Industry 4.0

Ira Moskowitz
Formerly, Vice President and General Manager, US Operations, Analog Devices, Inc.
Semiconductor Manufacturing

https://www.youtube.com/watch?v=-KTKg0Y1snQ

https://www.youtube.com/watch?v=WVLGKq9An28

https://www.youtube.com/watch?v=DIL_OOF5FFw
Industry 4.0 Drivers: Performance and Cost

- Advancing Use of Big Data and Analytics in an Information-Driven Factory
  - Equipment increasingly equipped with vast array of intelligent integrated sensors
  - Driven by the push for ever-advancing capability, and the availability of such advanced sensors to both enable and monitor (iterative)
  - Sensor capability matched by tremendous increase in computing and communication technology
  - Real time monitoring, pause and correction
  - IoT/IOE providing the connectivity
Industry 4.0 Customer Drivers

• Zero defects/single digit PPMs
  • Loss of traditional cause-and-effect defect reduction methods
  • Replaced by much more sophisticated analytics
  • Project work to correlate the most subtlest of defects with the most subtlest of variations

• 100% on-time delivery
  • Information requirements massive to schedule a wafer fab and meet this objective

• Ever-present ongoing cost reduction pressures

Requirement to sustain 100% on time delivery, near-100% yields, and 0 defects drives sophisticated collection, and analysis, of ‘Big Data’
Industry 4.0: Changing Workforce Skills Affecting all Labor Functions

- Process Development Engineers (M.S./Ph.D.)
- Process Sustaining Engineers and Managers (B.S./M.S./M.B.A)
- Operations Research Professionals (B.S./M.S./M.B.A./Ph.D.)
- Supervisors, Production Managers (ideally B.S./M.S./M.B.A.)
- Equipment Engineers (B.S.)
- Facilities Engineers and Managers, CAD Engineers (B.S.)
- Skilled/Licensed Technicians - Process, Equipment, Facilities (HVAC, Water, Electrical, etc.)
- Environmental, Health and Safety Engineers (B.S./M.S.)
- Quality and Reliability Engineers (B.S./M.S./Ph.D.)
- Supply Chain/MRP Managers (B.S./M.S.)
- IT/Shop Floor Control/Data Analytics Engineers and Managers (B.S.)
- Procurement and Purchasing Experts (B.S.)
- Manufacturing Finance Professionals (B.S./M.S./M.B.A.)
- Manufacturing Human Resources Professionals (B.S./M.S.)
- Highly Skilled Factory Operators (H.S./B.A./B.S.)
- Numerous Contractors for Services
Industry 4.0: Workforce Skills Affecting all Labor Functions

- Process Development Engineers (M.S./Ph.D.)
- Process Sustaining Engineers and Managers (B.S./M.S./M.B.A.)
- Operations Research Professionals (B.S./M.S./M.B.A./Ph.D.)
- Supervisors, Production Managers (ideally B.S./M.S./M.B.A.)
- Equipment Engineers (B.S.)
- Facilities Engineers and Managers, CAD Engineers (B.S.)
- Skilled/Licensed Technicians - Process, Equipment, Facilities (HVAC, Water, Electrical, etc.)
- Environmental, Health and Safety Engineers (B.S./M.S.)
- Quality and Reliability Engineers (B.S./M.S./Ph.D.)
- Supply Chain/MRP Managers (B.S./M.S.)
- IT/Shop Floor Control/Data Analytics Engineers and Managers (B.S.)
- Procurement and Purchasing Experts (B.S.)
- Manufacturing Finance Professionals (B.S./M.S./M.B.A.)
- Manufacturing Human Resources Professionals (B.S./M.S.)
- Highly Skilled Factory Operators (H.S./B.A./B.S.)
- Numerous Contractors for Services
Industry 4.0: Implications

1. Non-traditional skills and structures in the workforce

2. More collaboration required across all functions within the company, with its customers, and with its suppliers (especially tool vendors and IT)

3. Need for advanced cyber security increasing exponentially

4. Investment requirements increasing