Manufacturing

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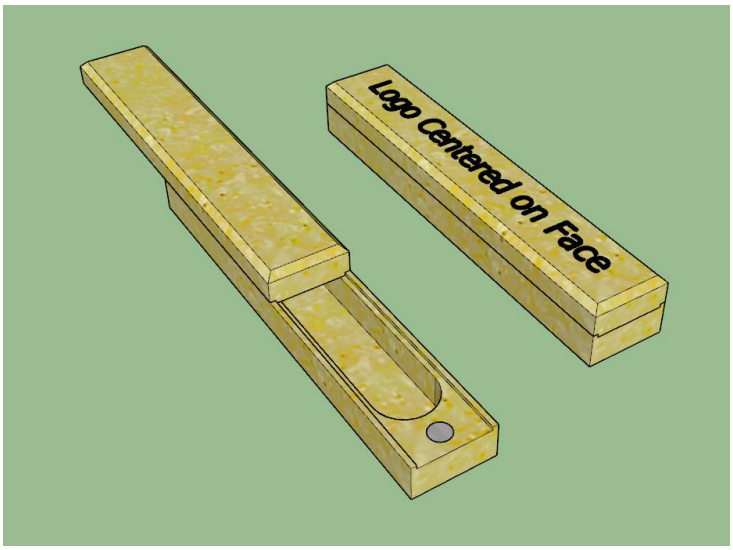


Description

The manufacturing competition is designed to both encourage and reward the study of production technology as it relates to manufacturing. Each participating team must include college students from TEECA affiliated chapters. The teams must design, document, fabricate and implement a continuous manufacturing system to produce an assigned product using only the tools on the official list.

Evaluation is based on team performance, safety, craftsmanship of tooling design, documentation of design efforts, and quality of the product.

It should be noted that part of the competition involves a certain degree of problem solving skills, especially when creating your tooling and inspection gauges. Teams are encouraged to be creative in the fabrication of the tooling to optimize both speed and repeatability. Exploiting the creativity of each school will allow both the products and tooling to increase in quality. The use of CNC equipment, lasers, and automated systems should be encouraged if the schools have access to such equipment. Partnering with a company with such equipment is also acceptable; however, utilizing the equipment should be a learning experience for the students. Selection and use of materials, equipment, or external partnerships should be well documented and defended during a presentation.

Team

Team members MUST be student members of ITEEA and members of an affiliated TEECA college or university and must be registered participants at the regional and/or national conference. Documentation of membership is required in order to compete. Teams must have at least three, but not more than six, members. Each team is allowed one graduate student to participate in the competition.

Overview

Pre-Production Phase

1. Prior to the competition (and the conference), teams will receive a set of plans to design, produce and test a product. Teams will supply their own materials. Pre-production, off-site activities are limited only to the tools and machines available to the team.
2. Operations to be done on-site at the conference are included at the end of this packet.
3. Teams may choose appropriate materials for the construction of their products.
4. *College / university colors and logo / name must be incorporated in the design*.
5. Each team will develop and document a complete, continuous manufacturing (line production) system to include all items listed in the judging form (see end of document).
6. Each team must provide a portfolio with complete and thorough documentation of all the pre-production phase work (see portfolio information).
7. All teams should display a fair and honest effort prior to the event based on student work. Although faculty input is needed and sometimes necessary, the work should be that of students and not faculty. Due to the complexity, this is considered a learning process and any input from faculty should be noted in the portfolio and shared during the presentation portion of the competition.

Competition

1. At the competition, each team will work in a designated area within the conference center. No laboratory facilities will be provided. The work must be done in the assigned area with only the tools listed on the official tool kit list. All teams must provide their own tools (see end of document for official tool kit list).
2. The complete manufacturing system must be finished prior to arrival at the conference.
3. Members of each team must be at the designated location at the announced time for the start of the contest (which includes the set-up phase).
4. Teams may use computers during the set-up phase of the production run; however, each team is responsible for such equipment.
5. At least one hour is allotted for set-up. Production will begin immediately following the TEECA dinner. (See On-site Set Up and Production Run section for more details).
6. Each manufacturing system will be tested during a scheduled production run at which time 13 products will be produced (unless the coordinator notifies you of a change). The dice vault should include a complete set of six dice suitable for playing games such as Farkle along with a set of written instructions.
7. Judges will evaluate the quality and the efficiency of the production line, as well as the products produced. Judges' scores are final and are not subject to review. If possible, a written review of the competition will be provided to the teams at a later date.

Portfolio

All items must be printed, organized in a binder, and presented to the judges at the assigned time. Each portfolio will require the following pages, in order.

- Cover page: school name, conference title, conference location, TEECA Manufacturing Competition, project title, and the date of the conference (including the year).
- Table of Contents
- Name and signature of TEECA Advisor(s), with email address(es) and contact phone number(s). Team roster with email addresses.
- Listing of off-site participants and their relationship to the production. (e.g. Billy Jones: drilled vertical pieces during pre-production run; Sue Smith: applied colored lacquer to end during pre-production run). Additional faculty names and level of participation. (e.g. Dr. Johnson: opened labs in evening, advised on safety considerations proposed by team).

Each team portfolio must present evidence of the pre-production process:

a. Tooling: design and development.
    i. Sketches to show the development of each piece of tooling

        ii. Orthographic tooling drawings (must be CAD drawings) in 2D and/or 3D form.
    b. Tooling Rationale – why did you build it the way you did? (chip clearance, adjustability, safety, accuracy, materials used, etc.)
    c. Product drawings. **Each team must create new drawings**, not simply use the ones provided by Wyrmwood. Drawings should be presented with:
        i. Orthographic views
        ii. Isometric view
        iii. Pictorial assembly drawings (exploded view)
        iv. Title Block
        v. Properly (and neatly) dimensioned with tolerances provided.
        vi. If necessary, include section views, detail views, and notes.
    d. Operation process chart
    e. Flow process chart
    f. Pre-production process – please document all steps with photos and descriptions
    g. Facilities / plant layout
        i. pre-conference
        ii. conference (competition layout plan using 2-3 tables)
    h. Quality control
    i. Product material selection rationale

Each team portfolio must provide financial information about the product/production:

a. Bill of materials
b. Cost analysis to include break-even (include tooling costs; do not include labor or capital investment such as machines, buildings, etc.)

On-Site Set Up and Production Run

1. Each team will have a minimum of one hour to set up their assembly line.
2. Each team must bring the necessary clamps, drills, bits, fasteners, and drivers needed to complete the assembly/product.
3. The only power tools allowed during the production phase are cordless drills, orbital sander, brad/nail gun and glue guns. **Absolutely no corded/cordless saws or routers will be allowed.**
4. Each team must provide all parts needed for the final assembly.
5. There should be enough finished pre-fabricated parts to make **13 finished products** (unless more are specified prior to the regional event).
6. Be sure to check the OPERATIONS TO BE DONE ON-SITE section below to ensure that certain parts will have final drilling and/or cutting processes needed for assembly which cannot be processed off-site. These on-site operations will need separate operation process charts as well as quality control measures identified.
7. The event will be judged in accordance with the Judging Form.
8. Safety is a prime concern of this competition and any violation of safety will have a profound impact on final scoring, with each notable incident having a ten (10) point deduction. Deductions can be from evidence found in pictures, documentation and/or the live competition portion of the event.
9. Work on-site should be completed only by team members listed on the team roster.

Tools/Supplies Permitted During Production Run

1. Tarp(s) enough to cover an area of floor 10'x16'.
2. Drills / impact drivers and/or hand drills/screwdrivers (6 max.) and batteries (extra batteries may be used if needed).
3. Drill bits, countersinks, and driver bits.
4. Glue guns (2 max.) Any type of glue is permissible. Glue guns are not required.
5. Hand planes
6. Hand saws
7. 1 Small power sander - orbital style.
8. Hammers or Mallets
9. 1 Brad / Finish Nail Gun w/ small compressor
10. Fasteners / Glues (you determine what works best for the material).
11. Safety glasses (required for all members).
12. Safety supplies (caution tape and warning signs to cordon off your work area).
13. Clamps for attaching tooling to tables.
14. Tools for adjusting tooling
15. Shop Vac (for cleanup after production run, or you can use during the production run).

Presentation

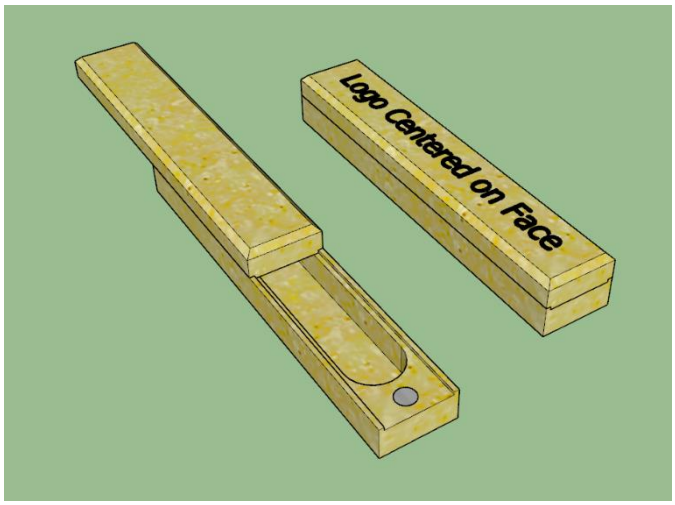
1. Presentation approximately 5-10 minutes per team
    a. Live Interview. Judges will ask a series of technical questions related to manufacturing in general and the product/processes specific to the completion.

Evaluation

1. Disqualification results for the following:
    1. Failing to appear at either the production run or presentation.
    2. Evidence that an unreasonable amount of input was made by the instructors / advisors.
    3. Unsafe setup, and or practices on site.
    4. Use of tools not listed on the above list.

2. The evaluation will include the following, based on a judging form provided.
    1. Pre-Production
    2. Portfolio
    3. On-Site Production Run
    4. Presentation / Live Interview

Operations to be done on-site at the conference



a. Cutting the lid and the base to proper length.
b. Cutting the .125 x 45° chamfer on the end of the base and the lid.
c. Drilling holes for the magnets/steel washers* and screws.
d. Cutting the two .094” x .062” rabbets in the lid.
e. Cutting the foam liner for the lid and base compartments.
f. Final sanding
g. Sand, finish (using a simple wax/soap type finish), and assemble**.

Operations that may be done off-site:

a. Stock may be pre-ripped to finished width.
b. Pockets may be pre-cut in blanks but cutting to final length must be done on site.
c. Recessed portion in the base can be pre-cut.
d. Chamfers may be cut on the sides, but end chamfers will need to be cut on-site.
e. Preliminary sanding may be done.
f. Logo/graphics may be done off-site, but the logo should be centered on the top of the lid as shown in the illustration. Additional graphics may be applied as desired by the team.

* Teams can select appropriate magnets to use as long as they stay close to the size specified in Wyrmwood's plans. The use of recessed and countersunk steel washers for the lid is also allowable.
**Assembly will include a set of six dice and instructions for whatever dice game you would like, Farkle, for example. Dice may be either purchased or fabricated by your school. Though no additional points will be awarded for fabricated dice, the documentation and execution of these may be used as tie-breaker.

Technology and Engineering Education Collegiate Association
TEECA MANUFACTURING COMPETITION - Judging Form

School:		Judge:		
EVALUATION CRITERIA				
Pre-Production				
Use of tooling – during the pre-production phase			80 pts.	
Tooling construction quality			50 pts.	
Part quality (size and shape)			50 pts.	
Documented Safety Procedures followed (show in pics)			20 pts.	
			SUB-TOTAL 200 pts	
Portfolio (should be in this order)				
Cover Sheet			1 pt.	
Table of Contents			2 pt.	
Signature page			1 pt.	
Offsite Participant page			1 pt.	
Tooling sketches (show the development of each)			10 pts.	
Tooling drawings			20 pts.	
Tooling Rationale (adjustability, accuracy, safety, etc)			30 pts.	
Product orthographic drawing			10 pts.	
Product pictorial assembly (exploded) drawing			10 pts.	
Operation process chart			10 pts.	
Flow process charts			10 pts.	
Pre-production process – please document all steps for each piece			100 pts.	
Facilities/plant layout – pre-conference			5 pts.	
Facilities/plant layout – conference			5 pts.	
Quality control			20 pts.	
Product material selection rationale			10 pts.	
Bill of materials			10 pts.	
Cost analysis (to include break even #)			10 pts.	
Overall organization of portfolio and appearance			10 pts.	

SUB-TOTAL 275 pts.		
On-Site Production and Presentation		
Compliance with rules	30 pts.	
Organization and flow of production run	20 pts.	
Use of tooling during the on-site production	20pts.	
Quality control (use of inspection gauges)	20 pts	
Quality of completed project	50 pts.	
Product Finish (including quality of the school logo)	20 pts.	
Safety Procedures	20 pts.	
Presentation – interview portion	20 pts.	
SUB-TOTAL 200 pts		
GRAND TOTAL		

Materials and Personnel Required

1. Judges for pre-production set-up, on-site production and presentation
2. Tables as needed for the live production (2-3 per team)
3. Calculator for each judge or a computer with spreadsheet software
4. Measurement tools

Judging Criteria

TEECA event organizers will appoint several judges to evaluate the contest entries. On scoring items where qualitative decisions or subjectivity is required, the judges' scores will be averaged. The judges' decisions are final and not subject to challenge.

Contest Coordinators

If there are any questions pertaining to this competition please direct them to:

Alex Johnson, PhD – Associate Professor
Department of Applied Engineering, Safety & Technology
Millersville University

Justin Egresitz – Doctoral Student
North Carolina State University

Questions will be discussed with other coordinators; a decision will be made and shared with all advisors whose school is participating in the event.