AFB factory hybrid production
AFB – The modular concept factory for all hybrid production tasks

The learning system for all processes associated with production automation and process automation:
- Production
- Handling of seals
- Packaging
- Filling
- Transportation and routing
- Storage
- Input/output

The ideal solution for hybrid production process requirements in the food sector. The platform connects stations and elements from the MPS® Modular Production System with stations from the MPS® PA learning system and the Compact Workstation.

The system is therefore completely modular and new processes and training content can be added gradually. Project work with hands-on training can take place at individual stations, on partially integrated production lines and in a fully integrated learning factory.
Megatrend: Hybrid automation

It's a fact that production and process automation have become inseparable in almost all manufacturing environments. Hybrid automation represents the convergence of production and process automation which is more than logical, given the trend towards convergence of the two automation techniques in the so-called hybrid industries.

Hybrid industries are the industries which require systems and solutions for both process and production engineering. The most striking examples are the food, confectionery and tobacco industries and the pharmaceutical industry.

Whether process and production oriented, or hybrid production, Festo Didactic training factories offer a unique range of facilities for training in automation for all industries – from incoming goods, through process and production engineering departments, to outgoing goods.
The mix is the key
Mechatronics is also making its mark outside production automation. Intelligent drive solutions, featuring high-precision mechanical components, a range of different drives, measured data acquisition and evaluation as well as integrated communications interfaces, ensure safe, optimised process automation too.

Flexibility
Making processes more flexible, systemising product quality, responding faster to new market trends – the drinks industry has much more to do in this day and age than merely quenching our thirst. On the one hand there is a need to establish and maintain a broad product spectrum and introduce new products in order to generate new demand, while on the other, legislation is increasingly demanding greater transparency of manufacturing processes.
Innovative technology and innovative learning

Innovative technology
Pneumatic and electric drive technology from Festo is a byword for innovation in industrial and process automation – from the single product through to the turnkey solution. With the AFB training factory we are for the first time delivering a learning environment which consciously incorporates trends and innovations from all areas of automation technology:

- Electric and pneumatic linear drive units
- Semi-rotary drives and grippers
- Valves and valve terminals
- Sensors
- Vision and control systems

The AFB training factory is designed and equipped like a state-of-the-art industrial plant, based on the automation know-how and engineering experience of Festo.

Innovative learning
Only by engaging in innovative learning using innovative technology can trainees be optimally prepared for their future work. Comprehensive documentation, software tools for simulation and visualisation and a variety of WBTs complete the AFB range of facilities.
In focus: the production process for six-packs

Six-packs are produced in four zones of the hybrid training factory. The following processes are mapped:
- Production of the liquid
- Production and feed of the caps
- Bottle feed
- Transport
- Packaging
- Storage
- Order compilation
- Logistics
The production zones

Zone 1

Process automation

Filtering, mixing, temperature control; recording, evaluating and controlling typical process variables such as temperature, level, pressure or flow rate; pumping fluids; shutting off pipelines; installing, commissioning or maintaining butterfly valves, slide valves or ball valves. These are just some examples of the wide variety of possibilities in this section of the training factory.

Specialist knowledge of programming, such as recipe preparation, or of plant documentation, such as reading and drafting R-I flowcharts or EMSR location diagrams are key focus areas in the training. Control technology plays a key role in process automation, in order to ensure high product quality. The processes selected for the training factory and the transparent design of the stations enables control technology to be taught in a practical and visual manner.

Zone 2

Filling and packing

Not only dosing, filling, capping and packing, but also the acquisition, storage and reliable management of product and quality data are key tasks in this section of the training factory.

Technologies such as RFID are becoming ever more prevalent in the production environment, in order to cope with the continually increasing number of product variants and to comply with the more stringent legal requirements in terms of product quality in the food or pharmaceuticals sector. Full recording of all ingredients or components used and the factors influencing the manufacture of a product must be ensured. Vision and sensor systems also play a key role in improving product quality and production flexibility.

In the training factory, for example, the position and fill level of each bottle and the state of completion of each lot is recorded by various optical sensors and a high-speed camera. The production data can be fully tracked by means of RFID tags in the bottle caps. A range of automation components, such as belts with electric drives, various handling units, programmable logic controllers and the latest operator control and monitoring tools, trainees are provided with an ideal platform to learn these key aspects.
Zone 3
Production automation

Fast cycle times, part gripping, handling, detection, differentiation, separation and mounting are characteristic features of production automation – the classic world of the mechatronics engineer. Programming controllers, adjusting sensors, operating, maintaining and servicing individual lines in a plant are typical activities.

In the training factory in this section the caps are produced, tested and fed to the bottles by the filling station. Programmable logic controllers monitor and control the production process. Various sensors record the end positions of the actuators or identify and differentiate between the work-pieces. Typical actuators used in production automation, such as linear cylinders, swivel cylinders, motors, parallel grippers or vacuum suction cups ensure fast, precise movement.

Zone 4
Transport and logistics

Almost all production facilities need logistics functions such as materials transportation or warehousing. At the AFB training factory, too, this is a key aspect: Empty six-packs have to be conveyed to the order compilation station or placed in storage. Completed six-packs are delivered just in time, or stored in an interim facility.

Chaotic or systematic warehousing, optimisation of the material flow, planning and prioritisation of orders are the key areas of focus in this section of the factory.

Particular demands are placed on line automation in this section too, however:

– Signals from the transport systems must be sent over long distances to the transport controller.
– High-performance drive units and positioning systems ensure fast, precise movement in the automatic warehouse.
– The communications required for this are based on systems such as the AS interface or CAN.
AFB training factory

Optimum operator control
Whether via touch panel, visualisation system or control panel, all the stations and the entire training factory can be operated and monitored in a highly user-friendly way.

Everything in hand
Whether bottle or six-pack, the professional handling units in the AFB training factory ensure a safe, precise, fast material flow.

Tried and proven
The MPS® stations, which have been deployed for training purposes thousands of times all over the world, supply the caps in the training factory. The stations particularly enable an optimum level of highly sophisticated training in mechatronics.

New
Automation technology is taught using state-of-the-art equipment; not just the new MPS® PA stations, but also the automatic warehouse, the filling station and the order compilation station.
AFB factory hybrid production

Visualisation
Either an overview of the complete plant or access to each individual station is available; the visualisation system at the AFB training factory permits monitoring of all signals and provides trend graphs of the analogue process variables, with remote access to the various functions and monitoring of all processes. All training factory stations communicate via TCP-IP with the visualisation computer.

RFID option
Full tracking and documentation of the entire production process is demanded in more and more areas of industry. The AFB training factory also makes this possible: Production data such as the recipe or batch identifier are stored on the mobile data carriers fixed to each individual bottle and can be checked prior to shipping. This means that state-of-the-art RFID technology can now be integrated highly demonstratively into automation training.

AFB-FMQ-BP-DSPB On request

Package
Comprising:

Stations
Zone 1: MPS®-PA filtering*, mixing*, reactor*, filling (quality sampling)* stations
Zone 2: AFB filling and order compilation stations
Zone 3: MPS® distribution**, separation**, processing**, buffering** and handling stations**
Zone 4: AFB pallet transport system, AFB automatic warehouse and AFB incoming goods and outgoing goods stations

Software and media
Step 7 Trainer Package programming software, COSIMIR® PLC Advanced, Fluid Lab®-PA, Mechatronics Assistant, WinCC

* Including mobile base frame, touch panel and S7-300 PLC board.
** Including mobile base frame, MPS® control panel and S7-300 PLC board.

Function
The AFB training factory produces complete six-packs. All the production steps involved are covered, from production of the liquid through to packing of the containers and storage and shipping of the finished product.

The process automation section of the plant is where the liquid is produced: Raw materials are filtered, mixed together with other ingredients according to different recipes, temperature-controlled and stored ready for use. In-line samples can be taken from the ongoing process before the liquid reaches the filling station. Bottles from a belt conveyor are filled and capped on a rotary indexing table. The bottles are then sealed with machined and tested caps and packed into six-packs. Depending on the order, the completed six-packs can be placed in interim storage via the belt rotation system or delivered for shipping. Empty six-packs can be conveyed back into the system on roller conveyors and either placed in storage or fed directly into the production process.

Training content
The multitude of stations and the technologies embedded in them permit an investigation of almost all relevant areas of control and automation technology.

- Use of RFID technology
- Vision systems and camera inspection
- Use and programming of PLCs
- Application of various handling devices and grippers
- Application of various electrical drives (DC, AC)
- Application of frequency converters
- Use of multi-axis handling systems for handling and palletising
- Networking sensors and actuators via AS-interface
- Use and commissioning of a CAN network
- Networking automated systems with Ethernet TCP-IP
- Measurement and control of electrical and process engineering variables such as level, flow rate, pressure and temperature
- Process operation and monitoring, system management
- Selection, deployment and control of process fittings

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AFB filling station

The filling station includes a large number of functions typical to the food industry: Bottle feed by conveyor, dosing with a dosing cylinder and filling and capping on a rotary indexing table.

The station can be operated both as a stand-alone unit or in conjunction with other stations.

In stand-alone operation the caps must be fed manually. When operated in conjunction with other stations, the caps can be fed by way of a handling station (MPS®). Filled and capped bottles are forwarded by conveyor to the next station (order compilation).

The liquid being filled is stored in a tank on the station. The tank can be filled manually or via additional process stations (e.g. MPS® PA).

The station is controlled by a PLC unit and operator control is via touch panel. Individual step and continuous cycle options are available. Status and messages are indicated graphically on the panel.

Special training aims
- Set-up, wiring and commissioning of an automated station
- Use of pneumatic linear units with variable stroke
- Use of pneumatic linear swivel units
- Controlling and monitoring material flow on a conveyor and a rotary indexing table
- Dosing and filling
- Process operation and monitoring

Order no. On request
With a high-precision 2-axis industrial handling system, 2 by 3 bottles are packed into each six-pack on the order compilation station.

The bottles are carried on conveyor belts to the handling station. A high-speed camera checks the six-packs.

The camera features a built-in controller which handles the complete image evaluation process.

With its TCP-IP interface and the additional CAN master interface, the camera enables wide-ranging communication options.

The station is controlled via a PLC board. Different operation modes can be selected on the control panel.

**Specific training content**
- Set-up, wiring and commissioning of an automated station
- Use of pneumatic handling unit with gripper
- Controlling and monitoring material flow by conveyor
- Vision systems, quality and process control with intelligent cameras

Order no. On request
AFB automatic warehouse station

The automatic warehouse can hold up to 16 six-packs on 4 levels each with 4 bays. A cartesian 3-axis handling system is used for stock movement. 2 toothed belt axes are driven by intelligent servomotors with an integrated servo amplifier, controller and CAN bus interface.

The third axis is executed as a rodless linear unit with precision guides.

The station is controlled by a PLC board with CAN master. The colour touch panel of the automatic warehouse provides user-friendly operation and monitoring.

Items can be easily taught-in, and stock levels clearly initialised and modified.

**Specific training content**

- Set-up, wiring and commissioning of an automated station
- Use of pneumatic linear units
- Electric drive and control technology
- Intelligent CAN bus technology
- Warehousing and logistics
- Process operation and monitoring

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Full six-packs awaiting shipping are placed by the pneumatic 3-axis handling unit on one of the two outgoing goods ramps. The handling unit features a pneumatic linear gripper to grip the six-packs.

The axes used are pneumatic linear axes developed specially for industrial assembly and handling systems.

Empty six-packs can be fed in by way of the incoming goods conveyor.

The station is controlled by a PLC board. Different operation modes can be selected on the control panel.

**Specific training content**
- Set-up, wiring and commissioning of an automated station
- Use of pneumatic handling units with gripper
- Handling technology
- Controlling and monitoring material flow by conveyor belt and roller conveyor

Order no. On request
AFB pallet transport system

The material flow within the AFB lines is implemented by the pallet transport system. The six-packs are conveyed to the individual stations on pallets which are equipped with an identification system. The transport system features 4 stop points, and can be expanded at any time.

The belt segments are driven by 4 AC motors.

The control is handled by a PLC with frequency inverter – professionally housed in the control cabinet. Communication with the stop points is via AS interface. The pneumatic stoppers are controlled using industrial valve terminals.

Specific training content
– Set-up, wiring and commissioning of an automated station
– Use of AC motors
– Electrical drive technology
– Use of frequency inverters
– Pallet identification
– AS interface fieldbus technology
– Material flow and logistics
– Protection circuits
– Design of industrial control cabinets

Order no.  On request
One training factory – over 100 different training systems

More than 15 stations can be integrated into the AFB training factory. In addition to the new AFB stations it also features stations from the MPS® family and stations from the new MPS® PA product line.

The unique interface and communications concept enables quick and easy modification of the factory layout.

This means the stations can be deployed at any time individually or in small groups for teaching purposes, and the AFB training factory can be assembled in different project stages.
Individual solutions

Need to meet special requirements? Numerous installations worldwide have resulted in a number of solutions specially focussed on hybrid automation.

Contact us with your requirements. We will design your optimum learning environment and implement it in a way closely linked to the actual process. We look forward to designing solutions with you for specific areas such as:
- Water treatment
- Cooling and refrigeration technology
- pH value measurement
- Conductivity measurement
- Integration of process control engineering
- Palletising
- Identification systems (RFID, barcode)

With our know-how in project planning, instrumentation, design and selection of process components, system integration and programming, through to didactic implementation, we will help you to put your ideas into practice quickly, reliably and cost-effectively.