



# INDUSTRY 4.0

2021

Workforce Trends

**PREPARED BY:**  
Workforce Intelligence Network &  
Michigan Works! Southeast

# WHAT IS INDUSTRY 4.0?

**The fourth industrial revolution is here! Technological innovations such as steam power, mechanization, and the internet totally changed the way we work and today new technologies are once again revolutionizing the workplace. This fourth industrial revolution, or “Industry 4.0,” involves smart machines, the Internet of Things (IoT), and artificial intelligence - bringing new opportunities and rendering many current jobs obsolete.**

## OVERVIEW OF THE CURRENT ADVANCED MANUFACTURING WORKFORCE

In our region, advanced manufacturing occupations are increasingly important for a wide range of manufacturers and occupations. Since 2010 employment in advanced manufacturing has seen an impressive 27.4 percent increase. Employment is currently at 25,216 workers, with a forecast of 0.9 percent growth through 2021. Other occupations displaying strong growth are maintenance and repair workers, general, first-line supervisors of production and operating workers, machinists, welders, cutters, solderers, and brazers, and industrial production managers.

## CURRENT ADVANCED MANUFACTURING DEMAND TRENDS

Southeast Michigan and the state, as a whole, offers a low cost of living for manufacturing workers, when compared to other states. This lower cost of living attracts a larger talent pool. In 2019, there were 5,737 job postings for advanced manufacturing positions, and a majority required specialized skills such as HVAC, plumbing, machining, tooling, and carpentry. Employment agencies report that their top postings are for new single-family housing construction (except for-sale builders), other motor vehicle parts manufacturing, all other plastics product manufacturing, and engineering services. With the introduction of smart manufacturing in the region, the top certifications sought after in 2019 were commercial driver's license (CDL), HVAC certification, American Society for Quality (ASQ) certification, pesticide applicator license, and certified forklift operator license.

# INDUSTRY 4.0 TECHNOLOGY DESCRIPTIONS

## AUGMENTED WORKFORCE



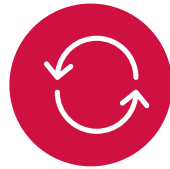
An augmented workforce is a blend of human employees and technology, working on tasks together. Machine learning is a key element, where computer programs access data and gradually learn for themselves.

## BIO-BASED PLASTICS AND COMPOSITES



With bio-based plastics and composites, heavier metal parts are replaced with plastic components using engineering-grade biopolymers and/or lighter natural-fiber-reinforced plastics, created partially or wholly by using plant feedstock.

## BLOCKCHAIN



Blockchain is a distributed ledger technology that enables the creation of a record of transactions, unable to be changed, to share with multiple participants in a business network, thereby enhancing the accuracy of the chain of custody in the manufacturing process.

## COBOTICS 2.0



A cobotic system includes a cobot and a human collaborating to achieve higher productivity and to protect human workers from potentially hazardous jobs (those with a higher incidence of accidents).

## METAL 3D PRINTING



Metal 3D printing creates devices and parts that could not be manufactured with a 3D printed plastic material. This additive process allows metal parts to be from a bed of powdered metal.

## ROBOTICS DISASSEMBLY



Robots are widely used in automotive manufacturing but not in remanufacturing, particularly at the critical stage of disassembly. Advances in this area will ensure that end-of-life product disassembly for remanufacturing will become easier, faster, and more cost-effective.

# INDUSTRY 4.0 TECHNOLOGY DESCRIPTIONS

Continued



## **SHORT-LOOP RECYCLING FOR AUTOMOTIVE MANUFACTURING**

Short loops, in which all recycling processes remain in the automotive sector, are new approaches to recycling raw materials such as steel, copper, textiles, and plastics, remain in the local automotive industry.



## **SMART DIGITAL TWINS**

A digital twin is comprised of a virtual object representation of a real-world item, in which the virtual object is mapped to physical things in the real-world such as equipment, robots, or any virtually connected business asset.



## **SMART WAREHOUSE ROBOTICS**

Advances in autonomous mobile robotics (AMR) technology make it easier for robots to be used in warehouses, where they support high volumes of small, multiline orders, often in collaboration with warehouse workers.

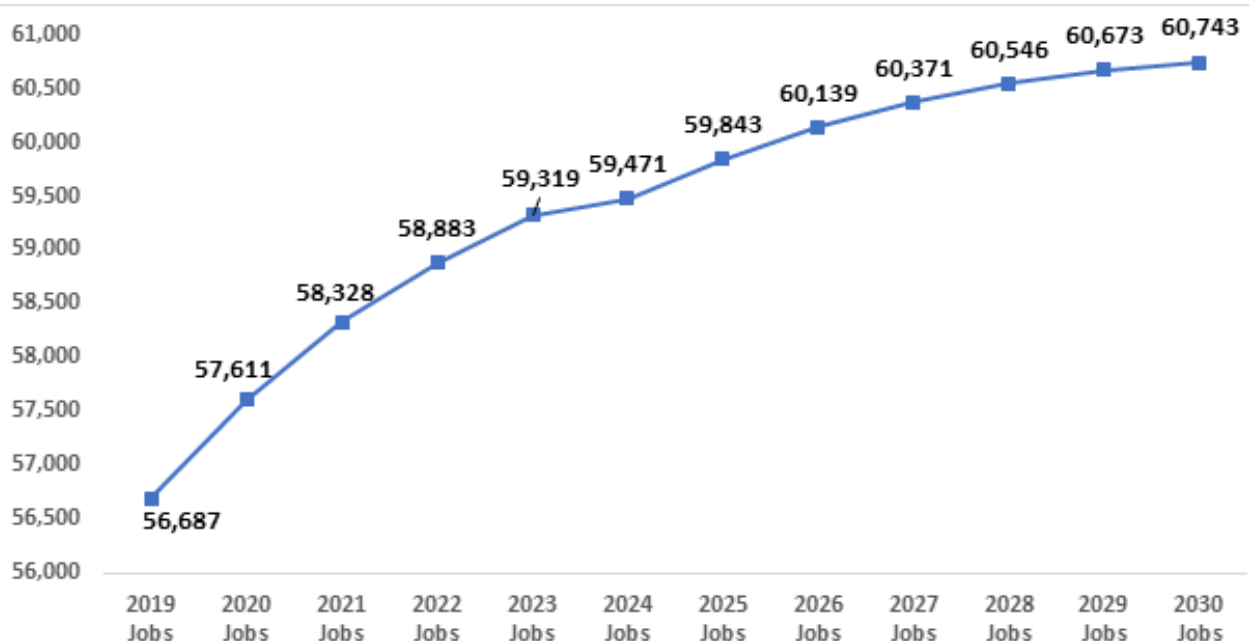


## INDUSTRY 4.0 WORKFORCE OVERVIEW AND WORKER DEMAND TRENDS

The digitization of manufacturing marks a significant transformation in the way a region's manufacturing infrastructure operates. Many businesses struggle to find talent with the necessary skills to adapt to new processes that are inevitable with the transition to smart machining. In 2019, there were 56,687 workers in Industry 4.0 related occupations. 2020 experienced a workforce of 57,611 workers. This represents a 1.6 percent or 924-worker increase since 2019. While workers are expected to increase through 2030, employment in smart manufacturing-related occupations is projected to begin leveling off around 2025. This is due to the autonomous nature of the emerging technologies. This indicates that employment in Industry 4.0 related occupations may experience a decline in the future.

Despite this potential future decline, employment is expected to grow by 4,056 individuals, or 7.2 percent through 2030. Industry 4.0 occupations expected to experience the bulk of growth include purchasing managers, computer systems analysts, software developers and software quality assurance analysts, web developers and digital interface designers, and computer numerically controlled tool programmers. The Industry 4.0 projected employment, including the top 10 fastest-growing occupations and their potential growth through 2030 illuminates the future of the workforce and the occupations needed to fill these industries.

**FIGURE 1: EMPLOYMENT IN OCCUPATIONS RELATED TO INDUSTRY 4.0, SOUTHEAST MICHIGAN, 2019-2030**



# TOP 4 FASTEST-GROWING INDUSTRY 4.0 RELATED OCCUPATIONS

**24%**

Software Developers  
& Software Quality  
Assurance Analysts &  
Testers

**22%**

Web Developers  
& Digital  
Interface  
Designers

**19%**

Computer Systems  
Analyst

**19%**

Computer  
Numerically  
Controlled Tool  
Programmers

Top Fastest Growing Industry 4.0 Related  
Occupations, Southeast Michigan, 2019-  
2030

Data: Emsi | Analysis: Workforce  
Intelligence Network



# WORKER DEMAND TRENDS

**8,000**

Industry 4.0 job  
postings per  
month  
(2019)

## TOP SKILLS

- Flatbed Truck Operator
- Warehousing
- Java & JavaScript
- Software Engineering
- Agile Software Development



In 2019, there were 43,485 postings for Industry 4.0 related occupations, with a monthly average of about 8,000 postings a month. In recent months, employer demand for Industry 4.0 occupations have seen a faster rebound in postings compared to other industries.

Smart manufacturing occupations require specialized skills for robot and software programming and troubleshooting. Most requiring Java and JavaScript, software engineering, and agile software development. Many of the top requested technical skills include flatbed truck operations, and warehousing.

# DEMAND FOR INDUSTRY 4.0 KNOWLEDGE

Educational providers have been working with industry employers to determine what skills and credentials are needed for specialized Industry 4.0 professionals and there are many institutions able to meet the demand in southeast Michigan. There are 10 institutions in our region that provide some form of training, degree, or certificate opportunities. There are 69-degree programs offered in Hillsdale, Jackson, Lenawee, Livingston, and Washtenaw counties. In 2019, the top programs experiencing the highest growth were computer and information systems security/information assurance, manufacturing engineering, international business/trade/commerce, computer engineering, general, and computer and information sciences, general.

The table below identifies all the education providers in the region that offer Industry 4.0 technology-related programs or have incorporated smart manufacturing curriculum into existing programs.

	Augmented Workforce	Bio-based	Blockchain	Cobotics 2.0	Metal 3D Printing	Robotics Disassembly	Short-loop Recycling for Manufacturing	Smart Digital Twins	Smart Warehouse Robotics
Adrian College	x	x	Not Offered	x	x	Not Offered	x	Not Offered	Not Offered
Cleary University	Not Offered	x	Not Offered	x	x	Not Offered	x	Not Offered	Not Offered
Concordia University-Ann Arbor	x	x	x	x	x	x	x	x	x
Eastern Michigan University	x	x	x	x	x	x	x	x	x
Hillsdale College	x	x	Not Offered	Not Offered	Not Offered	Not Offered	Not Offered	Not Offered	Not Offered
Jackson College	x	x	x	x	x	x	x	x	x
Siena Heights University	x	x	x	x	x	x	x	x	x
Spring Arbor University	x	x	x	x	x	Not Offered	x	x	x
University of Michigan-Ann Arbor	x	x	x	x	x	x	x	x	x
Washtenaw Community College	x	x	x	x	x	x	x	x	x

DATA: EMSI | ANALYSIS: WORKFORCE INTELLIGENCE NETWORK



# TOP 10 INDUSTRY 4.0 RELATED PROGRAMS & COMPLETIONS

**2,355**

Business  
Administration and  
Management,  
General

**768**

Computer and  
Information  
Sciences,  
General

**517**

Mechanical  
Engineering

**433**

Electrical &  
Electronics  
Engineering

**343**

Information  
Science/Studies

**271**

Industrial  
Engineering

**225**

Computer  
Engineering,  
General

**117**

Finance, General

**89**

Logistics,  
Materials, and  
Supply  
Chain  
Management

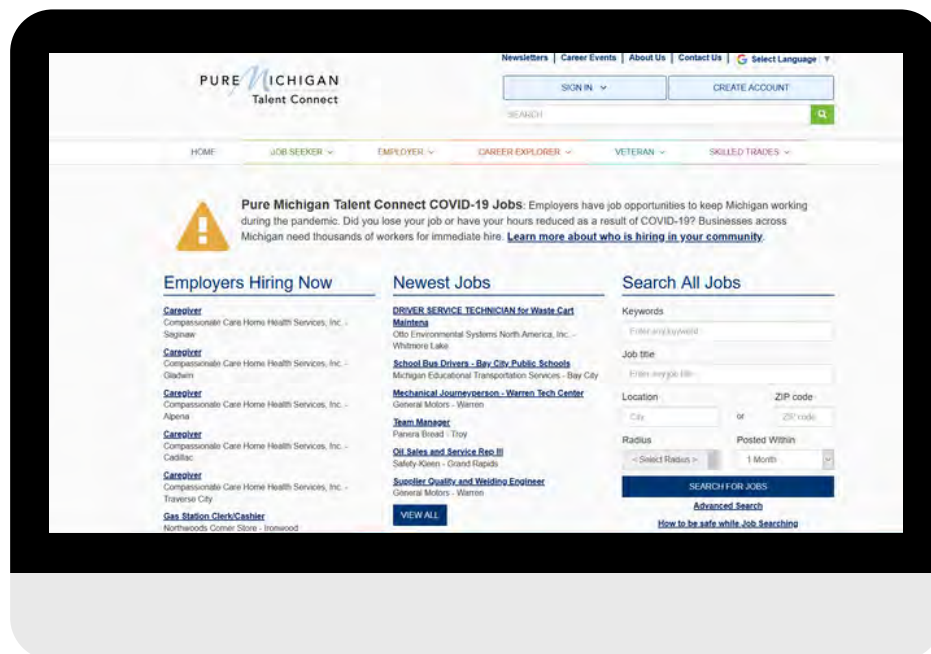
**68**

Materials  
Engineering

Data: Emsi | Analysis: Workforce Intelligence Network

## Pure Michigan Talent Connect

The Pure Michigan Talent Connect is a job recruiting resource supported by The Department of Labor and Economic Opportunity-Workforce Development. It is an online tool, designed to connect Michigan's job seekers and employers, and serves as a central hub linking all public and private stakeholders who support Michigan's workforce. Pure Michigan Talent Connect serves as the state's labor exchange system. Other resources provided throughout the website includes internship and apprenticeship information, career pathway guides that show key roles, common transition opportunities, and detailed occupation and institution information. The site also focuses on career pathways for skilled trades workers, a highly demanded field in the region.



# WORKER DEMAND BY TECHNOLOGY | AUGMENTED

## Augmented Workforce

Augmented workforce consists of a labor force comprised of both humans and robots or artificial intelligence, that uses augmented reality (AR) technology in various stages of production. Connectivity and cognitive technologies supports complex assembly, machine maintenance, expert support needs, and quality assurance processes in the manufacturing industry. The benefits of this collaborative strategy facilitate automation on the floor, enables productivity gains, increases resource efficiency, and drives health-and-safety improvements.



**11,958**

Number of workers  
needed in an  
augmented  
workforce by 2030

**75.9%**

Of that workforce  
are between the  
ages of 25-54

## EDUCATION

**71%**

Of postings specified a  
bachelor's degree or higher  
education

## EXPERIENCE

**40%**

Requested workers with 0-3  
years of experience

**LAND A CAREER WITH AN ASSOCIATES DEGREE**

*Web Developers*

*&*

*Digital Interface  
Designers*



# AUGMENTED EMPLOYMENT & WAGES

Top 5 Employers with Augmented Job Postings (2019)

(Employer names are listed as they appear in online job postings)

- University of Michigan
- KLA-Tencor Corporation
- CyberCoders, Inc.
- Stout Systems Development Inc
- Aerotek, Inc.

Top 5 Augmented Job Postings (2019)

- Software Engineers
- Software Developers
- JAVA Developers
- Engineers
- Quality Engineers

REGIONAL MEDIAN WAGE DISTRIBUTION FOR AUGMENTED OCCUPATIONS IN SOUTHEAST MICHIGAN (2019)

**\$49.80**

Computer Hardware Engineers

**\$43.19**

Software Developers & Software Quality Assurance Analysts & Testers

**\$42.71**

Mechanical Engineers

**\$41.54**

Industrial Engineers

# AUGMENTED SKILLS & CERTIFICATIONS



## Technical Skills

JAVA  
Agile Software Development  
Software Development  
SQL  
Software Engineering  
JAVA Script

## Foundational Skills

Management  
Communication  
Innovation  
Leadership  
Problem Solving

# IN-DEMAND CERTIFICATIONS

Augmented workforce occupations require specialized training and certifications to ensure workers are able to interact with and operate augmented technologies. Highly sought-after certifications include:



Six Sigma Green  
Belt Certification



Certified Quality  
Engineer



Six Sigma Black  
Belt Certification



Certified Quality  
Auditor



American Society  
for Quality  
Certified (ASQ)



Professional  
Engineer



Salesforce  
Certification



Microsoft Certified  
Professional



Microsoft Certified  
Systems  
Administrator  
(MCSA)

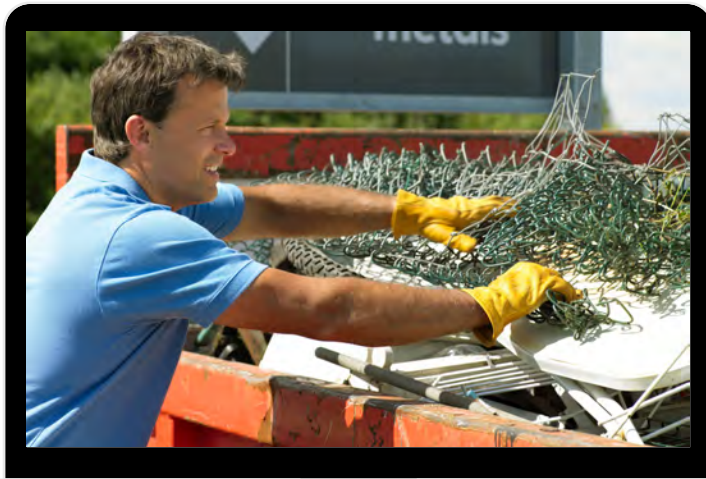


Product  
Certification

# WORKER DEMAND BY TECHNOLOGY | BIO-BASED PLASTICS & COMPOSITES

## Bio-Based Plastics & Composites

When processing bio-based plastics and composites, heavier metal and other not as environmentally friendly plastic components are replaced with engineering-grade biopolymers and/or lighter natural-fiber-reinforced plastics created partially or wholly using plant feedstock. For example, structures are produced using flax fibres and bio-epoxy resin combined with carbon fibres in hybrid composites, which are lighter, cheaper, and more environmentally sustainable than conventional polymers. The occupations in this group are primarily operators, engineers, and production managers that produce raw materials and parts that are suitable for multiple vehicle systems, including power-train applications.



**22,205**

Bio-Based workers by  
2030

**70.1%**

Of that workforce  
are between the  
ages of 25-54

## EDUCATION

**39%**

*Of postings specified a bachelor's  
degree or higher education*

## EXPERIENCE

**36%**

*Requested workers with 0-3  
years of experience*

## LAND AN ENTRY-LEVEL CAREER

*Packaging & Filling  
Machine Operators*

*&*

*CNC  
Operators*



# BIO-BASED PLASTIC EMPLOYMENT & WAGES

## Top 5 Employers with Job Postings (2019)

( Employer names are listed as they appear in online job postings)

- HomeAdvisor, Inc.
- Aerotek, Inc.
- University of Michigan
- Eaton Corporation
- Amcor Limited

## Top 5 Bio-Based Job Postings (2019)

- Maintenance Technician
- General Managers
- Machine Operators
- Handymen
- Maintenance Workers

## REGIONAL MEDIAN WAGE DISTRIBUTION FOR BIO-BASED OCCUPATIONS IN SOUTHEAST MICHIGAN (2019)

**\$79.27**

Operations  
Managers

**\$68.96**

Industrial Production  
Managers

**\$53.42**

Mechanical  
Engineers

**\$52.37**

Materials Engineers



# BIO-BASED SKILLS & CERTIFICATIONS



## Technical Skills

HVAC  
Auditing  
Restaurant Operation  
Mechanical Engineering  
Plumbing

## Foundational Skills

Communications  
Management  
Operations  
Leadership  
Problem Solving

# IN-DEMAND CERTIFICATIONS

Many workers in this field have exclusive skills gained through navigating specialized learning curriculum. Highly sought-after certifications include:



Six Sigma Green  
Belt Certification



Certified Quality  
Engineer



Six Sigma Black  
Belt Certification



Certified Quality  
Auditor



American Society  
for Quality  
Certified (ASQ)



HVAC  
Certification



Pesticide  
Applicator



CFC  
Refrigeration  
Certification



EPA 608  
Technician  
Certification



CDL

# WORKER DEMAND BY TECHNOLOGY | BLOCKCHAIN

## Blockchain

Blockchain is a distributed ledger technology (DLT) that allows data to be stored globally on thousands of servers, allowing anyone on the business network to see all other entries in near real-time. Occupations involved in blockchain secures users transactional transparency and provides users with the ability to create secure, real-time communication networks with partners around the world to support supply chains, payment networks, real estate deals, and healthcare data sharing.



**2,290**

Blockchain workers  
by 2030

**67.4%**

Of that workforce  
are between the  
ages of 25-54

## EDUCATION

**33%**

*Of postings indicated a minimum  
requirement of a high school diploma  
or equivalent*

## EXPERIENCE

**15%**

*Requested workers with 0-3  
years of experience*

## LAND AN ENTRY-LEVEL CAREER

*Sales*

*&*

*Freight  
Coordinators*



# BLOCKCHAIN EMPLOYMENT & WAGES

## Top 5 Employers with Blockchain Job Postings (2019)

(Employer names are listed as they appear in online job postings)

- The Home Depot
- Meijer, Inc.
- Fastenal Company
- The Buckle, Inc.
- Resource Manufacturing

## Top 5 Blockchain Job Postings (2019)

- Receiving Clerks
- Receiving Associates
- Clerks
- Sales Managers
- Balers

## REGIONAL MEDIAN WAGE DISTRIBUTION FOR BLOCKCHAIN OCCUPATIONS IN SOUTHEAST MICHIGAN (2019)

**\$48.56**

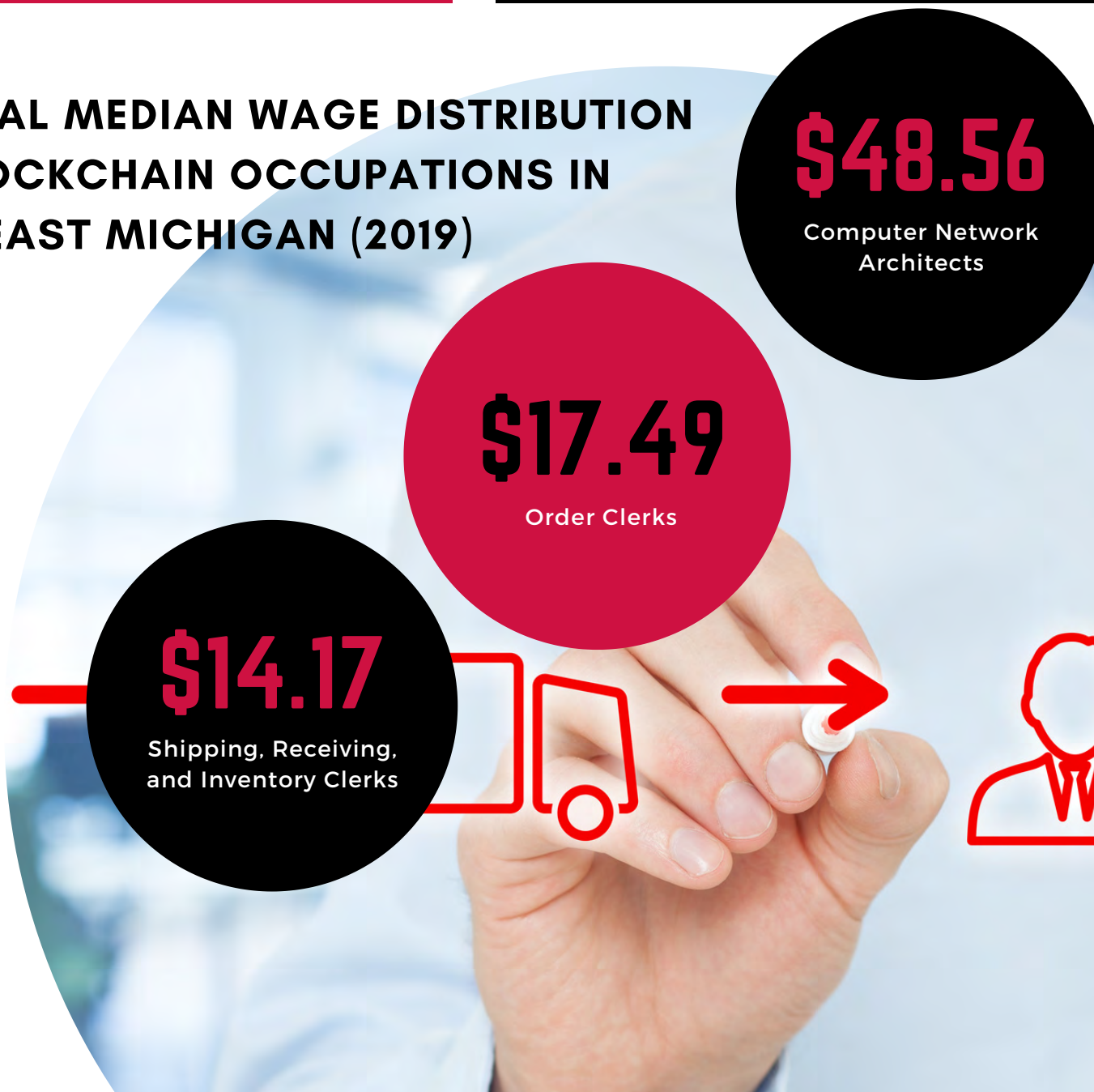
Computer Network Architects

**\$17.49**

Order Clerks

**\$14.17**

Shipping, Receiving, and Inventory Clerks



# BLOCKCHAIN SKILLS & CERTIFICATIONS



## Technical Skills

Warehousing  
Packing and Labeling  
Forklift Truck  
Merchandising  
Palletizing

## Foundational Skills

Communications  
Customer Service  
Sales  
Detailed Oriented  
Computer Literacy

## IN-DEMAND CERTIFICATIONS

Many workers in this field have exclusive skills gained through navigating specialized learning curriculum. Highly sought-after certifications include:



Certified Forklift  
Operator



Cisco Certified  
Internetwork  
Expert



Cisco Certified  
Network  
Associate



Cisco Certified  
Network  
Professional

# WORKER DEMAND BY TECHNOLOGY | COBOTICS 2.0

## Cobotics 2.0

Cobotics assist workers on the floor by using computing power to enhance worker capabilities with vision and sensor technologies. This allows operators to manipulate parts that are hot, heavy, bulky, or too small for precision handling. Cobotics related employees work in direct contact with the robot or in its immediate environment. Operators remain necessary for their detailed observation skills, to help support a lighter-weight, mobile generation of robots that safely interact with human workers.



**20,719**

Cobotics workers by  
2030

**71%**

Of that workforce  
are between the  
ages of 25-54

## EDUCATION

**57%**

*Of postings specified the requirement  
for applicants is to possess a bachelor's  
degree or higher*

## EXPERIENCE

**39%**

*Requested workers with 0-3  
years of experience*

## LAND AN ENTRY-LEVEL CAREER

*Mechanics*

*&*

*Operators*





# ROBOTICS EMPLOYMENT & WAGES

## Top 5 Employers with Job Postings (2019)

(Employer names are listed as they appear in online job postings)

- University of Michigan
- KLA-Tencor Corporation
- Aerotek, Inc.
- McDonald's Corporation
- HomeAdvisor, Inc.

## Top 5 Blockchain Job Postings (2019)

- Software Engineers
- Maintenance Technicians
- Engineers
- Handymen
- Software Developers

## REGIONAL MEDIAN WAGE DISTRIBUTION FOR COBOTIC OCCUPATIONS IN SOUTHEAST MICHIGAN (2019)

**\$49.92**

Electronics  
Engineers (Except  
Computer)

**\$49.80**

Computer Hardware  
Engineers

**\$47.89**

Health & Safety  
Engineers

**\$43.31**

Electrical Engineers

# ROBOTICS 2.0 SKILLS & CERTIFICATIONS



## Technical Skills

Software Engineering  
Software Development  
Python  
JAVA  
Electrical Engineering

## Foundational Skills

Communications  
Management  
Problem Solving  
Troubleshooting  
Operations

## IN-DEMAND CERTIFICATIONS

Many workers in this field have exclusive skills gained through navigating specialized learning curriculum. Highly sought-after certifications include:



Six Sigma Green Belt Certification



Professional Engineer



Six Sigma Black Belt Certification



Certified Quality Auditor



EPA 608 Technician Certification



HVAC Certification



Pesticide Applicator



Licensed Professional Engineer



EPA 608 Technician Certification

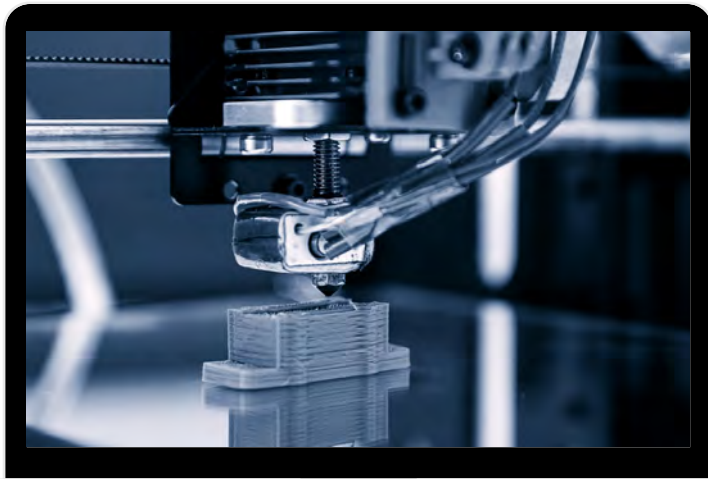


CDL

# WORKER DEMAND BY TECHNOLOGY | METAL 3-D PRINTING

## Metal 3-D Printing

Metal 3D printing, also known as direct metal laser sintering (DMLS) and direct metal laser melting (DMLM) is an additive layer in manufacturing technology. This additive process allows metal parts to be grown out of a bed of powdered metal. Manufacturers shifting toward metal-printing will enjoy more flexibility in general production floor operations. The adoption of additives for production tooling, spare and custom parts can increase industrial uptake of print components for their finished products. Building objects from the bottom up and using materials only when needed reduces waste, enables weight reduction and has a cost advantage, especially when using expensive materials such as titanium and nickel-alloy steels.



**20,164**

Metal 3-D Printing  
workers by 2030

**88%**

Of that workforce  
are between the  
ages of 25-54

## EDUCATION

**48%**

*Of postings specified a bachelor's  
degree or higher education*

## EXPERIENCE

**39%**

*Requested workers with 0-3  
years of experience*

## LAND AN ENTRY-LEVEL CAREER

*Machinist &  
Maintenance*

*&*

*CNC  
Operators*





# METAL 3-D PRINTING EMPLOYMENT & WAGES

## Top 5 Employers with Job Postings (2019)

(Employer names are listed as they appear in online job postings)

- University of Michigan
- McDonald's Corporation
- HomeAdvisor, Inc.
- Aerotek, Inc.
- CMS Energy Corporation

## Top 5 Metal 3-D Printing Job Postings (2019)

- Maintenance Technicians
- Handymen
- Electrical Engineers
- Maintenance
- Quality Engineers

## REGIONAL MEDIAN WAGE DISTRIBUTION FOR METAL 3-D PRINTING OCCUPATIONS IN SOUTHEAST MICHIGAN (2019)

**\$43.31**

Electronics  
Engineers

**\$42.71**

Mechanical  
Engineers

**\$41.54**

Industrial Engineers

**\$38.66**

Computer Systems  
Analysts

# METAL 3-D PRINTING SKILLS & CERTIFICATIONS



## Technical Skills

Electrical Engineering  
HVAC  
Mechanical Engineering  
Plumbing  
Tooling  
Auditing

## Foundational Skills

Communications  
Management  
Problem Solving  
Operations  
Leadership

## IN-DEMAND CERTIFICATIONS

Many workers in this field have exclusive skills gained through navigating specialized learning curriculum. Highly sought-after certifications include:



Six Sigma Green  
Belt Certification



CDL



Professional  
Engineer



Certified Quality  
Engineer



Certified Quality  
Auditor



Six Sigma Black  
Belt Certification



American Society  
for Quality Certified  
(ASQ)



Licensed  
Professional  
Engineer

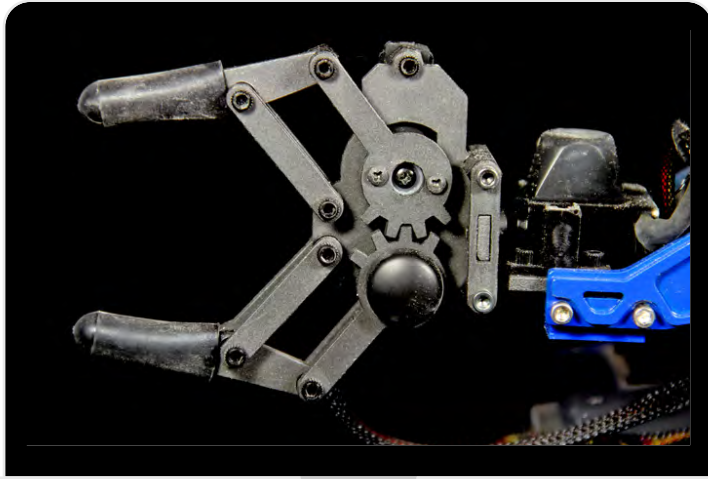


Engineer in  
Training

# WORKER DEMAND BY TECHNOLOGY | ROBOTICS DISASSEMBLY

## Robotics Disassembly

Robots are widely used in automotive manufacturing, particularly at the critical stage of disassembly. Disassembly is a critical step in the manufacturing process to increase end-of-life (EOL) value. This significantly reduces the environmental footprint of the manufacturer and/or product. The addition of robots to the disassembly processes and related operations helps determine the patterns that frequently occur during disassembly. Many disassembly processes are still performed manually due to the uncertainty associated with the quality and the quantity of the returned EOL products. Advances in this industry will mean that EOL product disassembly for remanufacturing will become easier, faster, and more cost-effective.



**1,450**

Robotic Disassembly  
workers by 2030

**72%**

Of that workforce  
are between the  
ages of 25-54

## EDUCATION

**58%**

*Of postings specified a bachelor's  
degree or higher education*

## EXPERIENCE

**46%**

*Requested workers with 0-3  
years of experience*

## LAND AN ENTRY-LEVEL CAREER

*Internship*

*&*

*Data Entry  
Specialist*





# ROBOTICS DISASSEMBLY EMPLOYMENT & WAGES

## Top 5 Employers with Job Postings (2019)

(Employer names are listed as they appear in online job postings)

- University of Michigan
- Anthem, Inc.
- CMS Energy Corporation
- Domino's Pizza
- Trescal, Inc.

## Top 5 Job Postings (2019)

- Business Analysts
- Programmer Analysts
- Business Systems Analysts
- Systems Analysts
- Data Entry Specialist

## REGIONAL MEDIAN WAGE DISTRIBUTION FOR ROBOTICS DISASSEMBLY OCCUPATIONS IN SOUTHEAST MICHIGAN (2019)

**\$38.66**

Computer Systems  
Analysts

**\$26.08**

Electro-Mechanical &  
Mechatronics  
Technologists

**\$24.65**

Electrical & Electronic  
Engineering  
Technologists

# ROBOTICS DISASSEMBLY SKILLS & CERTIFICATIONS



## Technical Skills

SQL  
Business Process  
Computer Science  
Business Requirements  
Project Management

## Foundational Skills

Communications  
Problem Solving  
Management  
Troubleshooting/Problem Solving  
Research

# IN-DEMAND CERTIFICATIONS

Many workers in this field have exclusive skills gained through navigating specialized learning curriculum. Highly sought-after certifications include:



Certified Scrum  
Master



Project  
Management  
Professional  
Certification



Automotive  
Service  
Excellence



Certified Power  
Quality  
Professional



Certified Scrum  
Product Owner



Six Sigma Green  
Belt  
Certification



Microsoft Certified  
Solutions  
Associate



AWS Certified  
Solutions  
Architect



Microsoft Certified  
Systems  
Engineer

# WORKER DEMAND BY TECHNOLOGY | SHORT-LOOP RECYCLING FOR MANUFACTURING

## Short-loop Recycling for Manufacturing

Short-loop recycling refers to an approach to recycling raw materials such as steel, copper, textiles, and plastics used in a manufacturing setting. Short-loop manufacturing workers, which predominantly work in the automotive sector, are set up to recover and recycle materials for remanufacturing, using multiple partnerships enabled by digital platforms and geo-proximity.



**31,100**

Robotic Disassembly  
workers by 2030

**63%**

Of that workforce  
are between the  
ages of 25-54

## EDUCATION

**82%**

*Of postings did not specify a desired  
educational level*

## EXPERIENCE

**28%**

*Requested workers with 0-3  
years of experience*





# SHORT-LOOP RECYCLING EMPLOYMENT & WAGES

## Top 5 Employers with Job Postings (2019)

(Employer names are listed as they appear in online job postings)

- CRST International, Inc.
- Roehl Transport, Inc.
- Hogan Transports, Inc.
- Hirschbach Motor Lines, Inc.
- Roadrunner Transportation Systems, Inc.

## Top 5 Job Postings (2019)

- CDL-A Truck Drivers
- CDL-A Flatbed Drivers
- Team CDL-A Truck Drivers
- Owner-Operator Truck Drivers
- Machine Operators

## REGIONAL MEDIAN WAGE DISTRIBUTION FOR SHORT-LOOP RECYCLING OCCUPATIONS IN SOUTHEAST MICHIGAN (2019)

**\$55.88**

Purchasing  
Managers

**\$54.90**

Industrial Production  
Managers

**\$41.54**

Industrial Engineers

# SHORT-LOOP RECYCLING SKILLS & CERTIFICATIONS



## Technical Skills

Flatbed Truck Operation  
Warehousing  
Merchandising  
Purchasing  
Dry Van Truck Operation

## Foundational Skills

Communications  
Management  
Operations  
Customer Service  
Leadership

# IN-DEMAND CERTIFICATIONS

Many workers in this field have exclusive skills gained through navigating specialized learning curriculum. Highly sought-after certifications include:



CDL



Hazmat  
Endorsement



Transportation  
Worker ID Card



Tanker  
Endorsement



Doubles  
Endorsement



Six Sigma Green  
Belt  
Certification



Certified Forklift  
Operator



Production  
Certification



Triples  
Endorsement

# WORKER DEMAND BY TECHNOLOGY | SMART DIGITAL TWINS

## Smart Digital Twins

The digital twin paradigm enables manufacturers to operate factories efficiently and gain timely insights into product performance through digital twin technology, that provides near real-time updates and digital asset representations. The term digital twins describe digital representations that are linked to physical machines. Digital twins differ from previous modeling technologies, such as computer-aided design (CAD), as they require sensors or videos and images to tie the virtual model to its physical counterpart. Having this connection lets engineers work on the digital, rather than the physical model.



## EDUCATION

63%

*Of postings specified a bachelor's degree or higher education*

## EXPERIENCE

43%

*Requested workers with 0-3 years of experience*

5,905

Smart Digital Twins  
workers by 2030

73%

Of that workforce  
are between the  
ages of 25-54





# SMART DIGITAL TWINS EMPLOYMENT & WAGES

Top 5 Employers with  
Job Postings (2019)

(Employer names are listed as they appear in online job postings)

- FCA US LLC
- CMS Energy
- HDR Engineering, Inc.
- Aerotek, Inc.
- Power Engineering, Inc.
- Hyundai Corporation

Top 5  
Job Postings (2019)

- Electrical Engineers
- Mechanical Engineers
- Engineers
- Product Engineers
- Project Engineer

REGIONAL MEDIAN WAGE DISTRIBUTION  
FOR SMART DIGITAL TWIN OCCUPATIONS  
IN SOUTHEAST MICHIGAN (2019)

**\$49.80**

Computer Hardware  
Engineers

**\$48.56**

Computer Network  
Architects

**\$43.31**

Electrical Engineers

**\$42.71**

Mechanical Engineers

# SMART DIGITAL TWINS SKILLS & CERTIFICATIONS



## Technical Skills

Electrical Engineering  
Mechanical Engineering  
AutoCAD  
New Product Development  
Computer-Aided Design (CAD)

## Foundational Skills

Communications  
Management  
Problem Solving  
Operations  
Leadership

## IN-DEMAND CERTIFICATIONS

Many workers in this field have exclusive skills gained through navigating specialized learning curriculum. Highly sought-after certifications include:



Professional Engineer



Licensed Professional Engineer



LEED Accredited Professional



Cisco Certified Network Associate



Cisco Certified Network Professional



Cisco Certified Internetwork Expert



Project Management Professional Certification



CompTIA Security+



Microsoft Certified Professional



# WORKER DEMAND BY TECHNOLOGY | SMART WAREHOUSE ROBOTICS

## Smart Warehouse Robotics

Smart warehouse robotics refers to the use of automated systems, robots, and specialized software to transport materials, perform various tasks and streamline/automate warehouse operations. As previously mentioned, advances in autonomous mobile robotics (AMR) technology makes it easier for robots to be used in warehouses, where they support workers with high volumes of small, multiline orders. This leads to productivity gains, reduces accidents and injuries among workers while providing opportunities for skills development and retraining.



**8,142**

Smart Warehouse  
Robotics workers by  
2030

**77%**

Of that workforce  
are between the  
ages of 25-54

## EDUCATION

**53%**

*Of postings specified a bachelor's  
degree or higher education*

## EXPERIENCE

**25%**

*Requested workers with 1-3  
years of experience*



# WAREHOUSE ROBOTICS EMPLOYMENT & WAGES

Top 5 Employers with  
Job Postings (2019)

(Employer names are listed as they appear in online job postings)

- University of Michigan
- KLA-Tencor Corporation
- Stout Systems Development, Inc.
- CyberCoders, Inc.
- Td Ameritrade Holding Corporation

Top 5  
Job Postings (2019)

- Software Engineers
- Software Developers
- JAVA Developers
- Web Developers
- Application Engineers

REGIONAL MEDIAN WAGE DISTRIBUTION  
FOR SMART WAREHOUSE ROBOTICS  
OCCUPATIONS IN SOUTHEAST MICHIGAN  
(2019)

**\$43.19**

Software Developers

**\$38.66**

Computer Systems  
Analysts

**\$28.49**

Web Developers

**\$24.97**

Industrial Machinery  
Mechanics

# SMART WAREHOUSE ROBOTICS SKILLS & CERTIFICATIONS



## Technical Skills

JAVA/JAVA Script  
Software Engineering  
Agile Software Development  
SQL  
Python

## Foundational Skills

Communications  
Problem Solving  
Management  
Research  
Integration



## IN-DEMAND CERTIFICATIONS

Many workers in this field have exclusive skills gained through navigating specialized learning curriculum. Highly sought-after certifications include:



Salesforce  
Certification



Certified Power  
Quality  
Professiona



General  
Certificate of  
Education



Microsoft Certified  
Professional



Microsoft Certified  
Systems  
Administrator



Microsoft Certified  
Systems  
Engineer



Certified Scrum  
Master



Certified Public  
Accountant



Salesforce  
Certified  
Administrator



