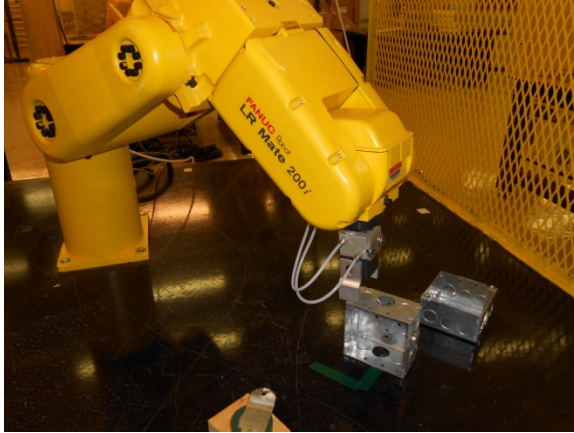


Careers In Advanced Manufacturing



**Your life, your career
can be this Advanced!**



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Sources:

U.S. Department of Labor

National Association of Manufacturers

Bureau of Labor Statics

Careers in Advanced Manufacturing
In Demand, Issue 3

Dream It! Do It!

Cerasis – Adam Robinson

The Amazing World of Manufacturing



Career opportunities abound for all kinds of jobs in the advanced manufacturing industry. With dozens of job titles from manufacturing engineer, to robotics operator, there is something for everyone, from hands on (machine operator) to high-tech (semiconductor engineer), to creative (design engineer), to scientist (pharmaceutical researcher).

Advanced manufacturing offers many kinds of work environments – in a manufacturing plant using your hands, in an office using computers to design parts, doing research in a lab, or negotiating deals in a conference room. Advanced Manufacturing invents and creates the products people need and want. Whether it is clothing, cell phones, computers or automobiles, CDs and DVDs, food and drink, athletic gear, medicine or cosmetics, virtually everything we use on a daily basis is manufactured. If you can dream it, we can make it!

Advanced Manufacturing operations are those that create advanced products, use innovative techniques in their manufacturing, and are inventing new processes and

technologies for future manufacturing. It's really a different approach to manufacturing and what makes manufacturing so versatile is technology.

Advanced manufacturing applies cutting edge concepts in electronics, computers, software and automation to improve production. The use of computer systems and software to monitor and control processes in large and small plants has led to increased product quality and productivity. Communications technology has increased the ability of engineers and plant managers to check on operations—even if it's halfway around the world.

These high-tech capabilities let engineers create more exciting products than were possible just a few years ago. One example of this can be seen in electronic devices like cell phones and digital recorders, which are getting smaller and less expensive, yet have more and more features built into them. This is possible because of the miniaturization of circuitry, and the use of “clean” assembly techniques that prevent contamination of sensitive components.



Think Robotics, Not Wrenches

In Advanced Manufacturing!

Forget what you've heard about manufacturing jobs moving overseas. Sure, some of that's happening. But if you're only catching the bad news, you're missing out on the good. Great career and entrepreneurial opportunities abound.

The fact is that the new breed of advanced manufacturers—that make everything from

computers to mountain bikes to cars —can't find enough trained people to hire!

While many manufacturing jobs have been outsourced to other countries, the jobs that are still here are the best ones. Jobs that utilize the latest technology such as lasers, micro-machining, and nanotechnology are jobs that require more skill and therefore, provide higher pay.

Looking at manufacturing wages in Economic Modeling Specialists International we see that jobs in manufacturing are among the best in our region. Manufacturing accounts for 29% of all jobs. In 2017 **manufacturing employers paid employees an average of \$76,835** while employees at non-manufacturing companies were paid an average of \$52,644 a year – showing a 31% premium for working in manufacturing.

Employers in central Indiana have indicated that finding trained people for their good paying jobs is hard work. The problem is that people don't know there are **awesome career opportunities** in advanced manufacturing here in our 12 county region. Local employers want people who really care about their work, and who pay attention to detail. No matter what job you have in advanced manufacturing, you will be involved in quality control and you have to be comfortable with computers.

Education beyond high school gives you a chance to get better at stuff that really matters in manufacturing such as creative thinking, teamwork, and problem-solving via lots of hands-on work. Technical schools, community colleges and universities in west central Indiana work with area employers to expose you to what the best companies are looking for such as robotics, nano technology, metrology—measuring the tiniest things, computer aided design and computer-aided manufacturing and equipment installation and repair.

Manufacturing Technology Trends to Change Paradigms Forever

3D Printing

One of the biggest news in the manufacturing technology sector in the last few years is the proliferation and **application of 3D printing technology**. It has caught the imagination of the general public and the manufacturing community like nothing since the invention of the personal computer and the internet. Within a few years, the technology has evolved so much that it is now possible to produce almost any component using metal, plastic, mixed materials and even human tissue. It has forced engineers and designers to think very differently when thinking about product development. As this more manufacturers **adopt and use 3D printing technology**, there is little doubt that 3D Printing will change the face of manufacturing forever.

Nanotechnology

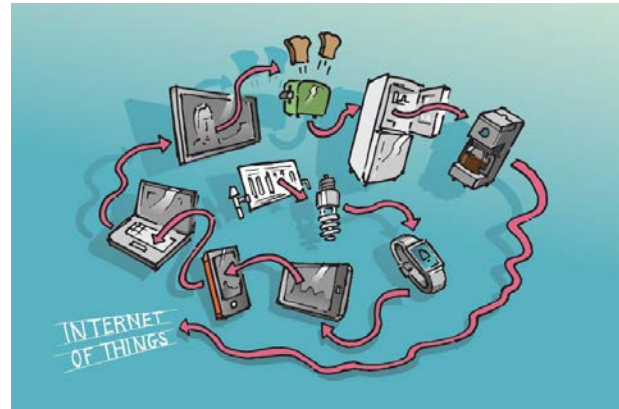
Nanotechnology is the technology of the future, but the first generation of the technology is already here. It involves the manipulation of matter on atomic, molecular and supramolecular scales; thus bringing with it super-precision manufacturing. Currently applied mostly in space technology and biotechnology, it is going to play an indispensable role in every manufacturing industry in the future. In many ways, it has already changed the world. Examples of application in nanotechnology include:

- Faster computer processing,
- Smaller memory cards that have more memory space,
- Clothes that last longer and keep the wearer cool in the summer,
- Bandages that heal wounds faster,
- And tennis and bowling balls that last longer.

In the future, there will be nanobots (microscopic robots) that will carry drugs to specific tissues in our body.

The Internet of Things (IoT)

The Internet of Things (IoT) is a **revolutionary manufacturing technology** that allows electronic



devices connected to each other, within the existing Internet infrastructure, to communicate with one another without human intervention. An IoT device connects to the internet and is capable of generating and receiving signals. As such, the use of this technology is going to have a profound impact on the manufacturing industry. IoT enables connected devices to "talk" to each other, sending and receiving critical notifications. An example of a critical notification is a defect or damaged ping. Once the device detects a failure, the IoT connected device sends a notification to another device or a user. This type of small, but critical, application of IoT in manufacturing results in reduced downtime, increased quality, reduced waste and less overall costs.

Big Data and Predictive Maintenance Technology

Manufacturing industries can significantly increase their efficiency and productivity with the technologies that allow them to collect, process and measure big data in real time. These technologies include electronic devices that connect factories through the internet and web pages that double as dashboards for controlling the processes.

Predictive maintenance technology helps predict snags and defects and thus cuts downtime and costs. In the future, manufacturers will implement big data and predictive maintenance technologies in every area of manufacturing. IoT is a part of big data and predictive technology that manufacturers are already using with remarkable success.

Manufacturing encourages creativity and analytical thinking. It is an area where ideas can be tested almost immediately, and where one person’s inspiration may lead to a major product breakthrough. For these reasons, students who want a career that is meaningful, exciting and rewarding, should consider advanced manufacturing. Whether a student’s interest lies in production, engineering or designing, experts say there will be plenty of demand in coming years for qualified candidates. The Manufacturing Institute recommends that students take math and science courses starting in middle school as manufacturing is technologically driven. Computer programming skills should be studied as well due to the importance of computer-aided design, engineering and manufacturing programs in product development and machine tool operation.

Even for an entry-level manufacturing worker, the pay is good. According to the federal government’s Bureau of Labor Statistics, the average hourly wage for a production worker making transportation equipment was over \$21 an hour. That’s about \$43,000 a year—without overtime. For someone making computers or electronic equipment, the average wage was almost \$18 an hour. Steelmakers make about the same. And it goes up from there. Gain more work experience and continue your education and you may find yourself a production control manager. They make an average of \$76,000 per year. What about a plant manager? They make an average of \$99,000 per year. Thinking really big? **A manufacturing executive makes approximately \$210,000.**



PAYDAY

Average annual salaries for Advanced Manufacturing careers

Assemblers and Fabricators	\$34,758
Chemical Technicians	\$36,713
Computer-Controlled Machine Tool Operators, Metal and Plastic	\$34,485
Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic	\$40,062
Electrical and Electronics Engineering Technicians	\$61,642
Electrical Engineers	\$74,909
Extruding and Drawing Machine Setters, Operators, and Tenders, Metal and Plastic	\$34,393
First-Line Supervisors of Production and Operating Workers	\$57,089
General and Operations Managers	\$84,147
Industrial Engineering Technicians	\$56,578
Industrial Engineers	\$82,242
Industrial Production Managers	\$99,486
Inspectors, Testers, Sorters, Samplers, and Weighers	\$38,392
Machinists	\$41,043
Materials Engineers	\$80,705
Mechanical Drafters	\$53,740
Mechanical Engineering Technicians	\$58,167
Mechanical Engineers	\$80,308
Nuclear Technicians	\$55,040
Team Assemblers	\$35,719



Something for EVERYONE

Josh Williams, 28

Plastics Fabricator/Entrepreneur

Q: What is your job?

A. I am the co-owner of The Board Factory. We make surfboards from expanded polystyrene foam, coat them with fiberglass cloth and epoxy resin, decorate them with artwork, then sell them. We just opened our business, and it's going really well. As the co-owner, I am also involved in running the business and hiring workers.

Q: Where did you get your training?

A. I learned by working with other surfboard shapers and gradually mastered the process. I also worked for a guy who built racing boats out of composite materials and learned about the different materials involved in plastic fabrication. I've brought a lot of what I learned there into my work as a surfboard maker.

Q: Why did you choose your job?

A. I love surfing and I wanted to learn how to make my own surfboards. I learned the skills I needed over time and began making my own boards. My friend Ed Sixberry and I decided to go into business together and see if we could make it work. For me, doing a job related to surfing is ideal because there is always a beautiful ocean nearby.

Q: What are your goals for the future?

A. I want to continue developing this business and see how far we can take it. I have also developed my own board design using a fiberglass composite material that I learned about from the racing boat technology, and I want to continue to develop that.



Heather Ziemba, 26

CNC Machine Operator

Q: How did you decide to become a CNC Machine Operator?

A: I was looking for a career that would offer variety, challenge, and growth opportunities. This job helps me learn important technical skills, and working as a CNC machine operator gives me opportunities to move within the industry.

Q: How did you get your current job?

A: Machinists can train in apprentice-ship programs, informally on the job, and in high schools, vocational schools, or community or technical colleges. Many machine operators learn their skills on the job.

Q: What do you do in your job?

A: I use different types of machinery to make parts. Each day, I receive a list showing the types and number of parts that need to be made. I type in the part specifications to adjust the machine's settings. I get the type of metal that is used to make the part, and I start making them. I work on several types of machines during each shift.

Q: Why do you like your job?

A: There is never a dull moment in my job. There are lots of activities on the floor, and there is a lot of camaraderie between the operators. There is always something new and challenging.

Coty Weil, 29

Robotics Operator

Q: How did you decide to become a robotics operator electrician?

A: After high school, I took a job on the production line at the Ford plant to earn extra money for college. The company offered an apprenticeship test and I decided to take it. I scored high enough on the test and was offered an apprenticeship.

Q: How did you get your current job?

A: The apprenticeship consisted of taking college courses and working a certain number of hours to gain on-the-job experience. Ford sent me to college, where I took classes in electricity, math, electronics, industrial electricity, and computers. I graduated in 2001 and went back to work for Ford. Two years ago, I moved to the body shop and began my current job.

Q: What do you do in your job?

A: I am responsible for one of the robotics operation lines. I watch the line and fix any problems that may come up. Sometimes a piece of material will get stuck on the welding robot while other times the metal parts aren't bent right and the robots aren't able to see the parts and move them through the line. Robots are unpredictable so anything could happen.

Q: Why do you like your job?

A: The troubleshooting aspect is really interesting. You have to know how the stuff works because it can be tricky when the problem isn't as obvious as a broken wire. I like working with robots and automation. I find it very interesting.



Keith Kamel, 29

Assistant Operations Manager

Q: What do you do?

A: From a production standpoint, I am the voice of Sports Illustrated to the outside world. I give manufacturing instructions to printing experts, and try to get the magazine printed in the most efficient way possible. I talk with people in other departments to make sure that enough paper is ordered for printing, and I make certain that it gets to the printing plant on time. I also ensure that the magazines get from the trucks to the newsstands on time. We need to make sure that we're building well-constructed magazines that can go out in a timely fashion, while saving Time Inc. money.

Q: What's the best part of your job?

A: Having the magazine at the end of the week. There's a lot of work that goes into it beforehand—from the paper, color, the inserts, to the way the magazine is produced. It's nice to be able to see your work at the end of the day.

Q: Where do you see yourself in five years?

A: Working at a magazine as a manager or director.

Q: What's so great about the printing world?

A: It's exciting to be part of the big world of publishing and production. You get to be part of making a product for a consumer to buy or read. And whether you realize it or not, you are part of the news.

Something for EVERYONE

Danyelle Sinclair, 23

Pharmaceutical Process Engineer

Q: How did you start out in your career?

A: I graduated from college with a B.S. in Chemical Engineering. I started with Bristol-Myers Squibb as a process supervisor in our bulk pharmaceutical pilot plant. In this role, I made the active ingredients for drugs to be used in clinical trials. Then I became involved in transitioning a process that was created in the laboratory to a larger scale in our pilot plant. I was in charge of setting up the process, managing the process and operators, and ensuring that we created a quality product.

Q: What are you working on now?

A: Currently, I'm working on the qualification, validation, and start up of our sterile filling facility. In this facility we will make clinical supplies of injectable drugs. This facility also has an advanced process control and data collection system.

Q: Why do you like your job?

A: It's wonderful to go to work every day knowing that what I am doing and the drugs I'm creating will help someone feel better.



Cole Johnson

Industrial Maintenance Associate

Q: What does your company do?

A: We build the Subaru Outback, Legacy, and Impreza. Where I work, in the body shop, we build and assemble the completed bodies that are then sent to paint shop.

Q: What do you do as a maintenance associate?

A: The main task of a maintenance associate is to ensure that the production line is running smoothly. That may entail a wide range of tasks which may include periodic equipment checks, responding to downtime calls, and making repairs to equipment.

Q: How did you enter this career path?

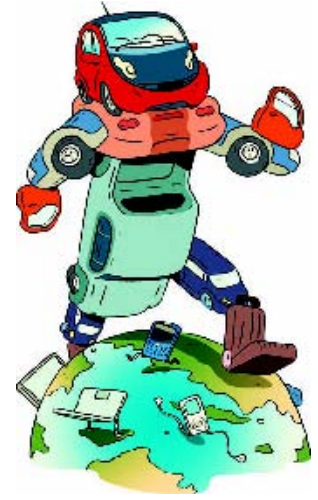
A: I started by obtaining an associate degree in Computer Integrated Manufacturing Technology from Vincennes University in Vincennes, IN. From there, I was given the chance to work as an intern at SIA and eventually worked my way into a full time position.

Q: What's the best part of your job?

A: I enjoy the challenge that comes with being a maintenance man. There is always something new to learn and troubleshoot. It keeps me on my toes and keeps my problem solving skills sharp.

Fun Facts

About Advanced Manufacturing



1.

How long does it take to make jelly beans?

Answer: 7 to 10 days! Once the center of the jelly bean, which contains its flavor, is made, it has to be cooled completely before it can get the right color. The jelly beans then go through the “painting” process several times to get their color. After the jelly beans are colored, they are first inspected by machines and then by hand to make sure that they are the right color and size. Finally, the jelly beans can be packaged and shipped.



2. What is the largest manufacturing industry in the world?

Answer: The automobile manufacturing industry. There are about 400 million cars and light trucks in the world today.

3. Where was the first signal seeking car radio developed?

Answer: Back in the 1947, the Delco Radio Division of General Motors developed the first signal-seeking car radio. In 1957 – Delco Radio Division also developed the first all transistor car radio.



4. What can you make with a 3D printer?

For musicians wanting a custom guitar, 3D printers are a convenient option. You tell the color, material and hardware you want and any customization you might like. The guitar body is made by spreading thin layers of nylon powder that is then fused in the correct locations for each component.

5.

What are the largest products manufactured in the world?

Answer: Ships. The Knock Nevis is a supertanker measuring 1,504 feet (over 1/4 of a mile) in length and 226 feet in width, making it the largest item manufactured in the world. If the Eiffel tower was laid on its side, it could easily be carried on the Knock Nevis.



6. What metal frequently used in manufacturing is compatible with human tissue and used as a biomaterial to replace human joints?

Answer: Titanium is light, strong, corrosion resistant, and easily formed. It is also used in airplanes, missiles, and space shuttles.



7. What is a computer chip?

Answer: A computer chip, also called a semiconductor, is one of the smallest and most fragile products in the world. Each chip has more than 5.5 million transistors inside it. A speck of dust, a bead of sweat, or a strand of hair on a chip would be like a dinosaur footprint and could easily destroy the chip.

Did you know?

There are more than 5,100 manufacturing jobs in Central Indiana. Over the next year, as businesses grow and older workers retire, there will be many more opportunities.



- Indiana has more manufacturing jobs than any other state, based on the size of our population.
- Indiana is among the top ten states for logistics jobs.
- 95% of Indiana's exports are manufactured products.
- 75% of the nation's people and businesses are within a day's drive of Indiana.
- Indiana is #1 in interstate highway access.
- Indiana ranks among the top ten states in railroad miles.
- Indiana ranks among the top twenty states for freight shipped by air and water.
- Indiana ranks #1 among states in attracting international manufacturing jobs

Get to Work!

According to Economic Modeling Specialists, Intl., the average salary and benefits for manufacturing workers is \$76,835 per year, compared with \$52,644 for other workers.

While job shadowing gives you a taste of working in a particular profession, you will also want to engage in internships, co-operative programs and summer employment at local manufacturing facilities to see the range of possibilities in manufacturing.

For more information about a career in advanced manufacturing, contact:

- Your school guidance counselor
- Your JAG specialist if you are in Jobs for America's Graduates (JAG) class
- WorkOne

Check out these on-line resources:

Top 60 Critical Occupations in West Central Indiana
Indiana Career Ready
Ivy Tech-Kokomo
Ivy Tech-Lafayette
Dream It! Do It! Indiana

www.workonewestcentral.org
www.indianacareerready.com
www.ivytech.edu/kokomo
www.ivytech.edu/lafayette
<http://www.dreamitdoitindiana.com>



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West Central Indiana Economic Growth Region 4 serves, Benton, Carroll, Cass, Clinton, Fountain, Howard, Miami, Montgomery, Tippecanoe, Tipton, Warren and White counties. Visit www.WorkOneWestCentral.org to find a WorkOne Center near you.

An initiative of the West Central Indiana Region 4 Workforce Board. Funding for this project has been provided by Indiana Department of Workforce Development. The WorkOne System is an equal opportunity employer and does not discriminate in the programs and services offered. Auxiliary aids and services are available upon request to individuals with disabilities. The TDD/TTY number is 1-800-743-3333. • El Programa de Financiamiento asistido de acuerdo con el Título 1 de WIA es un programa de Igualdad de Oportunidades de Empleo. Ayuda y servicios auxiliares están disponibles a solicitud para personas con discapacidad. El numero de TDD/TTY es 1-800-743-3333.

Oversight provided by Region 4 Workforce Board
www.region4workforceboard.org