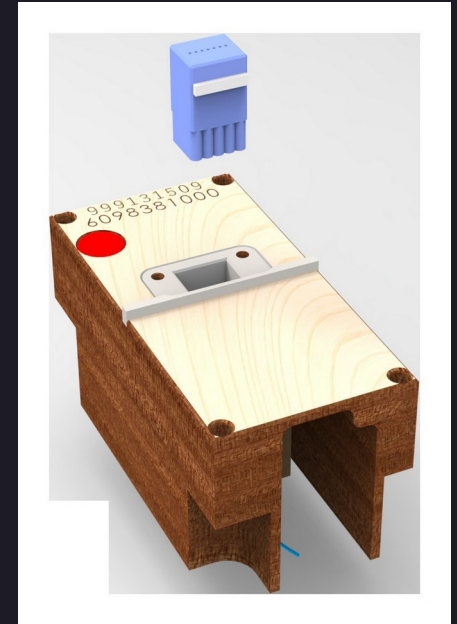


SIX SIGMA • DMAIC PROJECT

Eliminating Open Anti-Back Defects on Toyota Wire Harness Lines

Sumitomo Electric Wiring Systems, Egypt • May – Sep 2023

Role: Project Leader



Redesigned test jig: our breakthrough idea

Project at a glance

5.7% → 0%

Side anti-back defects (share of internal defects)

0

Customer concerns after rollout

-66.5%

Test-workshop downtime

-10.75%

Connector scrap

Define

Customer concerns & charter

Measure

Baseline by anti-back type

Analyze

4M + 5 Why root causes

Improve

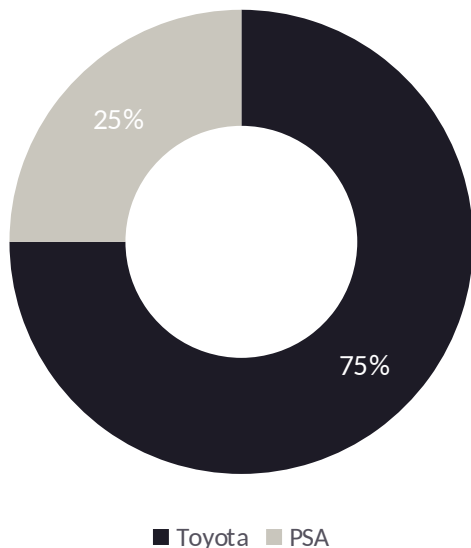
3 countermeasures, piloted

Control

Standardize & deploy

Toyota drove 75% of customer concerns

Official customer concerns, 2022/23 (n = 52)



9 Toyota claims

traced to open anti-backs that caused terminal back-out at the customer.



7.5% of internal defects

came from anti-back issues (May-Jun 2023): 3.5% open anti-back, 4.0% terminal back-out.



Hard to catch

Semi-open anti-backs passed the electric test board and the customer continuity test.

Project charter



Problem

Open and semi-open anti-backs escape to Toyota as terminal back-outs: high severity, low detection.



Goal (SMART)

0 customer concerns • –95% open / semi-open anti-back • –70% terminal back-out • by end of Sep 2023



Scope

Toyota CHR harness lines (roof, right door, left door), electric test boards and lay-up stations



Team

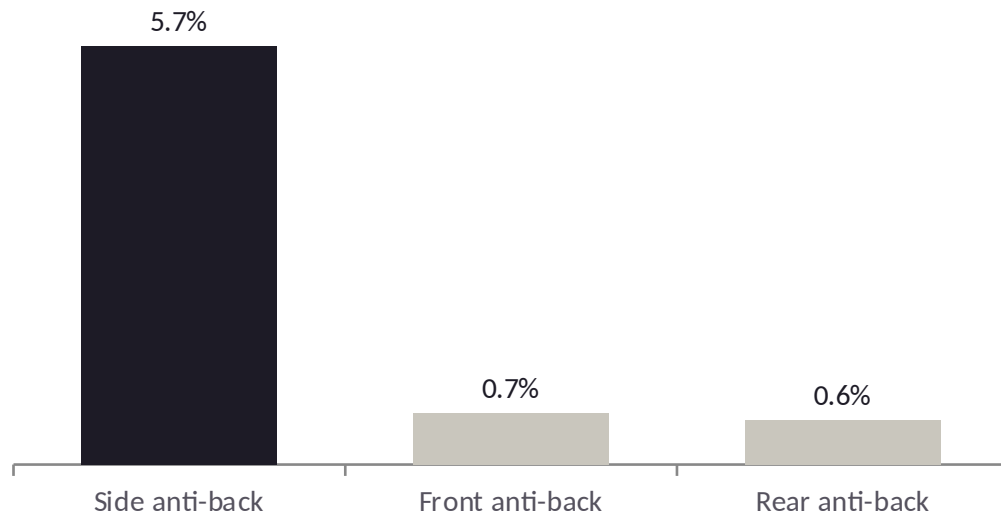
Cross-functional: production, quality and test engineering, led by the project leader

Timeline: WK 19 – WK 38 (May – Sep 2023) • 2 meetings / week

Defect prioritization (severity × detection × cost × repeat × effect): terminal back-out scored highest, 13 / 15

81% of anti-back defects came from side-type connectors

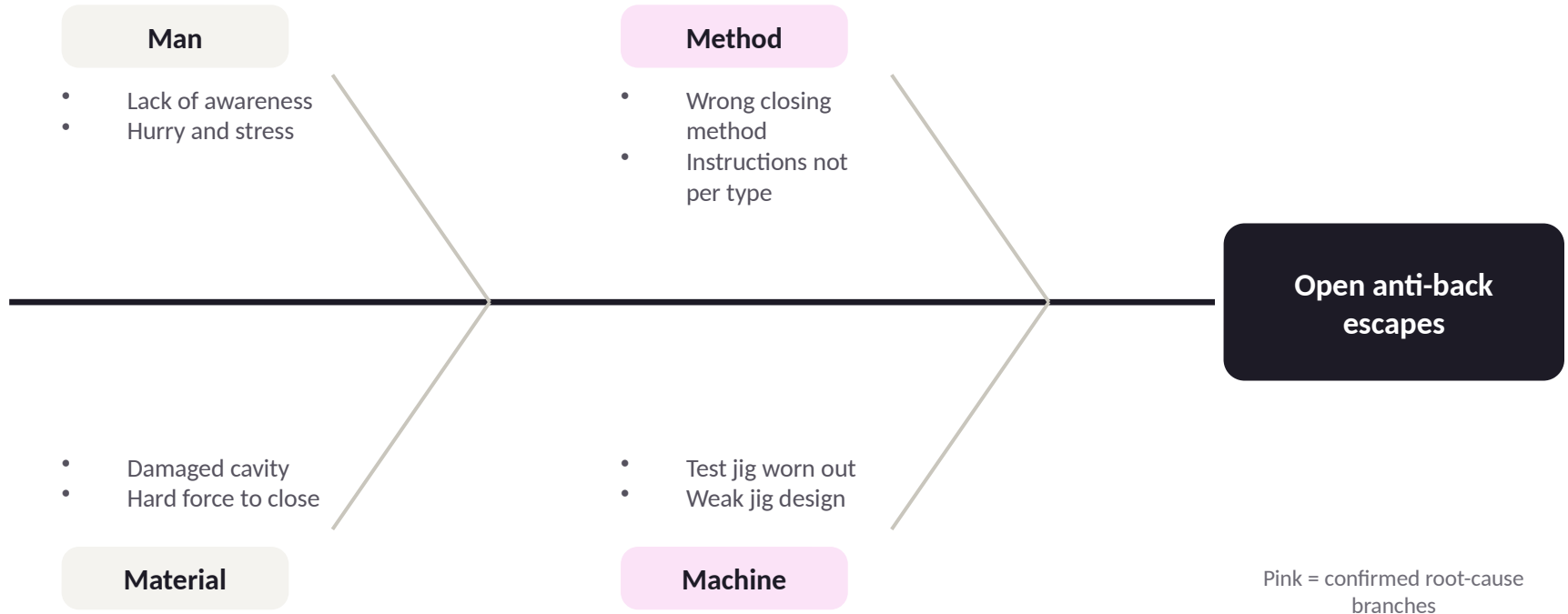
Baseline: defects as % of internal defects, May-Jun 2023



What we measured

- Defects split by anti-back position: side, front, rear
- Operator survey: unclear instructions, board passing open anti-backs, hard-to-close latches
- Test-jig check: a 1 mm semi-open anti-back still passed

4M analysis: where the defect comes from



5 Why: two root causes behind the escapes

OCCURRENCE

Operator did not close the anti-back correctly

Standard closing method not followed

Closing method differs by anti-back type

ROOT CAUSE

Training was not dedicated to each closing type

DETECTION

Electric test board passed an open anti-back

Detection cylinder had a loose nut; jig wore out before monthly PM

Jig needed continuous corrective maintenance

ROOT CAUSE

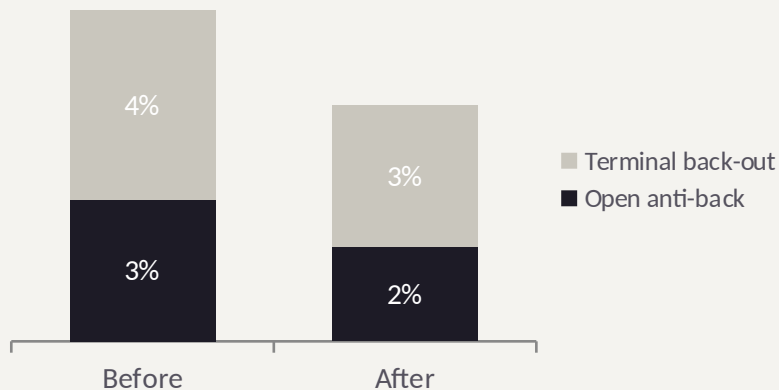
Test-jig design had weak points and missed 1 mm semi-open

Countermeasures 1 and 2 helped, but did not reach the goal



1 • Train operators by anti-back type

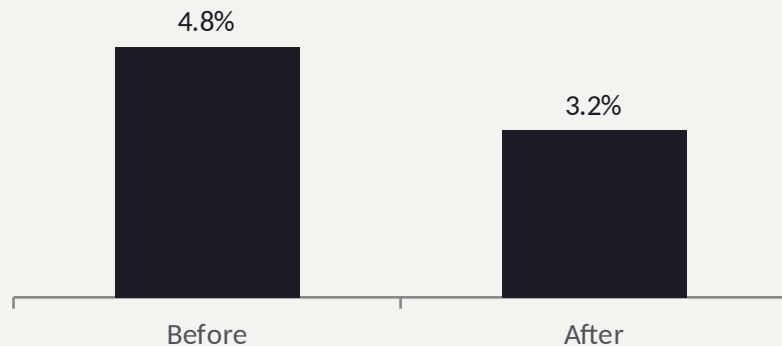
Sample board + manual for side, front and rear anti-backs and the right closing method.



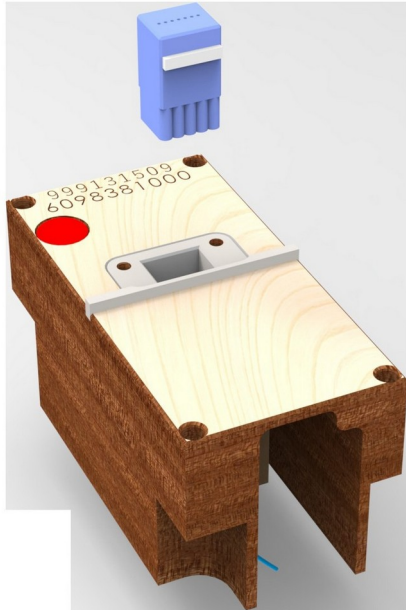
2 • Re-tune the test jig

Cylinder stroke set against a sensor so only a closed anti-back passes; weekly jig risk assessment.

Side anti-back, % of internal defects



Countermeasure 3: a two-cylinder jig with a 3-second timer



1

Presence cylinder

moves in until sensor 1 detects the connector body

2

3-second hold

timer delays the spacer cylinder, as the supplier recommended

3

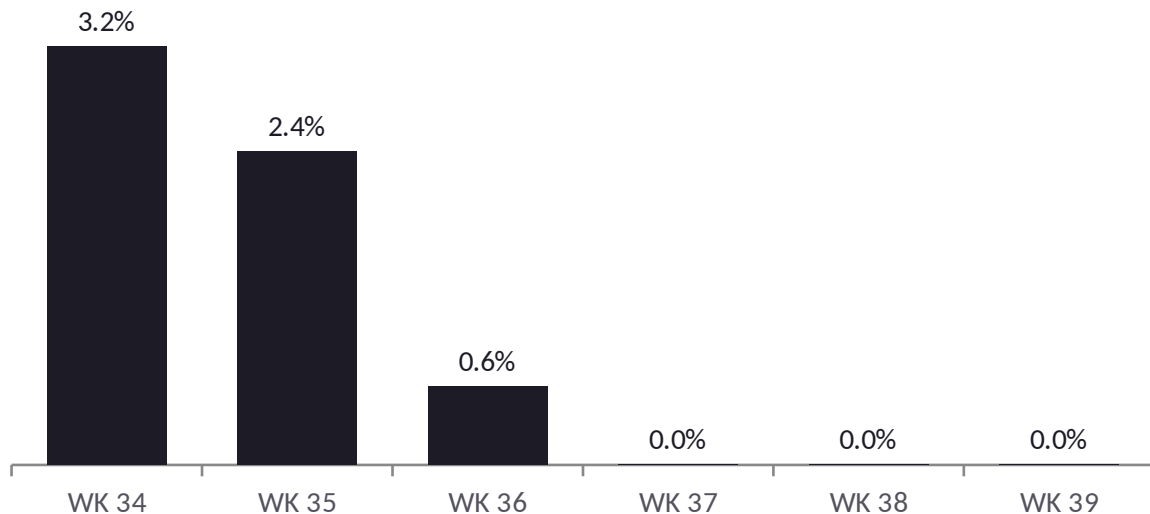
Spacer cylinder

slides over the anti-back; sensor 2 passes only a fully closed latch

Before: zero-delay cylinder risked passing an open anti-back. **After:** open anti-back cannot pass.

Pilot result: side anti-back defects hit zero by week 37

Side anti-back, % of internal defects (CHR roof, right door, left door)



0%

side anti-back defects from
WK 37 to WK 39

Front and rear anti-backs stayed at
0% through the pilot.

Business impact across quality, cost and delivery

**-10.75%**

Connector scrap, Jul vs Sep

**-66.5%**

Test-workshop downtime, Jul vs Sep

**123 s**

Electric-test cycle (was 120-130 s) vs 225 s takt

QCDMS & E score, before vs after



Locked in, validated and deployed across the group



Standardized

Process changes written into company standards



Weekly risk assessment

Electric-board jigs checked every week



Validated

Site, supplier and Central Engineering approval



Horizontal deployment (Yokoten)

Egypt · Cairo

Egypt · Port Said

Romania

Morocco · Kenitra

Morocco · Ain Aouda

650

jigs on 12 electric test boards next: CHR, Yaris and Yaris Cross

SMART GOALS: ACHIEVED

Zero customer concerns. Zero side anti-back defects.

Delivered before the end of September 2023, then shared with five sites in the group.

0

customer concerns

-66.5%

downtime

5

sites adopted