Sea-ircuitry

How can CNC machines be effectively used in manufacturing processes of circuitry?

Suggested Equipment Skill Level

Intermediate User

Equipment Skills

3D Design
Circuits

CNC Programmer

Career & Skillset Connections

-Comprehension Skills
-Computer Software Skills
-Math and IT Skills

Project Guiding Themes

-Engineering design process
-Designing in 3D modeling software
-Designing a prototype that meets multiple constraints

Suggested Software & Materials

-3D Modeling Software
TinkerCAD, OnShape, Autodesk Fusion 360, Autodesk Inventor, Solidworks
-Carbide Create Software
-Acrylic Sheet

Aligned VDOE CTE Course(s) and Competencies

Technical Drawing and Design	Precision Machining Technology I	Materials and Processes Technology
36-Weeks	36-Weeks	36-Weeks

VMASC

Sea-ircuitry

CNC Intermediate Skill Level

How can CNC machines be effectively used in manufacturing processes of circuitry?

Project Problem & Career Prompt

Your company has been contracted to manufacture underwater drones for the inspection of offshore wind monopiles along the east coast. The monopiles are the hollow steel tubing which forms the foundation of the offshore wind turbines. The monopiles are set about 100 feet into the ocean floor and require periodic inspection to ensure they are free of corrosion or damage. Your company's drones utilize circuit boards which are produced in your department. Work together with the CNC engineer to design the circuit boards and manufacture them. As the CNC programmer, proper manufacturing relies on you!

Project Background & Resources

Circuit Board design

Drone specifications - specifically circuit board size and location

Investigative Questions

What material is a curcuit board made out of, and can that be used on the CNC machine?

What currently exists for inspecting monopiles?

Project Criteria

-While the circuit board will not be functional, it needs to have spaces for components as if it were functional

-Final physical prototypes must be completed prior to project deadline

Project Constraints

-CNC Machine must be used for all parts of the prototype

-Prototype must be constructed from acrylic

-Prototype part(s) size cannot exceed the 8" x 8" x 3" cutting area

Suggested Pacing

1-2 Days of research and sketching ideas

3-4 Days of design

2-3 Days of constructing and finishing prototypes

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Sea-ircuitry

CNC Machine

Career & Skill Set Connections

CNC Programmer

A CNC Programmer is responsible for the operation of machinery (CNC Machine), reading and interpreting the design, programming the machine, and adjusting machine settings to produce the end product.

Essential Skills

*Problem Solving
*IT Skills (CAD)
*Mechanical
*Attention to detail
*Communication

Academic Pathway

High School Diploma
and
Community College/Certification
or
Bachelor's degree

Aligned VDOE CTE Course(s) and Competencies

Workplace Readiness Skills & Work-Based Learning Opportunities & Examine All Aspects of an Industry

Technical Drawing and Design

Exploring Technical Drawing Foundations

Prepare technical sketches

Interpret technical documentation

Producing Technical Drawings

Create solutions, using CAD

Producing Prototypes

Materials and Processes Technology

Exploring Additive and Subtractive Manufacturing

Identify computer-driven additive and subtractive manufacturing processes

Generate models to be converted into machine-compatible digital files

Create a product using computer-driven additive or subtractive processes

Precision Machining Technology I

Exploring the Foundations of Machining

Describe the formulas for determining speeds and feeds

Apply the properties of the various materials to cutting conditions and problems

Using Engineering Drawings and Sketches

Interpret standard orthographic blueprints

Planning and Managing Machine Jobs

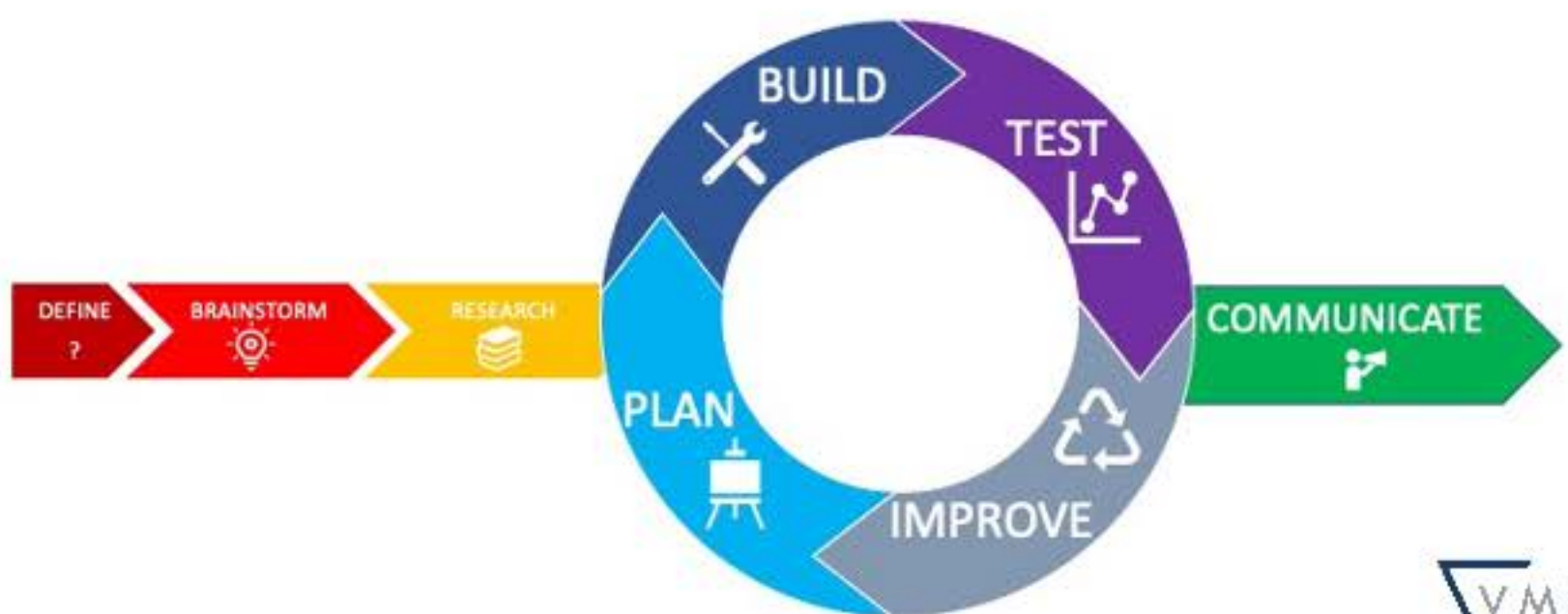Select machine tools for a given set of operations

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Project Management Plan

Team Member Roles

Team Goals & Timelines

Team Member Tasking

Sketches & Design Planning

DEFINE
?

BRAINSTORM

RESEARCH

BUILD

TEST

PLAN

IMPROVE

COMMUNICATE

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Notes

Notes