



ChemCar

Set of Rules 2012

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1 Preface

The **ChemCar**-competition has been carried out by the “kreative junge Verfahreningenieure” (kjVIs) of the VDI-GVC in co-working with DECHEMA e.V since 2006. In 2012 the Competition will take place at the “ProcessNet – Jahrestagung” in Karlsruhe. Aim of this competition is the accurate design of the reaction to achieve a certain distance, for example by adjustment of a specific reactant.

Students of chemical and process engineering, chemistry and further study courses are invited to contribute their know-how, creativity and ability to work in a team to succeed the provided task. The **ChemCar**-competition consists of two parts, the poster presentation and the race. This set of rules describes the procedure of the competition as well as the determination of the winning team. To focus the project on the chemical reaction, several technical requirements and restrictions to the model car have been imposed. In case of non-compliance to the rules in the following either points may be deducted or the team will be disqualified by the jury or the host.

2 Overview: Deadlines

Registration and concept submission:	19.04.2012
Notification of nomination:	11.05.2012
Submission of all relevant safety data sheets:	23.07.2012
Poster presentation and race:	12.09.2012

3 Prerequisite

For the competition eight teams will be nominated at maximum by the jury. Creative and original concepts will be favoured. Concepts which raise concern in safety matters will be denied. For the registration the following points should be taken into account:

1. Correct and punctual registration (point 4 registration).
2. Used chemical reaction contains neither safety nor environmental risks (point 6 safety and additional safety sheets).
3. Members have signed, that they read, understood and are willing to follow the regulations.
4. The team may consist of 7 students at maximum, who all must not have any degree as master or diploma. The students may be enrolled in different study courses. One member must be announced as contact person / team leader.
5. The team should be supervised by a qualified person from the university, who has a degree in the following or comparable courses of studies: process engineering, mechanical engineering, chemistry.
6. At least 50% of the team, including the team leader, have to attend to the competition on 12.09.2012.

4 Registration and concept submission

The registration and the concept submission have to be done until 19.04.2012 by email at chemcar@googlemail.com. A template can be found at www.chemcar.de. Registrations behind this deadline will not be taken into account.

The concept has to contain:

1. Description of the functionality of the model car including a sketch. The description has to be technical comprehensible – especially the chemical reaction and the conversion into kinetic energy.
2. A list of the used chemicals and their approximately needed amount.
3. First estimation of possible emissions and how those may be avoided.
4. Furthermore the registration has to contain the complete contact information of the qualified supervisor from the university (name, university, address, phone no, e-mail), the contact information of the team leader (name, university, address, phone no, e-mail) and a list of all team members (name, e-mail, studies, semester, university).

After approved registration the supervisor will obtain a summary of the team data including a declaration, that the rules have been accepted. This declaration has to be signed by every single team member. The scanned sheets as well as the actual certificate of enrolment of each member have to be sent to the kJVLs by email.

5 Rules

1. The energy source for running the ChemCar must only be predicated by a (bio)chemical reaction. With exhausting of this reaction, the powering of the ChemCar's engine has to be stopped.
2. Any device or physical principle for stopping the chemical reaction and/or the ChemCar is not allowed. This includes mechanical brakes, any electrical or mechanical device for measuring the distance or time travelled in any way. In case of doubts please refer to the organizers before submitting your concept.
3. Commercial acquirable batteries or fuel cells must not be used to power the ChemCar. Excluded are energy sources for secondary equipment (i.e. mixers).
4. Mechanical or electrical disengagement of the energy source from the drive mechanism is not allowed.
5. Any material or electrical circuit in the "ChemCar-System" must not be manipulated during the race. This means that any electrical switches, relays or similar components and material connections (wires, valves, tube, electrolytes,...) must not be manipulated for controlling the distance or time traveled by the ChemCar.
6. Operating the ChemCars by remote controls is not allowed.
7. It has to be possible to disassemble the ChemCar in its main parts within 10 minutes which need to fit in a (Curver-) Box of the size 526 mm x 436 mm x 285 mm (Curver UNIBOX III, 50 l). In case of reasonable doubts the jury can ask the participants to disassemble their car and check if it fits. Non-fulfillment will be punished with a five point deduction.
8. The ChemCar must weigh at least 2 kg and must not exceed 30 kg. During the race an additional weight of up to 30% of the ChemCar's empty weight has to be carried.

6 Safety

As result of the increased demands concerning the operational safety of the ChemCars revised safety rules including a guideline for the safety analysis will be published. The safety rules will be published until 01.03.2012 on www.chemcar.de. All requirements described in the file "ChemCar Safety Rules Rev.1.0.2012.pdf" are part of the official rules and must be strictly adhered.

7 Competition Instructions

The competition consists of two parts: the poster presentation and the race.

7.1 Poster

On the basis of a poster in DIN A0 the concept of the model car should be illustrated to the jury and the audience. The poster presentation takes place in the morning at 12.09.2012. The exact time will be announced beforehand. If the given space is sufficient it is possible to present the **ChemCar** as well.

The poster should contain the following content:

1. Name of the team and its members
2. An image of the model car
3. Technical description of the chemical reaction (How is the car powered? How is the distance determined which has to be run?)
4. The Originality of the concept
5. Abstract of the constructional processing including a process flowsheet

7.2 Race

1. Goal of the race is to reach the finishing line as close as possible under the conditions drawn by the jury (specified distance with additional weight). The distance between finishing line and the leading edge of the model car will be measured. Winner of the race is the team with the smallest distance to the finishing line.

2. The model cars must not leave the marked area (Figure 1). A variation of ± 15 degrees to the starting point will be tolerated. If any model car hits the right or left bar, the run will be aborted and the distance to this point will be taken with a penalty of three meters. If the car travel more than 25 m, the attempt will be invalid.

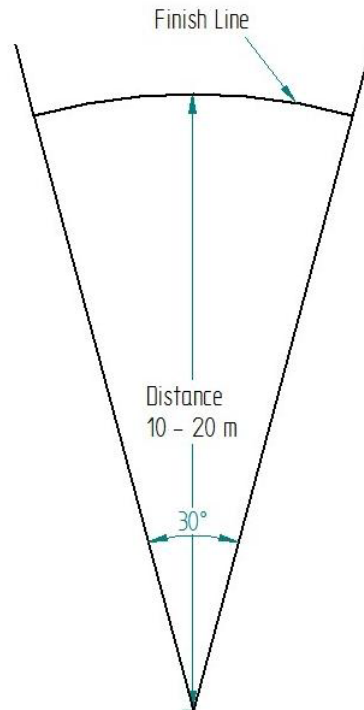


Figure 1: Sketch of the track

3. One hour before starting the jury will announce the conditions of additional load (0-30% of own mass) as well as the range (10-20 meter). Both parameters will be drawn, whereas the additional mass will be rounded down at full 100 g. These weights with a maximum diameter of 80 mm and a bore with a diameter of 8 mm will be provided by the kJVs. Figure 2 shows the differentiation of the weights. Sufficient space for the weights needs to be considered designing the ChemCar.

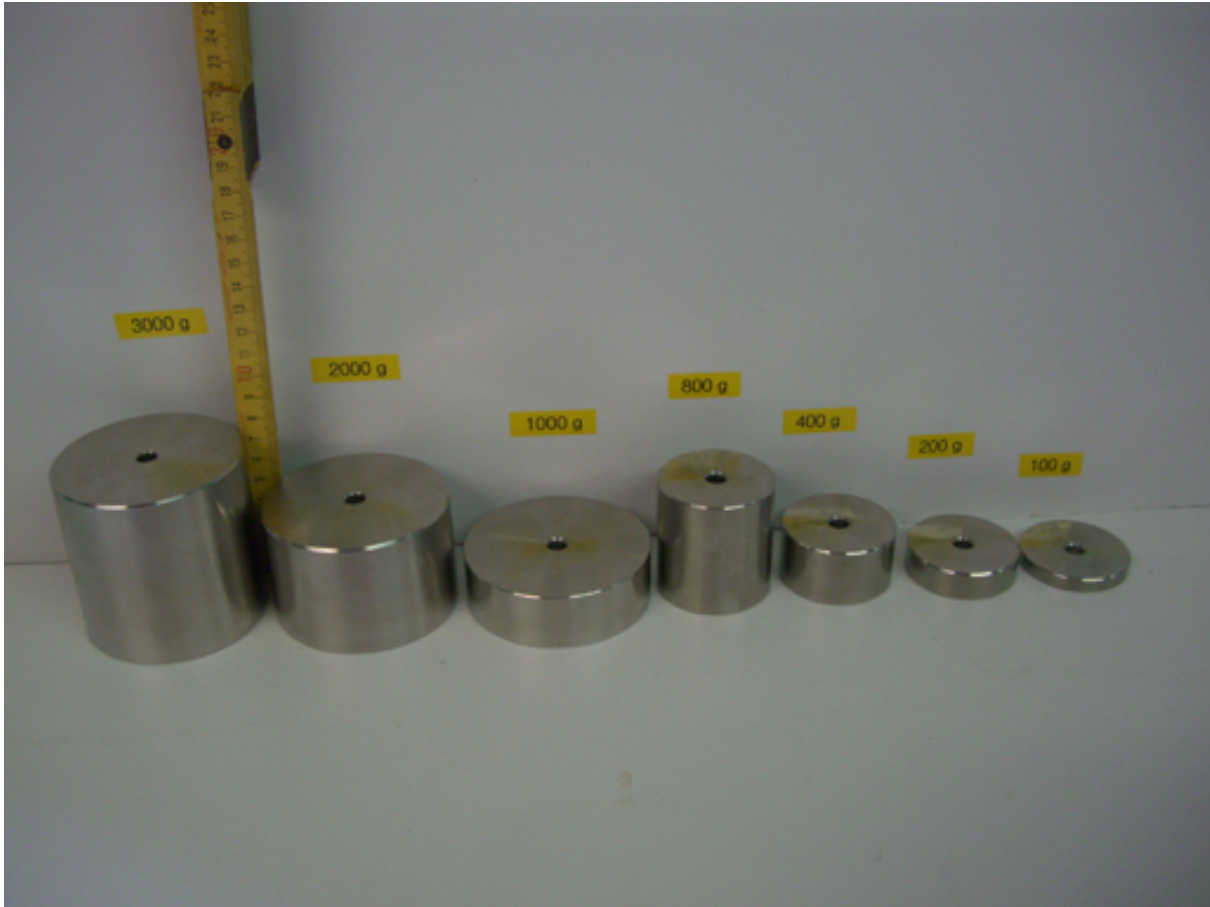


Figure 2: Used weights provided by the kjVIs

4. The starting order of the teams will be drawn after their nomination by the kjVis and will be the same in both attempts. The starting order will be communicated to the team leaders.
5. The first three teams in the order have to be ready 5 min before the start. After the first team finished their run, the fourth team needs to be ready and so on. This means that starting times are flexible and no explicit starting times will be assigned to the teams.
6. Each team has 3 minutes to carry out its attempt. The run starts when the starting mechanism is activated and ends when the car stops. If the time exceeds the time limit, there will be a penalty of 1 meter for each started 10 seconds. From the beginning of the 4th minute the attempt will be invalid.
7. At the start no part of the car may stick out beyond the starting line.
8. To determine the traveled distance the leading edge of the car will be used.
9. Each team has two attempts. For the score the superior result will be counted. Additionally a Bonus of 5 Points will be given to those teams whose deviation of the travelled difference from the distance to travel is smaller or equal to 10 % within both runs.
10. Each team has 15 minutes preparation time at minimum for the 2nd run.

11. The teams must use common protective clothing (especially safety goggles) during preparation and running of the model cars. Lab coats and safety goggles have to be organized by the teams. Also refer to the additional safety rules.

12. The jury or host have the right to deny the start of any team due to safety doubts at any time.

7.3 Points allocation – Overview

The maximum available number of points is 50, which is composed of the following parts (Fig. 3):

- maximum 25 points for the poster presentation

- maximum 25 points for the race

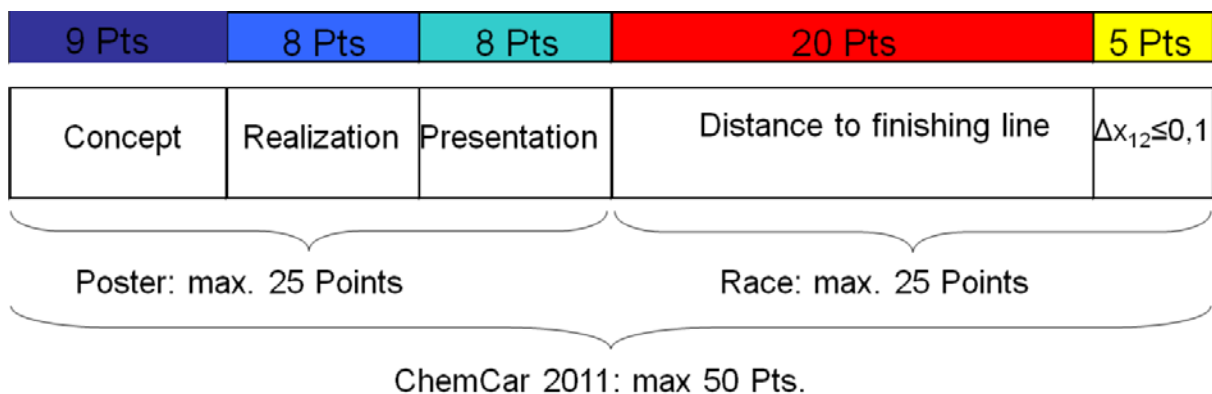


Figure 3: Overview over point allocation

The 25 points for the poster presentation consist of following parts:

1. Concept (9 points)
2. Realization (8 points)
3. Presentation (8 points)

The 25 points from the race are distributed as the followed:

1. The model car with smallest distance to the finishing line gains 20 points. - every following car obtains 2 points less
2. If a car accomplish in both attempts within a distance of $\pm 10\%$ of the distance to travel, the team will obtain 5 extra points.
3. If two or more teams achieve the same distance to the finishing line in their superior attempt, their 2nd best attempt will be counted for the comparison of both teams. If there is no difference as well, both teams obtain the same score.

The team with the most points will win the competition. At a tie, the result in the race decides about the ranking.

Immediate disqualification occurs at:

- smoke emission (ChemCar Safety Rules Rev.1.0.2012.pdf)
- loss of any liquids (including water!)
- safety doubts by jury or host

8 Summary of the modifications

Note that the following major changes to the regulations of 2011 have occurred:

- up to eight teams can take part in 2012
- The ChemCar needs to have a weight of minimum 2 kg
- The safety analysis procedure is revised

9 Prizes

The winners of the competition will receive the following prizes:

1. place: 2000 € and the **ChemCar** – trophy
2. place: 1000 €
3. place: 500 €

10 Contact

- Current information: www.chemcar.de
- Registration and questions: chemcar@googlemail.com
- General requests: kjVI@vdi.de