Topic:

Event – Presentation at Conference of High schools in hotel Narcis, Vlasina_10/06/2016:

Content:

1/ Short introduction and presenting a lecturer

2/ Festo Group short general information, facts and figures

3/ Festo Didactic general information

4/ Educational solutions & Learning systems

5/ Modular education systems for technologies

6/ Program – Pneumatics, Hydraulics (Festo), Mechanical trainer (Lab Volt)
Festo Group – Industrial Automation and Education

An independent family-owned company, founded in 1925.

Turnover 2015: 2.64 billion Eur / 18.700 employees worldwide / 61 companies; active in 176 countries for 300.000 clients; 250 subsidiaries worldwide

Innovative and self-learning: 30.000 products; 3.000 patents, more than 100 innovations/year; 15.000 customer solutions per year; R&D investments: 8% TO
Festo Group

A holistic, interdisciplinary approach & Symbiosis of Industry and Education

- Technology
  - Intelligent components
  - Modularity
  - Networked systems
  - Innovative solutions for functional integration and microsystems

- People
  - Human-machine interaction
  - Adaptive and intelligent technology
  - Simple, intuitive operation

- Qualification
  - Training the new generation of workers
  - Employee qualification
  - Learning systems by Festo Didactic
Festo Didactic

Symbiosis of Industry and Education

Increasing the productivity of over 300,000 clients worldwide.
Festo Didactic

Technical Education Solutions

<table>
<thead>
<tr>
<th>Education</th>
<th>Consulting</th>
<th>Training</th>
<th>Qualification</th>
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</thead>
<tbody>
<tr>
<td>Education solutions and equipment for mechatronics, factory and process automation</td>
<td>Consulting and capacity building</td>
<td>Seminars and training programmes in the fields: people, technology, organisation</td>
<td>Education, further education, coaching</td>
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<tr>
<td>Educational institutions</td>
<td>Factory and process industry</td>
<td>Festo Group</td>
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</table>

People advance through knowledge.

Founded in 1965; 820 employees worldwide   42.000 seminar participants annually
In 60 countries   Festolaboratories in 36.000 educational institutions
Turnover 2013: 115 Mio. €   360 apprentices and students
Festo Didactic

Education Solutions / Learning Systems

Learning systems with technical components

Learning factories for factory and process automation, hybrid factories

E-Learning programmes, software simulations, visualizations

We support economies in the improvement of their competitiveness.
Festo Didactic

The product system of technical education

System solutions: **FMS/CIM/Learning Factory/AFB**

Applications: **Factory automation, CNC/Robotics, process automation**

Basics: Pneumatics, Hydraulics, Camera systems, Controlling, Field bus, Sensors, Elektrics Elektronics, Electr. drives, Safety, Electrical Installation systems, SPS
Festo Didactic

Training und Consulting

Automobile and Supply
Food and Beverage
Electrics / Light Assembly
Flat panel / Solar
Biotech / Pharma
Water / Waste Water

We increase the productivity of industrial companies.
# Strategies for Competitiveness and Technology Innovation

**German manufacturers invest in the “Circle of Innovation and Qualification”**

<table>
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<tr>
<th>Push product innovation</th>
<th>Qualification of employees</th>
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<tr>
<td>Increased entrance of foreign markets</td>
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<tr>
<td>More customer specific solutions</td>
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<td>Cost reduction by organisational optimization</td>
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<tr>
<td>Extension of range of services offered</td>
<td></td>
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<tr>
<td>Focus on core competencies</td>
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<tr>
<td>Increased standardisation of production</td>
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<tr>
<td>Aggressive marketing</td>
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<td>More standard products</td>
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<td>Increased procurement in low-wage countries</td>
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<tr>
<td>Cooperation</td>
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<tr>
<td>Decrease of vertical integration</td>
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<tr>
<td>Investment in plant and machinery</td>
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</tbody>
</table>

**Level of importance**

1 2 3 4 5

Source: VDMA, 2010
Qualification for I 4.0 – Innovation Creates Demand!

Productivity and qualification

Economic development

→ Productivity
Knowledge
Innovation
Independence
Growth

Techn. innovation

Job creation

Education / Skills

Economic demand

→ Education
Skilled workforce
Creativity
Problem solving ability
High Technologies
Investments

pushes
Modular Education Systems for Technologies

Learning segments and locations in industrial environments

<table>
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<tr>
<th>Universities</th>
<th>Schools</th>
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<tr>
<td>Learning factories</td>
<td>Industry</td>
</tr>
<tr>
<td>Knowledge</td>
<td>Machine experience</td>
</tr>
<tr>
<td>Software experience</td>
<td>Problem solving</td>
</tr>
<tr>
<td>Programming</td>
<td>Machine operation</td>
</tr>
<tr>
<td>Process optimization</td>
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</tr>
</tbody>
</table>

Software experience

Knowledge

Universities

Learning factories

Industry

Machine experience

Machine operation

Problem solving
Connected Learning

New Learning Technologies for Global Markets

Mobile

Digital

Location independent

Tec2Screen®
Connected Learning

New Learning Technologies for Global Markets

Intuitive

Easy to share

Network relevant
Smart Grid / Smart Factory

Education for Mechatronics, Electronics, Factory and Process Automation

Energy efficiency

Renewable energies

E-Mobility
Industry 4.0

Digital, mobile networks

Intelligent networks

Decentralized

Wireless communication

MPS® Transfer Factory
Industry 4.0 – the Scenario

Components of production facilities communicate in decentralised, intelligent networks
Integrated Industry / 4.0

Students and trainees need to be able to ...

... understand IND 4.0
→ Components
→ Interfaces
→ Standards
→ Factory networks

... optimize, adapt and innovate
→ Algorythms
→ Control programs
→ Factory processes
→ HM interfaces

→ learn to work with these components in a real factory environment
→ see real life results
Learning at the Festo Technology Plant

Scharnhausen, Germany
Festo Didactic

Learning Systems
Festo Didactic

Learning Systems/ Pneumatics

Basic pneumatics training

1. Equipment set **TP101** – Basic level

2. Equipment set **TP102** – Advanced pneumatics
Festo Didactic

Learning Systems/ Electropneumatics

Basic electropneumatics training

1. Equipment set TP201 – Basic level electropneumatics

2. Equipment set TP202 - Advanced electropneumatics
Hydraulics

Hardware
Training packages hydraulics, text books, cables and connections, hydraulic aggregates, container for training packages, FluidSIM – simulations –software hydr., web-based training hydraulic basics.

Training goals
Independent development and construction of simple hydraulic controls by means of standard industrial components as well as error analyses and taking into consideration of economic efficiency.

Target group
Staff in the field of service, maintenance and construction, that is confronted with hydraulics, such as:
Operator, maintenance and repair staff, construction engineers, developer, etc.
Festo Didactic

Learning Systems/

Basic hidraulics training

1. Equipment set TP501 – Basic level in hydraulics
Benefits with hydraulics

1. Modular in structure
2. Quick fix mounting
3. Systematic storage
4. Tool free connection
Electro-hydraulics

**Hardware**

Training packages electro-hydraulics, text books, cables and connections, relays, solenoid valves, preselection counter, proximity switch, set of foils

**Training goals**

Independent development and construction of simple electro-hydraulic controls by means of standard industrial components as well as error analyses and taking into consideration of economic efficiency

**Target group**

as stated in hydraulics, but additionally with staff from the field of electricity / electronics
Proportional hydraulics

Hardware

Training packages proportional-hydraulics, text books, cables and connections, set of foils, sets of transparent models including the necessary special aggregate

Training goals

Independent construction and developing of complex hydraulic controls by means of standard industrial components

=> Expert in hydraulics!

Target group

 Constructors and developers in the field of mobile and stationary hydraulics as well as maintenance and service personnel in the range of production and operation
Basics in electrical Systems

Hardware

Mobile working-station, components for AC/DC technique, semiconductors, elements for amplifier, flip-flops and power-electronic, microcontroller training kit with DC-Motor, infrared – light barrier and optical receiver, incl. programming – SW Easy Lab.

Training aims

Independent design & development of electrical & electronic control and measuring exercises, trainings in AC/DC technique, semiconductor circuits, (diode/ transistor / thyristor), programming and simulation of microcontroller – circuits.

Target group

Staff in the field of service, maintenance and design, which is faced with electrical systems / electronics, such as:
Machine – operators, maintenance and repair staff, designers, developing engineers, etc.
**Industrial electrical systems, control of AC/DC motors**

**Hardware:** Three-phase current-supply unit, mounting board for contactor & relay, message & handling units, servo – break and drive-system incl. Controlling of results, SW – Drive Lab, diff. electr. machines (AC / DC motors) handling portal

**Training goals**

Independent creating and testing of motor – circuits, check and measuring of motor – characteristic lines of AC / DC motors, understanding and programming of handling units.

**Target group**

Staff in the field of service, maintenance and design, which is faced with electrical machines, handling units, controlling of motors, such as: Machine – operators, maintenance and repair staff, designers, development engineers, etc.
**Programmable Logic Controller - PLC**

**Hardware**

Training packages electronics/PLC, PLC in universal connection unit, learning software, programming software, simulation software, text books, foils, cables and PC-adapter

**Training goals**

Understanding of the connexions and operating modes of the basic principles in the field of PLC by means of learning and simulation software for autonomous developing the topic PLC using standard industrial products

**Target group**

Staff in the fields of service, maintenance, construction and developing of central and local acting PLC related to machines and supervisory control levels
MPS Stations -MPS 202 with controller of your choice /Simatic, CPX, Allen Bradley, Mitsubishi

Contains everything you need for training:
Distribution, Sorting

Accessories
2x trolley, 2x power supply unit, 2x control console, 1x workpiece set, 1x SimuBox

Control technology
1x PLC control package, 1x EasyPort

Software
1x FluidSIM® P, 1x Mechatronics Assistant, 1x Discover MPS® 200 web-based training program, 1x LOGO! Training web-based training program
FluidSIM® 5 Pneumatics/Hydraulics/Electrical engineering

- One FluidSIM® that covers everything: P, H and E all in the same simulation
- Professional CAD system: projects, drawings, print-outs
- Complete conformity: fluid technology to DIN ISO 1219
- Simulation in high definition: resolution up to 100 kHz, control via joystick
- New bigger libraries: all TPs up to date
- Flexible licence management: one licence for multiple users

FluidSIM® 5 is a comprehensive software for the creation, simulation, instruction and study of electropneumatic, electrohydraulic, digital and electronic circuits.
Robot station  Industrial quality

The Robot station can transport workpieces that are fed via a slide and place them in an assembly retainer. The sensor in the gripper enables the robot to differentiate workpieces by colour (black/non-black). The sensor in the assembly retainer monitors the orientation of the workpiece. From the assembly retainer the robot sorts the workpieces into various magazines or passes them on to the downstream station. Combination with the assembly station facilitates the assembly of workpieces.

High-precision, 6-axis articulated arm robot with extended mobility for minimal cycle times.
Fit for research:
with the Robotino® for Industry 4.0
Robotino

Premium and basic edition
Training room furniture and equipment

Hardware
Tables, chairs, video projector, whiteboard, flip chart, accessories

Training goals
see previous modules

Target group
without any limits
Look into the future: new Festo modules (formerly from Lab-Volt)
**Electric Power Technology Training Program (LabVolt Series)**

**Hardware**

Modular equipment to train on more than 130 full lab exercises, computerized data acquisition and dynamometer, basic electricity (loads, ac/dc, fixed and variable), power electronics (thyristors, IGBT, diodes), smart grid, transmission lines, home energy production, renewable energies, substations, SCADA, ...

![Electric Power Technology Training Program](image)

**Training goals**

Fundamentals of electricity, power electronics from basic to advanced, home energy production, renewable energies, conception of the power electronics equipment, smart grid technologies, transmission lines concept (AC/DC), electrical machines (motors and generators), ...

**Target group**

Mechatronics engineers, Staff in the field of service and maintenance of electrical engineering and machine construction, electrical engineers and staff in the field of renewable energies ...

![Target group](image)
Solar/Wind Energy Training System (LabVolt Series)

**Hardware**

Modular components, loads, solar panel, wind turbine, residential / commercial power meter, switches, load controller, batteries, inverter... Hybrid solution to study wind turbine and solar panel installations (residential/commercial/industrial)... Networked data acquisition, commercial grade components.

**Training goals**

Fundamentals, Installation, Historics, Operation, Maintenance and Services. Hands-on with the real commercial grade components

**Target group**

Energy technicians and staff in the field of renewable energies
Wind Turbine Training System (LabVolt Series)

Hardware

Main components of a large-scale wind turbine assembled and functioning like a realistic turbine. Mimics the operation of such a type of turbine. Large-scale components on training system for a great overview of the full system. Gearbox, yaw drive, pillow blocks, hydraulic unit, brakes, gauges, valves, SCADA, HMI, PLC, VFDs, breakers, ...

Training goals

Use this as a „close to real-life“ wind turbine. Teach maintenance situations for future maintenance technicians. Other similar trainers in Geothermal, Solar Thermal Energy, Hydrogen Fuel Cell and so on.

Target group

Energy technicians and staff in the field of renewable energies
FACET (LabVolt Series)

Hardware

Up to 30 different topics electronics learning board and one computerized base unit (manual option available) with connected learning capabilities. Measuring instruments and flexible power sources. Curriculum can be delivered on a Learning Management System with full control of the base unit to control fault insertion through the curriculum. Non-expensive solution to train on wide range of electronics topics

Training goals

Basic Electricity (AC and DC Fundamentals, Semiconductors, Transistors, Amplifiers, Magnetism...), Digital and Microprocessor Electronics (Digital Logic, 32-Bit Microprocessor, DSP, Microcontroller), Industrial Electronics (Thyristors, Power Control, Power Electronics, GTO), Communication Systems (Fiber optics, Transmission Lines, QPSK, DQPSK, DPSK), Advanced...

Target group

Mechatronics engineers, Staff in the field of service and maintenance of electrical engineering and machine construction, Energy technicians

*For a 10 boards setup with the LMS (out of 30)
HVAC-R training solutions (LabVolt Series)

Hardware

Several different type of trainers/demonstrators in the HVAC-R field (Heating, Ventilation, Air Conditioning and Refrigeration). Targeted hands-on with the real components. Full overview of complete refrigeration cycles. Data acquisition. Some are PLC controlled process. Also various skills trainers available to assemble a circuit loop from scratch.

Training goals

Refrigeration fundamentals principles, heat exchange, heat pumps, Air handling, Energy Management, automatic vs manual control. Skills training (Domestic Freezer, Heat Pump, Beverage Cooler, Air Conditioning) to teach wiring, piping, evacuating, charging, testing and troubleshooting

Target group

Industrial and commercial maintenance technicians, refrigeration technicians
Mechanical Training System (LabVolt Series)

Hardware

Flexible extrusion base units to assemble any kind of mechanical „circuits“. Belt, chains, gear drives, coupling, shaft alignment, bearing (including linear ones), gaskets, seals, ball screws, clutches and brakes. Maintenance equipment also to perform laser alignment, lubrication and vibration analysis. Different levels can be selected. Heavy-duty and cost effective.

Training goals

Teach the installation, maintenance, calculation, selection of the above components. Everything hands-on for true experience.

Target group

Industrial maintenance for technicians, mechanical engineering basics for non-technicians.
Industrial Controls Training System (LabVolt Series)

**Hardware**
Components usually found in any commercial and industrial electrical panels. Control devices (pushbuttons, switches, pilot lights), relays and contactors, protection devices (breakers, overload relay, fuses), drives (AC & DC), PLC, sensors (4 different types of sensors). Fault insertion switches on almost all modules (up to 4 per module)

**Training goals**
Basic controls (basic starting/stopping methods, control devices, protection), PLC-controlled motors, Variable Frequency Drive and DC Drive, Sensors, Troubleshooting

**Target group**
Electrical engineering for non-electricians but also for maintenance technicians, constructing engineers (machine developer)
Robots (LabVolt Series)

**Hardware**

Hands-on training on automated work cells using Servo Robot or Stepper-Motor Robot. Both come with a simulation/control 3D software emulating an industrial software (same type of programming). 6 degrees of liberty. Articular and/or Cartesian coordinates. Rotary or linear movements (Servo robot only). Many accessories available (Teach pendant, parts, slides, conveyors, carousel, feeder, ...)

**Training goals**

Familiarization, create programs, learn programming language, use simulation in 3D environment before implementing in real life, calibration, recreate industrial applications

**Target group**

Mechanical engineers, CNC technicians, electrical engineers, Mechatronics engineers, constructing engineers
Industrial Instrumentation and Process Controls (LabVolt Series)

**Hardware**

Industrial I&C components from recognized manufacturers (E+H, Emerson, AB, Foxboro, Honeywell, Siemens). Covers Pressure, Flow, Level, Temperature, pH and Conductivity control. Flexible system to create any type of process loops. Focuses on the components and also on the specific processes themselves. Impressive customization level.

**Training goals**

Teach all the fundamental principles of type of process loop listed above. Installation and calibration of industrial transmitters and valves. Use different type of controllers and interface. Data acquisition and analysis.

**Target group**

Process engineers, control engineers, Staff in the field of water treatment and process industries as well as oil and gas industry.
Telecommunications (LabVolt Series)

Hardware

Various training systems: Radar, Antenna, Satellite, Analog Communications, Digital Communications, Microwave, Telephony. 3D Lab emulation software for Analog and Digital Communications. Training using modular equipment to experiments the different telecommunications aspects but using real signal processing to be a realistic as possible.

Training goals

Train on the different technologies. Troubleshooting. Learn the different type of modulation (analogue and digital), measure antenna patterns, learn on a real radar (the only one of its kind), use data acquisition with most training system for a complete learning experience

Target group

Electrical engineers, communications engineers, telecommunications engineers, network engineers
We enable people and companies to succeed.

“Success of an education system is measured by satisfaction of the labor market with quality of its graduates”
Thank you very much for your attention!

Festo Didactic — Technical Education Solutions