



Cash Center Automation Solutions



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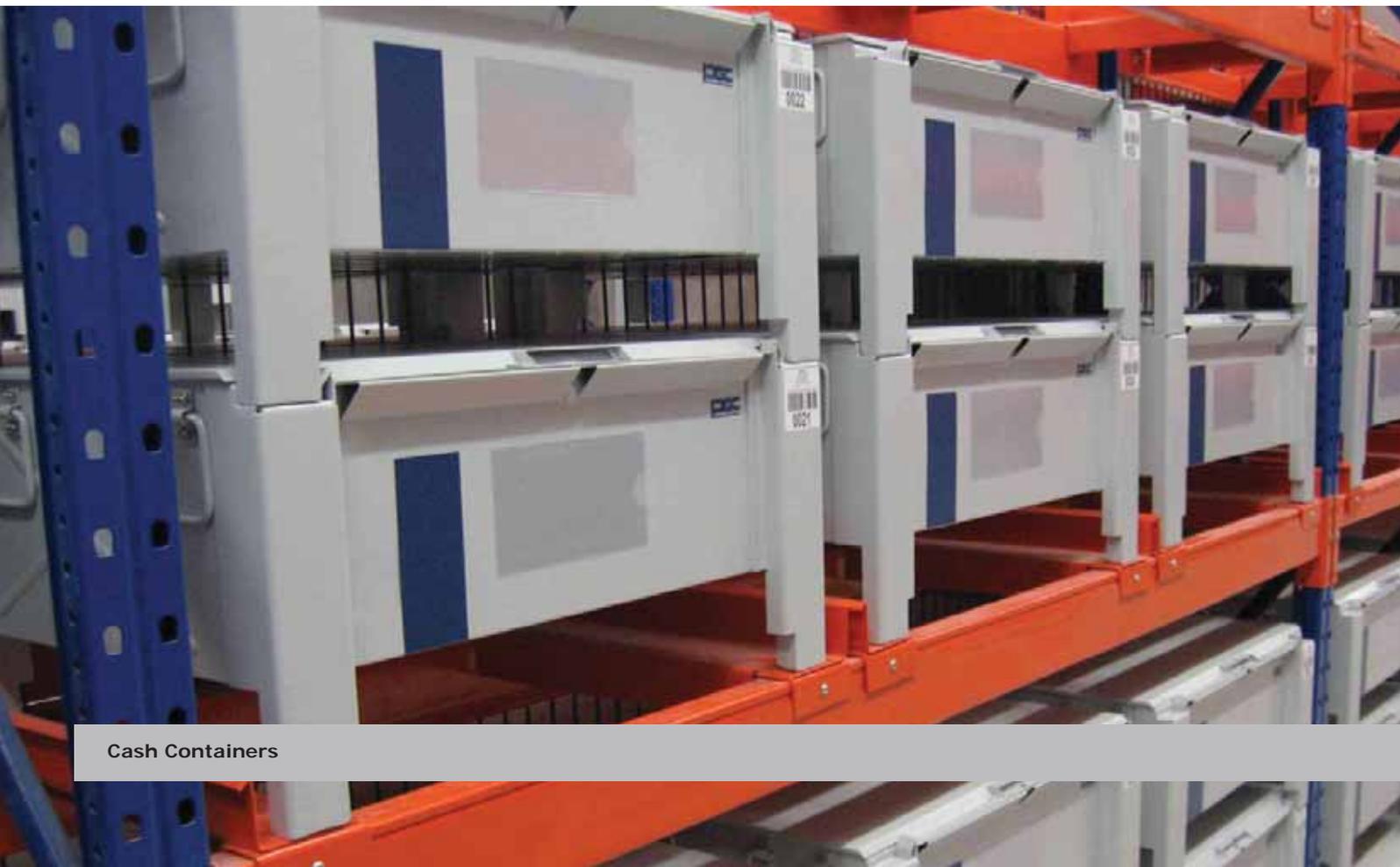
Cash Center Automation Solutions

Central Banks around the world are dealing with increasing volumes in cash storage, processing and distribution. At the same time the cash management department needs to guarantee the quality and volume of cash in circulation in a cost effective way.

For this reason Central Banks are replacing and combining their smaller regional branches and central cash centers by larger, more automated and better secured facilities. Automation, enforcement and traceability are key requirements for these cash centers.

The Zero-Touch implementation model eliminates almost every manual interaction from receiving over processing and payout. It is also based on further standardization of all logistic processes at the Central Bank, the commercial banks and the CIT companies. The PEC Cash Management System supports this standardization and the Web Portal facilitates the IT system integration, improving overall efficiency and reliability of the complete cash cycle.

PEC offers a complete solution for the Zero-Touch Cash Center. Our offering is based on more than 30 years of experience. It includes Cash Containers, Standardized Cash Packs, Vault Automation, Automated Pre and Post Processing, Automated Receiving and Payout, and a Cash Management System to control the entire operations of the automated facility.



Cash Containers

The Processes

CASH RECEIPT

The point of entry into the cash center is the automated paying and receiving room. The CIT operator loads the cash packs on an automated conveyor system. The system automatically scans the received deposits and checks them against the advanced shipping notices registered on the Web Portal.

A deposit can be any individually sealed and labeled cash package. Typical examples include bags, trays, cassettes.... The identification is done with barcodes or RFID tags, according to local or regional standards.

For smaller regional cash centers the receiving process may include additional operation steps, from receiving over counting and blind counting. These process steps can be individually configured for each depository institution and procedures can be changed over time.

Receiving will sort the deposits into different denominations, to facilitate the single denomination processing in the other parts of the cash center. Using a centralized receiving conveyor/palletizer, this process is fully automated.

Upon receipt of the delivery and electronic approval, the system will create the required accounting transactions, including the actually received deposits versus expected.

Finally the system generates a manifest as proof of delivery for the CIT employees.

AUTOMATED VAULT

In order to automate the material handling in the other parts of the cash center, the deposits are loaded in containers or trays. These packaging units are uniquely identified with fixed barcodes or RFID tags. The containers can be closed and sealed using preprinted barcode seals, or even be equipped with electronic locks, preventing unauthorized opening.

The storage in either containers or trays also determines which material handling system is used between the different areas in the cash center and the vault.

Containerized Systems:

The containers with the unsorted denominations are sealed and positioned on an AGV handling location. The operator will scan the container and the location, upon which the Cash Management System, will create the transport order for the AGV system.

The AGV will pick up the container and transport the container into the vault.

Minivault Systems:

The individual trays are transported to the vault entrance either manual or via a conveyor system.

Inside the vault the container or tray will be transferred by the ASRS system and positioned into a free location. The Cash Management System will automatically select an optimized location, as this container or tray will be due for processing within predetermined time slots.

In a similar way new banknotes coming from the print works can be sealed and stored in the automated vault.

PROCESSING

Before the bank notes are returned back into circulation, the cash deposits are verified, sorted and repacked in bundles.

The central cash center scheduling system will use the deposit date of the unsorted containers and trays while creating a schedule for each processing room. The schedule will contain individual processing orders for each task in the processing room.

The schedule is also used for the automatic generation and sequencing of transports from the automated vault into the processing rooms. The ASRS and AGV's will receive the sequence from the Cash Management System and execute the transport orders.

The sorting rooms are equipped with single or multiple denomination sorting machines. The results can be directly imported into the Cash Management System from these machines using XML files. The classification into quantities 'fit', 'unfit' or 'reject' are used as input for the reconciliation process.

AUTOMATED PRE AND POST PROCESSING

PEC automates the handling in the processing rooms by introducing its automated pre and post processing equipment. These machines are automating the different tasks of the processing operators before and after the processing. Also the reject handling is tracked in detail by the Cash Management System in order to create a correct balance for the room. The system includes packing machines that are creating traceable cash packs, again identified by an ID. This ID can be printed and labeled onto each bundle.

After this process the sorted banknote cash packs are stored in an empty container. When the containers are full, they are automatically closed, locked and sealed. The AGV systems will return these containers back to the automatic vault.

All containers and trays are transported into the vault and will be identified as inventory.

As part of processing, the Cash Management System will create a full audit trail for all cash flows, including the fit, unfit and rejects. The system will track the destruction process as well.

CASH ORDERS

The scheduling system receives the electronic cash orders from the commercial banks and makes a picking schedule based on the available stock and transport plan from the CIT companies.

The picking orders are automatically prepared on beforehand. The work load is spread throughout the entire working hours of the cash center or even moved to the days before. When the CIT arrives the AGV will transport the prepared containers to the Paying and Receiving rooms for payout to the CIT's.

The deliveries are packed in shipping units, a bag, cassette or even a full container. The shipping units are closed, sealed and identified with a unique barcode or RFID tag. Additional process steps such as counting and blind counting can be scheduled as well.

The contents of each shipping unit can be sent electronically to the customers.



Cash Management System

During every step of the process, the MWare Cash Management System will organize, control and enforce the correct and timely execution of that step.

MWare combines all control functions in one solution, including:

- **Custody Management:**
Full traceability on cash holdings per room, per team..., using individual traceable cash packs in each cash center operation.
- **Inventory Management:**
Organization and control of all cash movements inside the cash center.
- **Operations Control:**
Full control over all automated and manual operations in the cash center.

This way MWare forms the ideal solution for managing your cash center.

PHYSICAL TRACEABILITY

MWare will allow you to create individual warehouse and warehouse locations for the different process and storage zones in your cash center. Each container or tray will always be associated to such a location, and every cash movement will be generated and tracked by the system. MWare will always know exactly on which location or on which transport system (e.g. AGV n° 4) the container is located.

The traceable unit, which we referred to before, is identified in MWare as a Unit. Depending on the implementation the Unit can be a bundle, a strap, a tray, a box, ...

BANK SECURITY

MWare helps you enforcing the security procedures in every step of the process. The system supports assignment of operators and supervisors to functional roles, and enforces registration of ID's and passwords during critical transactions.

The complete physical flow will be tracked with different statuses for each Unit in a container. Each status will symbolize the processing stage of the Unit. A Unit can be on a storage location, in transport, used as an input to a machine, used as an output on a machine, suspect, blocked, waiting to be proofed.... Each transition will only be possible via the MWare system, taking into account the needed user privileges.

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- Inventory and warehouse management
 - Full physical traceability
 - Detailed scheduling and optimization of cash center operations

This audit and trail capability will lead the way towards a paperless approach. Only this way, a cash center will get the full benefit of automated material handling and storage.

DETAILED SCHEDULING

MWare has an embedded scheduling system, which allows you to turn your customer requests, such as deposits and cash orders, into individual receiving, processing and picking orders. The system will use the available capacity to make a feasible plan, respecting shift patterns, maximum lead times and due dates.

Scheduling also prepares a team plan, including availability of resources. The schedule will automatically generate the material handling orders from the automated vault to the different processing and paying rooms.

RECONCILIATION AND CLEARANCE

In order to process the receipts and payments, the MWare system will be integrated with the central bank's accounting and Real Time Gross Settlement (RTGS) systems that control the daily relation between the central banks and the commercial banks.

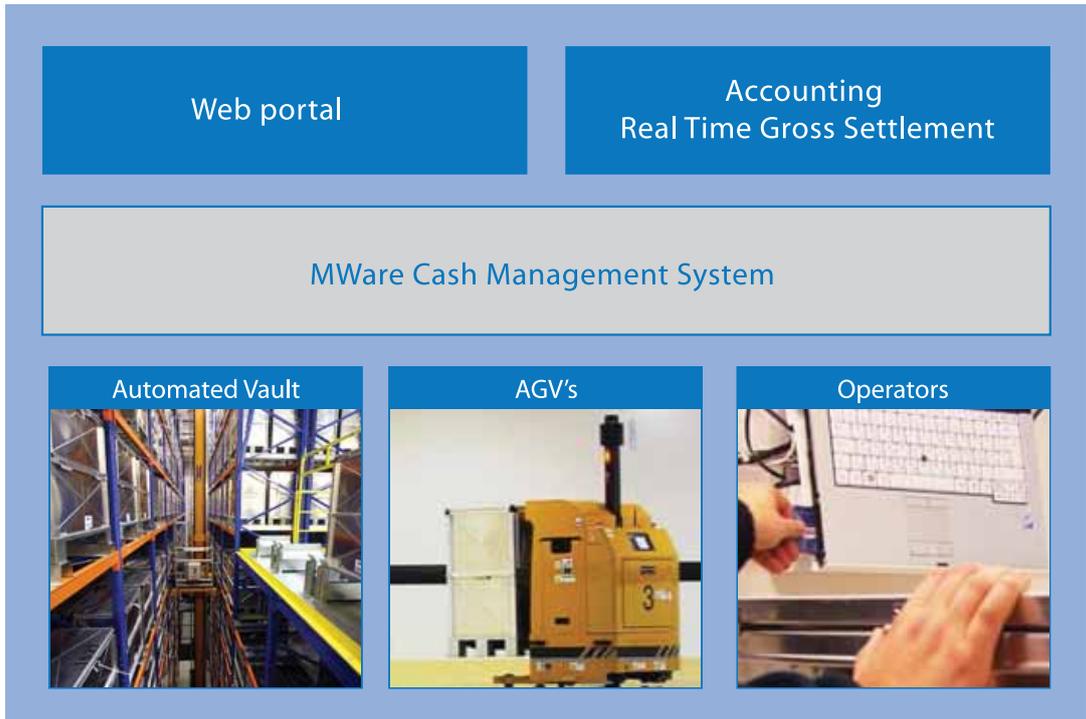
The communication is done via electronic messages. Typical messages include:

- . Advanced shipping notices sent from the commercial banks to the central bank
- . Delivery requests sent from the commercial banks to the central bank
- . Sorting differences sent from the central bank to the commercial banks
- . Picking/Shipping confirmations sent from the central bank to the commercial banks.

WEB PORTAL

MWare also includes a web based interface for the communication with commercial banks and CIT's. The system supports the announcements of deposit and payout orders, linking confidential CIT information....

- . **Automated integration with RTGS and Accounting**
- . **Paperless operating environment**
- . **Interfacing with cash processing equipment**



Automated Vault

CONTAINERIZED SYSTEM

For large Cash Center operations, generating high throughput in larger volumes, PEC delivers its solution based on containerized cash packages. The containers are typically holding between 100.000 to 500.000 banknotes, which increases efficiency in terms of material handling, storage capacity and density.

The heart of the system is the vault. The vault is the storage place for the sealed containers, loaded with coins or notes. An integrated automated storage and retrieval system (ASRS) will automatically pick up the containers, store them in the racks and finally retrieve them for processing or cash orders.

Using an Automated Storage and Retrieval System has a very positive influence on bank security and floor space. The unique concept of our ASRS design allows very dense 4-deep storage of coin and notes containers in a relatively small highly secured area.

The transport between the vault interior and the different processing and receiving rooms is done via AGV systems. The AGV's or Automated Guided Vehicles receive their transport tasks from the cash center management system, which will create, schedule and monitor the execution.

The combination of both automated material handling systems is preventing human vault access during the cash center operation hours, and creates a detailed physical trail of all cash movements in the cash center.

The management system controls every physical transaction on the cash and electronically enforces the bank security procedures. The management system supports and integrates all individual steps, such as cash receipts, cash orders, storage, sorting, bundling, canceling and destruction.

The management system works independent from, but is integrated with other central bank systems taking care for reconciliation, invoicing and clearance.

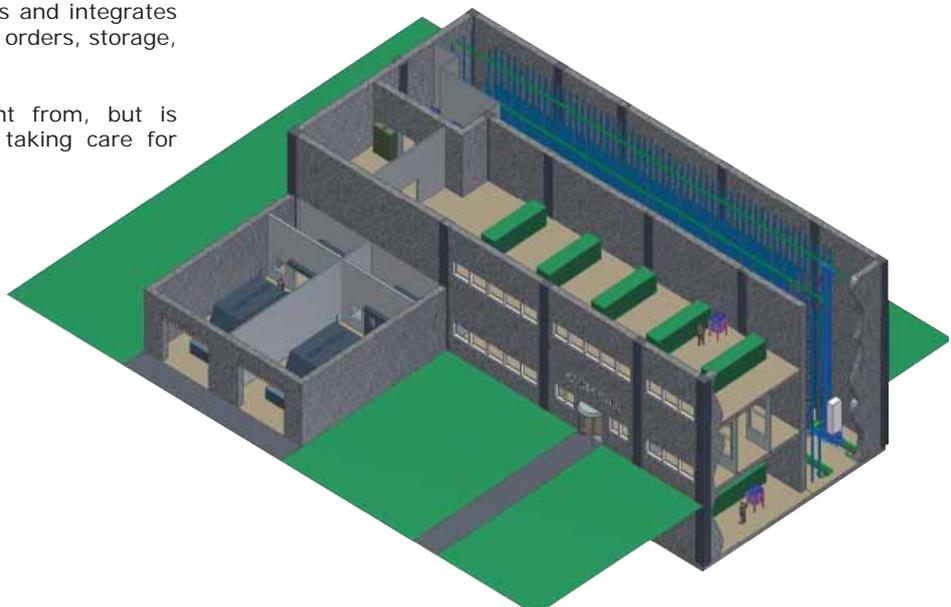
MINI VAULT

For Cash Centers handling smaller quantities or working more at retail level, PEC has developed a unique, automated, space saving and highly secured cash vault, using plastic trays or cardboard boxes as the individual packaging and material handling unit. A tray or box will typically hold 10 bundles, representing 10.000 banknotes. The system can also be used as a strategic storage system in remote areas.

Outside the vault the trays can easily be handled manually, or automatically via conveyor systems. Inside the vault the handling is completely automated by a high speed Automated Storage and Retrieval Systems (ASRS). This ASRS can handle the individual trays at a speed of 6 meter per second. The storage capacity can be tuned to the individual needs, by adding more ASRS aisles to the system.

The integration between the different areas of the cash center is done via the ASRS, as this system can pick and drop trays at different levels of the building.

The mini-vault systems can be combined with containerized systems in the same vault. In this case the mini-vault is used for automated order preparation.





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The Zero-Touch Cash Center

The ultimate goal in cash center automation is the elimination of all manual cash interactions in each stage of the process. This requires an integrated approach for the whole cash center instead of implementing island automation for e.g. the processing room.

PEC is offering the following standard solutions:

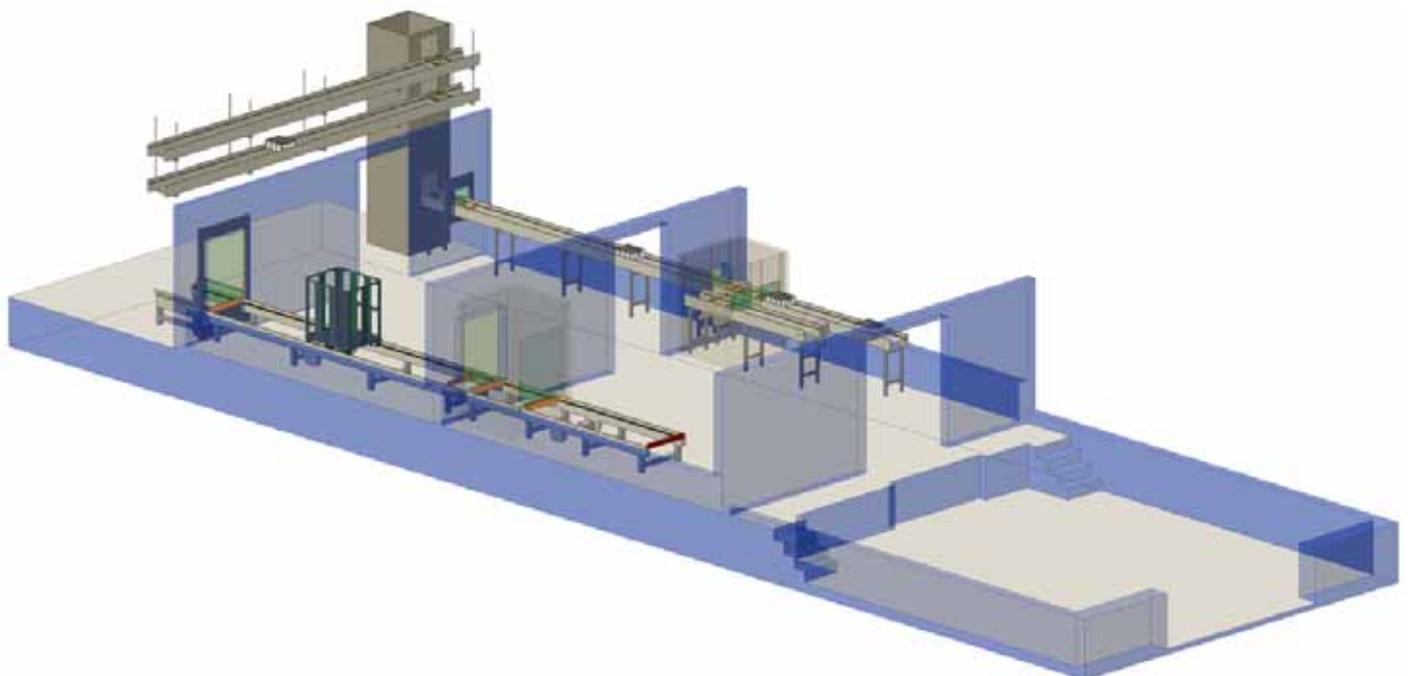
- . Self-service automated CIT docks for receiving and payout
- . Automated dock management
- . Centralized receiving conveyor and containerization
- . Automated material handling of containers and pallets by AGV's
- . Automated pre-processing
- . Automated post-processing, bundle and box packaging
- . Automated reject handling
- . Automated order picking and order preparation

These solutions are only feasible if they are controlled by a real-time Cash Management System. The MWare Cash Management System guarantees full traceability and accountability over the cash center inventory and its operations. Using barcode or RFID based bundle and box tracking, the automated systems are exchanging and checking real-time information with the Cash Management System. Any deviation will be detected immediately and will trigger alarms for the supervisors.

BUSINESS VALUES

The PEC Cash Center Automation Solutions create many advantages for the daily operations in a Cash Center:

- . The automated vault eliminates human access to bulk cash storage.
- . The automation level increases security in case of intrusion.
- . The ASRS optimizes the required floor space.
- . The automation reduces the operational cost.
- . The Cash Management System guarantees detailed traceability.
- . The system seamlessly integrates with Accounting and Real Time Gross Settlement.
- . The system eliminates all paper in the cash center.
- . The system seamlessly integrates with cash processing equipment.
- . The system supports RFID coded containers or boxes.





Automated material handling in all parts of the cash center

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