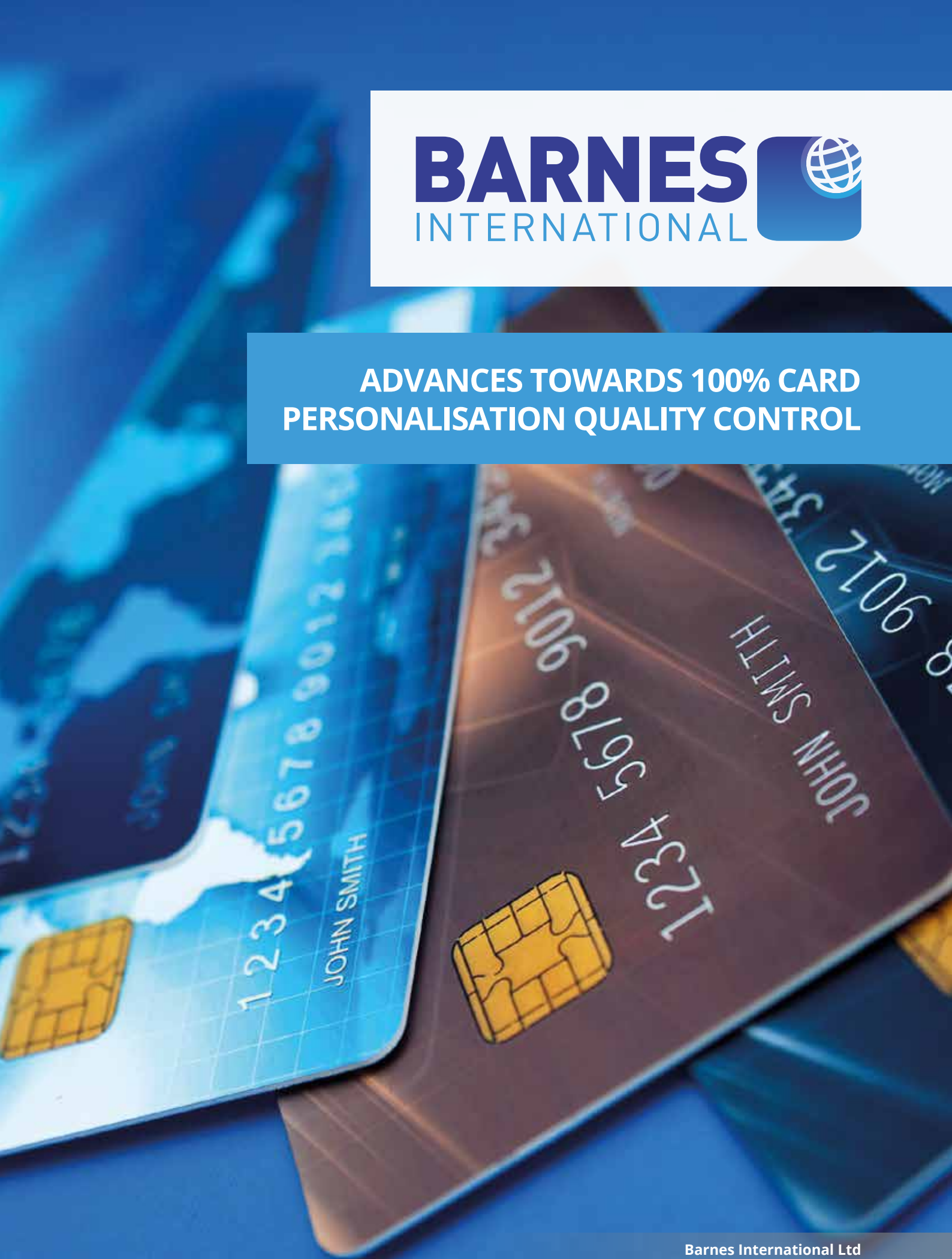
BARNES INTERNATIONAL

ADVANCES TOWARDS 100% CARD PERSONALISATION QUALITY CONTROL



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INTRODUCTION

Quality control during the card personalisation process is vital for card bureaus to ensure they are providing the highest quality cards to their issuer clients, and operating with efficient manufacturing processes. Currently, card personalisation validation testing occurs as a separate production process, post personalisation. This means that costly production errors are identified at the end of the batch, and data validation on the chip, mag-stripe or card embossing is limited and is a manual, time consuming process. However recent developments whereby card personalisation validation QC has become an integrated and automatic part of the personalisation process enables card bureaus to improve their production processes and efficiencies, and ultimately deliver a superior service to their clients.

WHY DO YOU NEED TO TEST CARD PERSONALISATION VALIDATION?

EMV cards are far more complex than mag-stripe cards. The chip contains more detailed information and has more complicated encoding. Dual interface cards add still further complexity. As a result there are far more opportunities for errors to creep into the personalisation process, with data mismatches occurring in different parts of the card.

It is therefore important to test the validity of the data in the following areas:

- Magnetic stripe vs chip data (contact and contactless)
- Adherence to Payments scheme specifications
- Issuer/ card type chip data integrity (tag data values)
- Cryptographic keys
- Card embossing and printing
- Card livery and stock

TYPES OF PERSONALISATION ERROR

ue to a lack of knowledge about EMV and payment scheme specifications, the high levels of manual intervention and the fragmented supplier chain in the card manufacture to issuance process, invalid data generation can easily occur.

Here are some examples of the most typical types of error:

- **Mag-stripe** encoding quality.
- **Data transposition** differences between mag-stripe, chip and contactless data.
- **Cryptography** - DES keys incorrect.
- **Formatting** – Incorrectly formatted data.
- **Production file creation errors**.
- **Chip malfunction** – damaged contact or contactless chip

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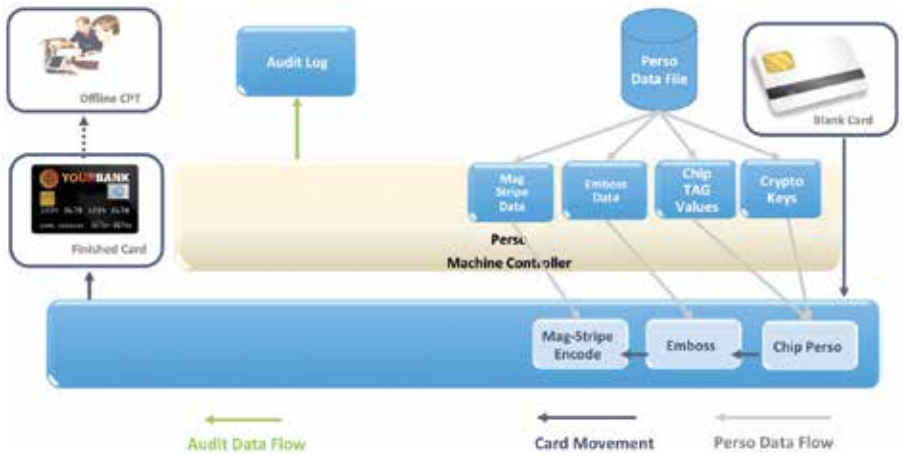
QUALITY CONTROL TODAY

It is not possible to perform 100% QC with the process commonly used today. Typically, cards are tested at the beginning and end of each batch, with random tests in between. Whilst this may identify data transposition errors, other data errors or damaged chips may go undetected.

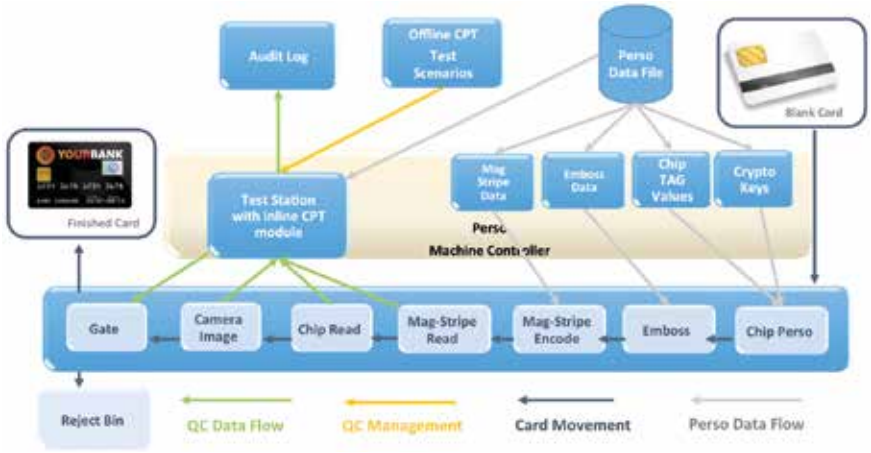
The Card Personalisation Testing process is currently "offline", meaning that finished cards are manually tested by operators using an offline Card Personalisation Test tool. This can add a significant amount of time to the QC process and additional process error and security risks are introduced with the high level of human intervention.

CURRENT EMV CARD PERSO PROCESS



ADVANCES TOWARDS 100% QC WITH INLINE TESTING

The latest development is to use inline testing, which means card personalisation validation is integrated into the personalisation process, performed automatically after personalisation by a QC test module built into the perso machine.



ACHIEVING 100% QC

To achieve 100% QC, all data elements should be validated:

- Mag-stripe data
- Contact / contactless chip data
- Cryptographic keys
- Embossing on card face
- Card Stock

To validate all the data elements, test scripts and scenarios are set up to:

- Validate data to EMV and payment scheme requirements
- Confirm chip, mag-stripe and embossing correlation (depending on machine modules)
- Identify incorrect data or keys
- Validate contact and contactless chip data
- Validate multiple application data
- Validate issuer-specific data
- Confirm card livery and stock

OFFLINE TESTING VERSUS INLINE TESTING

Whilst offline testing has been the industry standard for many years, it does have its limitations. If a card bureau wants to manufacture to full efficiency, then it should consider moving to inline personalisation QC.

Here are examples of how inline QC testing combined with the Card Personalisation Test tool (CPT) brings additional benefits:

- **Mag-stripe Data**
  - **Currently with offline testing** - It is possible to read all 3 data tracks on the magnetic stripe with the Magnetic Stripe Read Head in the QC module of the Personalisation Machine. This validates that the data on the magnetic stripe is the same as the data sent to the card via the Perso Machine Controller. However, if the data sent to the card is not valid, this will not be detected.

  - **Additional features of inline testing** – The Card Personalisation Test Engine allows the bureau to check the data against ISO rules, and correlate the data between the mag-stripe and the chip. It also allows the bureau to validate that the mag-stripe ICVV is different from the chip ICVV which is an anti- fraud requirement.

- **Contact / Contactless Chip Data**
  - **Currently with offline testing** – The contact chip ATR is activated and read by the Contact Coupler. The ATR is sent to the Perso Machine Controller which confirms it is live. However this test does not confirm that the personalisation data on the chip is correct and valid. Contactless cards add extra complexity when they are dual interface; in this scenario it is important to validate that the contact and contactless chip data match which is not possible with current offline tests.

  - **Additional features of inline testing** – As above, the ATR is activated and APDUs sent to the chip by the Contact Coupler. The APDU response data is then sent via the Perso Machine Controller to the Card Personalisation Test Engine, where tests are performed to validate:
    - EMV, Payment Scheme Application rules
    - Validation of Tag values against test Scenario values (Issuer / card)
    - Chip Data vs Mag Stripe & Contactless Chip
    - The correct keys were put onto the card

These tests take just a couple of seconds. Since they are run simultaneously with other card personalisation processes, they do not add additional time to the complete process.

- **Embossing on card face**
  - **Currently with offline testing** – Optical camera recognition (OCR) scans character impression on spent topping foil and displays it on the screen. The scan can be checked against the input data, and there is often a manual process whereby the operator is required to validate the OCR scan against the actual card, which can result in errors. In this process, this is no validation against the mag-stripe or chip cardholder data, issue and expiry dates.

  - **Additional features of inline testing** - The embossed data can be validated against the mag-stripe or chip cardholder data, issue and expiry dates. Furthermore, there is no need for any manual handling of the card, which reduces any potential security risks from operator fraud.

- **Card Stock Verification**
  - **Currently with offline testing** - A vision system captures the image of the front and back of card including stock reference; this is sent to the Perso Machine Controller where the image is validated to confirm the correct card stock for the card batch. This test is carried out in isolation from other data tests.

  - **Additional features of inline testing** – It is possible to add the card stock reference data to the test script and scenarios. This means that the Card Personalisation Test Engine can validate that the correct card stock for the batch has been used alongside all other card personalisation validation tests. This is particularly important when different card stocks are being used in the same batch.

A VALIDATION TEST REPORT

A Validation Test report provides a summary of the tests performed, and if and where errors occurred. The report allows the bureau to confirm test results to their issuer clients, identifying and explaining where and why cards have failed. The report can also be saved for audit purposes.

BENEFITS OF INLINE QUALITY CONTROL

- **100% card testing in real time**
  - Errors can be detected and corrected quickly
  - Reduces time and costs of re-issuance
- **Full data validation**
  - EMV and payment scheme
  - Tag values and keys
  - Issuer specific requirements
- **Increased production efficiencies & ROI**
  - Can run 24/7
  - No need for additional QC operatives
- **Improved data security**
  - Less need for human intervention
- **Full audit trail**
  - Comprehensive reports for each test

SUMMARY

It is clear to see why inline card personalisation validation is an attractive proposition for card bureaus looking to improve the efficiency of their current production practises and deliver a better solution to their clients. Whilst this is a relatively new development, adoption from progressive bureaus is expected to be rapid with increased pressure from card issuers in large emerging markets, who demand superior levels of product quality and service delivery.