Growing the Next Generation Automation Capable Workforce

Ted Rozier
Engineering Development Manager
Festo Didactic
Topics for Discussion

• **Who We Are**
  Festo vs Festo Didactic

• **Skills Gap**
  Does it really exists?

• **Mechatronics Training**
  What’s the buzz about?

• **Robotic Applications**
  Industry vs Education

• **Programming Skills (Best Practices)**
  – HMI
  – PLC
  – Robotics

• **What is Industry 4.0**
  – How do we introduce it to the classroom?
  – i4.0 Challenge
Festo would be defined as a global player in automation

- Festo has been offering components and solutions in Factory and Process Automation for **75 years**.
- Head Quarters Esslingen, Germany
- **Represented in 176 countries**
- Over 16,700 employees
Who We Are

Automation

- Components
- Systems / Solutions

Productivity

- Machines / Systems
- People / Organisations

Festo Didactic Education

- Training / Consulting
- Automation Learning Systems

Increase Productivity of 300,000 Customers worldwide.
Who We Are

Festo Didactic is a Global Training Company in Industrial Automation and Production

• Member of the Festo Group
• 80% Automation Manufacturing components/20% Training
• We practice what we teach
• Head Quarters Denkendorf, Germany, Eatontown, NJ and Quebec, CA
• Offers Industry specific training modules that assist in closing the skill gap between the classroom and the Industry. Within the last 40 years, over 36,000 technical schools and universities currently use our solutions.
• Provides 500,000 hours of Technical Training and Seminars in 26 languages to over 42,000 Participants – worldwide (Festo Qualified)
The Bionic Learning Network

The Bionic Learning Network is a cooperation between Festo and renowned universities, institutes and development companies with the goal to allow nature to inspire creativity in the automation technology field.
Does the education system provide the right quality and quantity of skilled graduates?

Do enough jobs exist in the labor market? What are the skill requirements of these jobs?

Technical Education & Qualification – The Foundation Stone for Development

Didactic

Qualification and HR Development

Economic Growth/Development

Industry
Does The Skills Gap Really Exist?

• 84% of executives agree there is a talent shortage in U.S. mfg
• Inability to recruit/hire the personnel with the **right skill sets** to match hiring needs
• Chronic condition: **300,000** open positions in manufacturing
Inability to recruit/hire the personnel with the **right skill sets** to match hiring needs
Deloitte: Skills Gap Report

Over the next 10 years:
- 3.4 million new jobs
- 1.4 million qualified workers

Skills Gap:
- 2 million qualified workers
STEM stands for a cluster of careers in the fields of:

- **Science**
- **Technology**
- **Engineering**
- **Math**
• 80% of the fastest growing professions are in the STEM fields
• Growth is 3x faster than non-STEM
• STEM workers are less likely to experience joblessness
• Command 26% higher wages
STEM – Technology and Engineering

• 79% of STEM students graduate college in four years
• 50% of all students graduate after six years
• 50% of recent college graduates are underemployed
50% of all STEM jobs are available to workers without four year degrees

20% of all STEM jobs require a four year degree or more in Engineering

STEM jobs for vocational and community college graduates have a 10% wage advantage
Disciplines that Lead to Strong Manufacturing Careers

1. Computer Engineering
2. Mechanical Engineering
3. Service Technicians
4. Electrical Engineering
“Wherever there is Automation and Manufacturing you will always have job security with Mechatronics talent!”

**Mechatronics** is a combination of knowledge from 3 disciplines:

- Mechanics
- Electronics
- Computer Science
Mechatronics is one of the 10 emerging technologies slated to transform the world. The US Department of Labor lists mechatronics as an emerging “green jobs” growth area. And, according to the Bureau of Labor Statistics, the job outlook for mechatronics is bright over the next 10 years.
What Is Currently Happening In The Shop
Develop A Thirst For Learning
Different Training Scenarios
Different Training Scenarios
Different Training Scenarios

- Mobile Robots
- Highly flexible Transport
- Intelligent Products
- Wireless Communication
- Mobile Devices
- Simulation Tools
Integration Skill Sets

- Check Robot Status From HMI
- Check Machine Status From HMI
Integration Skill Sets
Programming Best Practices

Example 1: Two Machines with Drawers

- Looks for Reference Positions and moves the robot accordingly.
- May drop parts in machines if permissible and moves out. Third machine can be added, or the second machine removed.
- Has limited recovery from drawer systems.
- Robot moves to the HOME position after moving out of machines/ drawers.
- Will remove any parts on the robot grippers and return to HOME.
- Displays message on teach pendant if drawers are open, so operator can close them.

Example 2: Two Machines with Conveyors

- Similar to Example 1, but without instructions or displays for the drawers.
- Instead, there are additional instructions to back away from conveyors or stocker systems. Many times conveyors do not need special recovery motions.
- Recovery from conveyors or stocker systems tends to be easier, requiring less operator involvement.
- Recovery programs are typically independent of machine models. They are dependent on layout and peripheral equipment options.
Humans are **visual learners**. According to a study done by neuroscientist Gordon M. Shepherd, “Vision utilizes nearly half the human brain and approximately 70% of its sensory capacity is dedicated to processing visual information.”
Visual Awareness
What is Industry 4.0/Smart Factory?

1. Steam Engines (1782)
2. Production Lines and Conveyor Belts (1913)
3. PLC, CNC (1954)
4. Smart Automation, Cyber physical Systems

What do we mean by Industry 4.0?

1st
- Steam engine
- 1782
- Power generation
- Mechanical automation

2nd
- Conveyor belt
- 1913
- Industrialization

3rd
- Computer, NC, PLC
- 1954
- Electronic Automation

4th
- 2015
- Smart Automation, Cyber Physical Systems, Big Data

Source: Prof. Zühlke, DFKI
How can we make Industry 4.0 more tangible?
"I am finished."

"I continue on to station 2."

Virtual emulation: this will enable automatic start-up and reconfiguration.

Plug and produce components: facilitate the exchange of defective production units and the reuse of individual units for new products.

Condition Monitoring: the filter reports a contamination level of 95%.
Festo Didactic – Research and Training for Industry 4.0

Mechatronics trained students will thrive in the Manufacturing Environment of tomorrow

- Mobile Robots
- Highly flexible Transport
- Intelligent Products
- Wireless Communication

Order complete in 30min
Fine, I have an empty shelf
Ok, service scheduled

Well, I bring it to stock

need service in 2 days
Industry 4.0
When production starts, each finished product that has to be produced will be uniquely identified with the number (SFC = Shop Floor Control number) against this number all the production history for this product will be collected and stored in SAP ME system.

The finished product will be placed onto the carrier to be moved from one workstation to the next. The carrier contains RFID chip where the production information will be written, thus helping other systems or machines to understand what product is now being processed. Each workstation on a conveyor is also equipped with the RFID chip to identify the moment when the product arrives and request or pass necessary information.
5 Key Enablers For Industry 4.0 Cyber Physical Systems

Mobile Networking

Social Media

Internet of Things Via 1 Protocol

Machine 2 Machine Self Regulation

Big Data & Predictive Analytics
New Competencies Required For Industry 4.0

I 4.0 Application scenarios require new competencies

- Ability to learn
- Abstractive ability
- Systemic thinking
- Problem-solving skills
- Working and learning in inter-disciplinary teams
- Context relevant I 4.0 expertise e.g.
- Network technology
- Collaboritive Robotics
- RFID technology...

Real-time data analysis

Maintenance crew

Control, monitor and improve human-robot collaboration

Understand autonomously regulated capacity utilization with bottleneck-oriented production control

Use Virtual reality

Help design energy transparency concept
Questions

• Why is it important to have a Mechatronics or Advanced Manufacturing Program?

• How many students do you have signing up for your Mechatronics program due to the demand of the Industry?

• With the urgency to bring Manufacturing back to the US, where do you see your program advancing?

• With the upcoming high demand for higher skill levels in the Automated Manufacturing industry, how will the education system react to make sure that your program breeds the right talent?
How do we go about training the next generation Automation capable Workforce?

1. Employers need to continuously strive to provide Advanced training for their Internal Staff to keep the workforce competitive

2. Educators need to keep their training programs up-to-date to help next-generation automation professionals.

DEVELOP A THIRST FOR LEARNING

Develop gold collar workers due to the added value of knowledge Mechatronics trained students bring.
Industry 4.0 Shopfloor (Challenge)
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Our mission is to be your partner in innovative research and training

Thank you for your attention!
Contact Information

Ted Rozier
Engineering Development Manager

Festo Didactic
607 Industrial Way W
Eatontown, New Jersey
USA

Telephone: 1-734-262-5166
Email: Ted.Rozier@Festo.com

http://www.festo-didactic.com/ca-en/