# OPERATION RIGHT SKILL, UPSKILL

## AN INITIATIVE OF THE SW CT MANUFACTURING REGIONAL SECTOR PARTNERSHIP

Results from Critical Occupation Skills Analysis & Focus Groups

September 2022

# Operation Right Skill, Upskill

## ABOUT THIS REPORT

Between April-June 2022, the Southwest Connecticut Manufacturing Regional Sector Partnership (The SW CT Manufacturing RSP) embarked on a process to determine the knowledge, skills and abilities of the most in-demand and important manufacturing occupations as decided by the SW Connecticut manufacturing professionals who elected to participate. This report outlines the purpose of this work, the process undertaken, the findings, and the recommendations for stakeholders.

This report is intended for two audiences: first, the eighteen distinct education and training entities in the SW region of the State who have manufacturing-related programming; and second, the diverse manufacturers operating in SW Connecticut that rely on, or could rely more on, the schools for qualified job candidates. This report also serves an additional purpose: to galvanize the SW Connecticut Manufacturing Regional Sector Partnership's ability to better network the region's manufacturers together around common needs and issues, and to strengthen their collective relationships with the region's many independently operating education and training institutions.

## CONTRIBUTIONS

### PARTICIPATING COMPANIES

Amrita Global Group, ARCH Medical Systems, Ashcroft, ASML, Bausch & Stroebel, Beta Shim, G & R Manufacturing, Hampford Research, Hannes Precision, JV Precision Machine, King Industries, Kubtec Medical Imaging, Lex Products, Microboard, Modern Plastics, Nuovo Pasta, O'Keefe Metals, OEM Controls, Penmar, PTA Plastics, Schwerdtle, Sikorsky Aircraft, Stelray Plastics, Thule, Unilever and West-Conn Tool.

### PARTICIPATING EDUCATION INSTITUTIONS

Ansonia High School, Bullard Havens Technical School, Derby High School, Emmet Obrien Technical School, Fairchild Wheeler Independent District, Gateway Community College, Housatonic Community College, Manufacturing Alliance Service Corporation (MASC), Naugatuck Valley Community College, Norwalk Community College, Platt Tech High School, Porter & Chester, Quinnipiac University, Sacred Heart University, Seymour High School, Shelton High School, University of Bridgeport, and Goodwin University.

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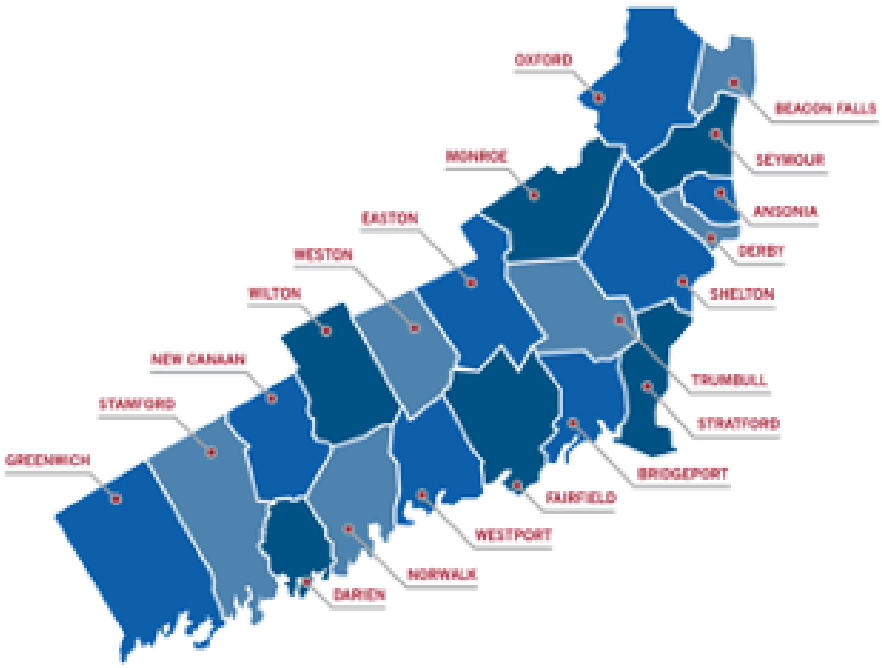
Special thank you to Jason Galassi from The Workplace Inc for research and data including in this report.

# ABOUT THE SW CT MANUFACTURING REGIONAL SECTOR PARTNERSHIP




## REGIONAL FOOTPRINT

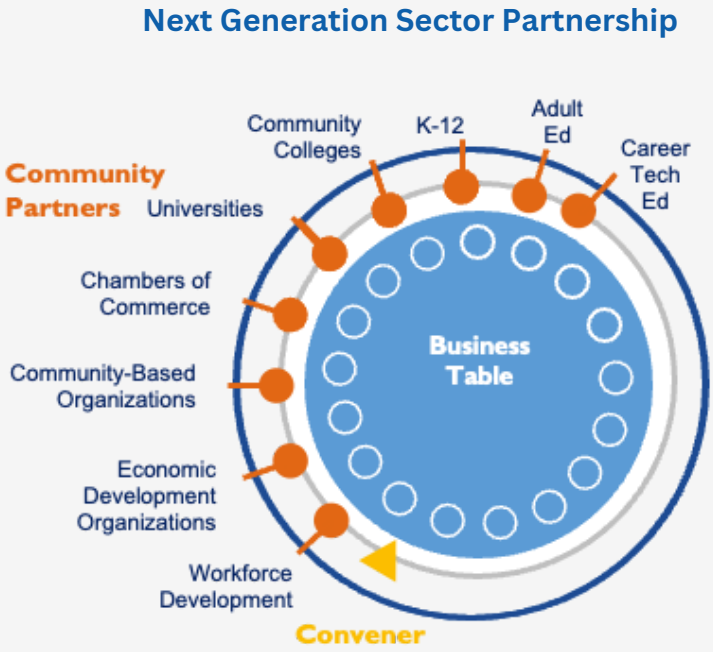
The SW Connecticut Manufacturing Regional Sector Partnership, established in June 2021, is a network of manufacturing executives in the Southwest region of Connecticut, stretching from southern Naugatuck Valley cities such as Seymour, Ansonia, Oxford, Derby, and Shelton to the southwestern and coastal cities including Monroe, Easton, Wilton, New Canaan, Greenwich, Stratford, Bridgeport, Norwalk, and Stamford. The SW CT Manufacturing RSP brings together C-suite business leaders from the over 200 manufacturers that actively produce products in southwest Connecticut, small and large and very diverse.

## THE RSP MODEL

Like other RSPs in Connecticut, the SW CT Manufacturing RSP is organized in a specific way to ensure that it stays industry-led and regionally-supported by stakeholders in education, workforce development and economic development. It is modeled after Next Generation Sector Partnerships, a model of industry partnership that mobilizes companies in a shared industry and a shared region around big problems that individual companies could never tackle on their own. To be successful the model requires building a connected network of companies, in this case manufacturers, in a region. It also requires a significantly higher than normal level of coordination across the otherwise independently acting education, training and economic development organizations in that same region. The SW CT Manufacturing RSP is convened by the Bridgeport Regional Business Council, acting on behalf of the larger region. It is supported by a collaboration of the Greater Valley Chamber of Commerce, Norwalk Chamber of Commerce, The Workplace Inc (a SW CT workforce development Board), Shoreline West region of Connecticut State and Community Colleges, and the Metro Council of Governments (COG).

## SWCT LEADERSHIP

The SW CT Manufacturing RSP is guided by a committed Executive Leadership Team made up of executives from five manufacturing companies: Microboard (an electronics manufacturer specializing in circuit boards and system integration), PTA Plastics (a custom plastic injection design and molding company), KUBTEC Medical Imaging (an imaging equipment manufacturer specializing in surgical margin precision), OEM Controls (a custom industrial control systems manufacturer) and Hampford Research (a specialty chemical manufacturer focused on electronics, adhesive, printing and personal care supplies).

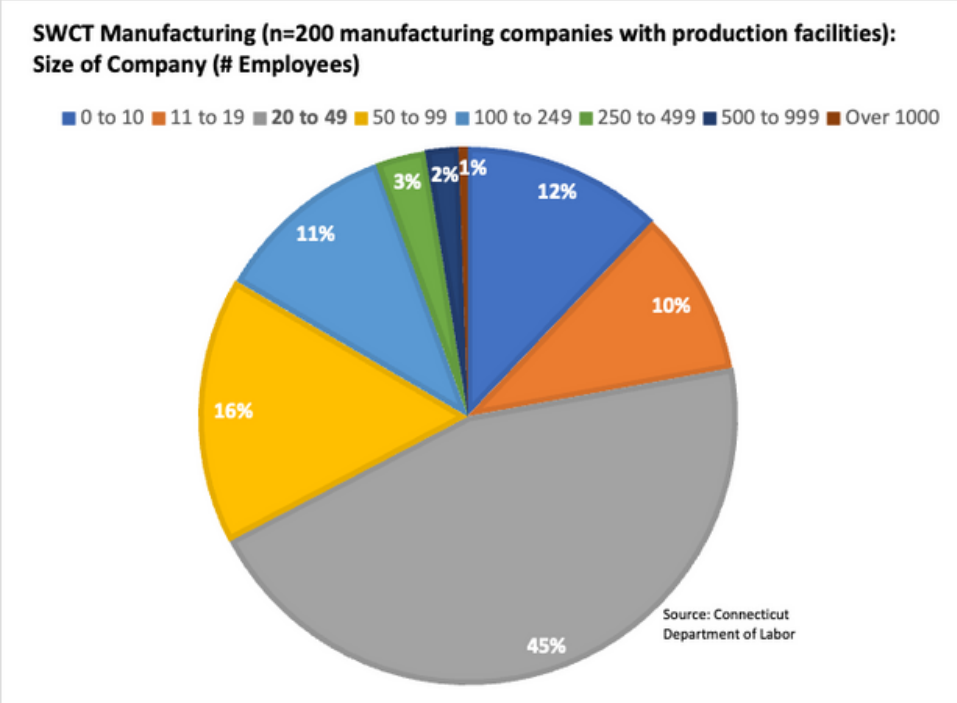



The SW CT Manufacturing RSP operates under a vision and metrics framework, created by the Executive Team. The framework includes network growth metrics (increasing active company participation, increasing active participation by public support organizations, among others), as well as impact metrics across four areas: increased local hiring; increased worker retention; value-add company-to-company networking; and effective use of state and local resources. The self-driven activities supporting these goals can shift on a quarterly basis, but at the time of the report included the following:

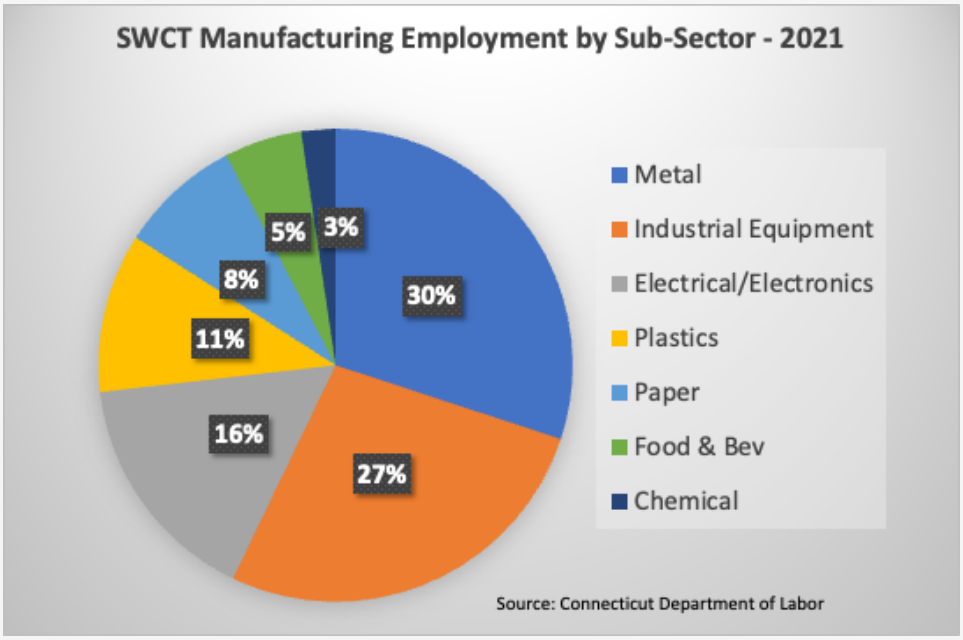
- Understanding & Focusing on Regional Challenges
  - A forum for BIG conversations: Living Wage, Affordable Housing, Transportation come to the forefront
- Active Engagement with Education & Training Partners
  - An aggregate understanding of in-demand jobs across SW CT
  - Refreshed Skills Standards for 5 Occupation Families with Education Partners leaning to fill the skills gap
  - Building local-for-local Industry-to-Education relationships
- Promoting Awareness of Manufacturing in SWCT
  - Website/Jobs Portal, A trademarked brand "MakeItCt", Outreach to Young Professionals, Summer 2022 LCD screen pilot in schools
- Executive Level Commitment & Connections
  - Monthly Exec “Power Hours”, Exec Peer Tours, Shared Initiatives
  - Learning from each other – worker recruitment/retention, business operations, programs/resources
  - Making Sense of and creating awareness/utilization of Local & State Programs

Since launching the SW CT Manufacturing RSP, over 38 unique manufacturers have engaged actively in networking, executive-level prioritizing and planning sessions, career fair activities, lunch and learns, company tours, and the critical occupation focus groups that are the feature of this report. The level of company engagement, at the time of this report, represents nearly 20 percent of the industry sector in the region and over 24,000 manufacturing jobs.

# THE OPPORTUNITIES: SKILLS AND JOBS ALIGNMENT




**The SW Connecticut region is mainly composed of small companies with almost 70 percent of operating manufacturers employing under fifty individuals.**



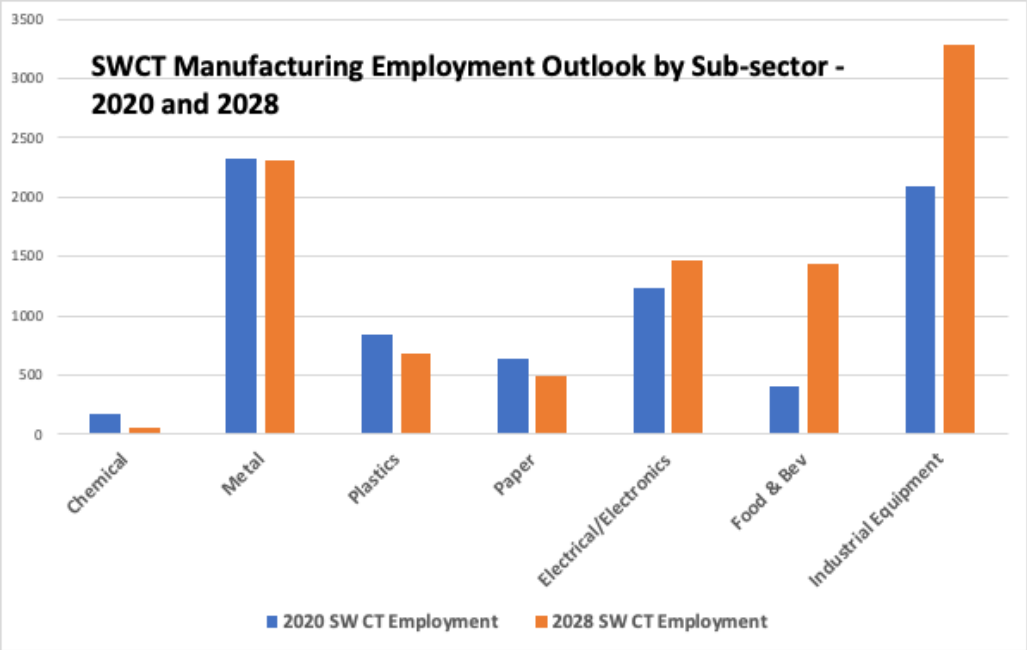

**Manufacturing in SW CT is disaggregated across a few dominant sub-sectors.**

## THE DATA

Manufacturing is stable in Southwest Connecticut. Over 300 manufacturers make SW Connecticut their home; 200 actively produce products in the region (others represent regional, national or international headquarters or those involved in distribution of manufacturing products and service-related businesses, not direct production).

These companies provide thousands of primary employment jobs and thousands more support positions. Nationally manufacturing, according the National Manufacturing Association, manufacturing has one of the largest economic multiplier effects of any industry. For every $1.00 spent in manufacturing, there is a total impact of $2.68 to the overall economy.

Employment is dominated by the Metals (30 percent) and Industrial Equipment (27 percent) sectors. Electrical and Electronic parts make up 16 percent of employment; Plastics 11 percent. Chemical products, Food and Beverage, and Paper manufacturing each represent between 3-8 percent employment in the region.




**Certain sub-sectors are projected to remain stable while others grow.**

Metal manufacturing is projected to remain stable. Industrial equipment, electronics and food & beverage manufacturing are projected to grow over the next five years.

## THE NEED

To keep operating, producing the products the world wants and needs, manufacturers in the region need a qualified workforce. This is their most pressing shared need. Also in SW Connecticut are nearly twenty independent education and training entities with manufacturing-related programming, each hard at work to provide manufacturers with qualified jobseekers. These education institutions each have manufacturing advisors for their programs, but to get a more robust and granular picture of employee skill requirements, they need access to more manufacturers in the region doing the actual hiring.

Other regions in the State have clearer pictures of their skills needs in this sector. The SW CT Manufacturing RSP presents an opportunity for the Southwest to get organized and connected.

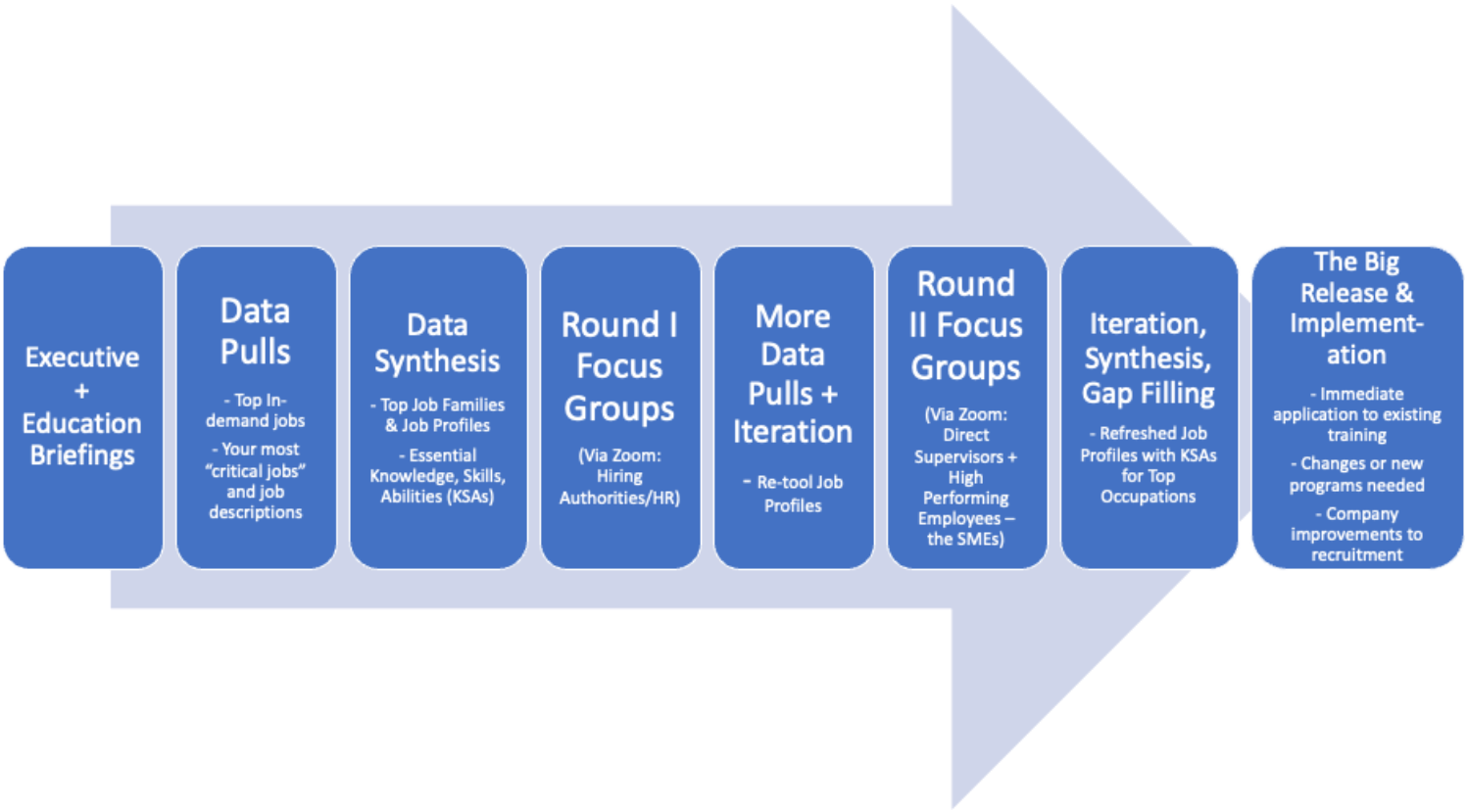
Toward that end, the RSP launched an Operation Right Skill, Upskill process with three desired outcomes:

1. **A Mechanism** for the manufacturing industry in SW CT to aggregate shared in-demand skills
2. **A Refreshed, comprehensive set of needed skills** and training criteria, for use by all of SW CT's education & training institutions to right-skill, upskill, and scale-up training in a comprehensive & coordinated way
3. **More and better local candidates for hire** – an increase in the pipeline of skilled workers with the right skills at the right time for critical jobs in the region

# THE SKILLS STANDARDS PROCESS

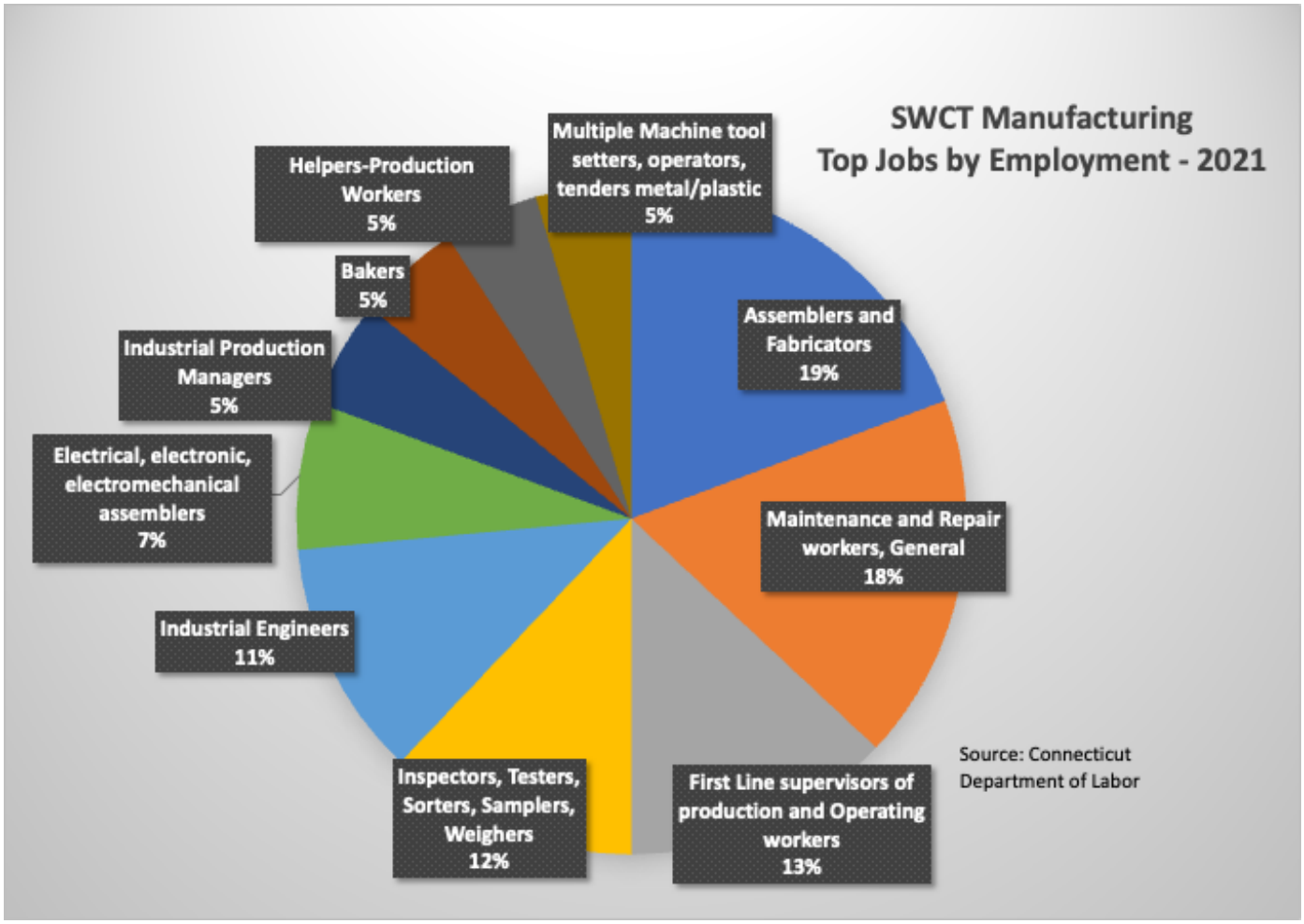
## THE WORKFLOW

Early briefings with manufacturing executives on the need to aggregate skills demands began in March 2022. The entirety of the process including deeper briefings with partners, data analysis and synthesis, recruiting for and conducting focus groups on shared critical occupations, and final analysis continued through June 2022. An open input and feedback period with education partners took place during July and August before synthesizing findings in this report in September.

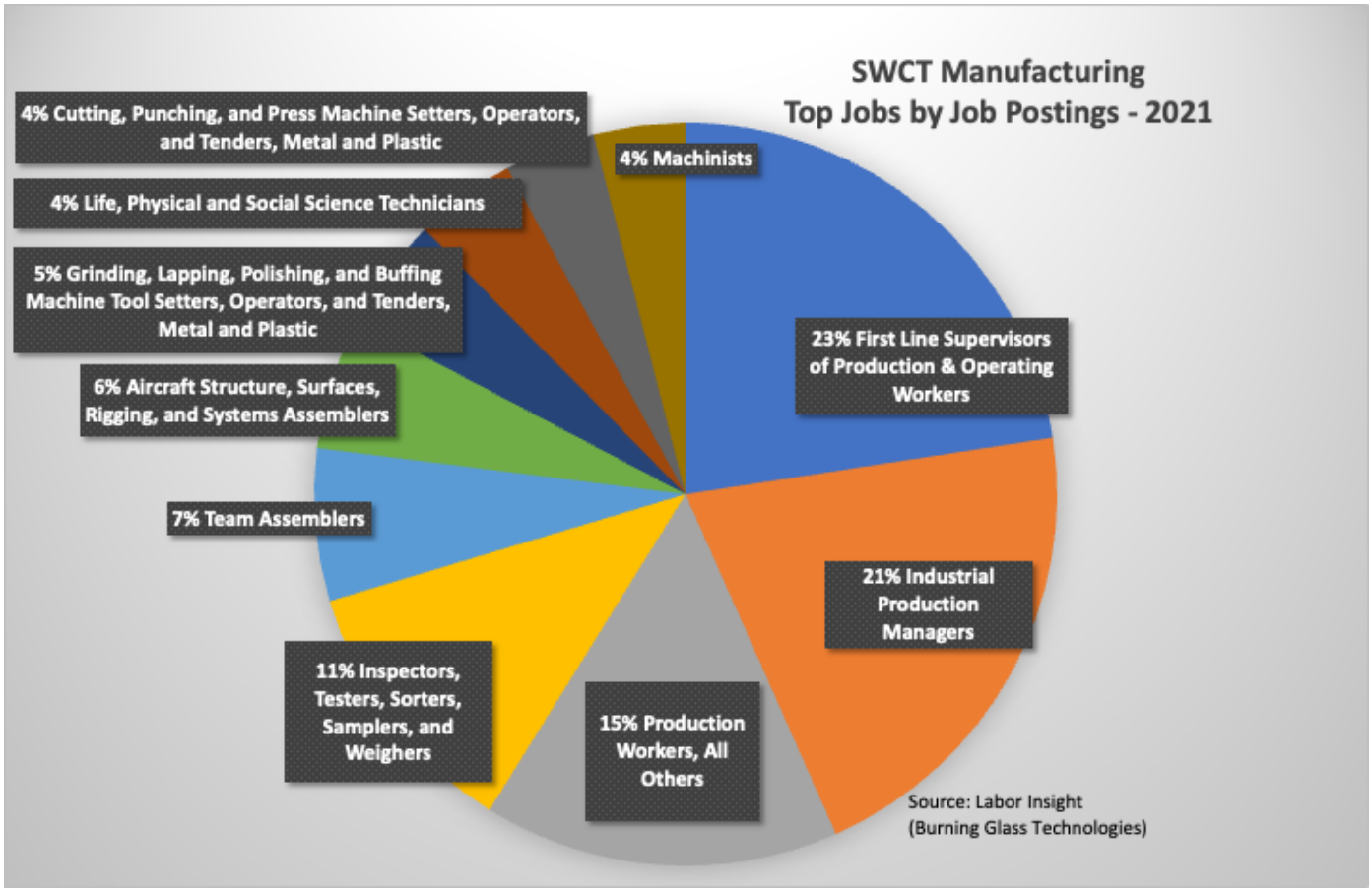



## DEFINING CRITICAL

The process of understanding and mobilizing around shared, high-priority skills gaps in manufacturing required combining labor market data with real-time data from companies doing the hiring. Early in the process, labor market information provided a baseline of occupations in manufacturing based on the highest number of actual jobs in the region as well as insights into demand based on highest rates of open job postings and projected growth in the region.




**Most critical occupations as if defined by most number employed**




**Most critical occupations if defined by most often publicly posted**

This information was then corroborated with collection of real time data in the form of current job descriptions for most critical occupations (self-defined by the companies) collected from a sample of manufacturers (n = 22) proportionately representative (as much as possible) of the make-up of manufacturers (size and sub-sector) in the region. Most companies defined “most critical” as hardest to fill with qualified candidates and/or the greatest number of openings. The over 75 job descriptions were analyzed and cross-checked with the labor market data on employment and job posting numbers.

By combining the previously described three categories of data (top by employment, top by job posting, top by shared job descriptions, the following Occupation families rose to the top as the most critical shared need across manufacturers in SW Connecticut.

## Five Most Critical Occupation Families in SW Connecticut Manufacturing

1. **Industrial Maintenance** a combination of related positions, including industrial machinery mechanics, calibration technologists/technicians, engineering technologists/technicians, control & valve installers and repairers, electrical/electronics repairers of commercial/industrial equipment, first line supervisors of mechanics/installers/repairers, and installation/maintenance/repair generally.
2. **Electrical/Mechanical Assembly** including a combination of related positions such as electrical, electronic and electromechanical assemblers.
3. **Metal Manufacturing** including welding, soldering, punching, press machine, grinding, lapping, polishing, buffing, plating, brazing, spraying and other machine tool setters/operators/tenders, machinists, tool and die makers, computer numerically controlled tool programmers/operators.
4. **Quality Assurance/Quality Control** including quality control, quality assurance, metrology and related.
5. **Supervisory occupations** including supervisory roles in maintenance and assembly.

## JOB PROFILING

With the final five occupation families selected, the process began to identify and outline the actual knowledge (K), skills (S) and abilities (A) required for an individual professional to be successful while employed. This analysis required a synthesis and comparison of the KSAs in the collected job descriptions with the KSAs in job profiles in a national database, the U.S. Department of Labor’s Occupational Information Network, otherwise known as O*NET. O*NET is an inventory of over 900 occupations across the U.S., with detailed descriptions of needed skills and education for the tasks and functions of each unique job. O*NET aggregates skills needs from national job profiles, and therefore provides a strong baseline for occupational KSAS, but not a customized set of KSAs that may be unique to an industry in a specific region.


**Sample O*NET Profile**

## FOCUS GROUPS

In order to customize and ensure education and training institutions in SW Connecticut would get a refreshed set of KSAs, the final phase of the Operation Right Skill-Upskill process included focus groups. Specifically, two rounds of focus groups:

1. With the human resource or hiring authorities, in some cases company owners or presidents;
2. With high-performing employees in each of the occupation families.

Focus groups were designed to be iterative. In the first round, human resource and hiring authorities were asked for the top needed KSAs for each occupation family. This information was combined with a summary of KSAs pulled from the synthesis of O*NET job profiles and actual job descriptions submitted by companies.

Participants then sorted the compiled KSAs into three sub-categories: 1. Must have; 2. Nice to have; 3. Not needed. These results were used during the second round of focus groups with high-performing employees, who similarly described per their own experience the most essential KSAs for successful performance. These once again were combined with the list resulting from the first focus group and sorted by 1. Must have; 2. Nice to have; and 3. Not needed.

# FINDINGS ON 5 CRITICAL OCCUPATION CATEGORIES

## GENERAL FINDINGS

The two rounds of focus groups provided an insight into the skills that are considered “Must Have” and “Nice to Have” as well as the attitudes that employers believe are necessary for on-the-job success. The KSA’s for each of the five occupations are listed below. There is some overlap between the five groups that can be used to develop a minimum set of skills necessary in the manufacturing sector:

| Common "Must Have" Skills | Common "Must Have" Attitudes |
|---|---|
| • Print reading<br>• Precision measuring and hand tools<br>• Basic math<br>• Mechanical aptitude<br>• Computer literacy<br>• Safety (OSHA-10)<br>• Lean manufacturing basics | • Problem solving/Critical thinking/Analytical skill<br>• Teamwork<br>• Written and verbal communication<br>• Safety conscious<br>• Quality focus<br>• Attention to detail<br>• Reliability/responsibility<br>• Results driven |

Detailed findings are found following this section in six occupational categories:

- INDUSTRIAL MAINTENANCE
- PLASTICS/METALS QUALITY ASSURANCE & CONTROL
- ELECTRICAL/ELECTRONIC ASSEMBLY
- ELECTRONICS QUALITY ASSURANCE & CONTROL
- MACHINING
- MAINTENANCE/PRODUCTION SUPERVISORS

# DETAILED FINDINGS BY OCCUPATION CATEGORY

## INDUSTRIAL MAINTENANCE

An industrial maintenance professional is someone who diagnoses, repairs, maintains, and monitors machinery and machine parts. They use a variety of mechanical equipment such as power tools, hoists, forklifts, and hand tools, such as wrenches and precision measuring micrometers, to perform emergency, scheduled, and preventive maintenance. There are several types of maintenance personnel, including industrial maintenance mechanics, millwrights, technicians, and diagnosis experts. Some industrial machinery mechanics use hand tools to perform lighter maintenance tasks, while other industrial mechanics operate control systems and perform diagnostic tests, as part of a preventative maintenance program. A brief overview of their responsibilities includes:

- Monitor equipment performance logs and early warning systems, in order to detect possible areas of malfunction in machinery.
- Perform routine repairs on constantly running machinery such as conveyor systems and assembly line robots.
- Perform early maintenance on vital electrical systems and circuitry to prevent system failures and/or fires.
- Help senior management develop maintenance plans by providing timely reports on all operational machinery.

### MUST HAVES

1. Troubleshoot and repair – Maintenance individuals must be familiar with a variety of manufacturing equipment and be able to identify problems and work to a solution through repair or replacement.
2. Preventative and predictive maintenance – More and more manufacturing facilities are working toward a predictive maintenance plan to prevent operation shut-downs.
3. Programmable Logic Controller- A great deal of manufacturing equipment is run with a PLC or computer-programmed. Industrial maintenance individuals must have a basic knowledge, program troubleshooting, input/output diagnosis, low voltage, and control circuitry.
4. Hand tools – These individuals must know how to use basic tools such as a wrench, screwdriver, table saw and others. They will also use precision measurement tools.
5. Print reading – This person will work with schematics and prints so should be familiar with standard print reading
6. Mechanical aptitude – This person should have mechanical/electrical ability.
7. Basic math – basic math skills should include analytical tools, decimals, fractions, etc.
8. Computer literacy – Individuals should know computer usage including basic navigation and MS Office tools.
9. Planning/timing with work
10. Safety-OSHA 10 – Lock out/tag out, and other safety procedures are an essential part of this skill set.
11. Lean Manufacturing basics – This person needs to have a solid understanding of lean manufacturing.
12. Documentation skills- The industrial maintenance individual will need to document their repair and maintenance on equipment.

### NICE TO HAVES

1. Sheet metal fabrication
2. Welding/pipe fitting
3. Rigging
4. Forklift
5. Design, layout, construct, install and service production systems
6. Machine setup and fixturing
7. Plumbing Certificate
8. Trains other employees
9. Knowledge of high-pressure hydraulics & pneumatics
10. Hazardous waste handling
11. Safety direction and operations
12. Knowledge of boiler, HVAC, air/nitrogen, chiller/cooling systems
13. Manual machining

### ATTITUDES

1. Interpersonal skills
2. Leadership
3. Conflict resolution
4. Written and verbal communication
5. Problem solving
6. Attention to Detail
7. Teamwork
8. Positive Attitude
9. Ability to influence
10. Accountability
11. Lead by example
12. Professionalism

## ELECTRICAL/ELECTRONIC ASSEMBLY

Assemblers use tools, machines, and their hands to make engines, computers, aircraft, electronic devices, control panels and more. Communication and problem-solving skills are essential. Employers report that while job tasks and functions are important, a good attitude and character are the most important factor when making hiring decisions. Most assemblers and fabricators are classified as team assemblers, but others specialize in producing one type of product or perform the same or similar tasks throughout the assembly process. Assemblers fulfill a number of entry-level, front-line duties that can vary by shop.There is an expectation that these are entry-level jobs and much of what the worker does will be taught on the job. It is imperative to have a clear understanding of the bigger picture of how the assembler's role contributes to the company-wide output. Assembler should be up front and honest about mistakes and suggest changes to the process that will help out the entire company.

### MUST HAVES

1. Electronic/electrical assembly – Assemblers need to know how to assemble electronic and electrical components in a variety of sizes and situations.
2. Precision and hand tools – Workers must have knowledge and use of basic tools such as a screwdriver, wrench, measurement gauges and inspection devices, multimeters
3. Manual dexterity – Assemblers spend much of their time working with their hands on small, sometimes fragile parts.
4. Safety mindset – Although safety training is a constant on-the-job event, it is essential that an assembler comes to the workplace with safety foremost on their mind.
5. Follow procedures – Assemblers must be able to follow a work order, understand the detail and variation in each.
6. Identify and load machine programs – Although assemblers are not typically programming the machines, it is important that they understand the work involved.
7. Machine operation – Assemblers will be working with a variety of machines and robots. It is important that they are comfortable with basic machine and robot operation.
8. Computer skills – Assemblers must have comfort with computers.They need to know basic navigation, keyboard, folder structure, and workplace guidelines.
9. Electric Static Discharge Protocols – It is important that assemblers understand the science behind ESD and the problems that ESD can cause in the product.
10. Soldering – Many assemblers solder and need IPC Certification; J-STD, IP610 standards.
11. Microscope – Many assemblers work long hours under a microscope or with another type of magnifier
12. Basic Math – Assemblers need to use math for analytical reasons. Basic addition, subtraction, and some algebra.
13. Quality control – Assemblers need to have a quality mindset. They will be required to keep detailed documentation and record keeping is a large part of the job.
14. Attention to detail – Assemblers are working with many small components. Detail is important.
15. Component identification – Assemblers mush have familiarity with fundamental component handling. In electronics, they should know the layout of the board and recognize reference designation.
16. Basic Project Management - It is important that assemblers understand their part in the company. They should understand what part they play with the customer and with their co-workers.They should have a basic understanding of the overall goal.
17. Print reading-schematics – Assemblers should understand line diagrams; the layout of board/reference designation.
18. Mechanical assembly – Assemblers must do both mechanical and electronic assembly well.

### NICE TO HAVES

1. Understanding the manufacturing process
2. Lean manufacturing
3. Operate unique processing equipment
4. Quality inspection and focus (components/final assembly)
5. Data collection
6. Apply adhesives and epoxies (company dependent)
7. Troubleshoot, maintain and repair instruments and equipment
8. Manual CNC Machining
9. Crimping- set up and operation (company dependent)

### ATTITUDES

1. Quick learner
2. Team work & Flexible- open to cross training
3. Customer focus (internal and external)
4. Analytical, problem solving, troubleshooting skills
5. Self-Motivated, engaged
6. Written/verbal communication, ability to give feedback
7. Results driven
8. Attention to detail
9. Safety focus
10. Quality and Continuous improvement mindset
11. Willingness to learn; open to feedback
12. Punctuality, responsibility, desire to succeed, passionate about role
13. Interested in understanding the process through to the end product
14. Responsible and initiates follow-up
15. Goal oriented-quality, time, focused on achieving

## MACHINING

Machinists and tool and die makers set up and operate a variety of machine tools to produce precision metal parts, instruments, and tools. Machinists use machine tools, such as lathes, milling machines and grinders to produce precision metal parts. These tools are either manually controlled or computer-numerically controlled (CNC). CNC machines control the cutting tool speed and do all necessary cuts to create a part.The machinist determines the cutting path, the speed of the cut, and the feed rate by programming instructions into the CNC machine. Many machinists must be able to use both manual and computer-controlled machinery in their jobs.

### MUST HAVES

1. Ensure safe use of machinery – Machinists should know basic lock out/tag out procedures. They should know how to make sure the machine is in proper state of use.They need to make certain that the set-up is correct and it is safe to proceed.
2. Print reading – Machinists need to understand tolerance. They must understand the difference between metric and imperial. They need to verify that the print is correct, match the part number and revision number to the job, recognized multiple part numbers. It is important to know isometric view, cross sections and tolerances.
3. Manual machining – It is important that machinists learn the fundamentals of manual machining to fully understand the operation of the machine.
4. Manual dexterity – Machinists are working with small measuring devices and tiny parts. Dexterity is a must.
5. Clean and debur product – A quality product is free of burs and other unwanted materials. That is the ultimate responsibility of the machinist.
6. Monitor and adjust feeds and speeds – Workers need to understand different materials and other machine conditions
7. Computer Skills – Workers need to have a basic knowledge of computer skills including navigation, email, email etiquette, MS Office, specifically Excel.
8. Hand and measurement tools – Workers must have knowledge/experience with calipers, micrometer, Vernier mic and others depending on production.
9. Basic math- Machinists will need to have a solid understanding of decimals, fractions and geometry produce quality product. They msut be able to convert standard to metric measurement.
10. Organizational skills – Workers are required to be organized in planning and completing their projects.
11. Housekeeping skills – Safety requires that workers are required to keep their work place clean and free of clutter.
12. GD&T – Machinists work each day with blue prints and must be able recognize and read various Geometric Design and Tolerancing symbols.
13. Tool knowledge – Workers must have experience with Indicating tools, cutting tools and others.
14. Making offsets – Machinists must have the knowledge to bring their parts into dimension
15. CNC- (Computer-numerically controlled) Advanced Machinists will program their machines in G-Code/M-Code and other programs.Even entry-level operators need to have a basic understanding of these programs.
16. CAD and Solidworks – A basic familiarity of design programs will provide the background needed for machinists to understand their part in the process.

### NICE TO HAVES

1. Quality Procedures and Inspection
2. Tool and Machine Maintenance & Repair
3. Design layout
4. Tool & Die manufacturing/ Wire/sinker EDM (company dependent)
5. Machining CAD/CAM (company dependent)
6. Design and fabricate work holding (fixtures)
7. Sharpen and maintain tooling
8. Operate chop saw, drill presses, Coordinate Measuring Machine
9. Knowledge of PC-DMIS (CMM programming- company dependent)
10. Knowledge of Geometric Dimensioning &Tolerancing
11. Knowledge of continuous improvement process procedures/ Lean Manufacturing
12. Familiarity with AS90100, ISO 9001
13. Foreign object debris control (company dependent)
14. Requirements in handling sensitive documents on the floor

### ATTITUDES

1. Communication skills, being able to ask questions; bringing up concerns, In-person conversations
2. Attention to detail/listening skills
3. Critical thinking
4. Flexibility for changing job requirements
5. Quick learner
6. Analytical/problem solving skills
7. Able to multi-task (run multiple machines)
8. Email and general business etiquette
9. Resume/Interviewing Skills
10. Teamwork – how an individual fits in with the department & the overall company
11. Leadership skills
12. Working with a mentor
13. Safety mindset
14. Punctuality
15. Community Involvement
16. Emotional intelligence
17. Attendance

## PLASTICS/METALS QUALITY ASSURANCE & CONTROL

Plastics/Metals quality control technicians are responsible for maintaining quality assurance processes, testing of products, and recording and analyzing of results gathered during product development and production. They work to ensure that production or manufacturing processes and products created meet the quality specifications that are laid down by the company. They ensure wastes are minimized; that there is improved efficiency during production, and that customers receive products that are fit for consumption. Specifically, quality control technicians measure dimensions such as length, height, and distance between reference points, using precision instruments such as micrometer, caliper, dial indicator, optical comparator, and other specific measuring equipment. They locate reference points on parts and measure dimensions, such as angle, arc, and radii, using a combination of aids, such as surface plate, angle plates, parallel bars, gauge blocks, V-blocks, and other precision measuring instruments.

### MUST HAVES

1. Familiarity with Components
2. Hand measurement tools – These inspectors must know proper usage of calipers, micrometers, drop indicators, optical comparators, pin gauges, etc.
3. Print Reading – These individuals must hold a basic knowledge of Geometric Dimensioning & Tolerancing including the symbols and convention. They should be able to conceptualize 2-D, 3-D.
4. Computer Knowledge – Inspectors need to have basic computer skills and be familiar with MS Office.
5. Microscopes- In many cases, inspectors are working under a microscope for long periods of time. They should understand various vision systems.
6. Housekeeping – Inspectors need to keep a clean, organized workspace.
7. Basic math – Inspectors daily use decimals and fractions.They also make English/metric conversions.
8. CMM - The (Coordinate Measuring Machine) is a standard tool for QA/QC inspectors. They need to know set-up, programming & operation. PC-DMIS is the standard program.
9. Analyze test data – These inspectors must be familiar with analysis tools. They should know Statistical Process Control including Minitab software, Statistics 101, and measurement system analysis.
10. ISO9001 – Many manufacturing sites are moving to this standard. QA/QC is an integral part of the achieving this certification.
11. Vision systems – QA/QC inspectors use laser measurement devices, CTA scanning and other tools.Individuals should know which measuring instrument works best, understand the capabilities and the percent error for each measurement method is important.

### NICE TO HAVES

1. SharePoint
2. MIL spec
3. Hand tools (screw driver, wrench)
4. Metrology tool inspection, calibration, maintenance, and repair
5. Develop gauging equipment
6. Provide technical support to other teams
7. PC Operation- CAD/SolidWorks-model & send to tool room for fabrication/IGES
8. Design jigs and fixtures
9. Safety-OSHA
10. Plastic injection molding knowledge
11. Cleanroom experience
12. Knowledge of ISO13485, ISO17025, AS9100
13. Machining background

### ATTITUDES

1. Attention to Detail (meet the customer requirements)
2. Teamwork – how does this person fit in with the current team
3. Verbal (presenting data to others) and written communication
4. Presentation skills
5. Problem solving
6. Trainable (Can accept feedback)
7. Quality focus
8. Entrepreneurial
9. Appreciating others & their ideas

## ELECTRONICS QUALITY ASSURANCE & CONTROL

Electronics quality control technicians perform a variety of tasks, such as; visual inspection, mechanical and dimensional inspection, print reading, interfacing with all levels of personal; engineering, management and customers, verifying work instructions and specifications including specific call out per the drawing. They work to ensure that production or manufacturing processes and products created meet the quality specifications that are laid down by the company. Through the work that they do, they ensure that wastes are minimized; and that there is improved efficiency during production, and ensure that customers receive products that are fit for consumption. Specifically, quality control technicians utilize a variety of inspection devices including micrometers, Vernier's, gauges, optical comparators, coordinate measuring machines, multimeters, microscopes, and other precision electronic measuring equipment.

### MUST HAVES

1. Inspect Components – QA/QC inspectors inspect electronic subassemblies and assemblies. This may include incoming inspection, roving inspection, first piece inspection or final inspection. At times, inspection may require black light inspection, robotic equipment and automated quality tools. Inspectors may work with customers to work out kinks in a new product.
2. Basic electronic test equipment – Inspectors must be familiar with power supplies, digital multimeter, oscilloscope, understanding wave form, digital resistance and voltage, control circuit signals, microscopes
3. Develop and implement inspection plans and procedures – Oftentimes the QA/QC Inspector is responsible for developing and documenting the inspection procedures for the plant.
4. Hand measurement tools- Inspectors use micrometers, calipers, rulers, English and metric units
5. Computer Skills – These individuals should be familiar with PC's-MS Office including Excel and Word. They should know basic navigation of the company's specific ERP.
6. Housekeeping – Keeping the workspace clean and in order is a important skill in this profession.
7. Basic math – Inspectors need to know fractions, decimals, and metric conversion.
8. Communication – Inspectors need to read and write English language proficiently.
9. Electrical Static Discharge – Inspectors should understand ESD and know the company procedures to avoid damage to product.
10. Soldering – These individuals must know how to solder and should have certification in IPC 610, and J Standard.
11. Conformal coat inspection – Some companies require that individuals can do conformal coat inspection.
12. Geometric Dimensioning & Tolerancing – Individuals must be familiar with GD&T convention and symbols.
13. Documentation – Inspectors will be responsible to record and report basic test data. These reports may include corrective action that will impact the plant.
14. Print reading- Inspectors must be able to read and interpret schematic line and wiring diagrams.
15. Diagnose assemblies to component level – Inspectors must be familiar with several different types of components.

### NICE TO HAVES

1. MIL spec (company specific), able to read and understand specs
2. Analyze test data, Statistical Process Control- general understanding
3. Measurement tool and instrument calibration and maintenance
4. Provide technical support for other teams
5. Coordinate Measuring Machine
6. Basic understanding of CAD
7. Knowledge of jig and fixture design
8. Continuous Improvement
9. Basic understanding of Lean Manufacturing, SIPOC (Suppliers, inputs, process, outputs, customers)
10. Safety-OSHA
11. Knowledge of surface mount technology (IPC 610)
12. Cleanroom operations (company specific)
13. Basic knowledge of ISO9000
14. Inspection under black light for coatings
15. Operation of robotic equipment
16. Perform prototype inspection
17. Understanding Acceptable Quality Level
18. Perform rework and repair at component or subassembly level

### ATTITUDES

1. Attention to Detail (meet the customer requirements)
2. Teamwork – how does this person fit in with the current team
3. Verbal and written communication, ability to communicate with customers
4. Quality focus
5. Problem solving and seeks out opportunities to solve problems
6. Trainable (Can accept feedback)
7. Pride in their work
8. Ability to adapt to different workflow
9. Ability to prioritize

## MAINTENANCE/PRODUCTION SUPERVISORS

Production managers are ultimately accountable for results on key metrics of manufacturing safety, quality, productivity, cost, and personnel.This involves an ongoing process of optimizing manufacturing operations, analyzing data to identify opportunities for improvement, continuously evaluating performance, and implementing solutions. As leaders of production teams, it also involves continuously teaching, developing and mentoring staff to build effective teams and take ownership. Maintenance supervisors are responsible for ensuring that the facility and machinery used in production run to their maximum efficiency and output. This includes total preventative maintenance, managing breakdowns of mechanical, electrical, and associated equipment. It includes people management and budgetary/cost responsibilities. As team leaders this involves planning scheduled maintenance, delegating work to the maintenance staff, and determining the priority and scheduling unplanned repairs.

### MUST HAVES

1. Knowledge of the product – The supervisor is ultimately responsible for the output of the product.
2. Manufacturing process – The supervisor must develop, implement, manage, and evaluate production procedures
3. Work Flow – The supervisor understands the management of workers and most efficient use of their time and talent.
4. The supervisor ensures that operators are executing on production procedures.
5. Suggest process improvements – An understanding of the principles of Lean Manufacturing and how to implement the improvements within a team are essential.
6. Basic math- High school level (arithmetic, geometry, algebra)
7. Basic English skills – Ability to communicate clearly with team members and administrators,
8. Safety focus – Since this person is responsible for several individuals within the plant, safety is critical
9. Technical knowledge – Although it is ideal if the supervisor is a master of the skills he/she is managing, the supervisor needs to have a least a basic understanding of the manufacturing skills including machining, tool making, electronics, etc. including an ability to converse in needed technical jargon.
10. Quality Fault Analysis - The supervisor needs a basic understanding of root cause and corrective action.
11. Print Reading – Much of the manufacturing operations depend on following the original prints/schematics.
12. Employee management – This includes team management, training, evaluation, counseling, direction and disciplining. This individual is expected to maximize retention & minimize turnover.
13. Record keeping/ Documentation – both for the manufacturing process and for managing individuals is a requirement of this position. This individual will document and evaluate performance/production standards.
14. Organization skills – The supervisor is managing different processes, records and procedures. An ability to keep all of this information in an organized format is imperative.
15. Production forecasting – The supervisor assigns the daily work schedule based on production. This person plays an important part in the overall process of getting the product delivered on time.
16. Computer Proficiency – Much of this work is kept on computers – computer proficiency is a requirement. A basic knowledge of MS Office including Word and Excel is important.
17. Able to handle pressure and multi-task – Supervisors are managing process, product and all the people involved. This individual will handle fires and trouble spots on a daily basis.

### NICE TO HAVES

1. Labeling Accuracy (Very specific company requirement)
2. Ability to converse in the same technical jargon
3. Operate, troubleshoot, repair production equipment
4. Machine start up and shut down
5. Maintain inventory
6. Raw material forecasting (company specific)
7. Basic knowledge of programmable logic controller troubleshooting (company specific)
8. CPR/First Aid
9. Quality focus- verify first article inspection (company specific)
10. Rework – some knowledge
11. Knowledge of ISO9000, AS9100
12. Health & Safety training
13. Basic knowledge of employment law (harassment/interviewing)
14. Familiarity with the union environment
15. Exposure to ERP system; SAP, Oracle, Access
16. Engineering background
17. Working with different generations
18. Direct and perform routine maintenance

### ATTITUDES

1. Interpersonal skills
2. Leadership
3. Conflict Resolution
4. Written and verbal communication
5. Problem Solving
6. Attention to Detail
7. Teamwork
8. Positive Attitude
9. Ability to influence
10. Accountability
11. Lead by example
12. Professionalism

# PROGRAM RELEVANCY

## STAKEHOLDER INSTITUTIONS

The following institutions offer training coursework and programs that are specific to the five key occupations covered in this report, and therefore may benefit from reviewing and integrating the skills into their curricula.

Important Notes: Some of these are technically outside of the SW CT region but are included because they are relevant and adjacent to the region. Not all education institutions in SW CT are listed here because they may not have manufacturing-relevant programming. Finally, these were accurate at the time of writing of report but curriculum and offerings can change.

### AREA HIGH SCHOOLS

Advanced Manufacturing (College Connections Program with Housatonic Community College) →

- Bassick High School (Bridgeport)
- Ansonia High School (Ansonia)
- Derby High School (Derby)
- Kolbe Cathedral High School (Bridgeport)
- Stratford High School (Stratford)
- Harding High School (Bridgeport)

### AREA TECHNICAL EDUCATION SCHOOLS

Precision Machining Technology →

- Eli Whitney Technical School (Hampden)
- Emmett OBrien Technical School (Ansonia)
- Bullard Havens Technical School (Bridgeport)
- Platt Technical High School (Milford)

Mechatronics →

- Platt Technical High School (Milford)

### AREA COMMUNITY COLLEGES

College Credit Certificate - CNC Machining

College Credit Certificate - Machine Technology

AS -Electronic Engineering Technology

AS - Engineering Technology

→

- Naugatuck Valley Community College (Waterbury and Danbury)

College Credit Certificate - Machine Technology

AS - Machine Technology

→

- Housatonic Community College (Bridgeport)

## ADJACENT AREA COMMUNITY COLLEGES

AS - Manufacturing Engineering Technology

AS - Mechanical Engineering Technology

College Credit Certificate - Quality Control

College Credit Certificate - Computer Assisted Drafting

→ • Gateway Community College (New Haven)

## AREA UNIVERSITIES

AS - CNC Machining

AS - Quality Management

→ • Goodwin University/University of Bridgeport

## CERTIFICATES OF COURSE COMPLETION (NON-COLLEGE CREDIT) OFFERED IN THE AREA OR ADJACENT

CNC Entry level, Fundamentals Machine Technology, Machinist Technology, CNC II, Intro to Plastics Injection Molding

→ • Manufacturing Alliance Service Corporation (MASC)

Blueprint Reading I & II, CAD 2D, Arc welding/MIG Basic, SMAW/STICK, OSHA 10, Fundamentals of Metrology-Quality Control, Fundamentals of Machine Technology

→ • Naugatuck Valley Community College (Waterbury and Danbury)

Intro to Manufacturing, Intro to CNC Machining, CNC Machining I, CNC Machining II & III, Coordinate Measure Machines (CMM)

→ • Housatonic Community College in partnership with Platt Technical High School (Milford)

Basics of Metrology, Basics of Metrology and Coordinate Measurement Machines, Intro to Coordinate Measurement Machines, Intro to Geometric Dimensioning and Tolerancing, Gauge Repeatability & Reproductibility Analysis, Intro to Blueprint reading, Basics of CAD, Shop Match, Essentials of Failure Mode Effects Analysis, Electrical Soldering and Wiring, Continuous Quality Improvement, ISO 9001; Essentials of Use of Statistical Process Control Charts, Intro to Supply Chain management, Lean Manufacturing PRinciples, Safety and Ergonomics in Manufacturing, Six Sigma Yellow Belt, Root Cause Analysis Primer & II, Essentials of Risk Management, Fundamentals of Value Stream Mapping, Overall Equipment Effectiveness, Basics of Programmable Logic Controllers, CPT Process & Maintenance, Certified Logistics Technician,

→ • Goodwin University/ University of Bridgeport (via Mobile Training Lab)

# RECOMMENDATIONS

## TEN RECOMMENDATIONS

1**. Establish new internships and apprenticeships in manufacturing,** specifically in Industrial Maintenance where employers maintain that on-the-job training and experience is a "must-have". Programs that pair well with industrial maintenance are mechatronics, PLC programming, hydraulics, pneumatics and electronic controls. Internships and apprenticeships are a proven, effective way for students to gain practical experience prior to permanent employment. Use the forum of the RSP to recruit employer sponsors, and to find best practices and ways to reduce burdens on employers who may be new to hosting students in this capacity.

**2**. **Create an Electrical/Electronic Mechanical Assembly Boot Camp.** Although these positions do not require a certificate or degree, they do require some level of training in manufacturing which is creating a gap in entry-level training that could lead to advancement to the higher skill and knowledge technician positions. The 40-80 hour boot camp could include basic information such as basic math, blueprint reading, metrology, and process improvement. Use the members of the RSP to help students complete the program with a guaranteed interview with employers.

**3. Compare the findings of this report with the current CNC Machining programs** (including getting a stronger sense of demand-supply numbers) at high schools, MASC, Goodwin University, Housatonic Community College and Naugatuck Valley Community College. Manufacturers in this process stated that they are not finding the exact skill sets they need in the machining students.

**4. Evaluate program demand for a Tool and Die program.** Tool and Die machinists represent about 20% of the total machinists in the region and they are difficult to find. A separate Tool and Die certificate and/or apprenticeship could help to meet that need.

**5. Create a multi- employer customized training in QA/QC for incumbent workers.** Compare the findings of this report with the current Quality Assurance/Quality Control Programming at Goodwin/UB, as well as at Gateway Community College. Identify a funding source to create a customized training that multiple manufacturers (small and large) can leverage to upskill their QA/QC professionals.

**6. Also consider a specific "upskill, backfill" strategy that utilizes a short-term training for Supervisors in Manufacturing for incumbent workers.** Training supervisors to step up the ladder could provide a career pathway for entry-level or craftsmen who want to move into management. Several of these courses have been developed in manufacturing and similar industries. They are often built in collaboration with a community college/technical school and supervisors from the industry. Topics could include HR law and basics, building effective teams, project management, and cost and statistical process control. Encourage separate education institutions to partner on this in order to leverage different strengths and course offerings. Also consider if higher Engineering degrees could benefit from stronger QA/QC and Supervisory coursework.

# RECOMMENDATIONS CONT.

**7. Use the RSP's Executive Committee or establish a distinct Education Committee to plan quarterly information exchanges between manufacturers and educators.** Require that one exchange per year be a facilitated Annual Region-wide Advisory Team Meeting . This committee should include representatives from manufacturers as well as the lead contacts at schools throughout the region. For educators, the Annual Region-wide meeting can serve as one of their required Perkins Grant Advisory Meetings. It is an opportunity for manufacturers to positively impact education institutions and their curriculum and for school personnel to consistently hear about trends and hiring needs from a variety of manufacturers.

**8. Keep building the RSP website as the go-to site where manufacturers can quickly assess training opportunities and programs that are graduating skilled students.** Include a user-friendly inventory of available training classes in Southwest Connecticut. This list should include the class title, a brief summary of the topics, location, tuition, a link to information about the schedule and registration. Possible future topics and contact information for customized training (single or multi-employer) can also be included. Once developed the Partnership should keep it updated quarterly, and along with the educational institutions themselves, be responsible for broadcasting the information to the manufacturers.

**9. Create a Manufacturing Teachers Institute.** Manufacturing instructors are difficult to find. Although manufacturers may know their craft, they may not have the training necessary to educate students. This institute could provide teaching fundamentals and teaching techniques to industry experts willing to act as instructors.

**10. Identify the who and how of a SWCT Manufacturing Partnership *Education & Training Concierge.*** At a minimum, this person will be reponsible for keeping the data in this report from going stale, helping craft Quarterly Information Exchange agendas, facilitating Annual Region-wide Advisory meetings, knowing which institution offers which programs, and helping build stronger connections across educational institutions toward a manufacturing career pathway system.

# CONCLUSION

The findings and opportunities presented in this report provide educators a first step in finding ways to ensure that existing and future classes and programs are well attended and produce a pipeline of graduates well-positioned to secure jobs in SWCT's manufacturing sector. For manufacturing executives and companies, the SW CT Manufacturing RSP is the opportunity to build ongoing and consistent discussions around curriculum corrections/changes with area education partners.

This report represents just the beginning of what a committed network of manufacturers in SW Connecticut can accomplish together and in partnership with regional educational institutions.

SOUTHWEST CONNECTICUT MANUFACTURING PARTNERSHIP