



ErmaFlex #3&4

Polyprod

Multi-format packaging cell for dosing products
Liquids, Solids and Granules in pots or bottles

Polyprod at a glance

> Highlights & Key Activities :

- ✓ Production with campaign change
- ✓ Assembly, disassembly and mechanical adjustments
- ✓ Development and updating of a maintenance file
- ✓ Fault finding method
- ✓ Programming and diagnosis
- ✓ Recyclable consumables
- ✓ ASI fieldbus
- ✓ Technical documentation integrated into the CMMS "Access

> Particular components :

- ✓ 1 solid screw feeder
- ✓ 1 volumetric liquid dosing machine with membrane
- ✓ Cap distribution table
- ✓ Pick and place device for caps and screwing device for lids
- ✓ Pallet chain conveyor
- ✓ Control cabinet with M340 PLC and Siemens TP177 colour touch panel and ASI bus

References

- ✓ **PP30-PP38**: Polyprod with Schneider M340 PLC, Siemens TP177 colour touch panel and ASI bus
- ✓ **PP33**: Kit of components for maintenance work on the dispensing table (geared motor, table support wheels, tray drive shaft and fixing flange) and the Polyprod (pick and place rotary table, volumetric dosing unit, solid dosage counting disc + inductive sensor)
- ✓ **PP34**: ASI programming case
- ✓ **PP35**: ASI detection and beacon wiring kit (photoelectric sensors, buzzer, ASI connection interfaces, connection cables)
- ✓ **UC90**: Option: Fault box for electrical cabinet, remotely configurable on tablet (Not supplied)
- ✓ **TD30**: Distribution / accumulation table with speed variation
- ✓ **UC13**: Supervision
- ✓ **AE10**: Schneider M340 PLC with Asi bus and touch panel
- ✓ **EA60**: Environment 4.0 PLC + Polyprod Desk with 3D Digital Twin on Virtual Universe Pro
- ✓ **MN11**: Polyprod programmable digital mock-up
- ✓ **SK20**: Sick TDCE Smart IoT Gateway & Smart Sensors Kit for Polyprod Ermaflex
- ✓ **IO00**: IO-Link package for electrical and pneumatic measurements
- ✓ **UC51**: Option: Visual instructions & Monitoring of production indicators on the Tulip open application environment and touch pad, for one machine (with a 3-year subscription to Tulip Pro, €1170 excl. tax per year thereafter)
- ✓ **UC52**: Visual instructions option on the Tulip open application environment and touch pad, for one machine (with a 3-year subscription to Tulip Standard, €570 excl.)
- ✓ **DF00**: Industrial augmented reality solution DIOTA Tablet

CAP CIP, Bac Pro PLP - MSPC

BTS MS - IUT

Universities - Engineering schools

Trouble-shooting box



IoT Sick Pack



Functional description

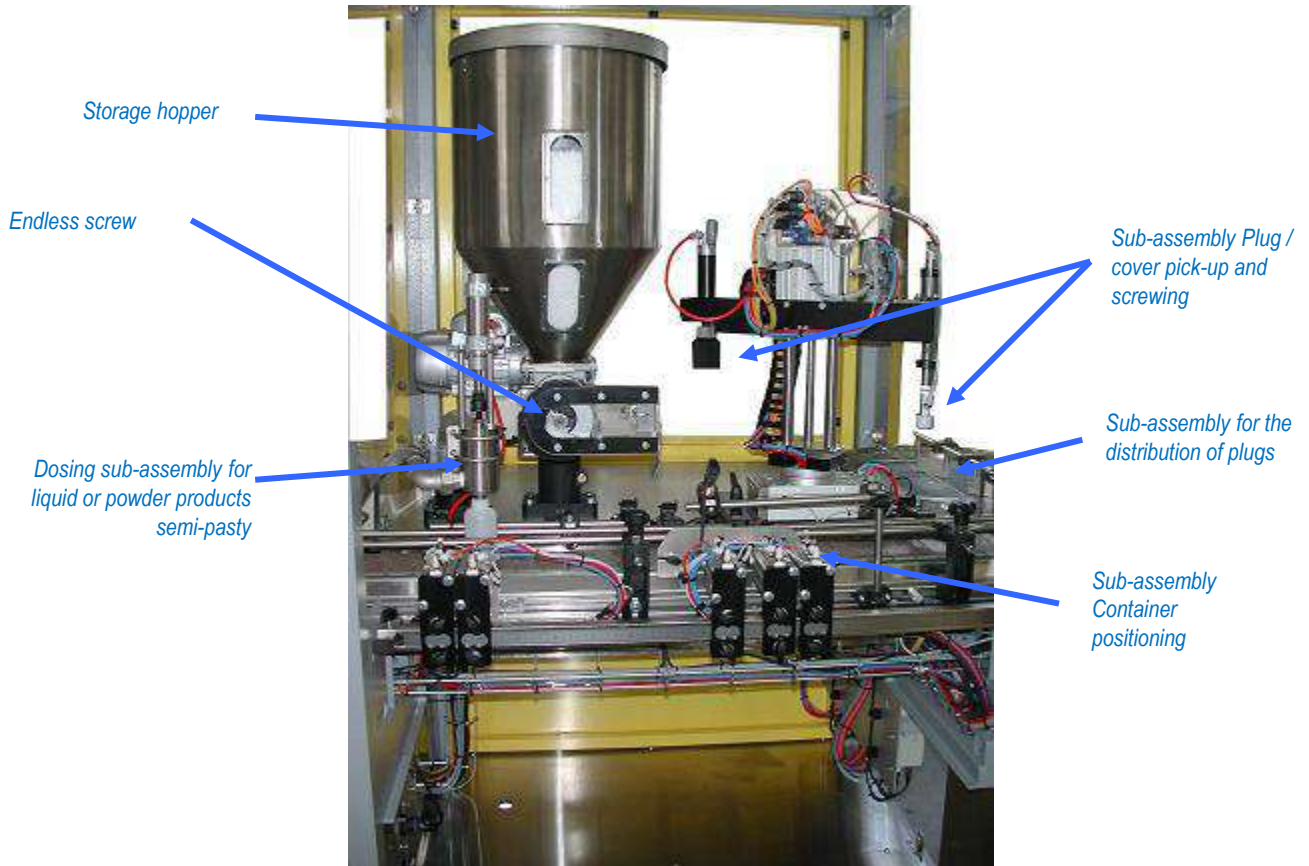
- ✓ The ERMAFLEX automated multi-format packaging cell is a system for dosing liquid, solid and granular products into pots or bottles
- ✓ The system provides 5 main functions:
 - Conveyance of **jars or bottles**
 - Packaging a **liquid product** in a bottle or jar
 - Packing a **solid product** in a jar
 - Distribute caps or lids
 - **Stopping bottles or jars by screwing on a stopper**



Polyprod cell integrated in the Ermaflex line

System architecture (continued)

Sub-assembly Distribution of solid products



- ✓ It is used to dose solid products (granular type) into pots
- ✓ It is mainly made up of:
 - A storage hopper
 - A worm gear with a three-phase asynchronous gear motor
 - An inductive sensor counting system



Cylinder "solid product outlet shutter".



Tank level sensor

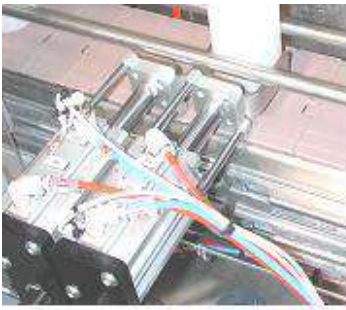
Dosing gear motor



Sensor "Encoder rotation worm".



Sub-assembly Container positioning



Cylinder "Entry, dosing lock" and
Cylinder "Stop in dosing position".



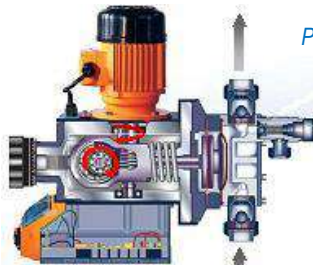
Double cleat cylinder "Entry and exit of screwing lock" + Cylinder "Indexing containing To screwing lock" + Cylinder "Clamping to screwing post".



Jam detector

- ✓ It allows the jars or bottles to be positioned under the dosing system.
- ✓ It is mainly made up of:
 - Two pneumatic cylinders
 - A pallet chain conveyor

Sub-assembly Dosing of liquid or semi-pasty products



Dosing pump

Product output



Cylinder "Liquid outlet shutter".

Product entry



Liquid tank level" sensor

- ✓ It is used to dose liquid or semi-pasty products into pots or bottles
- ✓ It is mainly made up of:
 - A positive displacement diaphragm pump
 - An electronic control system
 - Adjustable spout position

Sub-assembly for the distribution of plugs



Accumulation table for caps / lids



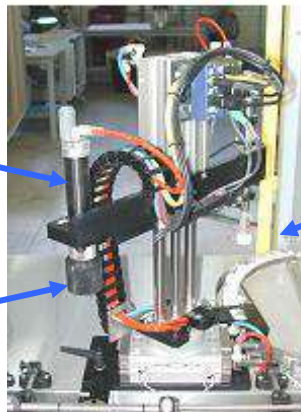
Cap dispensing magazine with screwing head for caps and containers in "bottle" format

- ✓ It allows the corks to be taken to the catching station.
- ✓ It is mainly made up of:
 - A turntable equipped with a torque limiter
 - A three-phase asynchronous gear motor driving the turntable
 - Adjustable guides to direct the plugs
- ✓ It is possible to connect a vibrating bowl to feed the corks (consult us for a quote)

Subassembly for taking and screwing on caps / lids

Pneumatic motor
"Rotation
screwing".

Screwing head



Cap gripper



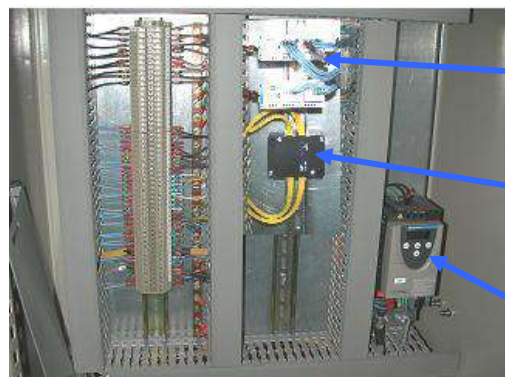
Rotating table "Pick
and Place".

Detector "Gripper cap at the
dispensing station".

Detector "Gripper plug at the
gripping station".

- ✓ It allows the caps to be taken from the tray, placed on the jar or bottle and then screwed on. The second operation is carried out in masked time.
- ✓ It is mainly made up of:
 - A rotary table for the rotation of the screwing gripper head
 - A double-acting pneumatic cylinder to raise and lower the gripper
 - A suction cup with a vacuum pump with a venturi effect
 - A pneumatic motor for screwing

Control cabinet



Remote relay inputs/outputs

Passive module for bus branching

Product conveyor drive



The programming of the ASiBus addresses is done with a specific addressing terminal (Option)

- ✓ It contains:
 - A disconnecting switch
 - A Préventa safety relay to manage the emergency stop
 - Fuse holders
 - A power supply to power the low voltage circuits outside AsiBus
 - An AsiBus power supply
 - Contactors and relays to control the various electrical actuators
 - A drive to control the speed of the conveyor
 - A Schneider M340 PLC with an AsiBus network coupler and an Ethernet switch
 - Terminal blocks



Pneumatic distribution

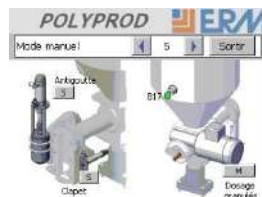
The system includes:

- 1 soft-start air handling system
- 2 AsiBus valve islands containing mono-stable and bi-stable valves
- 2 solenoid valves

Control panel

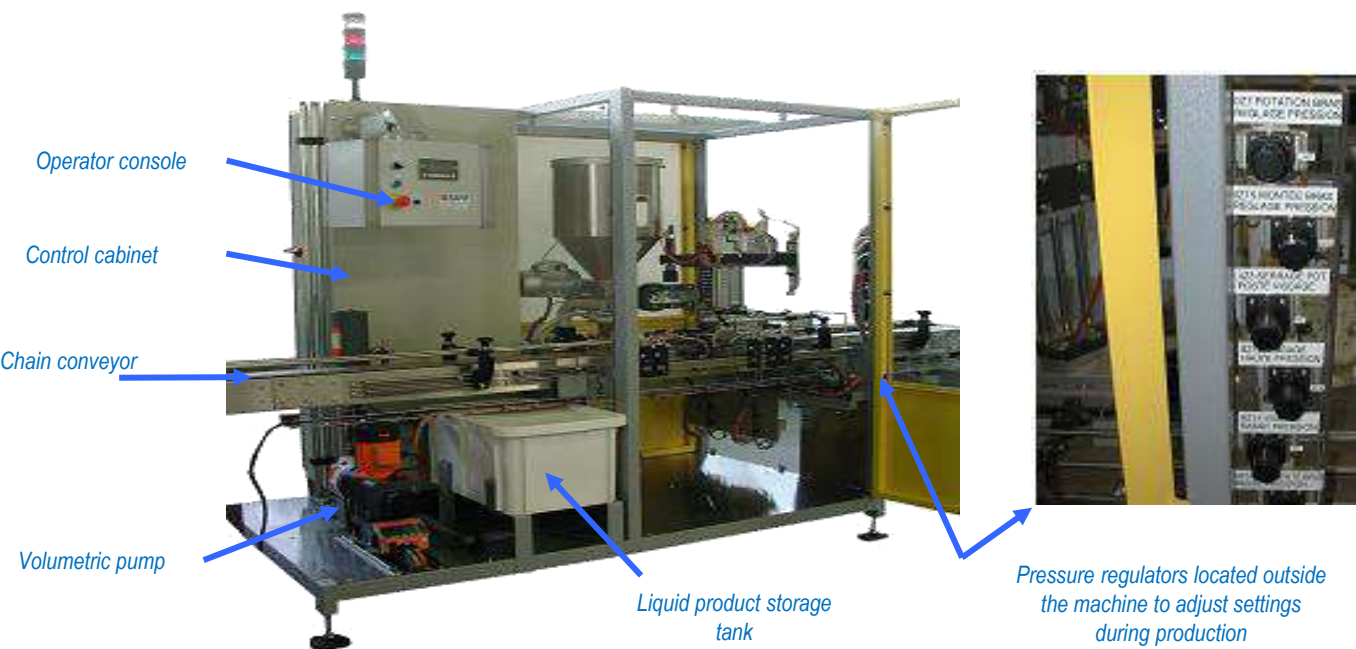
The system desk is a desk

It contains all the dialogue components for the system.



Features :

- ✓ L/ W/ H: 2750 x 1120 x 2300 mm
- ✓ Electrical energy: 400V three-phase + neutral
- ✓ Pneumatic energy: 7 bar
- ✓ Weight: 500kg
- ✓ Consumables: 100 jars, 100 vials, granules



Accessories for Practical Work

- ✓ 2x O-ring, 2x four-lobe seal
- ✓ Length of conveyor chain to pallet
- ✓ Flat suction cup
- ✓ 2x 2A fuses and 3x 4A fuses

Panned components for TP Diagnostics

- ✓ Double acting anti-rotation compact cylinder, D32mm, stroke 40mm
- ✓ NO reed sensor with display
- ✓ M18x60 PNP clear range energetic photocell 430mm
- ✓ Additive block 2NO+2NF
- ✓ 2/2 NC pneumatic solenoid valve
- ✓ Three-phase contactor
- ✓ Relay 24VDC



Options

Option Component kit for maintenance work (PP33)

Kit of components for maintenance work on the distribution table (geared motor, table support wheels, table drive shaft, etc.) and mounting flange) and the Polyprod (pick and place rotary table, volumetric dosing unit, solid dosage counting disc + inductive sensor)



Option: ASI programming case (PP34)

ASI programming case



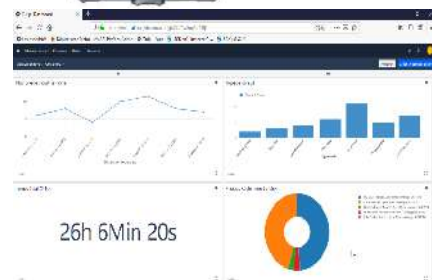
Optional Wiring Kit (PP35)

ASI detection wiring kit and audible beacon (photoelectric detector, e.g. optical sensor, buzzer, UPS connection interfaces, connection cables)



Options Visual instructions & Monitoring of production indicators on the Tulip open application environment and touch pad (UC51-UC52)

- ✓ Tulip is a web-based environment for creating applications on tablets and touch screens for the **digitalisation of workstations**
- ✓ Visual 0-paper intervention procedures
- ✓ Supervision of machines by OPC-UA to **retrieve production data**
- ✓ Declarations of **production stoppages and defects**
- ✓ Suggestions for **continuous improvement** by operators
- ✓ 0-paper control thanks to **connected tools** (Scale...)
- ✓ Dashboards for monitoring **production indicators** (OEE, output, etc.)
- ✓ Easy to modify applications and create new ones (100% graphical)
- ✓ Implementation of lean manufacturing concepts (Andon, 5S...)



www.erm.li/tul



Driving assistance



Production order & preparation for a production launch



Change of format

Sick TDCE Smart IoT Gateway & Smart Sensors Kit for Ermaflex (Ref: SK20)

- ✓ The Sick TDCE Smart IoT Gateway & Smart Sensors Kit for Ermaflex and Unbundler (Ref: SK20) contains:
- ✓ 1 Sick Smart IoT Gateway TDC-E200EU
- ✓ 1 IO-Link master communicating with Node-RED to create a dashboard and generate alerts
- ✓ 1 IO-Link USB Master Kit for parameterisation of IO-Link components
- ✓ 1 IO-Link photoelectric sensor
- ✓ 2 Digital photoelectric sensors
- ✓ 2 Temperature sensors with IO-Link signal conditioners
- ✓ 1 Vibration sensor
- ✓ 1 IO-Link compressed air meter (for leak detection)
- ✓ 1 MODBUS TCP electrical energy meter



SICK
Sensor Intelligence.

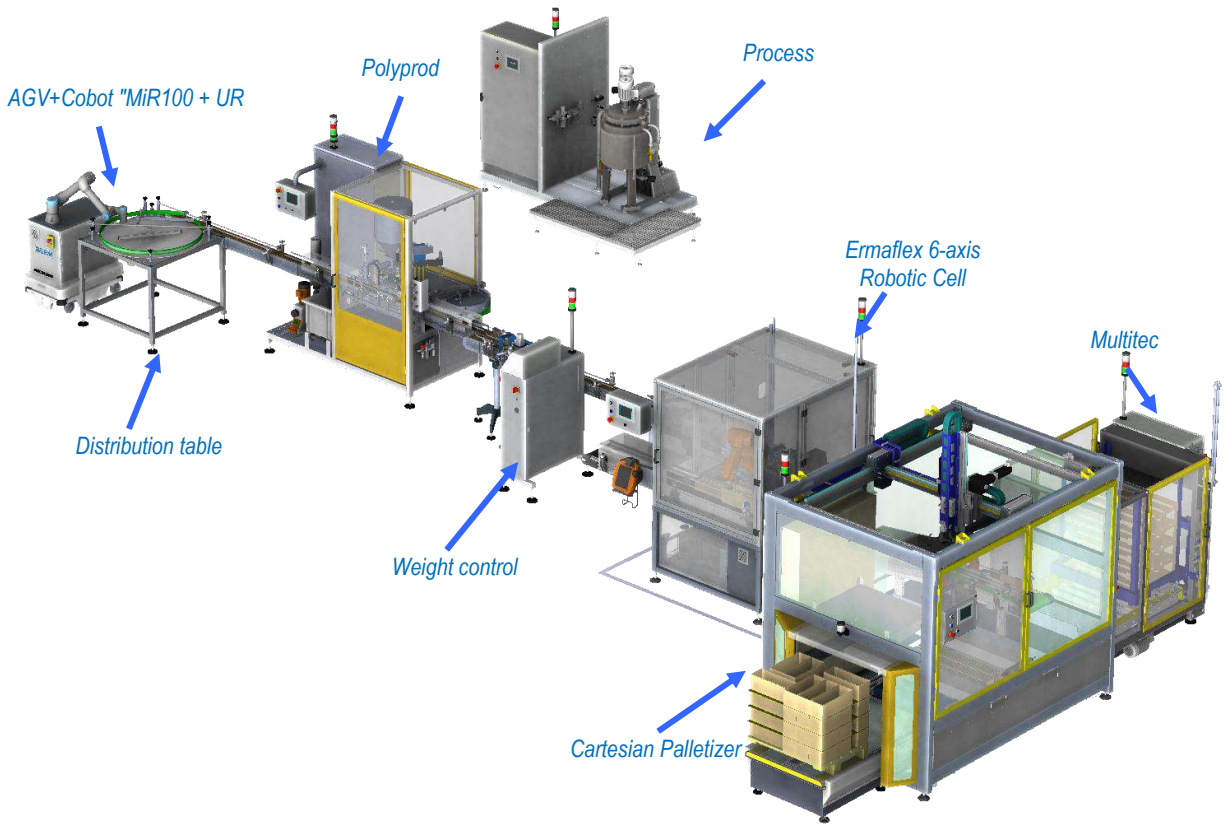


Thanks to the detailed operating procedures proposed for each machine below, the activity of deploying Industrial IoT monitoring on an industrial system is accessible from the Bac PRO level.

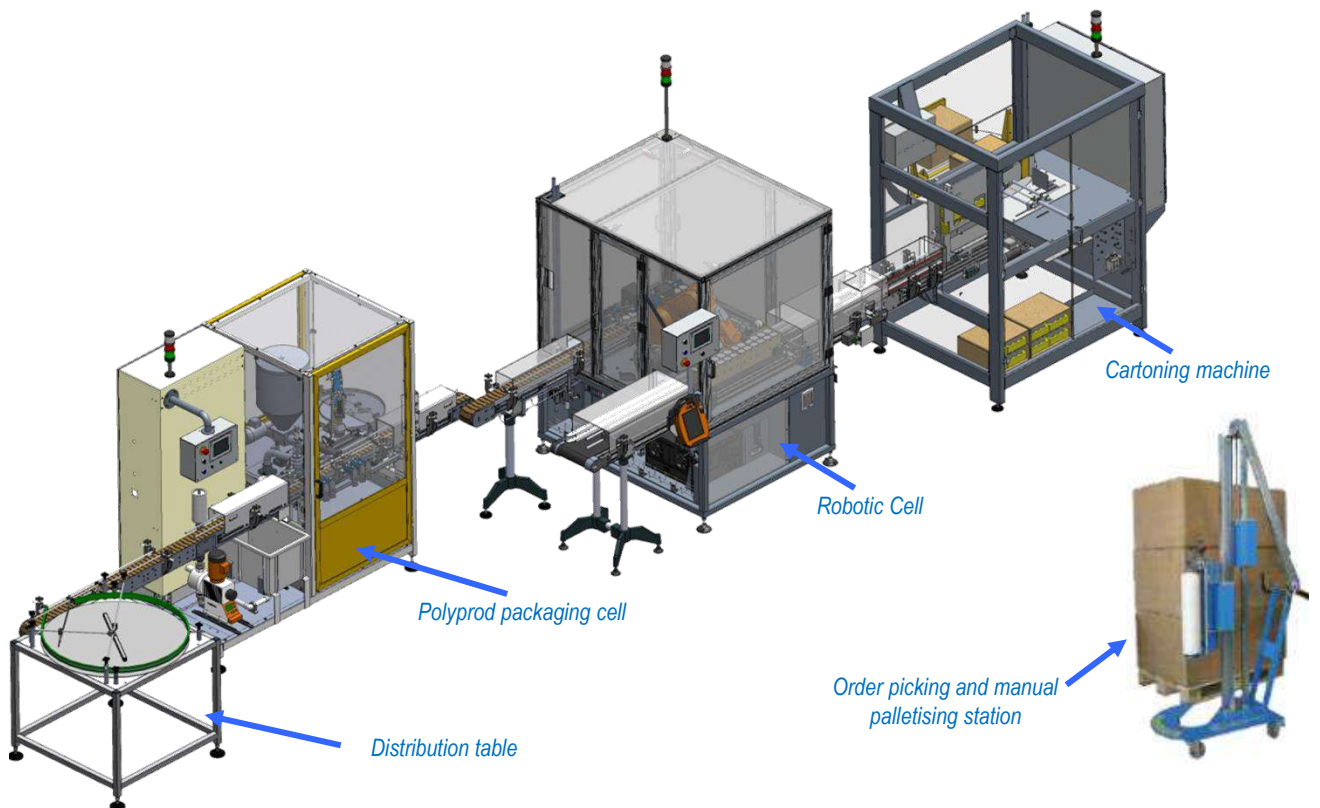
www.erm.li/sk10



Polyprod integrated in the Ermaflex line



Polyprod integrated in the Ermaflex R line





Related and complementary products

PLC & Touch Panel + Digital Twin in VU Pro)



Programming in Schneider and Siemens environments and then simulation in the digital twin

Smart IoT Sick TDCE & Smart Sensors Case (SK00)

The Smart IoT Sick TDCE & Smart Sensor Gateway Toolkit contains several industrial smart sensor application cases.



SICK
Sensor Intelligence.

www.erm.li/sk00

IO-Link package for electrical and pneumatic measurements (IO00)

Study and implementation of an energy measurement system, communicating and IOT compatible



www.erm.li/io00

Ethernet IO-Link Master Kit, Supervision & IO-Link Sensors (IO01)

Design and implementation of IO-Link master and IOT compatible sensors



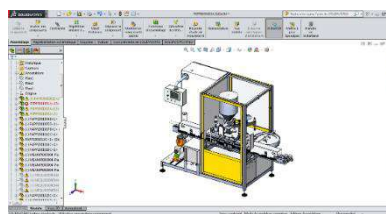
www.erm.li/io10

Augmented reality DIOTA

- Industrial augmented reality solution for manufacturing, maintenance and quality
- Scenario on the Polyprod system, Multi-format packaging (dosing and sealing of liquid and granulated products in pots or bottles)

DIOTA
AUGMENTING INDUSTRIES

www.erm.li/dio





Pedagogical approach

General educational activities

- ✓ Functional analysis of the system
- ✓ Study of electrical, pneumatic and mechanical technologies
- ✓ Study of constructive solutions (Solidworks files)
- ✓ Controlling a system
- ✓ Analysis of system performance
- ✓ Assembly, disassembly, adjustment of the operating part
- ✓ Change of campaign
- ✓ Development and updating of a maintenance operating file
- ✓ Partial or complete programming of the operating cycle
- ✓ Diagnostics & production

Practical work proposed by ERM Automatismes

TP1: Setting the dosing unit (Dosing pump)

- ✓ Learn about the operation of the dosing pump
- ✓ Learn about the Batch and Contact modes of operation
- ✓ Calculate parameters for production data
- ✓ Set up and adjust for production data

TP2: Measuring the dispersion of the dosing unit

- ✓ Setting the scene
- ✓ Preparation of the workstation
- ✓ Measurement of the tare weight of each bottle
- ✓ Preparation of the dosing machine
- ✓ Filling of 100 bottles in automatic mode
- ✓ Vial weighing and data capture
- ✓ Interpretation of results

TP3: Preventive maintenance

- ✓ Preparation of the intervention
- ✓ Pump removal
- ✓ Diaphragm removal and installation
- ✓ Removal and installation of valves
- ✓ Installation of the dosing unit
- ✓ Re-installation of the pump and recommissioning

TP4: Troubleshooting (Faulty contactor)

- ✓ Setting the scene
- ✓ Establish the precise nature of the failure
- ✓ Identify the faulty function
- ✓ Identify and list the components related to the failure of the function
- ✓ Locating the fault
- ✓ Assess the component, propose a diagnosis
- ✓ Trigger a corrective maintenance intervention

TP5: Troubleshooting (Faulty pneumatic valve)

- ✓ Setting the scene
- ✓ Establish the precise nature of the failure
- ✓ Identify the faulty function
- ✓ Identify and list the components related to the failure of the function
- ✓ Locate the fault
- ✓ Assess the component, propose a diagnosis
- ✓ Trigger a corrective maintenance intervention

Teaching scenario sheets: Examples of practical exercises to be created from the ERM Automation framework

- ✓ **Practical production management activities**
 - Worksheet 17: Level 1 maintenance: Cleaning the unit in accordance with good practice. (the procedure, the products, the risks)
 - Worksheet 18: Level 2 maintenance: learning to formulate a usable pre-diagnosis for maintenance.
 - Sheet 19: Controlling Polyprod with a production control chart
- ✓ **Practical maintenance activities**
 - Sheet 1: Corrective maintenance (degraded additive contact block)
 - Sheet 2: Improved maintenance (Implementation of a control device for uncapped bottles at the exit)
 - Sheet 3: Corrective maintenance (Replacement of wearing parts of the dosing pump)
 - Sheet 13: Preventive maintenance (Analysis and improvement of the quarterly preventive maintenance visit)
- ✓ **Automation**
 - Sheet 4: Learning and experimentation (Testing all run and stop modes and extracting the corresponding loops from the GMMA)
 - Sheet 5: Improving maintenance (Finding a solution to a defect and making the software change)
 - Sheet 6: Learning and experimentation (Writing first-level maintenance sheets for pneumatic action chains)
 - Sheet 8: Learning and experimentation (Study of the transition to category 3 of emergency stop management)
 - Sheet 10: Improved maintenance (Insufficient reliability of the screw revolution counting device)
 - Sheet 11: Improved maintenance (Adding a fault to the operator panel program)
- ✓ **Electrical engineering**
 - Sheet 9: Learning and experimentation (Implementation of the grid connection and electrical checks)
- ✓ **Functional and structural analysis**
 - Sheet 12: Design and representation of the support for the 2 control sensors of Sheet 2)
- ✓ **In-training assessment for maintenance**
 - Sheet 14: First evaluation situation (Diagnosis on faulty contact, PLC output not relayed and dosing unit not controlled)
 - Sheet 7: Second assessment situation (Replacement of a failed variable speed drive)
- ✓ **In-service assessment for production management**
 - Worksheet 15: Maintenance, adjustment, start-up, shut-down of an automated production system: Replacement of the diaphragm on the liquid dosing pump, then adjustments for restarting production
 - Sheet 16: Operation in degraded mode of an automated production system, evaluation of results, participation in improvements: In normal production, operate the polyprod, record values (tightening of caps or dosing) in accordance with a procedure.



Virtual Indus "Maintenance

Virtual reality training unit for industrial jobs
(Production, Maintenance, Electrical engineering, Energy...)

Video on



Virtual Training Module: Maintenance & Diagnosis of the Polyprod dosing / capping cell

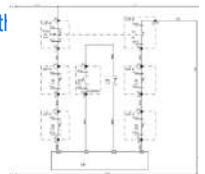
- ✓ The main objective of this module is to carry out a diagnosis (corrective maintenance)

SEQUENCE 1:

- **Situation:** The line driver alerts the maintenance department and sends them a fault report. A problem has been reported on the Polyprod machine. The man/machine interface indicates an alarm message: "LACK OF CAP" while the operator reports that there are caps on the cap distribution table. As a BR qualified maintenance technician, you are required to identify the problem.

SEQUENCE 2:

- **Situation:** A problem has been reported on the Polyprod machine. The alarm message: "EMERGENCY STOP" is displayed but it that he has not pressed the emergency stop. As a BR qualified service technician, you are asked to identify the problem.



SEQUENCE 3:

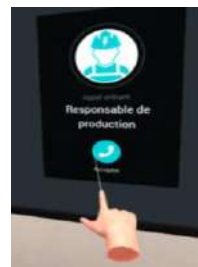
- **Situation:** A problem is reported on the Polyprod: when the machine is switched on, the HMI does not light up and the and the warning beacon remains off. Resetting is impossible. However, the dosing pump is visibly undervoltage as well as the sensors of the operating part. The I/O modules are also undervoltage but faulty. As a BR qualified service technician, you are asked to identify the problem.

Objectives:

- Establish the diagnosis and identify the defective components

Learner activities :

- Be informed: "Gather all information about the state of the system".
- Identify the faulty function
- Hypothesise failures: components likely to be faulty
- Locate test points and expected values: voltage measurements
- Identify the risks associated with the activity
- Equip and implement the E.P.I.- E.P.C. - E.I.S.
- Carry out tests, measurements and controls
- Interpreting the results
- Identify defective components



POLYPROD		ERM	
E	MOD 1	MOD 1	
n	I1.1V0.0.0	I1.2V0.0.0	
L	I1.1V0.0.1	I1.2V0.0.1	
F	I1.1V0.0.2	I1.2V0.0.2	
S	I1.1V0.0.3	I1.2V0.0.3	
E	MOD 2	MOD 3	
n	I1.1V0.0.0	I1.1V0.0.0	
L	I1.1V0.0.1	I1.1V0.0.1	
F	I1.1V0.0.2	I1.1V0.0.2	
S	I1.1V0.0.3	I1.1V0.0.3	
E	MOD 4	MOD 5	
n	I1.1V0.0.0	I1.1V0.0.0	
L	I1.1V0.0.1	I1.1V0.0.1	
F	I1.1V0.0.2	I1.1V0.0.2	
S	I1.1V0.0.3	I1.1V0.0.3	
E	MOD 6	MOD 7	
n	I1.1V0.0.0	I1.1V0.0.0	
L	I1.1V0.0.1	I1.1V0.0.1	
F	I1.1V0.0.2	I1.1V0.0.2	
S	I1.1V0.0.3	I1.1V0.0.3	



Reference :

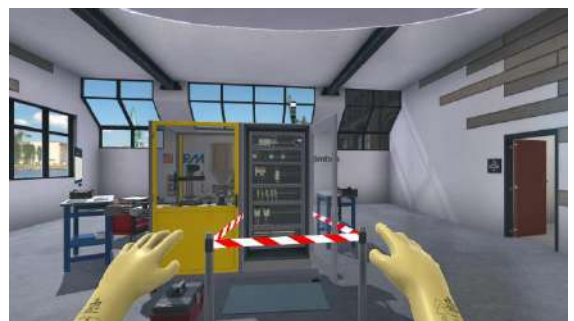
VS010-03-1 : Virtual Indus Training Module: Maintenance & Diagnosis of the Polyprod dosing/capping cell => Unit cost for one licence

Variants are available for several licences for the same establishment - Please contact us

www.erm.li/vim



Virtualised Polyprod packaging system



Virtual Indus "Production

Video on
**YOU
Tube**

Virtual training module: Production control of the Polyprod dosing / capping cell Statistical Process Control SPC1 (sampling procedure - drift observation - dosing machine adjustment)

✓ The main objective of this module is to **monitor production related to the analysis of indicators, production parameters and product specifications**

✓ **Setting the scene:** the packaging company must produce bottles of liquid for a customer. The airline pilot must ensure the conformity of the order with the customer's specifications (amount of product in the bottles).

✓ The training module is composed of **3 sequences:**

Sequence 1: Collection procedure

- **Objectives:** To carry out a **sampling procedure** to calculate the average and range of products packaged on the production line and then interpret the results. This procedure uses control charts and graphical representations of results

Sequence 2: Observation of the drift

- **Objectives:** Carry out **statistical controls** during production. **Observe, qualify and anticipate** the results of indicators in order to **Identify a drift** in production. This activity implements control charts (monitoring limit, control limit, zone of (e.g. normality, enhanced surveillance and out-of-control) and the notion of drift

Sequence 3: Setting the dosing machine

- **Objectives:** To **control the production line** by carrying out statistical checks on control charts in order to identify any drift. **React to the fault found and decide to adjust the metering pump** with the decision. This activity implements the control charts, the drift and the decision support table

✓ **Reference :**

VS10-01-1: Virtual Training Module: Production Control of the Polyprod Dosing/Capping Cell => Statistical Process Control SPC1 (3 teaching sequences: Sampling procedure - Observation of the drift - Adjustment of the dosing machine) - 1 licence

Variants are available for several licences for the same establishment - Please contact us



Virtualised Polyprod packaging system



TABLEAU SPC		CARTE AUX MOYENNES		CARTE AUX ETENDUES	
PRÉLEVEMENT N° 4					
Moyenne cible	13,18 g	Moyenne cible	12,41 g	Moyenne cible	13,7 g
Moyenne limite	111,64 g	Moyenne limite	123,17 g	Moyenne limite	112,89 g
Moyenne réelle	88,28 g	Moyenne réelle	99,98 g	Moyenne réelle	88,24 g
Moyenne	88,71 g	Fluctuation		1,40 g	Delta
<input type="checkbox"/> Aucune action <input type="checkbox"/> Ajuster les paramètres <input type="checkbox"/> Réajuster <input type="checkbox"/> Contrôler la qualité		<input type="checkbox"/> Réajuster les paramètres <input type="checkbox"/> Réajuster la qualité <input type="checkbox"/> Réajuster la production		<input type="checkbox"/> Réajuster les paramètres <input type="checkbox"/> Réajuster la qualité <input type="checkbox"/> Réajuster la production	

Virtual training module: Production control of the Polyprod dosing / capping cell Statistical Process Control SPC2 (Dosing machine qualification - Control card control)

✓ The main objective of this module is to **control a production line using control cards**

✓ **Setting the scene:** the packaging company produces bottles of liquid for a customer. The airline pilot must ensure compliance the customer's order in relation to the customer's specifications (amount of product in the bottles).

✓ The training module is composed of **2 sequences**

Sequence 1: Qualification of the dosing machine

- **Objectives:** To carry out **statistical controls** by sampling in order to monitor the significant steering indicators, machine parameters and product. **Optimise and qualify the settings and validate the production.** This procedure implements the control charts (limit of This is the case for the different types of monitoring (e.g. surveillance, control, normal, enhanced and out-of-control), graphical representations and drift.

Sequence 2: Control card piloting

- **Objectives :** **Control the production line with control charts. Adjust** production parameters and **correct** drifts. This activity implements control charts and the notion of defect

✓ **Reference :**

VS10-02-1 : Virtual training module : Production control of the Polyprod dosing/capping cell => Statistical Process Control SPC2 (2 teaching sequences : Qualification of the dosing machine - Control by control cards) - 1 licence

Variants are available for several licences for the same establishment - Please contact us



www.erm.li/vip



"Habilitation B1V, BR, BS, B2-BC

Virtual reality training cell for electrical clearance according to NF C 18-510

Electrical accreditation & ERM Virtual Indus "Accreditation" virtual training unit

Virtual Indus Habilitation is a variation of Virtual Indus with 3D scenarios for acquiring and consolidating practical skills combined with theoretical knowledge related to electrical habilitation.

In order for electrical authorisation to be issued by the employer in accordance with standard **NF C 18-510**, the employer must ensure that the employee has received theoretical and practical training to provide knowledge of the risks associated with electricity and the measures to be taken to intervene safely when carrying out the operations entrusted to him.

The electrical qualification is divided into two main stages:

- Acquisition of theoretical knowledge
- Acquisition of practical skills.

Virtual Indus Habilitation was designed with this in mind, i.e. it allows learners to apply **practical skills** (know-how and interpersonal skills) during theoretical training with the "right to make mistakes" without risk to themselves or the equipment. Virtual Indus Habilitation places the learner at the heart of this training and allows the trainer to "rediscover" his or her teaching role.

Virtual Indus Habilitation is not a substitute for practical activities in a real situation, but it is the **accelerator for acquiring reproducible and transferable behavioural automatisms in reality**.

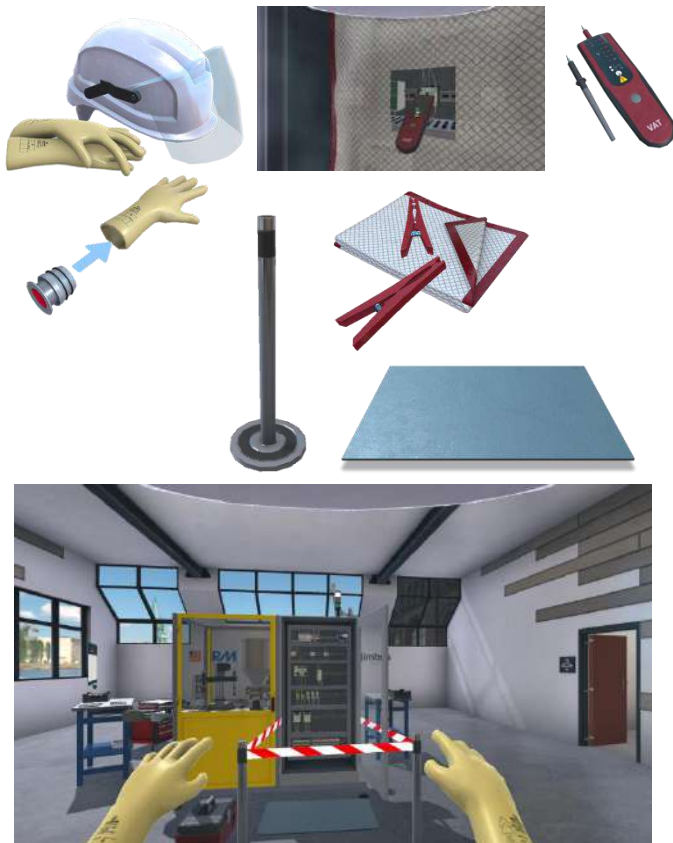
Virtual Indus Habilitation is available with the Electrical Habilitation training modules:

- ✓ For **B1V electricians** (working on an industrial system)
- ✓ For **those in charge of basic BS interventions** (activity on a tertiary installation and activity on an industrial electrical cabinet)
- ✓ For **general intervention officers BR** (activity on an industrial system)
- ✓ For **B2 - BC work and consignment officers** (activity on an industrial system)

Other empowerment training modules are currently being developed. Please contact us

www.erm.li/vie

All the modules provided include contextualised scenarios with practical activities that have a wider purpose than just electrical clearance tasks.



Regulation & Virtual Indus " Habilitation

The **Virtual Indus Habilitation** training modules have been designed and developed with expert trainers with reference to official documents:

- ✓ **Standard NF C 18-510** "Operations on electrical installations and structures and in an electrical environment - prevention of electrical risk",
- ✓ **Decree no. 2010-1118 of 22 September 2010** on operations on electrical installations or in their vicinity
- ✓ The guides associated with this standard :
 - **UTE C 18-510-1** "Recueil d'instructions de sécurité électrique pour les ouvrages" for operations on structures (electricity transmission and distribution networks)
 - **UTE C 18-510-3** "Electrical safety requirements for operations carried out on electrical installations or in their environment (excluding electricity production installations)
 - **UTE C 18-531** "Electrical safety requirements for personnel exposed to electrical risks during non-electrical operations and during simple electrical operations
 - **UTE C 18-540** "Electrical safety requirements for low-voltage operations on installations and structures not under voltage".

Stay informed about our new products

