

WROCLAW SMARTMOTO CHALLENGE

SMARTMOTO CHALLENGE 2017

Rules 3.1*



PURPOSE OF THE PROJECT

First purpose of this event is to stimulate development of technology concerning electric motorcycles all around the world. This is an opportunity for students of engineering and design schools to collect and develop different practical skills. Not only the ones based on knowledge of technologies but also being acquainted with a team work, preparing and developing projects, fundraising and presenting the final results. The students can get familiar with modern technology and comprehend their market. On the other hand the manufacturers from the motorcycle industry will have a laboratory of ideas and an additional source of future market and product technicians.

OBJECTIVE OF THE PROJECT

The 2017 WSMC edition will consist on manufacturing a fully functional electric light enduro motorbike, following the European rules L1E, or L3E, with lights and blinkers.

The phases during the project will include market analysis, definitions on product and its design, and as a consequence of this, building a real prototype of an electric motorcycle. It will be also mandatory to work on a business plan that explains how each team evaluates the launch of its vehicle in terms of production, prices, dealers, markets.

The purpose of this document is to define what are the variables, constraints and criteria to use during the execution until the event in Wrocław.

PROJECT SCOPE

The scope of the project this year is for engineering degree universities as well as the participation of mixed teams with departments or design schools from other European universities. Also teams from technical high schools will be accepted. The final projects will be presented for verification in a workshop (5 days) at the campus of Wrocław University of Science and Technology with no more than 20 teams.

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1.- WROCLAW SMARTMOTO CHALLENGE 2017 RULES

1.1- EXECUTION TIME FOR PROJECT

The calendar project will be announced on the website and the project must be defended in Wrocław in the form, place and conditions that will be specified later in this document.

1.2- WHO CAN TAKE PART IN THE EVENT

The project is for multidisciplinary teams of students that during 2016 and 2017 are studying or have studied in any of these kinds of schools this period:

Which schools can participate:

- Universities
- Technical universities
- Technical high schools – by agreement

The number of students from each team must be between 8 and 30 students under the conditions described later, and it must have a faculty advisor as responsible. The faculty advisor must be present during the competition.

Mixed teams will be accepted from various training centers. Although, they must have only one faculty advisor that must be from the engineering university.

The geographical location of universities and educational institutions will have no restrictions in this edition.

Important: Teams should submit the list of the team members with the signature of the principal of the university or the person with legal capacity to sign that the students are enrolled in the school of the team they are working for.

1.3- STAGES OF THE PROJECT

The competition is composed of six stages. Each one evaluates different aspects of the project:

| | | |
|-----------|--|--|
| STAGE Ia | Registration and first part of payment from a form submitted by the organization. | From December 1st 2016 to February 15th 2017 |
| STAGE II | Design brief. The document written as a file will be specified before February 15 th . | Deadline May 31 st 2017 |
| STAGE Ib | Second part of payment for registration and dorms | Deadline June 30 th 2017 |
| STAGE III | Presentation of the final product design. It will be previously specified before March 21 st . | Deadline July 15 th 2017 |
| STAGE IV | Presentation of the prototype during the competition.(*) | August 2017 |
| STAGE V | Theory evaluation of the industrial development, design event and business plan presentation during the competition. | August 2017 |
| STAGE VI | Dynamic testing of the prototypes during the competition. | August 2017 |

(*) Prototypes presented at the stage IV must pass all tests required for getting the approval, demonstrating that they are safe and that they meet all the requirements for driving on public roads under EU rules. Otherwise the vehicle will not be evaluated at stage VI.

1.4- MAIN CHALLENGE ADMINISTRATIVE ACTS

1.4.1- REGISTRATION (Stage I)

The teams wishing to participate in the first edition of the SMC Wrocław should fill out and send the registration form between 1st December 2016 and 15th February 2017, following the procedure that will be announced on the SmartMoto Challenge website, www.smcwroclaw.pl.

The total cost of registration has two charges. One as the registration fee (1) and the other as the accommodation fee (2a or 2b). The registration fee is €1200 but it is paid in two parts. In this way if team does not finish the project at time, it is not necessary to pay the second part of registration fee. The accommodation fee applies if the team is going to use Wrocław's dorms with one meal per day included.

| | | |
|------|--|------------------------------|
| (1) | Registration fee part 1 | €500 + VAT per team |
| (2a) | Part 2 - Accommodation fee using Wrocław's dorms | €500 + €45 per student + VAT |
| (2b) | Part 2 without using dorms | €500 + VAT |

The registration fee (1) is mandatory for all the teams participating in SMC Wrocław. Accommodation fee with charge per student will only be charged to the teams that need to stay in Wrocław dorms during the days of the competition. If team is not going to use Wrocław dorms part 2 of registration fee is only €500 + VAT.

The dorms have running water, toilettes, showers, shops nearby, means of public transportation and energy (230 V).

1.4.2- PROJECT DOCUMENTATION AND SPECIAL TASKS

| | | |
|--|---|------------------------------------|
| STAGE II | Presentation of design briefing with main features of the prototype. | Before May 31st at 20.00h (GTM+1) |
| Between STAGE II and STAGE III the team should send the list of all the team members signed by an academic authority of the corresponding university where the team members are studying. If any change occurs in the team along the project, the team responsible has to inform the SMC organization. | | |
| STAGE III | Presentation of the final product design and technical justification of the project | Before July 15th at 20.00h (GTM+1) |

1.4.3- TEAMS

The teams will consist of a minimum of 8 and a maximum of 30 members, which will formalize the registration before 15th February, 2017, coordinated by a tutor as faculty advisor, from the university they belong to. In addition to the tutor, one of the team members should be appointed as a manager who will be responsible for the partner functions with the organization.

The maximum number of teams for this year is 20. If the number of requests exceeds this maximum, there will be a filter between those candidates who meet the eligibility requirements, according to the filing date of registration.

1.4.4- INSURANCE

Entered universities should integrate the work done, during the days in Poland, in the training curriculum for challenge inside the activities covered by school insurance. However, each team should have a private insurance as cover against any accident that may happen. This information must be shown to the administrator.

1.5- PROJECT EVALUATION

During the days of projects presentation in Wrocław, jury will score the prototypes. For this, it has been necessary define a scale from 0 to 1000 for evaluating the dynamic and static aspects of each project. This year two categories will be considered: Type A and Type B. Type A will contain projects with motors up to 4 kW. Type B for motors with power between values 4 kW and 8 kW.

1.5.1 STATIC EVENTS

1.5.1.1. Product design analysis

This document must justify in detail the bearing capacity of the vehicle. This document will have had a previous evaluation during project development. It will be analyzed each and every one of the documents of the equipment by the judges for this purpose defined by the organizing committee. For evaluation some questions may be done by the judges assigned to that purpose by the organizing committee. From 0 to 250 points divided into: body and brakes 75 points, lights and ergonomics 25 points, smart components 75 points, energy recovery and reuse of components 50 points, usability and maintenance 25 points

1.5.1.2. Business Plan

A document with a presentation in ppt, prezzi, or equivalent, by the teams which shall contain the following mandatory items:

- 1. Detailed product cost (parts and labour). This cost report will be oriented to know what could be the total prototype cost for a company that could be interested in producing such e-bike.*
- 2. Structure for mass production (where and with which costs)*
- 3. Product Marketing*
- 4. Plan Projected sales and profits the first 3 years*

The score is from 0 to 250 points divided into 100, 50, 50 and 50 in the order of the previous sections.

It must represent the real cost of your *Smart Moto*.

For each subsystem you must specify the cost of each item, in terms of price if it has been purchased or the cost of manufacturing. In this last case you must consider the labor hours cost and raw material. A complete *SmartMoto* split is mandatory in order to know your all subsystems. **Ask your providers about costs.**

This will be a document that judges will read and ask on them to each team.

You will dispose 20-25 minutes with a ppt. or similar tool for explaining:

Your presentation must be referred to one specific country and must contain:

- 1. Executive summary (resume)*
- 2. Innovation Team*
- 3. Industry background*

4. Competitor analysis
5. Market analysis
6. Marketing plan
7. Production plan
8. Operational plan
9. Financial and economic plan

No separate report is required for your Business Plan

1.5.2 PREVIOUS TEST BEFORE START THE MOTOR

Before start the vehicles, they must pass the following tests and standard safety check carried out by personnel authorized scrutineering companies.

1.5.2.1. Rules verification

Both mentioned companies will control that the model fits the design and standards sent to the organization before 15th July 2017.

1.5.2.2. Sealing

During 60 seconds the vehicle will be submitted to a rain test. The traction must be ON from the beginning, and the test will be passed if the system remains ON.

1.5.2.3. Brakes

- Verification by Ministry of Transport Test for vehicles of proper braking.
- Leaving standing start and operating the front brake at 5 meters, the bike must stop in 3 meters sector.
- Leaving standing start and operating the rear brake at 10 meters, the bike will stop in 5 meters sector.
- If the bike has full braking on one lever only the second criterion is applied.

The usage of the brakes should disable the throttle, i.e. it is not possible to brake and accelerate simultaneously.

1.5.2.4 Noise

There must be a beep of over 70dB in a radius of 2 meters around the motorcycle when the system state switches to ready to drive. The duration of the sound shall be between 1 and 3 seconds. The sound shall be easily recognizable, i.e. no animal sounds, human voices, songs, etc.

1.5.2.5 Emergency button

There shall be an emergency button to stop the whole system if necessary. A wristband that disconnects the system in case of being at more than 50cm of the handlebar will also be accepted.

1.5.2.6 Kickstand

The motorcycle shall dispose of a kickstand. In case it is in use, the traction system shall be deactivated (the system cannot be in drive ready state if kickstand in use).

1.5.2.7 Light

Front and rear lights shall be on always when the system is in drive ready state, to ensure that pedestrians and other drivers know the motorcycle is ready to drive.

1.5.2.8 Drive ready indicator

The display on the handlebar shall have a drive ready icon to know the system is in this state. Taking in consideration new 2017 European rules, driver must access to this state doing two volunteer actions. (eg. Key on + button)

1.5.3 DYNAMIC EVENTS

All dynamics events must be done with the complete body and accessories of each smartmoto which will be presented on design event. It is not allowed change some parts of the body during dynamic events except tires. The evaluation will have a total of 500 points and consist of:

1.5.3.1 Acceleration

With 1 driver on the motorcycle, 50 meters standing start. The fastest time wins. 4 attempts each team and choose the best result. 4 runs (2 runs per driver) on the hard ground. Maximum 100 points.

1.5.3.2 Acceleration +

With 1 driver on the motorcycle, 50 meters, standing start. Before the competitions there will be drawn couples to create a competition tree. The team goes to the next stage of the competition after winning at least 2 of 3 rides. 3 runs on the hard ground. Maximum 100 points.

1.5.3.3 Cones

With 1 driver on the motorcycle. There will be set a track to test maneuverability of a motorcycle. Each cone fallen down 2 seconds added to the total time of the lap. 4 runs (2 runs per driver) runs on the hard ground. Maximum 75 points.

1.5.3.4 Enduro Track

With 1 driver on the motorcycle, one lap (1km long) on the off-road track, standing start. The fastest time wins. 4 attempts each team and choose the best result. 4 runs (2 runs per driver). Maximum 75 points.

1.5.3.5 Endurance

20 minutes on an off-road track (1km long), number of full laps is counted. 2 attempts per team. The track will be the same as Enduro Track competition. The team with the highest number of laps within 20 minutes wins. Maximum 150 points.

In dynamic events, points will be assigned as follows:

In each event the best team will be assigned with the highest possible score, the worst with 20 points, rest will be assigned proportionally. The time difference will be used to proportionally distribute the subtraction of points from the winner to the other.

| Score | 25 | 50 | 75 | 100 | 150 | 250 | 500 |
|--|----|----|----|-----|-----|-----|-----|
| STATIC EVENTS | | | | | | | |
| Product Design Analysis | | | | | | x | |
| Body and brakes | | | x | | | | |
| Lights and ergonomics | x | | | | | | |
| Smart Components | | | x | | | | |
| Energy recovery and reuse of components | | x | | | | | |
| Usability and maintenance | x | | | | | | |
| Business Plan | | | | | | x | |
| Detailed product cost | | | | x | | | |
| Structure for mass production | | x | | | | | |
| Product Marketing | | x | | | | | |
| Projected sales plan and profits the first 3 years | | x | | | | | |
| TOTAL STATIC EVENTS | | | | | | | x |
| DYNAMIC EVENTS | | | | | | | |
| Acceleration | | | | x | | | |
| Acceleration + | | | | x | | | |
| Cones | | | x | | | | |
| Enduro Track | | | x | | | | |
| Endurance | | | | | x | | |
| TOTAL DYNAMIC EVENTS | | | | | | | x |

Table 1. Score table for the project

1.6 - ORGANIZATION

The organization of the event is provided by the Wrocław University of Science and Technology.

Politechnika Wrocławska,
Wybrzeże St. Wyspiańskiego 27
50-370 Wrocław

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To review the various project areas SMC has defined three commissions for evaluation:

Theoretical project evaluation Commission
Static events evaluation Commission
Dynamic events evaluation Commission

Those committees will evaluate the project based on a score table that will be published together with the regulations. Their decisions will be final.

1.7- AWARDS

Awards for each category (A and B):

- 1.7.1 For the 1st place in general classification.
- 1.7.2 For the 1st place in static part classification.
- 1.7.3 For the 1st place in dynamic part classification.

Awards for both categories:

- 1.7.4 To the fastest motorcycle (for the best time of all 50m races).
- 1.7.5 To the bravest team.
- 1.7.6 To the best body and brakes design.

1.8- INDUSTRIAL PROPERTY

Due to the direct relationship with industry, project has defined the following clauses that refer to industrial property of the projects presented:

- Each university can reach economic agreements along the event with any company involved directly or indirectly as a sponsor at the event.
- If the university has patented the business object, only university can negotiate with any company.

1.9- LANGUAGE

The official language for the event is English. All written documentation submitted by the organization and/or participants will be written or spoken in English. The final decisions of the projects will be in English.

1.10- WEB PAGE

The challenge website is www.smcwroclaw.pl.

1.11- TEAMS AND EVENTS AREAS

Teams will be hosted in a Wrocław's dorms at Wittiga St 6-8, 61-628 Wrocław

The static events and dynamic events will be carried at Wrocław University of Science and Technology campus and special race track, following schedule on the website.

Schedule of events in Wrocław will be published in July on the website.

1.12- MANDATORY EQUIPMENT FOR RIDERS

Helmet, gloves and off-road boots required. Least as garments long jeans, long sleeved shirt and shoes must be closed. No flip-flops allowed.

2.- TECHNICAL REGULATIONS

Described below are the rules to apply in the construction of the vehicle which should be under the category L1E or L3E. Maximum nominal voltage 60 V on battery.

2.1 FREE PARTS AND MATERIAL USED IN THE PROJECT

All components and materials used to build a motorcycle must be approved in Europe.

2.1.1- FRAME

They may use any material that is used in frames of bikes already on the market. For using a different material, it must demonstrate its technical feasibility under a protocol to be announced in the coming months.

2.1.2- WHEELS

Only vehicles with 2 or 3 wheels will be accepted. The only restriction is that no bicycle wheels will be allowed. But other diameter and width and aspect ratio tire can be used. All tires used must exist in the market. No tires prototypes are allowed.

2.1.3- LIGHTS

The lights must be powered from the same source as the engine and must form a structure following the European Standard. You can use light bulbs, halogen headlamps or with LED technology or any technology that meets the Standard, with a maximum supply voltage of 12 volts.

Must have 4 turn signals in amber colour (blinkers) with hazard warning option (4 lights working at time) included.

2.1.4- BRAKE SYSTEM

Brakes should be powered by cable, hydraulic or electric circuit to one or both wheels simultaneously. They can have an energy recovery system. The components of the braking system, except in the subsystem of energy recovery, must follow the European Standard. Systems ABS and brake assist are allowed.

2.1.5- VEHICLE SMART COMPONENTS

Because the development is related with a motorcycle for adventure and fun, we must be sure that in case of problems we can be safe. Because of that reason this year the motorcycle must be able to send a message with position, kilometers that can run and level of battery when we define a minimum level that we can define previously. This information must be sent as web page, e-mail or sms message to some friend, company etc.

2.1.6- BODY AND SEAT

It can use any type of material approved for building motorcycles in Europe. The body can partially cover the wheels of the vehicle. Designs will not be accepted with sharp edges capable of producing incisions in the body at speeds below 10 km / h. The seat must have a part permanently attached to the frame or body it can swing on. Motorcycle may be optionally ready for two people. The vehicle must have 2 mirrors, one for each road side.

2.1.7- POWER TRAIN (ECU+BATTERY+ENGINE)

ECU, battery and electrical engine are not specified. Cells must be homologated in Europe. Teams can use any brand, but with the limitation of 60 V on battery as nominal value.

Engine could be on wheel or not. Two categories: up to 4 kW and greater than 4 kW until 8 kW.

2.2 MANDATORY PARTS AND MATERIALS USED IN THE PROJECT.

2.2.1- SAFETY SYSTEMS

The motorcycle must be locked electrically if the bridge or the crowbar is used in the vehicle that has such an element.

The usage of the brakes must disable the throttle, i.e. it is not possible to brake and accelerate simultaneously.

The SmartMoto must start to only move after two conscious actions. For example: key + switch button.

ADDITIONAL INFORMATION

SMALL SCHEME FOR A TYPICAL ELECTRIC LIGHT MOTOBIKE

