

# INTRODUCING CAREERS IN MANUFACTURING

## A RESOURCE TOOLKIT FOR MANUFACTURERS

### CLASSROOM PRESENTATIONS

Prepared by  
MAGNET, the Manufacturing Advocacy & Growth Network  
In Partnership with the  
SMART Consortium  
WVIZ/Ideastream PBS

A BET4KIDS PROJECT

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## I. INTRODUCTION

Advanced manufacturing is an economic driver in the country and the region. The demands of modern advanced manufacturing require increased knowledge in the STEM (Science, Technology, Engineering, and Math) areas and a solid understanding of their applications in the industry. Additionally, the skills of problem solving, critical thinking, communication, and team work are key to the creativity and innovation required in the modern workplace. The changing work environment, the growing use of technology, and product and process innovations require workers who are prepared to participate in ongoing training and challenging educational programs that address the demand for a highly skilled workforce.

Students and teachers must be introduced to the world of manufacturing and the career opportunities available. Students need to be encouraged to pursue the requisite courses early on in their high school curriculum so they are prepared to participate in postsecondary educational programs and earn the certificates and degrees needed in advanced manufacturing. Highly skilled individuals are required for the innovation and new product developments needed to keep our country competitive. The importance of STEM courses as well team building and communication skills must be presented to youth if we are to address the future workforce challenges facing the manufacturing industry in Ohio. Young people need to begin on the career paths now so they will be prepared for these jobs when they complete their education.

Through the MAGNET Ambassador Program manufacturers are connected with students and teachers in the schools to address these challenges. This toolkit provides suggestions and resources to assist the manufacturer in presenting to a group of students.

## II. OVERVIEW OF TOOLKIT

This toolkit is designed to serve as a guide for manufacturers. There are links to online resources that might be helpful to reinforce your points or exemplify the kind of work or product unique to your company. Suggestions are provided for different grade levels and course subject matter. It is important to help the students see how what they are learning in school relates to the world of work.

There is a companion toolkit for educators with numerous resources and suggestions to prepare students for the presentation and for follow-up activities. Links to those resources are provided in the attachment to this toolkit. There might be a video or website with information about your type of manufacturing that you would want to suggest to the teacher for use in preparation for your visit.

Additional information and materials can be found at [www.magnetnetwork.org](http://www.magnetnetwork.org) and [www.dreamit-doit.org](http://www.dreamit-doit.org), as well as any of the other resources listed in the last section of this toolkit.

### III. PREPARING FOR A CLASSROOM VISIT

- A. Once you have accepted the assignment, confirm with the teacher, the date, time, location, number of students in the class, grade level, and amount of time for the presentation.
- B. Develop an outline of your presentation.

*A sample outline is provided in Section IV as a guide.*

- C. Identify any materials about your company and business that you could bring to the class. Consider sample products that you manufacture, photos of your products or facility, sales and marketing materials that would be appropriate.
- D. Determine what technology you will need and see if it is available in the classroom.
  - 1. Projector & Computer Will you use a power point presentation? *A ppt presentation template is included in Section V.* Review the slides, fill in the information about you and your company, select the slides that you will use for this presentation.
  - 2. Do you have a video about your company or a sales video that would be appropriate to illustrate your product?
  - 3. Is there something available on the web that you would like to show to the students?
- E. Review the materials in Section VI of this toolkit to determine if there are any resources that you would like to suggest to the teacher for use prior to your presentation.
- F. Decide if you want to give the students an activity to do. Will there be sufficient time to do it? What materials, if any, do you need to bring. Activities are more successful with middle school children than with high school students. Confirm with the teacher that this would be acceptable. *A sample activity is included in the powerpoint template in Section V.*
- G. Prepare your presentation outline from topics and resources in the following sections. Remember to allow at least 5 minutes at the beginning of the time frame for getting settled and 5 – 10 minutes at the end for questions and discussions.

*Note: all resources and components do not need to be used. This material is provided to assist you and for your use based on your comfort level and the type of class you are speaking to.*

- H. Prior to the date, re-confirm the logistics with the teacher including access to the school building. Where do visitors enter, where do you sign in?

## IV. CLASSROOM VISIT OUTLINE

### A. Introduction & Presentation Overview

1. Introduce yourself and your role in the company.
2. State the goal of the presentation:  
To introduce advanced manufacturing
  - What it is
  - Why it is important in Northeast Ohio
  - Who works in it
  - Careers available
3. Tell about your career path, how you got to your current position, your education and work experiences, what you like best about your job.

### B. Introduction to Manufacturing

1. What is Manufacturing
2. Why is it important in the state and region
3. Number of companies, jobs and salaries in NE Ohio  
*Powerpoint slides in Section V provide information on manufacturing, facts about manufacturing in the U.S. and Ohio, an activity for students*
4. Skills needed for jobs in modern manufacturing
5. Student Activity Depending on the age group and time available, students can attempt to manufacture something in small groups. They should try to:
  - a. Make as many as possible
  - b. Make the product exactly alike
  - c. Determine what you would use it for
  - d. Decide who would buy it
  - e. Take 10 minutes for this activity!Materials: Post it notes ( 3 – 4 packages)
  - 2 boxes of paper clips, any size
  - 2 boxes of ink pens, any color
  - Box of rubber bands
  - 30 safety pins
  - 4 glue sticks
6. Debrief: What did each group manufacture?
  - a.. Who designed the product?
  - b. Who assembled it?
  - c. Who counted the products?
  - d. How could you have made more products?

### C. Introduction to Your Company

1. What we manufacture
2. How it is used
3. Who uses what we make
4. Samples of products, photos, or company recruiting/sales video
5. Description of types of jobs, salary range, benefits, (tuition assistance, health care, etc)
6. What you look for in an employer.
7. Internships: if you provide internships, at what stage in education process, why internships are beneficial to students
8. Invite class to visit company and describe what you will see

### D. Questions

## V. POWERPOINT PRESENTATION

A sixteen slide power point presentation is attached. The slides can be edited and deleted based on the presenters' preference, the age group of the students, the time available, and the classroom setting. You will want to insert your name, name of the company on the first slides.

- Slides 4 and 6 -9 are more appropriate for older middle school students and high school students:
- Slides 11 & 12 are more appropriate for middle school students

The quiz questions on slides 6 -9 are presented below as a document that can be used as a hand out if preferred.

## VI. MANUFACTURING QUIZ

1. Where does Ohio rank in manufacturing among the states?
  - a. First
  - b. Third
  - c. Fifth
2. What percentage of products made in Ohio are made in NEO?
  - a. 20%
  - b. 40%
  - c. 60%
3. Approximately how many manufacturing companies are located in the 16 counties of NEO?
  - a. 10,000
  - b. 5,000
  - c. 12,000

4. Approximately how many people work in manufacturing in NEO?
  - a. 100,000
  - b. 300,000
  - c. 50,000
  
5. What is the average annual salary in NEO?
  - a. \$50,000
  - b. \$30,000
  - c. \$70,000

## **VII. EDUCATOR BACKGROUND INFORMATION**

The following manufacturing facts are included as part of the Educator's Toolkit. It is possible that the teacher has used this material in preparation for your visit. You might want to prepare a few questions as part of your presentation or select some of the multiple choice questions provided in the next section.

### MANUFACTURING FACTS

1. Every \$1.00 in manufactured goods generates an additional \$1.37 worth of additional economic activity – more than any other economic sector.
  
2. Manufacturers are responsible for more than 70 percent of all business R&D, which ultimately benefits other manufacturing and non-manufacturing activities.
  
3. The United States is the world's 2<sup>nd</sup> largest exporter; 61 percent of all U.S. exports are manufactured goods, double the level of 10 years ago.
  
4. Over the past two decades manufacturing productivity gains have been more than double (actual figure 2.5 times) that of other economic sectors. These gains enable Americans to do more with less, increase our ability to compete and facilitate higher wages for all employees.
  
5. Manufacturing compensation averages more than \$65,000, the highest in the private sector, and manufacturers are leaders in employee training.
  
6. Business has been an important contributor to economic growth and tax receipts at all levels of government, contributing 43% of all corporate taxes collected by state and local governments.

*\*Source National Association of Manufacturers*

## OHIO MANUFACTURING FACTS

- Ohio manufacturing is responsible for:
  - More than 20% of Ohio's Gross State Product
  - More than 800,000 jobs for Ohio Workers
  - An annual payroll of more than \$39 billion
  - The second highest weekly earnings of any economic sector
  - More than \$26 billion in products to more than 196 countries
  - A safer environment through decreased emissions and increased recycling
  
- Ohio ranks third nationwide in manufacturing output
- Ohio's industrial strength comes from its competitive, traditional industries. In 2004, \$56.7 billion of the state's \$82.2 billion in manufacturing output consisted of durable goods, 69% compared to 56% for the nation. Durable goods include transportation equipment, industrial machinery, primary metals and lumber and wood products.
- At 20.2%, manufacturing's contribution to Ohio's Gross State Product (GSP) is nearly double that of any other private industry sector.
- Ohio ranked second nationally in new site selections in 2005. Manufacturing accounted for 58% of those investments.
- In 2006, Ohio ranked third in manufacturing employment nationally, with 6.1% of manufacturing jobs nationwide.
- Manufacturing investments are the leading source of new Ohio private investments. In 2004-2005, nearly 700 major new investments were made in Ohio industrial machinery and fabricated metal manufacturers were the leading investors.
- Out of Ohio's 21,442 manufacturing establishments, only 293 employ more than 500 workers. In fact, 82% of Ohio manufacturing companies employ fewer than 50 workers. These small businesses make a major contribution to their local communities in job creation and taxes.
- Ohio manufacturing leads all economic sectors in total state payroll.
- In 2005, Ohio ranked seventh in exports to the world. Sixty-seven percent of Ohio manufacturing companies with one hundred or more employees are engaged in some form of export.

\*Source: [www.ohiomanufacturingfacts.com](http://www.ohiomanufacturingfacts.com)

## CAREERS IN MANUFACTURING VIDEOS

MAGNET, in partnership with the Northern Ohio Technology Association (NOTA), presented six career awareness sessions in 2008-09. The sessions were broadcast live by WVIZ PBS to high schools across the state. A DVD containing all of the sessions is available from MAGNET. Each session can be downloaded from the MAGNET website at [http://www.magnetwork.org/education/wviz\\_nota\\_distancelearning.htm](http://www.magnetwork.org/education/wviz_nota_distancelearning.htm)

The sessions begin with a presentation on a specific topic followed by questions and answers from the students. The presenters include young adults and college interns who are working in the field. The DVD includes only the presentations. The entire 45 minute session is included on the web. The topics are:

1. Introduction to Careers in Manufacturing;
2. Careers in Welding;
3. Careers in Product Development and Innovation;
4. Making Manufacturing Tools;
5. Bio-Medical Device Manufacturing;
6. Engineering Careers in Manufacturing

## VI. MANUFACTURING WEBSITES FOR EDUCATORS

The following URL's are included as part of the educator's toolkit. There may be some references appropriate for your specific industry cluster or company that you would like to reference or use as part of your presentation. The focus should be to explore careers in manufacturing, training requirements, challenges and opportunities. The importance of the STEM curriculum should be stressed in these activities.

### Career Voyages in Advanced Manufacturing

<http://www.careervoyages.gov/advmanufacturing-main.cfm>

Excellent for advanced middle school and high school students, educators, and parents. Walks you through steps to get started for each career area and provides research for the area of interest. Easy to maneuver around the site and includes videos and other helpful links.

### Cool Stuff Being Made

[http://www.dreamit-doit.com/content/videos/cool\\_stuff\\_being\\_made.php](http://www.dreamit-doit.com/content/videos/cool_stuff_being_made.php)

Good site for undecided high school students. Includes videos, and research on different areas of interest to help the student find their area of interest through a variety of tools. Helpful for educators assisting students in career decision-making.

### How Everyday Things are Made

<http://manufacturing.stanford.edu/>

-- This site is excellent for high school students who are interested in engineering, especially mechanical or design engineering. It tests individual's knowledge and desire to learn more about the process of engineering different products. Educators could use as a teaching guide. Includes professional videos and links to additional information. Useful information for younger students with teacher assistance.

### How Products are Made

<http://www.madehow.com/>

Good site for research in manufacturing. A little more difficult to navigate. Information listed in article format that will then take you to another area with more articles.

### In Demand-Advanced Manufacturing

<http://www.zinio.com/express?issue=139857355&flipEnabled=false&flipNotSupported=true>

Information and sources for manufacturing research for the high school student or the person looking into information on certain manufacturing careers. Consists of articles and research data. Educators could access articles and statistics from this site. This is more of a Q & A site for in-depth research.

### I was wondering-Women in Science

<http://www.iwaswondering.com/>

--Great information for the younger student, focusing on girls and science. This site is colorful, exciting and has interactive games. Educators could use this as a teaching guide and tool for getting the female students interested in exploring the world of science. A fun site for younger students.

### Junior Engineering Technical Society

<http://www.jets.org/>

Website for high school students who are members of the Engineering Technical Society or who want to learn more about this organization. This site lists the organizations events, winners and other areas of interest for those interested in engineering. This site includes news and issues for this society and displays content for students who take part in their events.

### Manufacturing is Cool

<http://www.manufacturingiscool.com/>

Great for the high school student looking for more information on manufacturing careers. Very easy to access and provides information from curriculum to job opportunities. Great tool for the educator to also explore the curriculum needed for the careers. Useful links focused on manufacturing. Very user-friendly. May be helpful to the advanced grade school student who wants to learn more about manufacturing careers.

### Manufacturing Tours

[http://www.dmoz.org/Kids\\_and\\_Teens/School\\_Time/Science/Technology/Manufacturing/](http://www.dmoz.org/Kids_and_Teens/School_Time/Science/Technology/Manufacturing/)

This site provides links to a variety of online plant tours appropriate for middle school and high school age students. Could be a good resource for individual research in manufacturing careers or industries.

### Modern Marvels

<http://www.history.com/video.do?name=modernmarvels>

-- Good site for educators. There is a "classroom" section with a library of materials to present as well as interactive learning games. There is also a wide array of videos and other classroom materials. Appropriate for younger students and high school students. This is more of a research or history learning site.

### General Motors Education

<http://www.gm.com/experience/education/teachers/index.jsp>

--This site is a GM teaching/education site. Strictly limited to the GM research and findings in different areas; technology, quality and safety. Good for the high school student or educator who is doing research or wants to learn more about the auto industry through the GM perspective.

<http://www.pmaef.org/educator/> (PMA's resources for educators)

--Link to the Precision Metalforming Association's website with additional tools for educators.

<http://corporate.honda.com/america/public-policy/factory-tour.aspx> (Honda factory virtual tour)

Dedicated site to Honda Corporation in America with virtual plant tour.

<http://marylandmanufacturing.info/cms/node/193> The TIME Center and RMI have been working to identify a collection of interesting, entertaining, and educational websites – targeted for students and educators. Review a list of great online technology resource web sites. These are great resources to learn more about manufacturing technology and for educators to use to develop curriculum. (there are over 30 new websites in this list)

<http://www.nasa.gov/offices/education/about/index.html> (NASA's education website-lesson plans, online programming, classroom activities)



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## The Manufacturing Advocacy and Growth Network

*Serving 16 counties in Northeast Ohio*



## WHY MANUFACTURING?

- Manufacturing output has increased despite losing employment
- U.S. manufacturers produce more today than any other time in U.S. history - GDP
- U.S. manufacturers continue to be the world's leader with 24% of "share of world-wide manufacturing."
  - Japan is second with 22%.



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- *\*Source National Association of Manufacturers*



## WHY MANUFACTURING IN OHIO ?

- Ohio ranks third in manufacturing among the states (behind Texas and California)
- 12,000 manufacturing companies in NEO
- 40% of products made in Ohio are made in NEO
- 300,000 people work in manufacturing in NEO
- The average manufacturing salary in NEO is \$ 50,000.



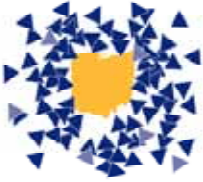
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  - A safer environment through decreased emissions and increased recycling
- Ohio ranks third nationwide in manufacturing output



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## **WORKFORCE DEMANDS**

- NEO manufacturers will need between 5,000 and 6,000 employees each year for the next ten years
- Requirements for these jobs vary from 6 months of training to advanced degrees
- Jobs require skills in STEM (Science, Technology, Engineering, & Math) as well as communications, problem solving, teamwork, and creativity



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## Careers in Manufacturing

NEO manufacturing jobs in demand

Categories include

- Manufacturing & Production
- Engineering
- Information Technology
- Other openings: accounting, finance, and human resources, sales.



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## MAGNET INTERNET RESOURCES

- [www.magnetnetwork.org/education](http://www.magnetnetwork.org/education)
- [www.dreamit-doit.com/northeastohio](http://www.dreamit-doit.com/northeastohio)