



**INDUSTRY 4.0**

## SmartCIM 4.0

### Industry 4.0 Manufacturing for Education

The SmartCIM 4.0 solution introduces vocational and engineering classrooms to the industrial automation and industry applications typical in modern plants and to create skilled workers for next generation jobs. Taking a system-based approach, SmartCIM 4.0 deals not only with individual components of industrial training, but also with networking and communications, systems integration and the essential employability skills students need in modern industry.

SmartCIM 4.0 integrates cutting edge technology systems - the core concept of Industry 4.0.

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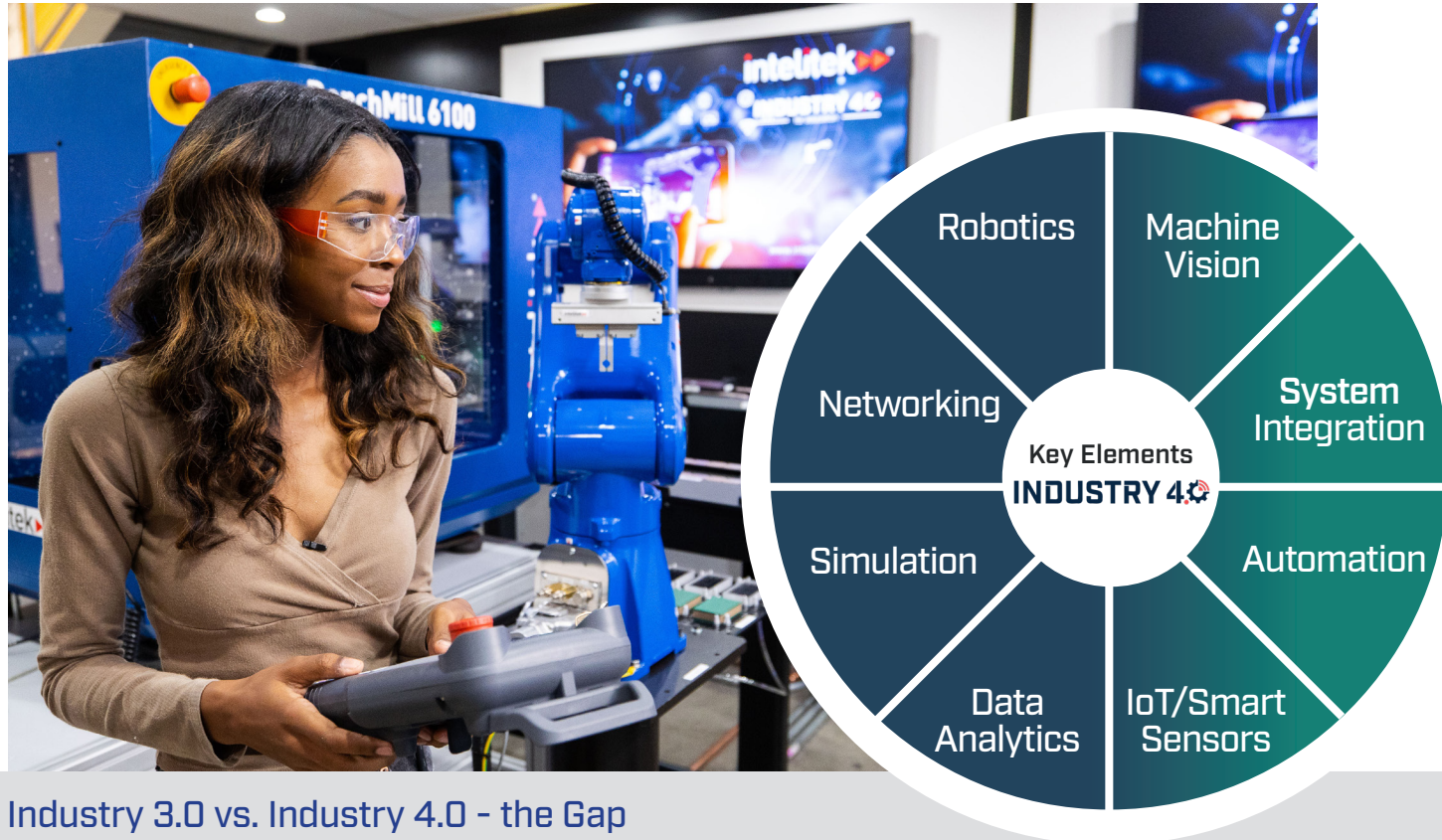
ALIGNED WITH





# Reshaping Manufacturing Training

As Industry 4.0 becomes widely adopted, new career options will be created in industry that do not currently exist



## Industry 3.0 vs. Industry 4.0 - the Gap

Industry 4.0 introduces technology and capabilities that take automated manufacturing to the next level. Automation, integration, Information collection and data analysis enable predictive maintenance, flexible mass production manufacturing and efficient optimized factories.

- As more complex systems are integrated both physically, as well as in the cloud, system level understanding and system integration knowledge is required. Strong skills in automation, integration, systems communications, networking and data analysis are essential job skills.
- Industry 4.0 revolves around data collection and analysis from every part of the factory floor. Data is the cornerstone of production planning, efficiency and predictive/preventative maintenance.
- Digital twinning which is a combination of simulation and visualization of the system in action enables real-time monitoring, viability testing, enhanced safety and optimized processes
- Collaborative robots enable simplified assisted learning in a safer environment.

Intelitek's SmartCIM 4.0 is an integrated, end-to-end manufacturing process with real industrial equipment capable of producing real products. The cell has all the components typical to state-of-the-art Industry 4.0 factories and is used to train students of all levels about manufacturing and Industry 4.0 concepts.

## SmartCIM4.0

### Industrial Hardware

- Built with Intelitek and leading industry vendor hardware
- Full size, real industrial equipment from end-to-end
- Manufacturing line produces real products

### Industry 4.0 Enabled

- Sensors on all levels and all components report real-time cell status
- Multi-tiered IP and IIoT communications network all elements
- Central management, cloud connectivity and data analysis integrated

### Multi-Station, Flexible Design

- Industrial loop conveyor links a variety of different manufacturing workstations
- Pick and choose, machining, welding, assembly, storage, additive, and 3rd party components
- Industry 4.0 sensors, IoT, and IP communications link to OpenMES manager

### Multi-Vendor Integration

- Partner vendor stations industrial equipment can be easily integrated
- Curriculum aligned with industry standard certifications





# SmartCIM 4.0 Computer Integrated Manufacturing Solution

The SmartCIM 4.0 Computer Integrated Manufacturing systems are complex interconnected manufacturing configurations that have several key components like automated production workstations, automated storage and retrieval systems (ASRS), assembly stations, quality control and additional manufacturing stations all linked by a closed-loop conveyor. The system is managed by OpenMES, a central management control application over a TCP/IP communication network. The bespoke solution uses workstations to perform a variety of automated tasks as part of the production process including 3rd party machines and processes.

## Stations Examples

### 1 AUTOMATED STORAGE & RETRIEVAL STATION

The ASRS system includes a dedicated Cartesian robot that transfers parts between storage cells and conveyor pallets. The ASRS is controlled and monitored from the central management console. The ASRS can include RFID, QR code or other inventory and location tracking devices

### 2 SUBTRACTIVE MANUFACTURING MACHINING STATIONS

A multitude of semi-independent workcells where an articulated robot arm tends a machine, performs part manipulation and/or assembly tasks are used in the CIM. The robot loads and unloads parts to and from the CIM conveyor. The robot can be mounted on a linear slidebase for mobility and larger work area.

Machining options include milling, turning, routing, laser engraving, etc.

All machines and robots are Ethernet connected and include multiple monitoring sensors for health and status tracking

### 3 ASSEMBLY & QUALITY CONTROL STATIONS

The assembly and QC stations are equipped with a range of assembly and quality control options including local storage jigs, feeders, pneumatic part holders and machine vision sensors. These stations are used to collect, construct, measure and approve work in progress, raw materials and finished goods.

## SmartCIM4.0

- Custom tailored to your needs
- Bespoke system design - modular and expandable
- Each station is customizable and configurable
- Supports third-party components

### 4 ADDITIVE MANUFACTURING MACHINING STATIONS

The welding robot loads and unloads parts to and from the CIM conveyor in addition to performing arc welding and part manipulation tasks in a shielded welding cell environment.

Integrated into the process of parts production, a 3D printer can manufacture part of the finished goods or add customization to parts as they progress through production

### 5 REAL PRODUCTION PROCESS

The closed loop conveyor frame moves pallets carrying part templates (holders) that are loaded and unloaded at each station by robots and manipulators.

The system can manufacture a variety of complex multi-part components in materials like aluminum, brass, plastic, wood, composite, and wax. Examples of student projects include pen holders, games, chess pieces, etc.

### 6 PROGRAMMABLE LOGIC CONTROLLER AUTOMATION

The PLC system controls and monitors the flow of pallets on the conveyor with the help of sensors and actuators that are built into the stations. PLCs also control safety devices, connect to the smart sensor IoT network, participate in intra device communications and control and report via Ethernet to the management station.

### 7 SENSORS AND IIOT

Advanced sensors are used for monitoring, tracking, quality control and maintenance of the many devices and the products in the system. The sensors connect via a multi protocol IIoT configuration via wired (digital and analog), wireless, IoT protocols and Ethernet.

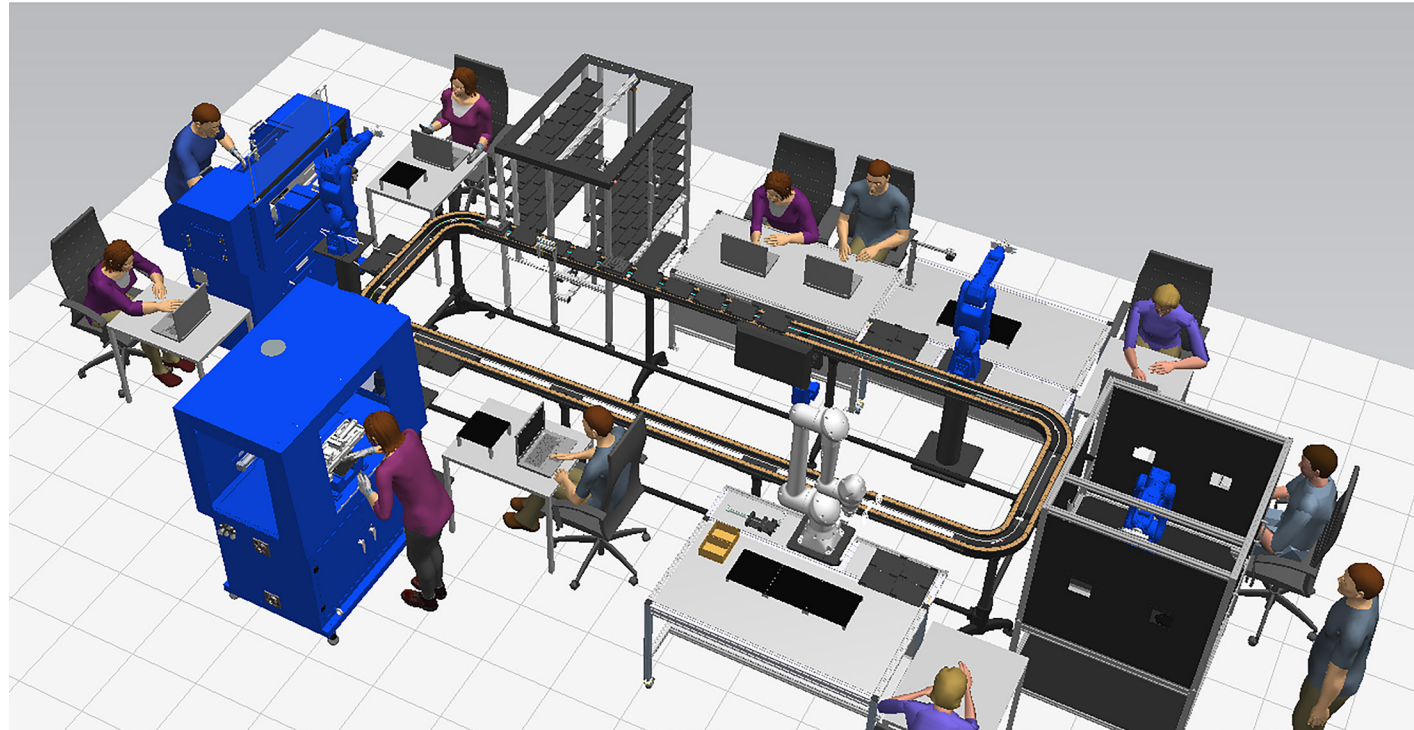
### 8 MANAGEMENT STATION

Integrating the system is extremely sophisticated. Using Intelitek OpenMES software, 3rd party MES and ERP packages, Siemens PLM applications, design tools, cloud computing and remote monitoring applications, the System Management is an advanced learning space for system integration students.



## SmartCIM 4.0

The Industry 4.0 Training Program is a combination of the SmartCIM 4.0 production line, a series of standalone trainers and accompanying curriculum. The combined solution is a comprehensive program that provides students with in-depth training on specific skills found in industry as well as the skills related to Industry 4.0.



The SmartCIM 4.0 is the core of the solution. SmartCIM 4.0 is a full-size manufacturing production line with stations designed to manufacture parts from raw material, assemble products and test them for adherence to quality control standards. The solution above is a six station example. This is a flexible model and can be constructed with more or less stations to suit the needs of the school and the program being installed.

### STANDALONE TRAINERS

The SmartCIM 4.0 incorporates elements of industry and much of the training is completed on the system itself, but some specific areas of expertise are served by standalone training stations. These include electrical, mechanical, hydraulics, pneumatics, PLCs, sensors, data analysis, IIoT, Virtual Reality/ Augmented Reality and some of the integration packages used in the program.

### CURRICULUM

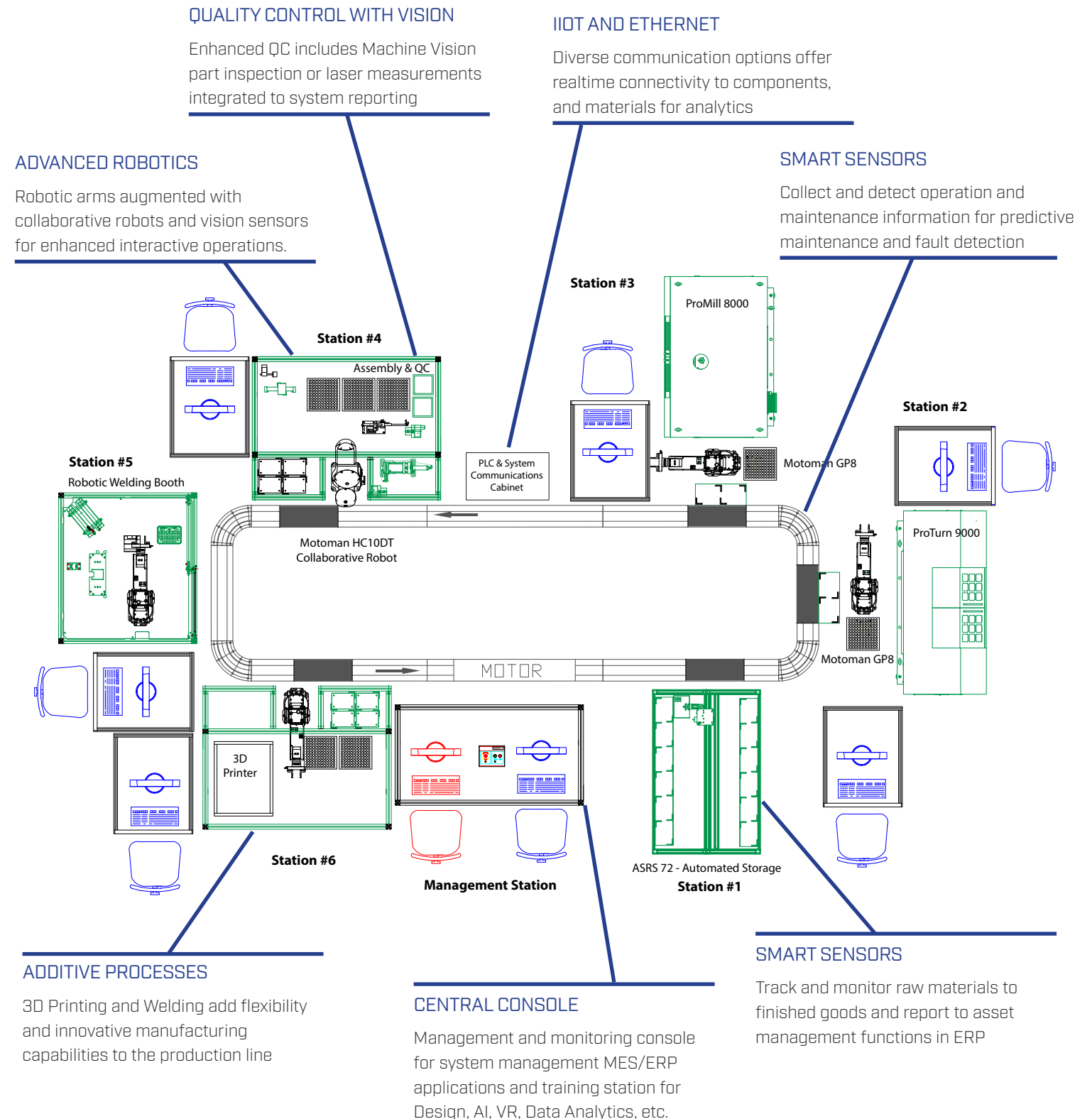
The solution is accompanied by a series of learning programs designed for education. The curriculum are integrated with the equipment in the SmartCIM 4.0 and the standalone trainers and are heavily focused on hands on and project based learning. The curriculum are developed in levels to suit the needs of novice, specialist, and expert level students.

### SUSTAINABILITY

The hardware, software, applications, components and curriculum are supported by the Intelitek on-going maintenance and efforts to keep the solution updated and the educators trained. Annual train-the-trainer professional development ensures programs are maintained and educators are skilled in all aspects of the program and it's content.

## Industry 4.0 Integration

SmartCIM4.0 is the latest generation of 35 years of CIM systems delivered to educational institutions for advanced training. The system has been upgraded with many enhancements to ensure the components and the content is Industry 4.0 ready and student will learn to install, operate and use the new capabilities just as they may upgrade an existing production line.





SmartCIM4.0 is a modular and flexible solution for educating and training students in the principles and technologies of Industry 4.0 computer integrated manufacturing

### Real Manufacturing Process

SmartCIM 4.0 is not a demo system. Using industrial equipment, conveyors, tools, materials and software, the system manufactures real products and a school using the CIM environment develops their own unique outcome. The system supports multiple product production processes at the same time and Industry 4.0 processes can be integrated, optimized and machines shared and allocated to different processes as required.

### Interoperability

SmartCIM4.0 is an open-architecture solution that integrates both Intelitek and other vendor solutions. Intelitek partner with leading vendors in industry and when specific needs are defined for a solution, we have integrated multiple other vendor products and solutions into the production cycle.

### Sustainability

By collaborating with industrial vendors at the forefront of commercial production lines, SmartCIM 4.0 is able to maintain an updated educational environment. Intelitek also offer professional development and ongoing training and support to help introduce new staff members to the system as the school's program grows and matures.



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