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DMS Education
Creative engineering for quality education

cell conveyor
& belt conveyor

built-in wifi
router

machine vision
by camera

DELTA robot
4 axis

cybersecurity

industry
4.0

breakdown box
troubleshooting on
smartphone

communication
wifi, bluetooth
sercos, ethernet
& optical fiber

hydropower
plant

reality
augmented
configurable

compaction
hydraulic
& pneumatic

A shop of
integrated spare
parts

**great diversity
of sensors**
weighing, ultrasound,
inductive, capacitive,
encoders, IoLink...

**ultra-detailed
3D modeling**
(inside cylinders,
hydraulic unit,
reducers etc...)

digital twin

**video
presentation**

Schneider ᵍElectric

COGNEX
vision

UNIT FOR THE RECOVERY
OF RECYCLABLE
MATERIALS

DESCRIPTION

This training support has been designed to acquire all the skills of maintenance training.

The Recyclable Materials Recovery Unit aims to automate the sorting and compacting of recyclable household waste (cans, caps, boxes, etc.)
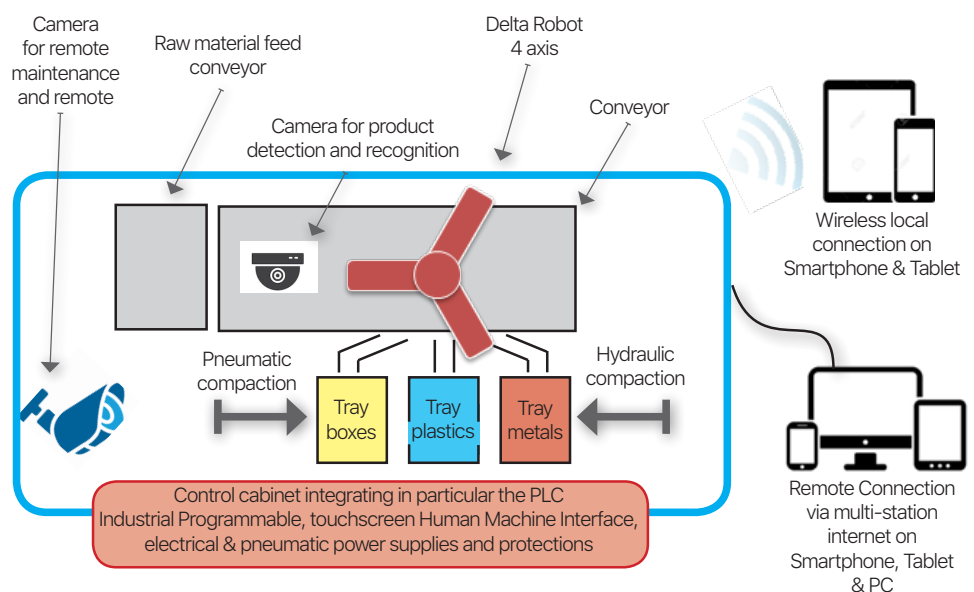
This multidisciplinary system addresses mechanical, electrical, hydraulic and pneumatic skills in the context of environmental issues.

A tablet serves as a user interface, and allows access to activities. These activities are presented in the form of dynamic PDF forms and include links to dynamic videos, photos, 3D plans.

In order to allow students to carry out the proposed activities in real conditions, the system called 'Unit for the recovery of recyclable materials' makes it possible to sort different types of common household recyclable waste (cardboard, metals, plastics) with :
- at the system input : the bulk material
- output: material sorted and compacted in 3 different bins.

This teaching aid makes it possible to conduct training sessions on a complete didactic system (integrating digital, communicating technologies, making it possible to respond to the problems of industry 4.0 and to link scientific and technical issues).

Sorting via a 4-axis DELTA Schneider robot.
Raw material : small cardboard boxes (cake packets type), plastic bottle caps (mineral water/sodas), ferromagnetic metal lids (jam jar lids & beer caps) & soda cans.
Compaction in the output bins: Pneumatic for cardboard, Hydraulic for metals, no compaction for plastic caps.

INDUSTRY 4.0

Augmented reality

▷ INDUSTRY OF THE FUTURE ◁

The Augmented Reality provided is a mobile application allowing diagnostic assistance and corrective and preventive maintenance.

The application allows dynamic visualization of specifications, electrical diagrams as well as real-time data coming from the PLC.

Possibility to: modify/build/use own AR with other workshop equipment.

the ✚ product

up to 3 pairs simultaneously on the system

engine maintenance, reducers, guide, arm... is rendered very accessible on this Delta Robot

augmented reality

digital twin

CMMS fully implemented + a cordless hand shower

one tablet to do it all :
① dremote HMI
② maintenance by AR
③ dynamic activities
④ access to technical documents
remote maintenance

The **Recyclable Materials Recovery Unit didactic system** makes it possible to approach the
activities and skills of the maintenance baseline, in particular:

	Activities	Use of the support / session
Pole 1 : Preparation, securing and closure of his intervention	**System Discovery** Preparing, securing and closing his intervention Objective: Discover the system in its environment: characteristics, dimensions, safety and materials.	Take charge of an intervention request generated by the CMMS. Identify the dangerous phenomena and the risks related to its intervention. Functional analysis (SADT, FAST,...)
	Getting started with the system Participate in the recommissioning of the system Objective: Take control of the system, discover the console and operating modes.	Collect the necessary items. Appropriate the different procedures (manual, automatic, degraded mode). Prepare the system for commissioning. Start the system, source the work.
	Study of the functional chain Preparing, securing and closing his intervention Objective: Discover and identify the functional chain: division into subsets.	Analyze the functional organization of the machine for selective sorting of recyclable materials. Decline service functions into technical functions. Show the different flows of energy, information and material.
	Study of the energy chain Preparing, securing and closing his intervention Objective: Discover and Study the energy chain..	Analyze the structural organization of the energy chain: Supply, Distribute-convert, Modulate, Store, Transmit, Act; Transmission and conversion of energy, constructive solutions.
	Study of the information chain Preparing, securing and closing his intervention Objective: Discover and study the chain of information.	Analyze the structure and organization of the information chain. Acquisition and processing of information. Analyze constructive solutions: TOR, digital, analog and intelligent.
	Appearance control and monitoring of wearing parts of the DELTA robot Monitoring activity Objective: Carry out a mission of monitoring and inspection of the sub-assemblies of the line.	Take charge of the request for intervention. Monitor the operation of the system by mobilizing the 5 senses. Carry out checks on the robot. Collect and report the control results on the CMMS.
Pole 2 : Preventive maintenance	**Conveyor Belt Settings** Systematic preventive maintenance activity Purpose: To check the tension and alignment of the conveyor belt.	Take charge of the work order. Secure his intervention. List maintenance support tools (CMMS, augmented reality), and/or manufacturer documents. Check the tension and alignment of the conveyor belt (Validation of Tracking between the camera and the robot). Analyze the various indicators, identify and correct any deviations if necessary.
	Replacement of the bearings of the telescopic axis of the delta robot Systematic preventive maintenance activity. Objective: To develop professional gestures.	Take charge of the request for intervention. Identify the component to be replaced. Become familiar with a technical manual written in English. Replace the component in accordance with the operating procedures. Deconsign or participate in the deconsignment of systems if necessary. Make settings.
	Check and replacement **Robot guide elements** Conditional preventive maintenance activity. Objective: Replace consumables that have reached their wear limit.	Take charge of a manufacturer's maintenance plan. Identify the elements to be replaced. Check the availability of parts (CMMS, general store). Study the disassembly (2D plan, 3D, ranges, augmented reality). Replace component. Adjust, check, test.
Pole 3 : Corrective maintenance	**Corrective maintenance activity** Diagnose failures. Discuss during the course of the intervention, face-to-face and remotely. Objective: Diagnose breakdowns (remotely)	Discuss during the course of the remote intervention. Establish the failure report. Collect data through the cloud, remote maintenance and connected sensors, communicating HMI. Issue and prioritize faulty chain and component hypotheses (exploit API and HMI info...). Validate the hypotheses of faulty components. Carry out the repair. Participate in the recommissioning. Feed, update the documentation, the CMMS.
	Corrective maintenance activity Perform troubleshooting, repairs. Report in writing, orally (updating the CMMS or the historical file of a system). Objective: Repair (face-to-face).	Check the hypotheses of faulty components. Carry out the repair. Exchange during the course of the intervention with the customer if necessary call after-sales service (customer advice). Participate in the recommissioning. Feed, update the documentation, the CMMS.
Pole 4 : Continuous improvement	**Continuous Improvement Activity: Connecting the System** Participate in improving the intrinsic safety of a system.	Observe and see the need for improvement (in the areas of reliability and/or maintainability and/or intrinsic safety of a system without changing the original function. Identify communication networks.
	Continuous improvement activity: installation of a connected detector Amendment	Study the specifications of the modification: choice of sensor. Realize the implementation of the modification: realize the sensor support thanks to 3d printing. Install the sensor.
	Continuous improvement activity Modernization	Analyze the need for modernization. Realize the implementation of the modernization. Use Augmented Reality to make the intervention on the hydraulic power plant more reliable. Analyze the risks of new technological solutions.

DIGITAL ACCOMPANYING DOCUMENTS

The system to be taught «Unit for the recovery of recyclable materials» is supplied with accompanying documents in digital form :

- A technical folder with the presentation of the system, its functional and structural description and its specifications. The technical characteristics of all the components are indicated there in a very exhaustive way. Detailed 3D models (interiors of the hydraulic unit and its accessories, interiors of cylinders & reducers...) are also provided.

- A complete educational folder, with dynamic practical activities completely written and corrected.

- A resources folder containing educational and technological resources, presenting additional information likely to enrich the scientific and technological culture of learners.

CMMS, Maintenance guides & 3D model

Augmented reality

TO ORDER

The Recyclable Materials Recovery Unit system is offered :

- Reference **BACMI3000** corresponds to the complete didactic system.
(The system, a tablet, augmented reality, the CMMS implemented with its scanner, the spare parts store with components allowing maintenance activities to be carried out)

- Reference **BACMI3020** for an additional hydraulic unit.
(for Assembly/Dismantling activities)

- Reference **BACMI3021** for an additional cell conveyor.
(for Assembly/Dismantling activities)

- Reference **BACMI3050** corresponds to the AMR robot complement. (Autonomous Mobile Robot)
- Reference **BACMI3060** corresponds to the digital twin complement.
- Reference **BACMI3070** corresponds to the IO-Link Pack add-on.
- Reference **BACMI3080** corresponds to the breakdown box complement.(Remote connection on web server)

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