

LABEL
ACADEMY

WORKSHOP

RFID IN LABELS AND PACKAGE PRINTING

**RAIN RFID and NFC LABEL MANUFACTURING,
TESTING AND QUALITY CONTROL**

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Contents

- 1. Converting RAIN RFID and NFC labels**
 - Equipment requirements
- 2. Quality Control in RAIN RFID production**
 - What is the quality of RAIN RFID?
 - How quality is tested?
 - Cost of the quality

RFID Converting

Input material?



Dry Inlay



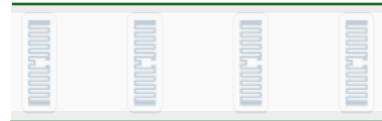
Uncut Wet Inlay



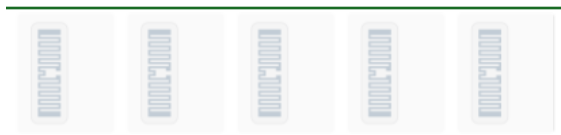
Cut Wet Inlay



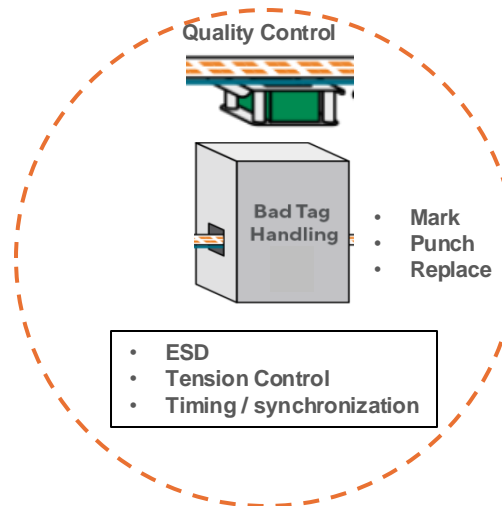
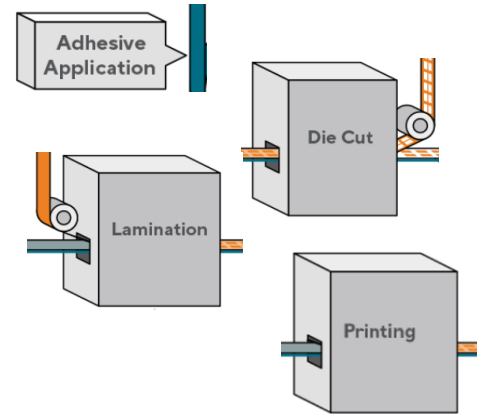
Uncut Label



Cut Label



Converting process?



Output material?

Cut Label



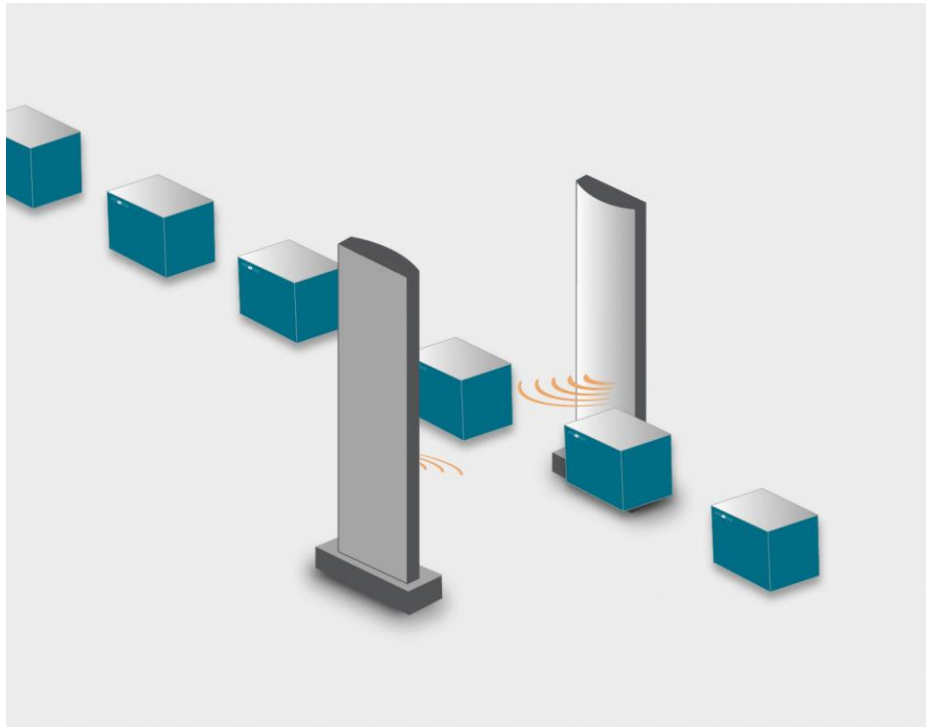
Printed Label



Printed and Encoded Label



Quality of RAIN RFID



Performance

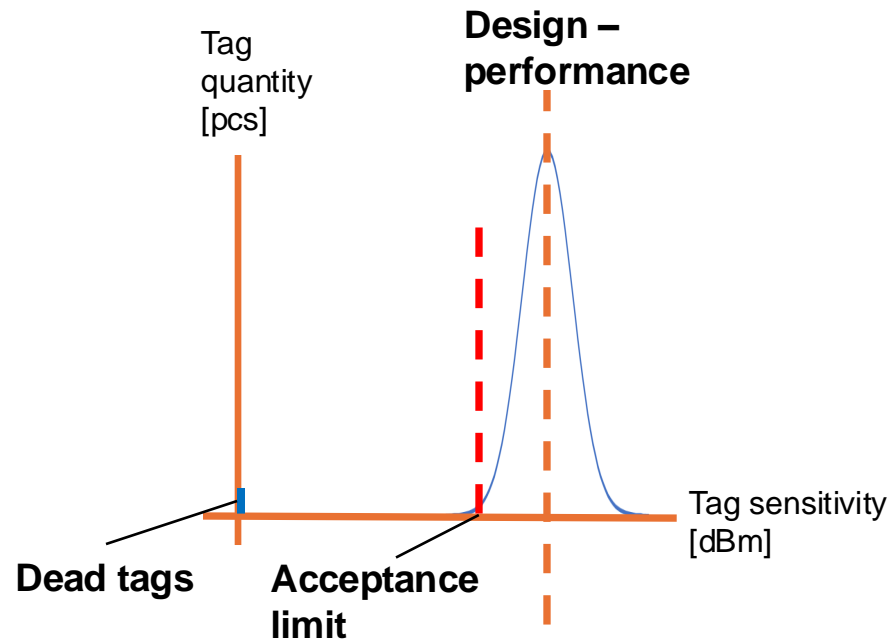
= Designed readability

= Design quality

Production Quality

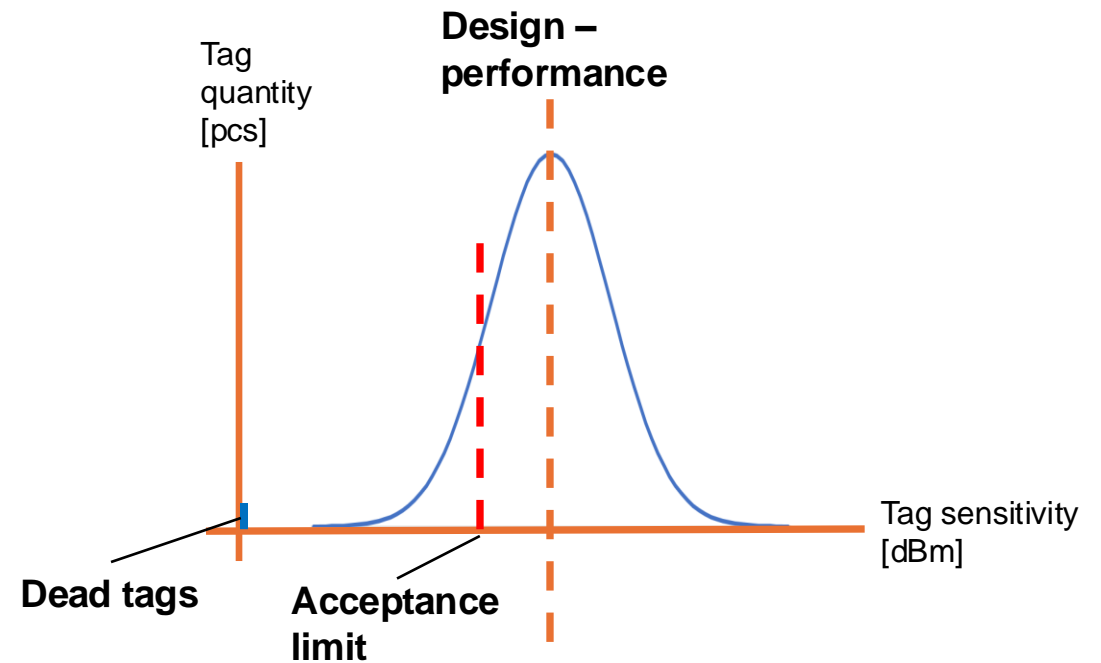
= Consistency of the readability of tags.

Quality of RAIN RFID



High Quality

- Low variance
- High yield

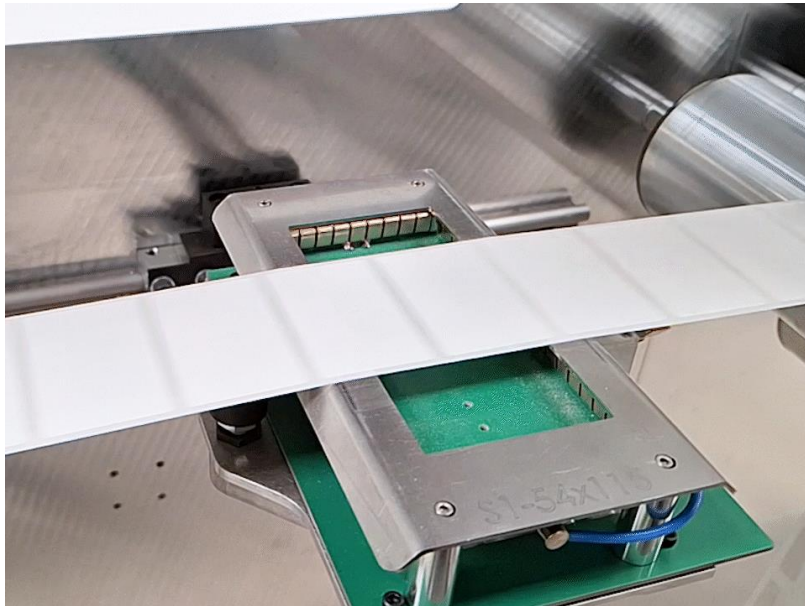


Low Quality

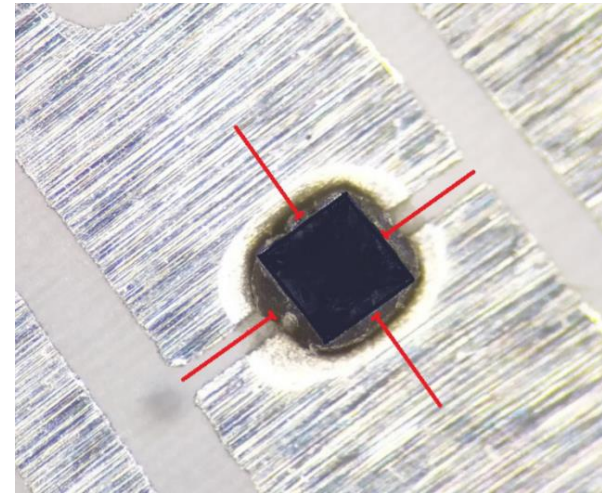
- High variance
- Low yield

RFID Quality control

RFID Label quality is tested using RF.

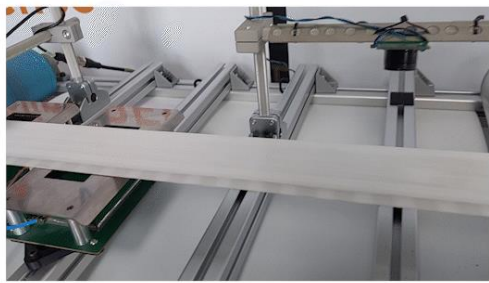


RFID quality cannot be seen/visually inspected



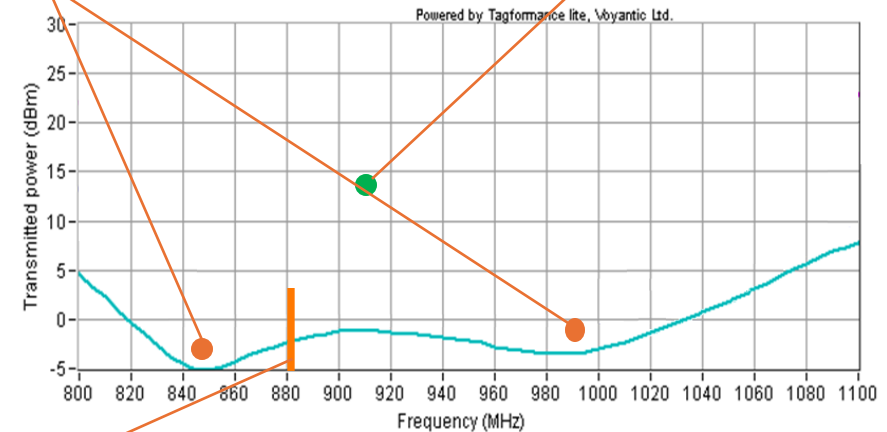
RAIN RFID Quality control

- Standards for criteria: No
- Common industry best practice: 3-point test



Verifying that each tag is within acceptable limits from design (3dB variance)

Reading EPC/TID for tracking



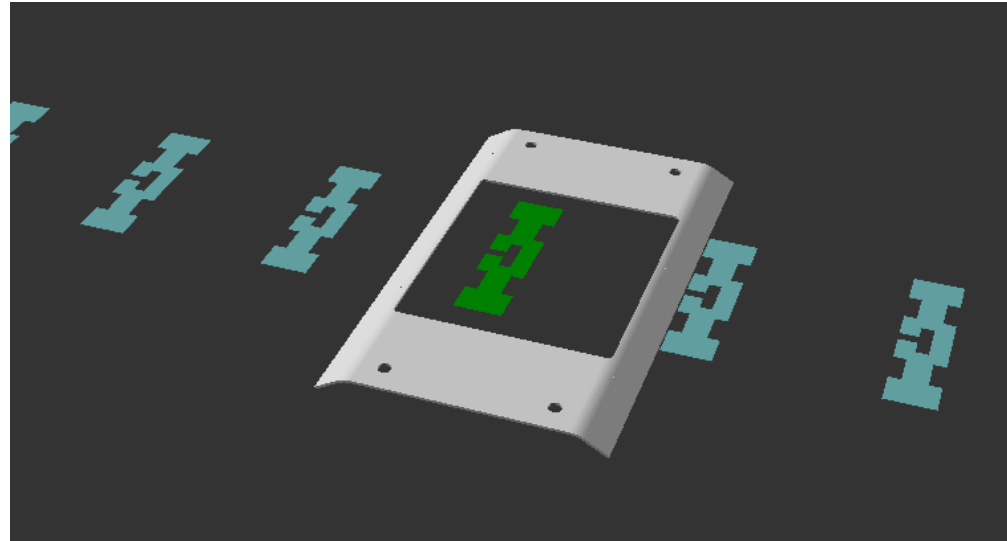
Measuring sensitivity for capturing variance

100% testing

Far field performance

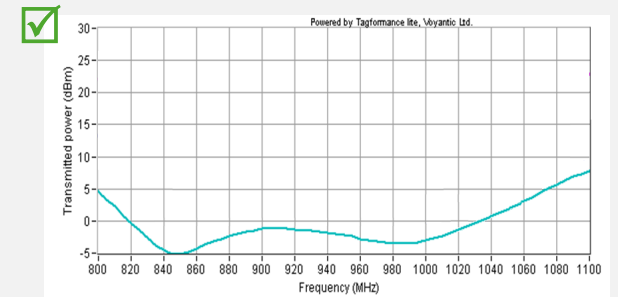
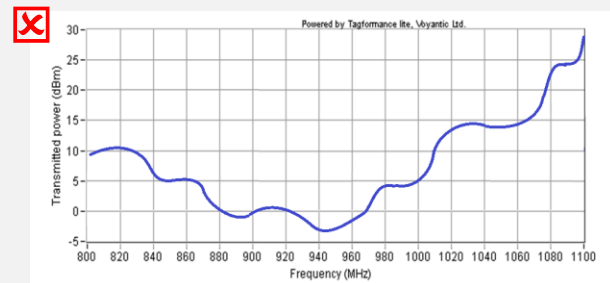
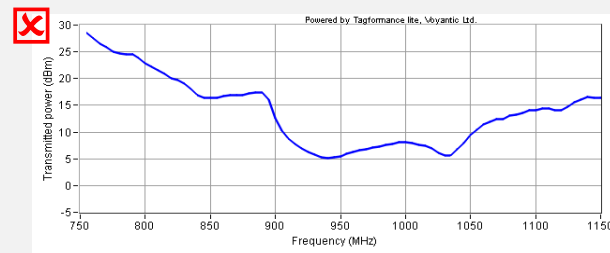
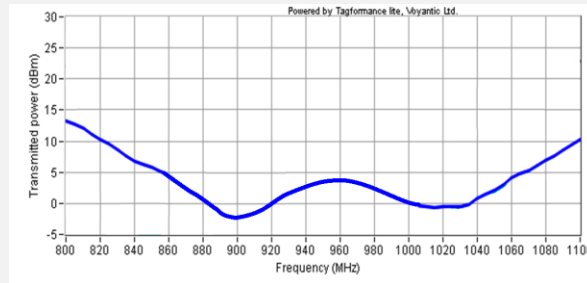
RFID Quality control

One tag at a time: Neighboring tags to be isolated.



Far field performance at close proximity?

- Far field threshold curve. One tag at more than 1ft distance from antenna.
- If multiple tags are in the field (tags on liner), the test result is distorted, even if select or shielding is used for isolating a single tag.
- Near field antenna connects with magnetic field to the loop of dipole antenna. Frequency response is different from far field.

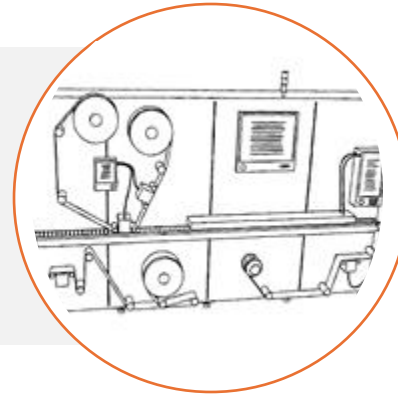


Solution: e-field coupling element shows the tag's far field performance, even if the tag is at close proximity

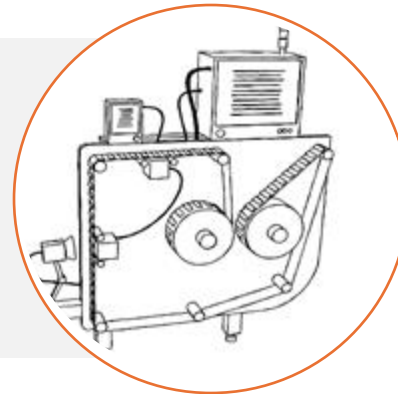


RFID Quality control

Inline: Quality testing is integrated to converting machine

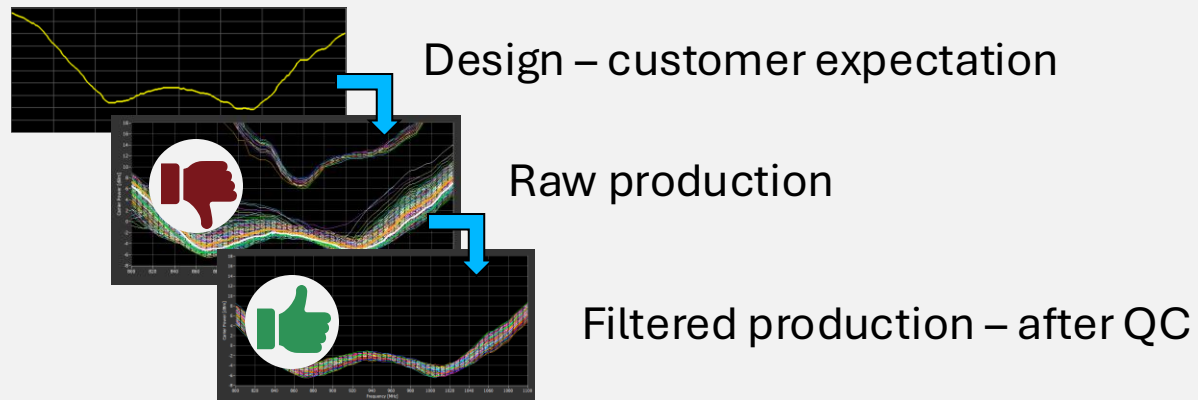


Offline: Quality testing is made with separate reel-to-reel machine



RFID Quality control

Delivery quality

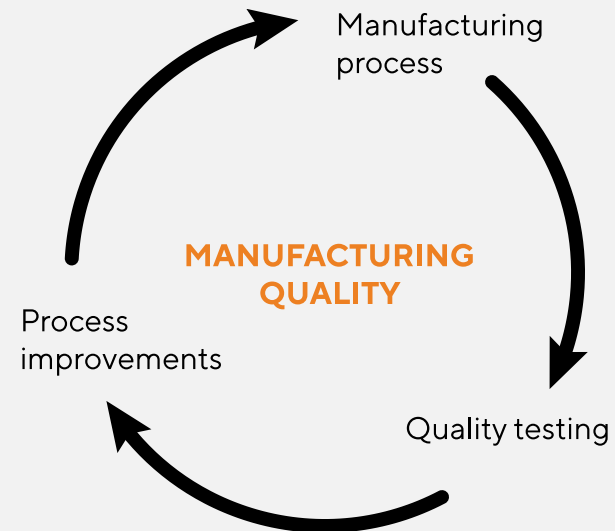
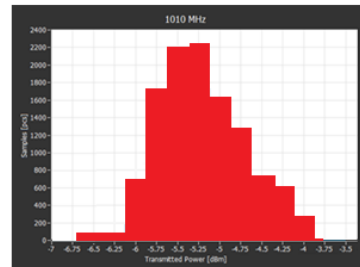
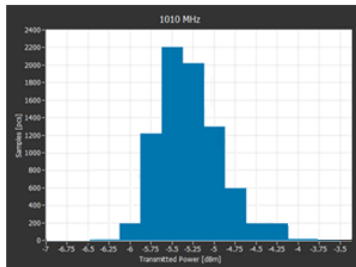
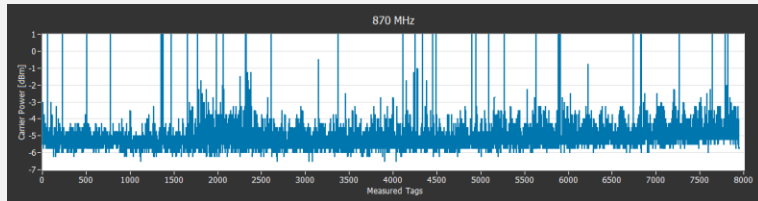


Proof of quality – log files

| Time stam | Pass/Fail | Read data (err/data) | Tested points | Sensitivity 1 |
|-----------|-----------|----------------------------|---------------|---------------|
| 17.22.36 | PASS | 0/A11011606000020522C9D463 | 1 | 0/-5,00 |
| 17.22.36 | PASS | 0/A11011606000020522C9D462 | 1 | 0/-4,75 |
| 17.22.45 | PASS | 0/A11011606000020522C9D461 | 1 | 0/-6,25 |
| 17.22.45 | PASS | 0/A11011606000020522C9D460 | 1 | 0/-6,00 |
| 17.22.46 | PASS | 0/A11011606000020522C9D45F | 1 | 0/-4,25 |
| 17.22.46 | PASS | 0/A11011606000020522C9D45D | 1 | 0/-3,75 |
| 17.22.48 | PASS | 0/A11011606000020522C9D45C | 1 | 0/-3,50 |
| 17.22.48 | PASS | 0/A11011606000020522C9D45B | 1 | 0/-3,25 |
| 17.22.49 | PASS | 0/A11011606000020522C9DD5A | 1 | 0/-6,50 |
| 17.22.49 | PASS | 0/A11011606000020522C9DD59 | 1 | 0/-6,00 |
| 17.22.51 | PASS | 0/A11011606000020522C9DD58 | 1 | 0/-6,00 |
| 17.22.51 | PASS | 0/A11011606000020522C9DD57 | 1 | 0/-5,75 |
| 17.22.54 | PASS | 0/A11011606000020522C9DD56 | 1 | 0/-6,25 |
| 17.22.54 | PASS | 0/A11011606000020522C9DD55 | 1 | 0/-6,25 |
| 17.22.56 | PASS | 0/A11011606000020522C9DD54 | 1 | 0/-6,00 |
| 17.22.57 | PASS | 0/A11011606000020522C9DD53 | 1 | 0/-6,00 |
| 17.22.58 | PASS | 0/A11011606000020522C9DD52 | 1 | 0/-6,00 |
| 17.22.58 | PASS | 0/A11011606000020522C9DD51 | 1 | 0/-6,25 |

RFID Quality control

Continuous improvement and long-term development



Cost of Quality

Internal Failure Costs

- Scrap
- Downtime
- Analysis work

External Failure Costs

- Complaints
- Sales Reductions

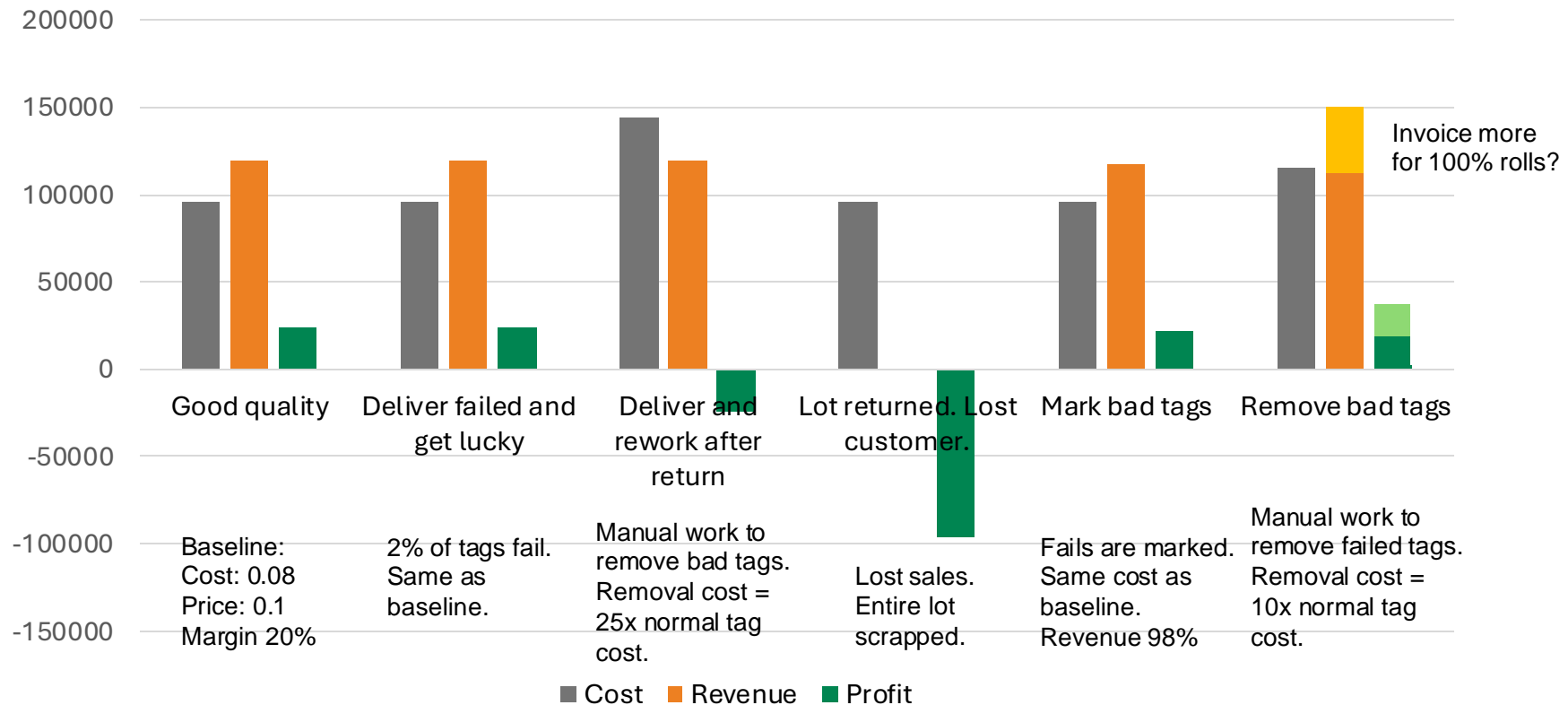
Prevention Costs

- Quality planning
- Capability evaluations
- Quality improvement training and projects

Appraisal Costs

- Incoming inspections
- In-process and final testing
- Product and process audits

Cost of Quality



Thank you!

Visit us at **booth 3804** and
RFID Experience!

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