7th International Conference on Chemical Engineering
ICChE 2023

Student Competition 1

Application of Chemical Engineering for Improving the Day-to-Day Life

Objective: This project is intended to identify a problem or difficulty in our day-to-day life and propose a sustainable conceptual solution based on chemical engineering to improve the quality of life.

Presentation Mode of the Project: The project is to be presented as a recorded video covering each essential aspect. The team is fixed to four members. Each member of the team is required to participate in the presentation. The permissible time span of the recorded presentation is 5-6 minutes.

Contents of the Project Presentation:

a) **Problem Statement and Consequences (30 Points):**
A clear statement of the problem or difficulty identified from our day-to-day life. This part should also include all adverse consequences of the identified problem or difficulty.

b) **Sustainable Conceptual Solution (50 Points):**
   i. Overall method and specific process of the solution
   ii. Supportive science
   iii. Engineering applications
   iv. Favorable financial measures
   v. Heath, environment and safety considerations
   vi. Sustainability of the solution

c) **Outcome and Benefits (20 Points):**
Outcome and specific benefits with quantitative data/information are required to be presented.

Registration: Interested team is required to complete their registration with the submission of a brief abstract/summary by 31 October, 2023.

Link for Registration: http://surl.li/ltzdx

Final Submission: The deadline for final submission is 30 November, 2023.

Prizes: Reasonable Cash Prize Money, Certificate of International Recognition, and more.

Correspondence:

Chair of Student Event Subcommittee	ICChE 2023 Secretary
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***Coordinator: Asst. Prof. Ahaduzzaman Nahid (Cell: 01725475521) for any urgent contact

Student Competition 2

Chem-E-Car Competition

Objective: The aim of the competition is to provide students with an opportunity, in a team-oriented hands-on design and construction of a small chemically powered car. It tests the ability of the participants to safely control and harness the energy of a chemical reaction by initiating the car and allowing it to traverse a fixed distance carrying a certain load.

Rules and Regulations:

General Rules:

1. Each team will consist of a maximum of four members multiple teams from the same class are allowed, provided their abstracts and models must have to be different.
2. Teams must strictly adhere to the given deadlines, failing to do so will lead to disqualification.
3. The final date for abstract submission and registration is **(**October 15, 2023**).** The Chem-E-Car model should be built based on the final abstract. Any change that is not included in the final abstract will be penalized and may lead to disqualification.
4. The decision of the judges or event coordinators would be considered the final decision.

There are two stages at the Chem-E-Car Competition: Basic viva about your project and car performance.

Stage1: Basic viva test

Each team must send an email containing an abstract (pdf format) about their Chem-E-Car model by the Subject < Chem-E-Car-Team name> by **(**October 31, 2023**)**. The abstract must contain the following information:

1. Team name, member's name, email ID, and name of each member's respective institution.
2. Schematic of the model along with its dimensions.
3. List all necessary components, chemicals, and other accessories.
4. Cost of chemicals required and the procedure to set up your model. The cost of chemicals must be given according to which grade you have bought and the general selling price in the market for that chemical.
5. Elucidation of the chemical reaction or power source employed.
6. The innovative ideas, design, and unique features of your model.
7. Brief description of the stop mechanism along with necessary figures or schematics.
8. Environmental and safety measures considered while developing your model.

The basic viva test will occur at the same time as the Safety Inspection on the day of the Chem-E-Car Performance Competition. Team members must be present during judging to answer questions from the judges.

Your project will be judged according to the following criteria:

- Quality of the project and team member presentations
- Design creativity and unique features of the vehicle and safety considerations
- Team demonstrates knowledge of reactions, calibration methods by answering judge questions.

Stage 2: Car performance competition

Size of Car: All components of the car must fit into a box of dimensions no larger than 40 cm x 30 cm x 20 cm. The car may be disassembled to meet this requirement. If the judges are uncertain whether the car will fit inside the box when dissembled, they may request that the team demonstrate that they can do this.

Water Load Container: The car must carry a container (or containers) that holds up to 500 mL of water without spilling. An example of such a container is a 500 mL PET bottle. At the competition, only the water will be supplied, thus each car must already have its own container.

Load and Distance: Each car will be given two opportunities to traverse a specified distance carrying a certain additional load. The required load and distance will be given to each team 24 hours prior to the start of the performance competition. The distance will be between 10 and 12 m + 0.005 m and the load will be between 100 and 500 mL of water. Teams may not add or remove any "load" (or other inert items) to adjust their vehicle weight. Teams are only allowed to adjust "fuel" or chemical reactants used in the car's chemical reaction.

Vehicle Drive System: An objective of this contest is a demonstration of the ability to control a chemical reaction. The only energy source for the propulsion of the car is a chemical reaction. The distance a vehicle travels must be based on a quantifiable change and direct control of the concentration of a chemical species. This chemical reactant species must be a solid, liquid, or vapor. An example of a typical propulsion system is an electrochemical reaction employing a custom-built battery, which is not similar to conventional batteries.

Vehicle Design Component: Vehicles entered into the competition must have a significant and demonstrable student design component, particularly with respect to the vehicle drive system, and the starting and stopping mechanisms. Both the chemical reaction driving the vehicle and the start/stop reaction (if there is one) must be physically on the vehicle during the competition (i.e., pre-loading of a drive system such as a capacitor assembly is not allowed). The vehicle must be powered by a chemical reaction and must be stopped by a quantifiable change, and direct control of the concentration of a chemical species. This chemical reactant species must be a solid, liquid, or vapor. Any vehicle that is purchased from a vendor

without major modifications to its operation will be disqualified.

Commercial batteries: No commercial batteries (for example, AA batteries) are allowed as the power source. Commercial batteries are allowed for specialized instruments (e.g. detectors, sensors, microprocessors etc.) only. **If commercial batteries are used as the source of propulsion, then the team will be disqualified immediately.**

Autonomous vehicle: The car must be an autonomous vehicle and cannot be controlled remotely. Pushing to start the vehicle or using a mechanical starting device is not allowed. Onboard computer control or programmable controllers are allowed but must not in any way control or measure the distance traveled. The program must be loaded onto the controller/computer/processor prior to the competition and may not be changed or communicated after the competition begins without proper permission. Wired or wireless communication with the onboard computer/controller is not allowed after the start of the competition. Teams will be asked to provide a copy of their complete program to the rules committee on the competition day. Examples of an on-board programmable system might be an Arduino or Raspberry Pi. Some examples of stopping mechanisms are the detection of color intensity from iodine clock reaction, detection of conductivity change from acid-base reaction (Strong acids and bases are to be handled carefully using gloves), etc.

No brakes: No mechanical force can be applied to the wheel, gears, driveshaft, etc., or ground to slow or stop the car.

Mechanical or electronic timing devices: There can be no mechanical or electronic timing device(s) to stop the chemical reaction or to stop the car. In addition, a timing device cannot utilize what is normally considered an instantaneous reaction. For example, a liquid or gas draining out of a vessel to serve as a stop switch would be considered mechanical timing and would not be allowed. The stopping mechanism must be described briefly in the abstract and any corrections needed will be informed via email.

ICE: Internal combustion engines using an alternative fuel (e.g., biodiesel, ethanol, etc.) are allowed. The fuel MUST be completely synthesized by the students (no additive blending is allowed). Succinct safety procedures for the maintenance and operation of this engine must be demonstrated by the team with consideration to indoor operation.

Note: Internal combustion engines are not allowed to emit visible combustion smoke to the competition space and are subject to sound restrictions.

Pressure-based car propulsion: Using chemical reactions to generate a gas to power the car is allowed. However, the gas released must be non-flammable, non-toxic and environment friendly. Moreover, pressurized vessels represent a significant explosion hazard due to the substantial energy contained in it.

Therefore, if the pressure generated is greater than five psig, then the car should have the following safety measures:

Course Layout and Distance Measurement: The car will start with its front end just touching the designated starting line. There will be a designated finish line. The distance will be measured with respect to the frontmost point of the car. The goal of the competition is to have your car stop closest to the specified finish line carrying the specific load. The course would be wedge-shaped with a starting line and the prescribed distance clearly marked from the starting point.

A vehicle that goes outside the course will have its distance measured to where it went out of bounds, and a penalty will be added to the measured score. “Outside the course” is defined as having the entire vehicle outside the side tape boundaries of the course. The tape is considered a part of the course. The car must traverse this distance within 4 minutes or the position at the end of four minutes will be counted as final.

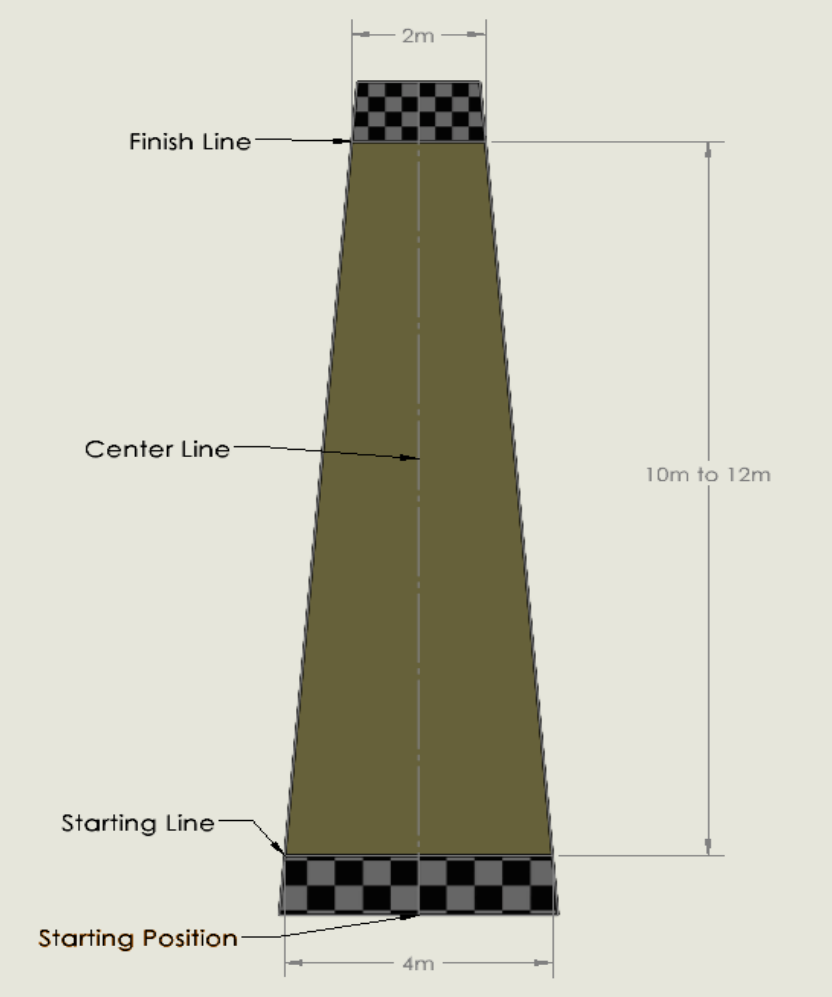

Fig: Racetrack Specification

Starting Procedure: Each team will be given two actual runs. The best time and distance will be counted. There will be a trial run phase before starting of the actual run where the participants can try out their car in a replica model of the actual track and fix any issues before each teams 'time of participation in the race.

Competition Order Logistics: The purpose of the time restrictions is to allow all cars to compete at the competition within the period allotted for the event.

1. Team start order will be determined by the organizers.
2. The order for the first round may change because of disqualifications (rules violations, abstract problems, or safety issues). If a car is disqualified that was scheduled to start before your car, then you will move-up one position in the start order earlier than was originally scheduled.
3. The load and distance will be announced 24 hours before the competition starts. So, all teams are requested to get ready for maximum load capability on their design.
4. The first team will be given a five-minute warning before the competition starts.
5. Each team will be given 4 minutes for the car to start moving, traverse the distance and stop. When the car stops, the timer is reset for the next competitor. The timing will also stop if the car travels out of ds. If the car does not stop within the 4-minute period, then the distance traversed at the end of 4 minutes will be counted as the final position.
6. After the car for team 1 stops, the distance traveled is measured and Team 1 should take their car directly to the chemical disposal station to dispose of their spent chemicals. This disposal process will be repeated for each car upon completion of its run.

Marking Criteria:

The winners of the Chem-E-Car competition will be selected based on the combined performance in the three stages. The marking scheme is provided below:

75%marksoncarperformancecompetition

25%marksonViva

Marks reduction in the car performance competition:

If the load is discharged from the car during run time, then there will be penalization.

Once the car crosses the starting line, team members cannot touch their car i.e. No chemicals can be added. Any type of contact with the car thereafter will lead to penalization.

The final distance will be measured from the finish line. The distance will always be measured from the finish line to the front point of the car. A vehicle that goes outside the course will have its distance measured to where it went out of bounds. Each centimeter covered by the car will be measured and marks will be given according to the total distance covered for deviation from the

centerline if above 1 m then marks will be reduced. If the car is not of appropriate size, then it will lead to disqualification. If any harmful chemical is released and is not mentioned in the final abstract, then it will lead to disqualification and otherwise some marks will be subtracted.

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