with Operator B, who is newly trained	No change	No change
Machine	No Abnormality observed	**Aikyan , Change details** 5M1E change report log.	AI flagged abnormal pressure dips 2 hours before leak incidents	No change	No change
Material	No change in raw material	**Aikyan , Change details** 5M1E change report log.	AI found 85% of leak cases used this specific sealant batch	No change	No change
Method	As per operation manual	**Aikyan , Change details** 5M1E change report log.	AI correlated SOP change date with start of leak trend	No change	No change
Measurement	No Abnormality observed	**Aikyan , Change details** 5M1E change report log.	AI flagged Flux weight change during leak period	No change	Flux weight change 20 Apr'24
Environment	No Abnormality observed	**Aikyan , Change details** 5M1E change report log.	AI found sealant curing failure correlated with low temperature conditions	No change	No change

🧠 **AI-Driven Insights Summary**

- **Most likely root cause**: **Flux quantity change** caused by a **detected flux weight changing point**.
- **Contributing factors**: As per meeting change the weight.
- **Suggested actions**:
  - Verify Flux Weight Calibration by Recheck the calibration settings of the flux dispensing system
  - Look for correlations between flux weight changes and product quality or process deviations.
  - Perform a controlled test to confirm that the flux quantity change is directly linked to the detected weight change point.
  - Adjust control limits to prevent future deviations.
  - Ensure everyone is aware of the updated procedures and potential impact.
  - Track flux quantity and product quality after implementing changes.

3 📊 Trouble History Benchmarking – Core Heater Leak Follow up and Verification

❑ **No Database**

Step	Description	Data Source	AI Assistance	Mock-up detail
1. Search Historical Cases	Query past defect records with similar keywords: "heater leak," "sealant failure," "pressure drop"	Quality database, traceability system	AI uses NLP to find similar past cases even with different terminology	Have
2. Filter by Similar Conditions	Match by: • Same product model • Same process step • Same machine or material lot	Quality database, traceability system	AI clusters similar cases and ranks them by similarity score	KL116140-4291, Mar 24
3. Compare Root Causes	Review root causes from past heater leak issues	Quality database, traceability system	AI highlights recurring causes (e.g., sealant curing, pressure inconsistency)	1) Pressure inconsistency 2) Brazing condition NG (weak fillet)
4. Review Countermeasures	Identify what actions were taken in past cases and their effectiveness	Quality database, traceability system	AI evaluates which countermeasures reduced defect rates most effectively	1) Adjust control limits 2) Adjust Flux weight
5. Suggest Benchmark Actions	Recommend actions based on successful past cases	AI knowledge base	AI suggests: "Recalibrate pressure gauge	1) Recalibrate pressure gauge 2) Increase Flux apply 3) Capsule Dimension control

🧠 **AI Insights Summary**
Matched Case: Heater leak in March 2024 on same model, caused by Pressure inconsistency and Brazing condition NG
Effective Countermeasure: Implemented machine condition limit control adjustments to enhance operational stability and prevent threshold breaches.
Benchmark Suggestion: Apply same countermeasures and monitor defect trend for 7 days.

4 ❑ **Connect DX Line**

5 📊 Suggested KPI Metrics for Dashboard

❑ **KPIs RMR Application**

KPI	Description	Example Value
Defect Rate (%)	% of units with core heater leaks vs. total produced	2.3%
MTTR (Mean Time to Repair)	Average time to resolve a heater leak issue	4.5 hours
First Pass Yield (FPY)	% of units passing inspection without rework	91.2%
Affected Lots	Number of material lots linked to the defect	3 lots
Operator Error Rate	% of defects linked to operator handling	35%
Machine Downtime (hrs)	Total downtime of heater press machine	6.2 hours
Sealant Batch Rejection Rate	% of sealant batches rejected due to quality	12%
Environmental Deviation Events	Number of times temperature/humidity exceeded limits	5 events

Interactive Filters + KPI Integration
Date Range Selector → KPIs update dynamically
Line/Operator Filter → View KPIs by production line or shift
Material Lot Filter → See defect rate by lot
Machine ID Selector → Track downtime and anomalies per machine
Environment Toggle → Correlate KPIs with temperature/humidity