

# Ensuring quality : operational challenges and the need for advanced inspection solutions

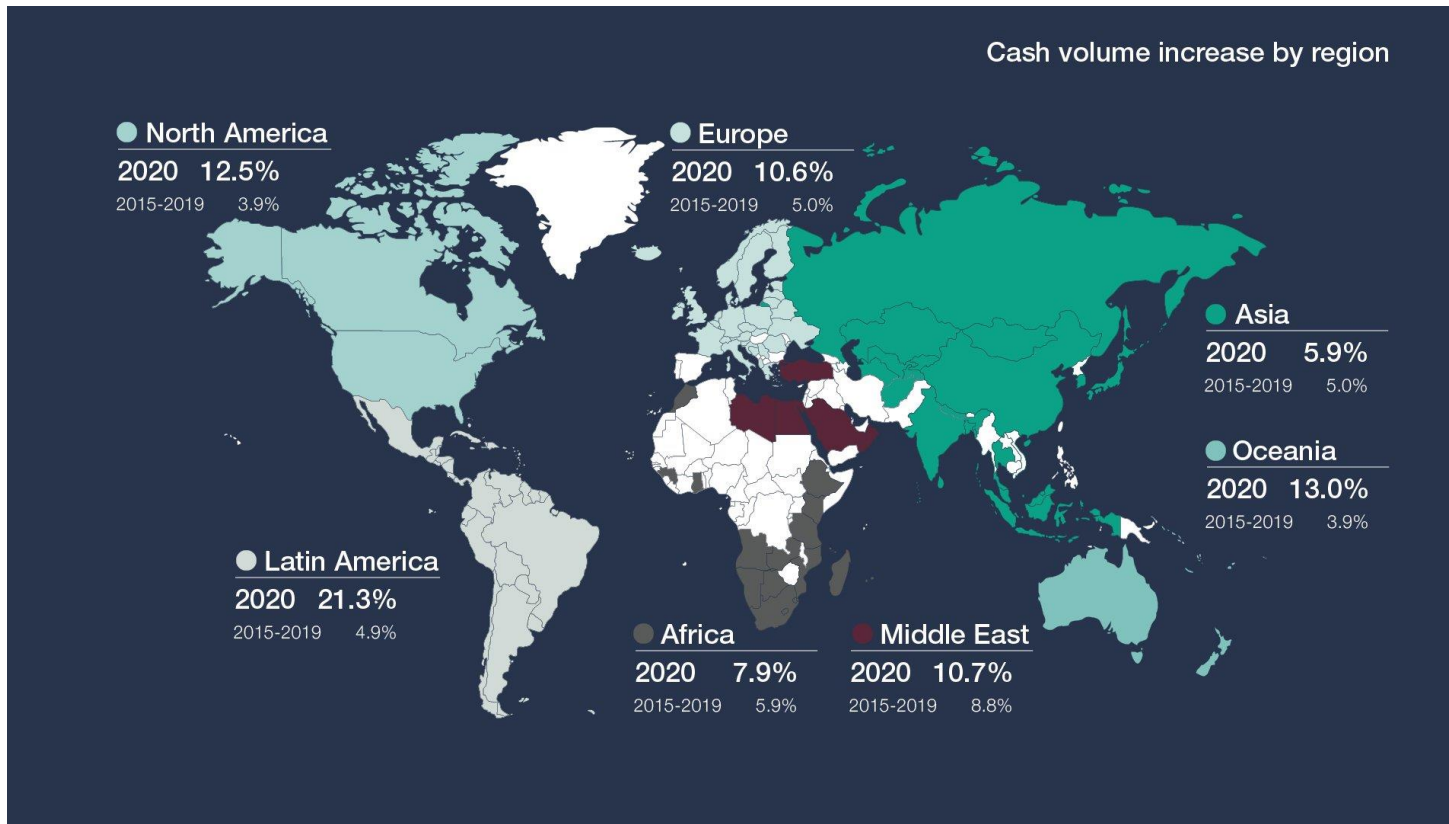


**SEPRINTO & PARTNERS**  
experts together



in-core  
systèmes

# The banknote printing industry growth

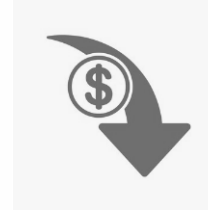


- Rise of the volume of cash in circulation, despite digital payments
- Clean banknotes policies, replace unfitted banknotes
- Measures against counterfeiting, Growing variety in banknote security features and increasing complexity in banknote design

# Operational challenges



Increasing competition



High demand for cost savings



Increase delivery speed & higher quality



New designs, new security features



Deal with existing Infrastructure

shutterstock.com · 1724269738

# How to face the operational challenges?

NEW state-of-the-art equipment

**OR**

ENHANCE existing infrastructure:

- Upgrade and integrate advanced inspection solutions

# Case studies of integrating advanced inspection solutions

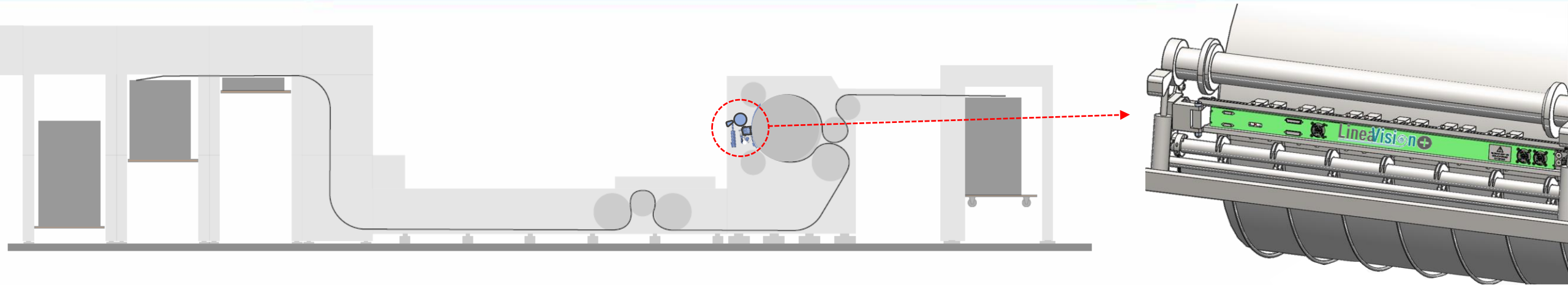
1. Case 1: ADD in-line inspection system into existing screen-printing machine
2. Case 2: REPLACE in-line inspection system into existing intaglio printing machine
3. Case 3: ALTERNATIVE Off-line Smart Table equipment for offset single sheet conformity validation and quality checking

# MECHANICAL CHALLENGES



- Without major modifications of the existing machine
- Fit in available space
- Sheet stability
- Simple mechanical integration
- Fast installation

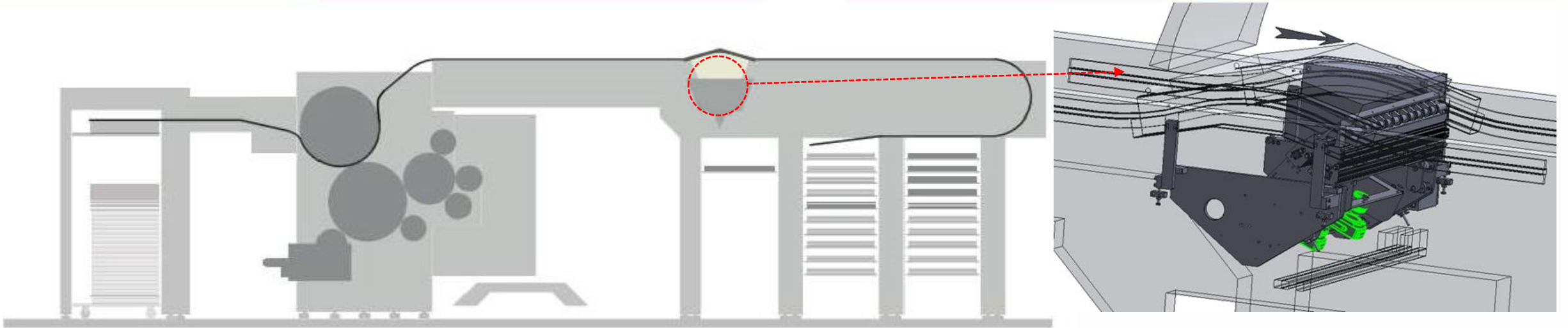
# Case1: ADD in-line inspection system into existing screen-printing machine



Compact solution with CIS sensor 300 DPI and IR light



# Case2: REPLACE in-line inspection system into existing intaglio-printing machine



**Mechanical installation in the same location of previous vision system:**

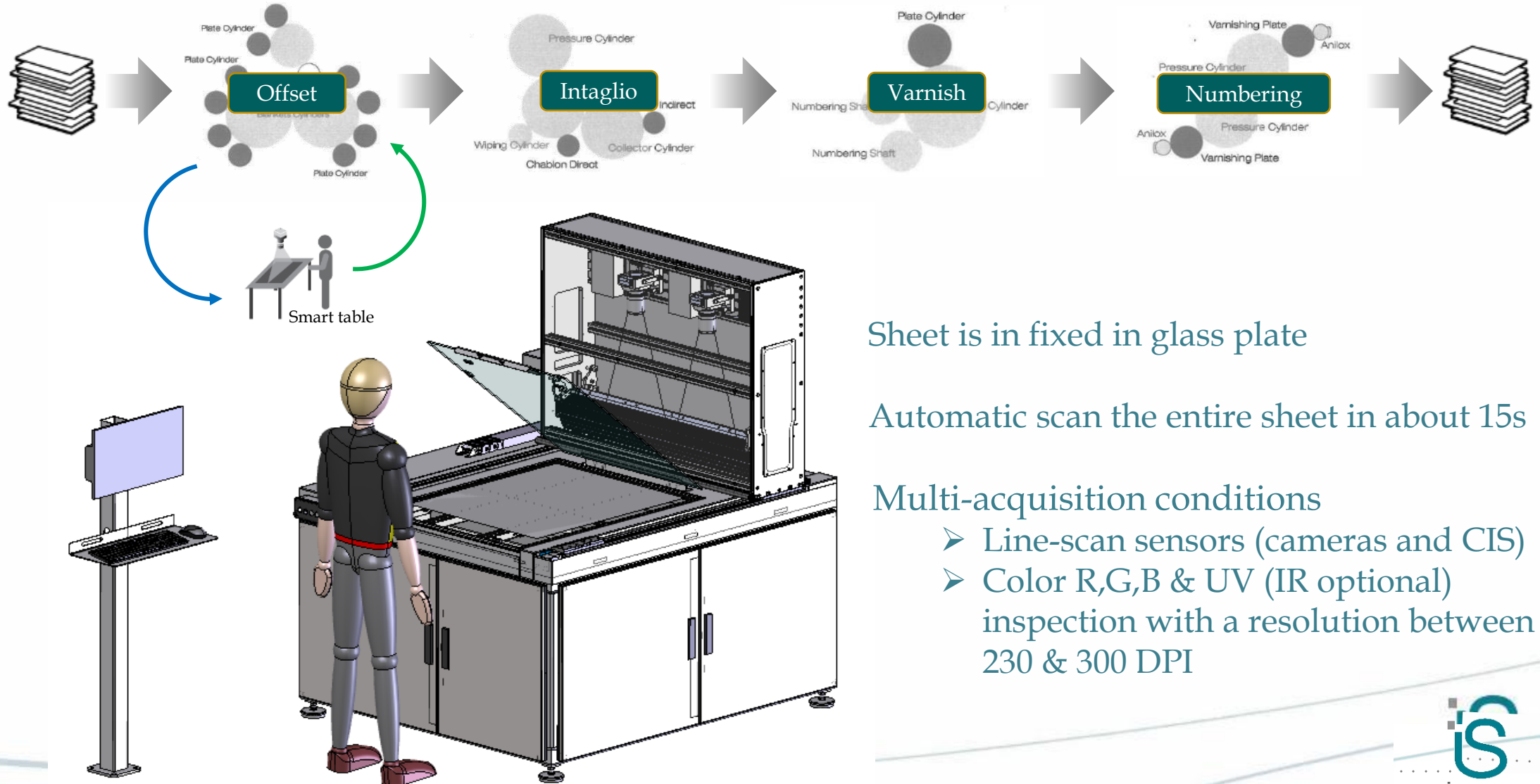
- Enough space
- Sheet stabilization system

2 x Line-scan cameras, full R,G,B, IR inspection

- Registry control
- Defect detection



# Case3: SMART TABLE : Single sheet conformity validation and quality checking



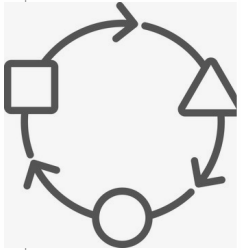
Sheet is fixed in glass plate

Automatic scan the entire sheet in about 15s

Multi-acquisition conditions

- Line-scan sensors (cameras and CIS)
- Color R,G,B & UV (IR optional) inspection with a resolution between 230 & 300 DPI

# APPLICATION / PERFORMANCES CHALLENGES



## FLEXIBILITY

- To deal with multiple printing layers
- To control different security features
- To set up different quality settings for each feature



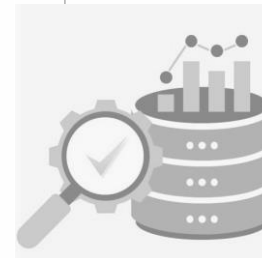
## HIGH RESOLUTION

- Print to Print Register
- Print to Paper Register
- Dimensional control (positions, measurements, ....)
- Aspect control



## REAL-TIME

- Reduce process variations
  - Reduce waste
  - Increase yield
  - Increase quality

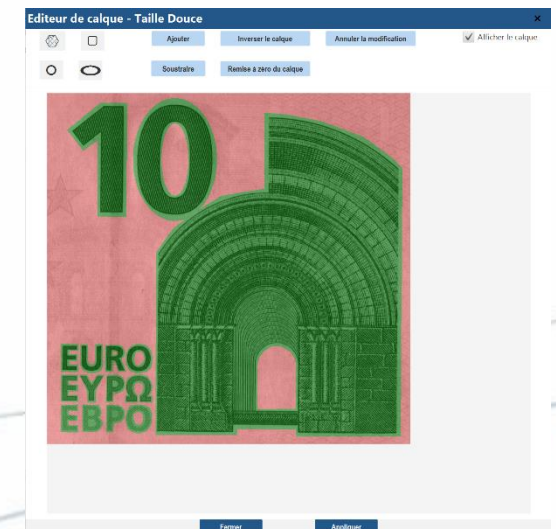
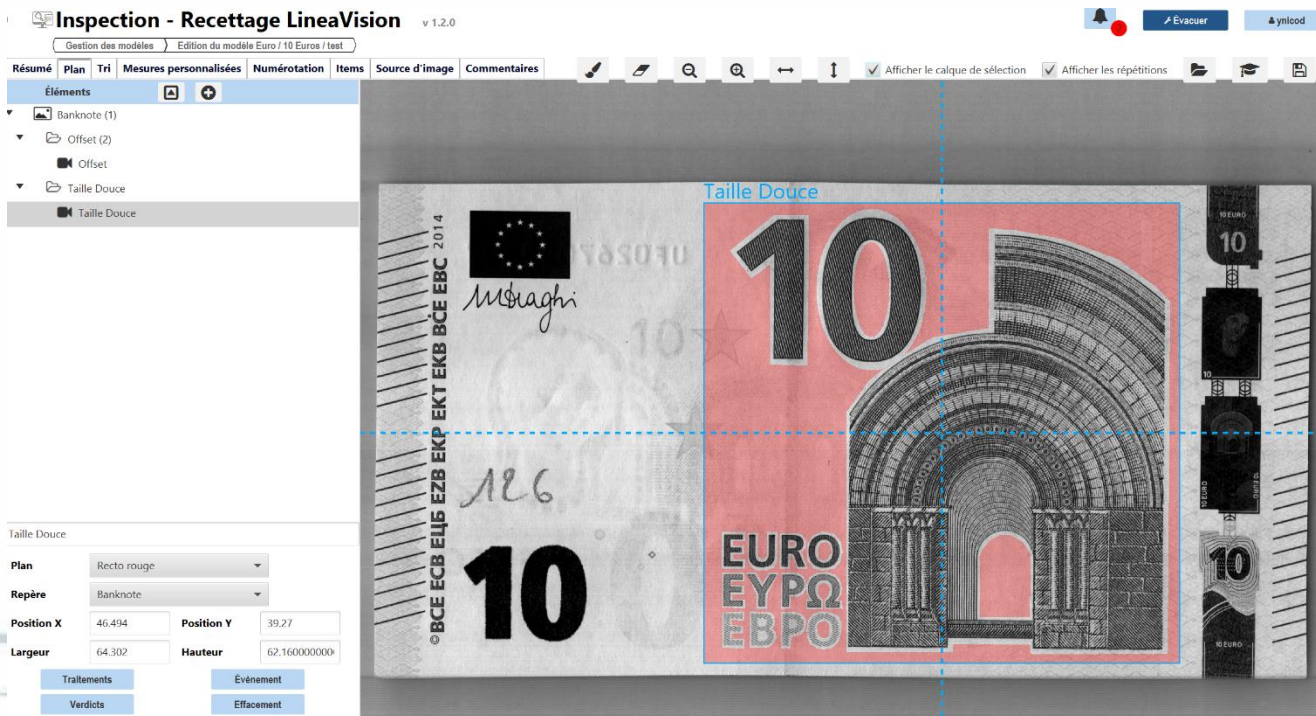
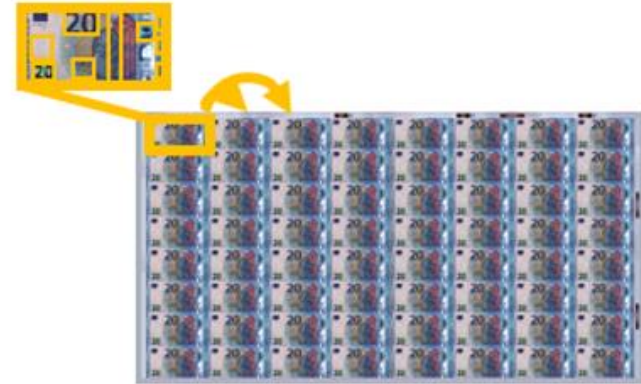


## DATA MANAGEMENT

- Quality data
  - Per single banknote
  - Per sheet
- Historical Data available for analytics and process improvement

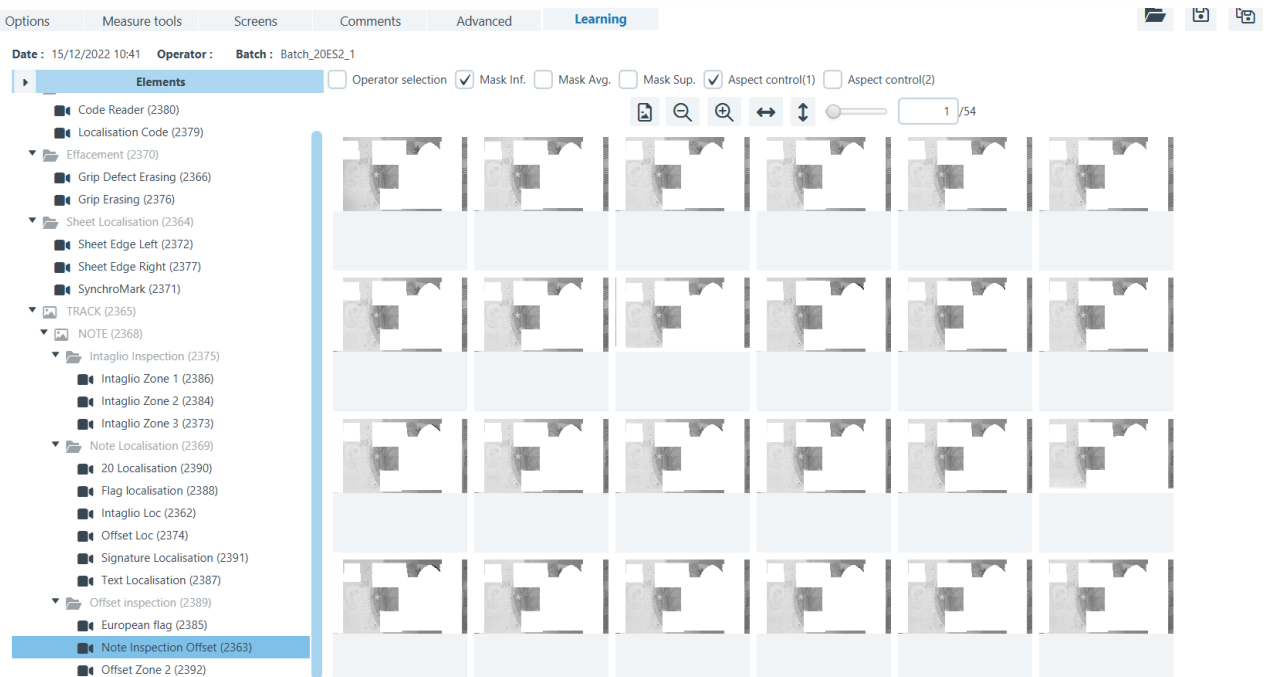
# INSPECTION AND CONTROL

- Set up “the model” in which you define the nominal representation of the banknote
- Detection strategies per critical/uncritical area
- Useful tools to select shapes of areas to inspect

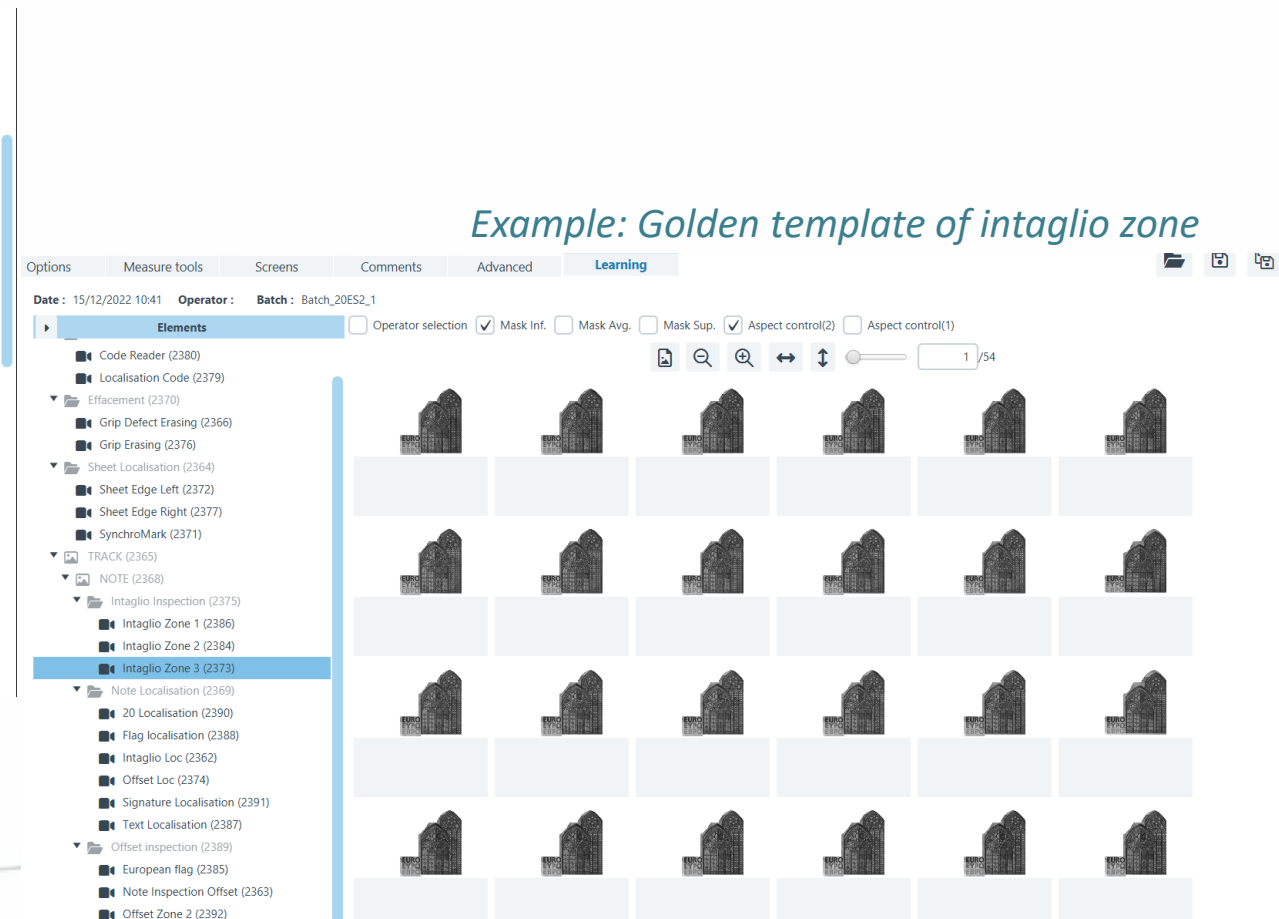


# INSPECTION AND CONTROL

- Learning on nominal production to create “golden template”
- Golden template and masks for each area defined on the model
- During inspection, detection of variabilities outside accepted tolerances of the golden template



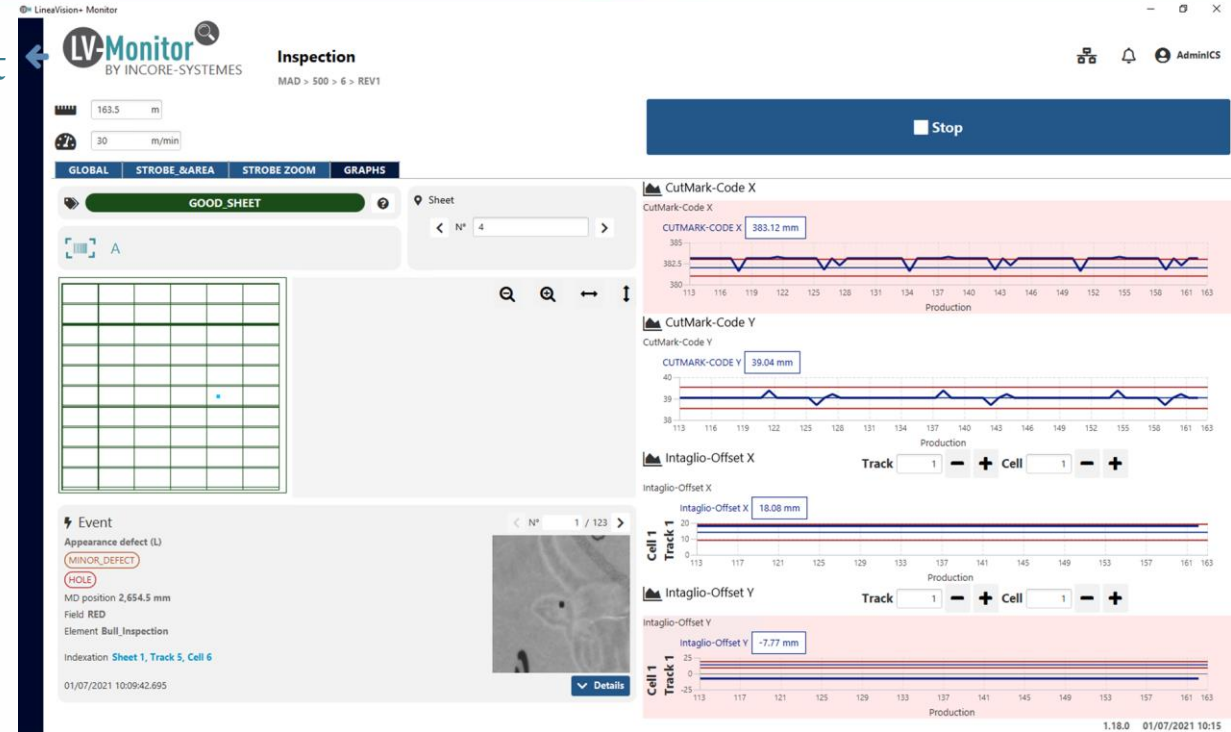
Example Golden template offset layer



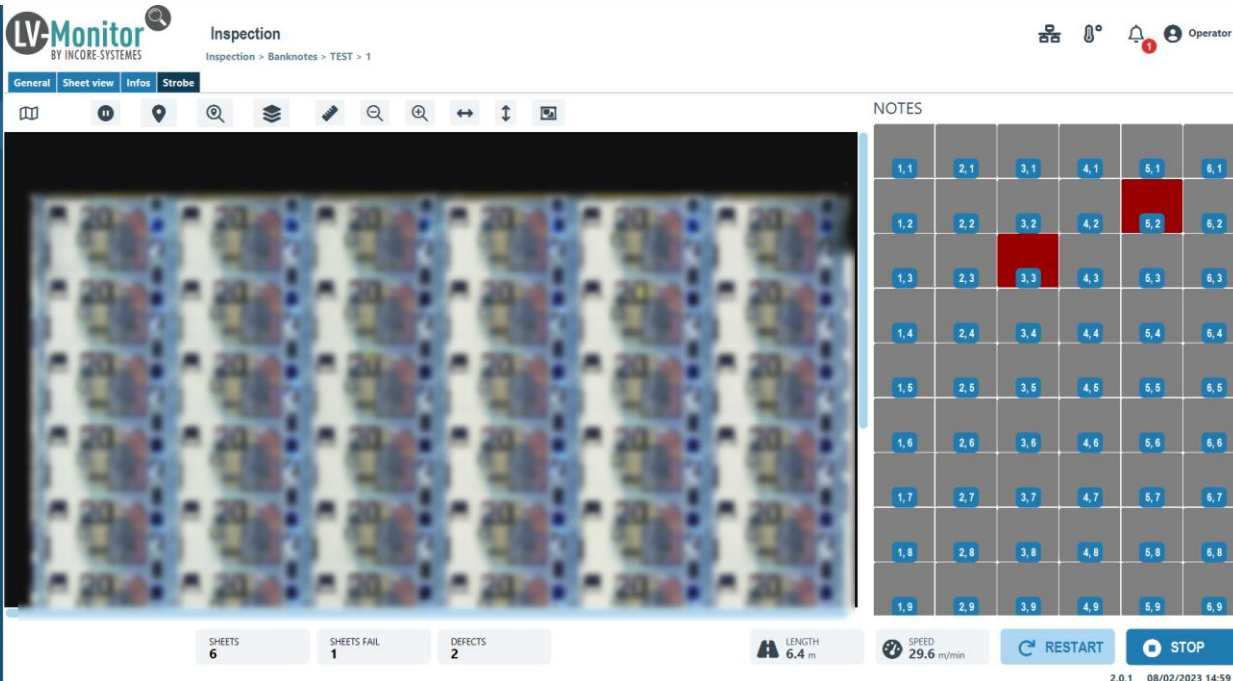
Example: Golden template of intaglio zone

# REAL TIME INFORMATION

- Real time information with useful information to alert operator of process drift.
- Multiple screens with configurable HMI
- Touchscreen



Graphs of registry control between layers



Dynamic Live image of product, zoom in/out.

# SHEET VIEW

**LV-Monitor**  
BY INCORE-SYSTEMES

## Inspection

Inspection > Banknotes > TEST > 1

Operator

General Sheet view Infos Strobe

**BAD SHEET** SHEET N° 6

030221053004678039

Event Defect **CRITICAL DEFECT** Spot (Missink Ink) Pos. MD/Abs 4.09 m Field Intaglio Inspection Element Intaglio 20 Indexation **TRACK 3, NOTE 3** 08/02/2023 14:59:54.918

TRACK 1-NOTE 1	TRACK 2-NOTE 1	TRACK 3-NOTE 1	TRACK 4-NOTE 1	TRACK 5-NOTE 1	TRACK 6-NOTE 1
TRACK 1	TRACK 2	TRACK 3	TRACK 4	TRACK 5	TRACK 6
TRACK 1-NOTE 2	TRACK 2-NOTE 2	TRACK 3-NOTE 2	TRACK 4-NOTE 2	TRACK 5-NOTE 2	TRACK 6-NOTE 2
				■	
TRACK 1-NOTE 3	TRACK 2-NOTE 3	TRACK 3-NOTE 3	TRACK 4-NOTE 3	TRACK 5-NOTE 3	TRACK 6-NOTE 3
		■			
TRACK 1-NOTE 4	TRACK 2-NOTE 4	TRACK 3-NOTE 4	TRACK 4-NOTE 4	TRACK 5-NOTE 4	TRACK 6-NOTE 4
TRACK 1-NOTE 5	TRACK 2-NOTE 5	TRACK 3-NOTE 5	TRACK 4-NOTE 5	TRACK 5-NOTE 5	TRACK 6-NOTE 5
TRACK 1-NOTE 6	TRACK 2-NOTE 6	TRACK 3-NOTE 6	TRACK 4-NOTE 6	TRACK 5-NOTE 6	TRACK 6-NOTE 6
TRACK 1-NOTE 7	TRACK 2-NOTE 7	TRACK 3-NOTE 7	TRACK 4-NOTE 7	TRACK 5-NOTE 7	TRACK 6-NOTE 7
TRACK 1-NOTE 8	TRACK 2-NOTE 8	TRACK 3-NOTE 8	TRACK 4-NOTE 8	TRACK 5-NOTE 8	TRACK 6-NOTE 8
TRACK 1-NOTE 9	TRACK 2-NOTE 9	TRACK 3-NOTE 9	TRACK 4-NOTE 9	TRACK 5-NOTE 9	TRACK 6-NOTE 9

SHEETS 11 SHEETS FAIL 1 DEFECTS 2 LENGTH 9.6 m SPEED 30 m/min RESTART STOP

2.0.1 08/02/2023 15:01

# DEFECT AND QUALITY MANAGEMENT

**+ ADD VERDICT** *VERDICT PER SHEET*

Default verdict **GOOD SHEET**

**WARNING SHEET**

MINOR DEFECT **>** GREATER THAN

**OR** MAJOR DEFECT **●** PRESENT

**+ ADD RULE**

**BAD SHEET**

MAJOR DEFECT **>** GREATER THAN

**OR** CRITICAL DEFECT **●** PRESENT

**OR**

**+ ADD RULE**

**+ ADD VERDICT** *VERDICT PER BANKNOTE*

Default verdict **Good Cell**

**Bad Cell**

CRITICAL DEFECT **●** PRESENT

**OR** MAJOR DEFECT **>** GREATER THAN

**OR** MINOR DEFECT **>** GREATER THAN

**+ ADD RULE**

Each verdict trigger an I/O signal to drive different actions (defect or banknote marking, sheet ejection...).

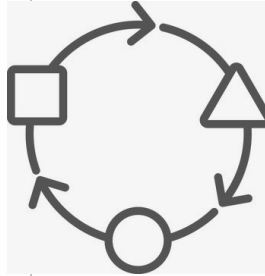
# HISTORICAL DATA AVAILABLE FOR ANALYTICS AND PROCESS IMPROVEMENT

- Report synthesis with detected defects, alarms, measurements
- Inspection statistics

The screenshot displays the LV-Monitor software interface. The top navigation bar includes 'Previous', 'LV-Monitor BY INCORE-SYSTEMES', 'Inspection', and 'Inspection > Banknotes > TEST > 1'. The main interface is divided into several sections:

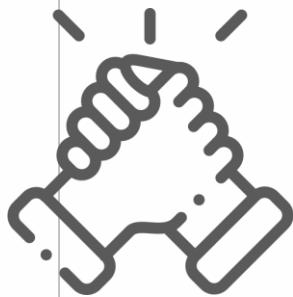
- History:** Shows two inspection tracks: 'TRACK 5, NOTE 2' and 'TRACK 3, NOTE 3'. A 'SYNCHRO ELEMENT' is highlighted with a red box and a magnifying glass icon.
- Cartography:** A graph showing inspection data over time. The x-axis represents length in millimeters (0.0 to 825.0), and the y-axis represents vertical position in millimeters (-91.1 to 3.9). The graph shows vertical lines indicating inspection points.
- Event Details:** A detailed view of a 'CRITICAL DEFECT'. The defect is identified as a 'Spot (Missink Ink)' with the following details:
  - Pos. MD/Abs 4.09 m
  - Field Intaglio Inspection
  - Element Intaglio 20
  - Indexation TRACK 3, NOTE 3
  - Pos. CD/Ref 334.99 mm (Sheet Edge Left)
  - Pos. CD/Alt -485.72 mm (Sheet Edge Right)
  - Date/Time: 08/02/2023 14:59:54.918
  - Size: W 6.78 mm, H 2.69 mm
  - Dimensions: X 358.1 mm, Y 4,090.93 mm (Absolute)
- Summary Statistics:** Located at the bottom, showing 'SHEETS 11', 'SHEETS FAIL 1', and 'DEFECTS 2'. It also displays 'LENGTH 9.6 m' and 'SPEED 29.9 m/min'. Control buttons for 'RESTART' and 'STOP' are visible.

# KEY TAKEAWAYS OF ADVANCED INSPECTION SOLUTIONS



## COST SAVING & QUALITY

- Integrate in-line quality control into printing process to detect drifts as soon as possible
- High resolution system with powerful software tools
- Solution adapted with banknote complexity challenges
- Improve quality and Reduce waste



## SUPPORT

- Remote support
- Maintenance
- Training
- Software evolutions
- Spare parts

# IN-CORE SYSTEMES – WHO WE ARE



**Turn-key solutions**

Advanced In-line quality control & traceability for the banknote manufacturing industry

Image configuration  
Image acquisition  
Real-time data processing  
Real-time data broadcast

**Core know-how**



**Full mastery of key technological components**

Inhouse or long-term partners



# SEPRINTO & PARTNERS

Providing innovations, improvements and cost savings by optimizing our clients' printing processes



LASERLINE  
SECURE



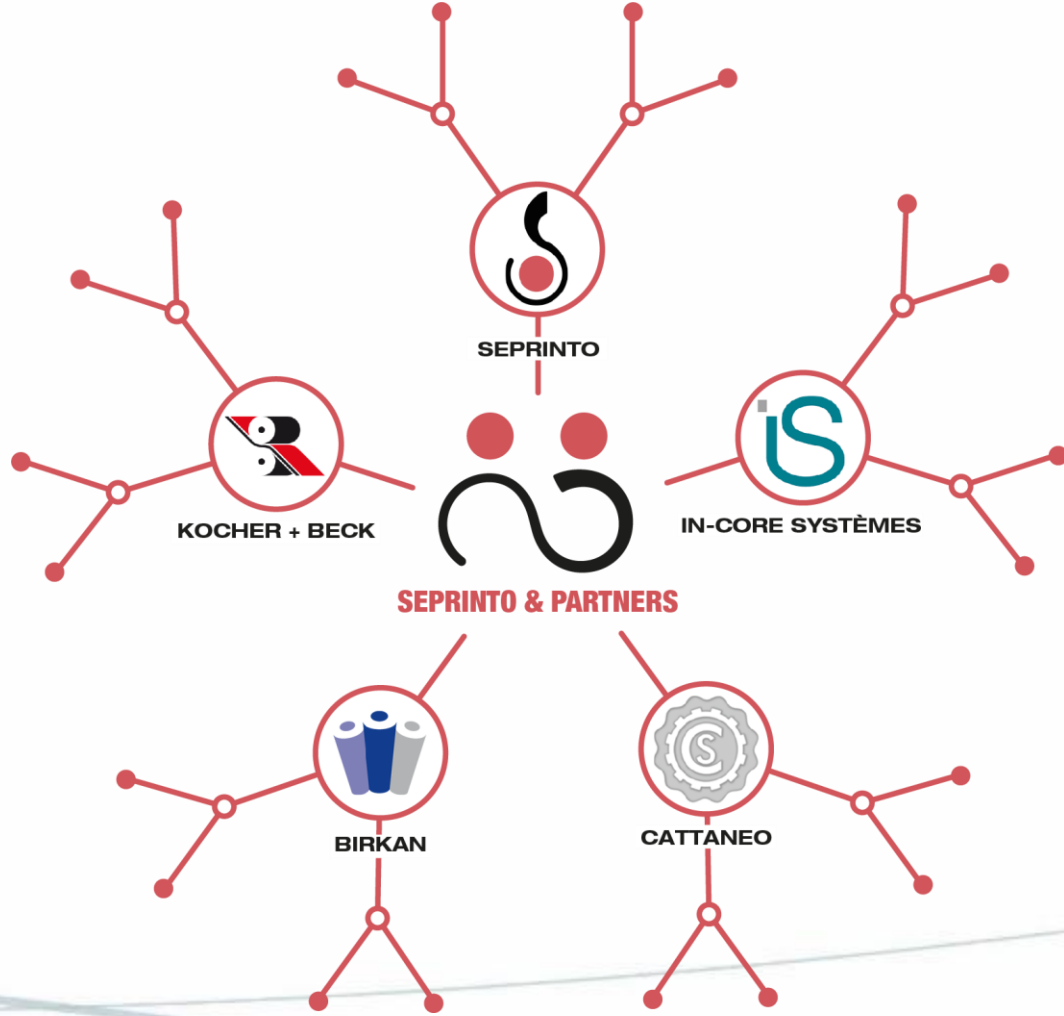
READY-TO-USE PASTE  
FOR WIPING  
CYLINDER



TRAINING AND  
CONSULTING



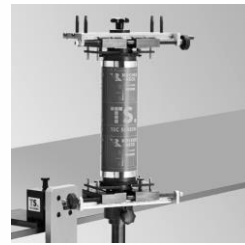
IN-LINE  
INSPECTION  
SYSTEMS



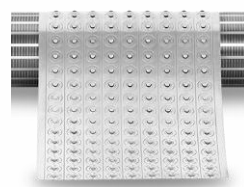
BLANKETS



WEB FED  
INTAGLIO  
PRESSES



ROTARY  
SCREENS  
FOR  
SECURITY  
INK



MICRO-  
EMBOSSING

# THANK YOU FOR YOUR ATTENTION



Catalina GUTIERREZ  
[cgu@incore-systemes.com](mailto:cgu@incore-systemes.com)  
10 rue Ampère  
69680 CHASSIEU - FRANCE  
[www.incore-systemes.com](http://www.incore-systemes.com)

