



*The 30<sup>th</sup> SIAR International Congress of  
Automotive and Transport Engineering*

*Craiova, Romania, October 23-25, 2019*

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# **Book of Abstracts**

The 30<sup>th</sup> SIAR International Congress of  
Automotive and Transportation Engineering

## **Science and Management of Automotive and Transportation Engineering**

**Editors**

**Racilă Laurențiu Daniel, Dumitru Ilie**

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I. Răcilă, Laurențiu Daniel (ed.)

II. Dumitru, Ilie (ed.)



## **Brief history of the S.M.A.T. International Congress**

### **“SCIENCE AND MANAGEMENT OF AUTOMOTIVE AND TRANSPORT”**

This Congress represents, through the collaboration within SIAR (Society of Automotive Engineers of Romania), the combination of the academic world and of the researchers' efforts from the main Romanian university centers (Bucharest, Brasov, Craiova, Cluj-Napoca, Pitesti and Timișoara), being in fact the XXX<sup>th</sup> edition in the Society of Automotive Engineers of Romania sphere.. At the level of the Ministry of National Education, which also ensures the patronage of this event (reaching its 4<sup>th</sup> edition in Craiova), it is associated as an internationally renowned scientific event.

The structure of the scientific events was built on a specific topic whose thematic area was distributed as follows: advanced engineering methods, advanced powertrain and propulsion, road vehicles and environment, modern transport systems and road traffic, special vehicles, materials and technologies, targeting scientific aspects of particular mechanical engineering interest in general and of automotive and transport engineering in particular.

The 2001 SIAR Congress was hosted for the first time in the University of Craiova, by the Faculty of Mechanics. At the SMAT 2001 edition 289 authors participated, with a total of 234 papers (with 359 authors), published in three volumes at the Universitaria Publishing House, ISBN 973-80-43-23-4.

At the next edition held in Craiova – SMAT 2008 – 284 authors represented over 20 universities. Thus, a number of 172 scientific papers were published in two volumes (924 pages) at the Universitaria Publishing House, ISBN 978-606-14-0865-1.

At the 2014 SMAT Congress edition, a number of 134 scientific papers were selected for publication and 7 invited scientific papers, the result of the activity of about 240 authors was edited electronically in the Congress CD. A



total of 69 papers (approx. 50%) presented during the congress were specifically reviewed for publication in Applied Mechanics and Materials - Automotive and Transportation Engineering, published by Trans Tech Publication Ltd, Switzerland, in print version with the ISBN 978-3- 03835-703-2 and electronically available at <http://www.scientific.net>.

At the SMAT 2019 Congress, about 200 specialists from the country and abroad, respectively about 70 students (participants in the special competition of Automotive Dynamics and Assisted Design in Automotive) announced their presence. The participants represent universities and research institutions from the country and abroad (Politehnica University of Bucharest, Transilvania University of Brasov, Military Technical Academy of Bucharest, University of Bacau, Technical University of Cluj Napoca, University of Agricultural Sciences and Veterinary Medicine Bucharest, University of Craiova, University of Medicine and Pharmacy of Craiova, Ovidius University of Constanta, "Gheorghe Asachi" Technical University of Iași, University of Oradea, "Aurel Vlaicu" University of Arad, University of Pitești, Politehnica University of Timisoara, Institute of Solid Mechanics, INMA, RTR, IPA, AVL - Austria, University of Campinas – Brazil, Mauá Institute of Technology – Brazil, School of Automotive and Traffic Engineering, Jiangsu University, Zhenjiang, PRC, TMVS Lab, Virginia Tech Blacksburg, VA - USA, University of Nevers - France, Technical University of Chisinau – Moldova, University of Nis - Serbia, Dokuz Eylül University of Izmir -Turkey, etc.). The most representative papers were selected and published in the Springer publishing house proceeding volume, respectively in a proceeding in the Universitaria Publishing House in Craiova.

The economic environment is well represented at this edition too, Craiova being an important center in automotive and assisted design (we note FORD Romania, Renault Technologie Roumanie, INAS, CadWorks, CaeLynx Europe, AVL, NextRom, etc.).

## **Editors**



## The Calculus of the Pressures in the Characteristic Points of the GDI Engine Cycle

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**Extended Abstract.** The GDI Engines are a viable option for the compliance with the more and more severe environmental protection standards. The main advantage of this type of engine is the operation with very lean mixtures at low and medium loads. The operation at low and medium loads takes place, mainly, in urban regime, exactly where a drastic reduction of the pollutant emissions produced by the road vehicles is necessary. The authors have developed an original model for the thermal calculus of a GDI Engine, depending on the rotational speed and on the environmental temperatures, that aims to be a useful instrument for the study of the thermal processes that take place in this type of engine.

The most important assumption made for the engine cycle is that the burning process takes place in two steps: the main burning phase (which is considered to be an isochoric process) and the afterburning (which is considered to be a polytropic process with subunit coefficient).

By developing a calculus algorithm of the state parameters in the characteristic points of engine's cycle, depending on the rotational speed and on the environmental temperature, one aims the development of a useful instrument to estimate the pollutant emissions and the identification of the measures that should be taken in order to reduce them. In this paper is presented the calculus algorithm for the pressures in the characteristic points of engine's cycle, excepting the ones at the intake port and the one at the end of the intake stroke. These are the subject of other paper.

The main part of the paper is dedicated to the presentation of the calculation algorithm for the temperatures: at the end of the compression process, at the end of the main burning phase, at the end of the expansion stroke, at the end of the free exhaust and at the end of the forced exhaust.

The calculated data were compared with the experimental one. It was observed that the calculated data are close to the experimental one.

The differences appear because the assumption of two steps burning and the difficulty to estimate the heat transfer between the working fluid inside the burning chamber and the cylinder's walls.

**Keywords:** GDI Engine, the engine cycle, the working fluid pressure.

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## An Engine Mechanism Dynamic Analysis by Considering the Kinematic Elements as Deformable Ones

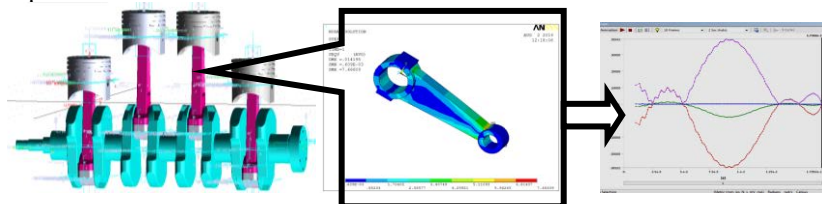
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**Extended Abstract.** Through this paper is presented a methodology for optimal response analysis in dynamic conditions of an internal combustion engine mechanism. Thus, it will be analyzed a four stroke engine mechanism by considering this with rigid kinematic elements with the aid of MSC Adams and after this the same mechanism will be analyzed with kinematic deformable elements in ANSYS software environment. Also it will be presented an optimization algorithm of the proposed mechanism with the MSC Adams software when the mechanism elements are considered rigid ones and specific optimization algorithms for the mechanism with flexible elements, by considering the input data obtained through an interface ADAMS-ANSYS software. The obtained virtual models are designed with a flexible character in a parameterized mode. This means that the obtained results will be easily coupled with other results which were obtained through experimental tests.



**Fig.1.** Four stroke engine mechanism workflow for dynamic analysis.

**Keywords:** Dynamic Analysis, Deformable Elements, Finite Element.

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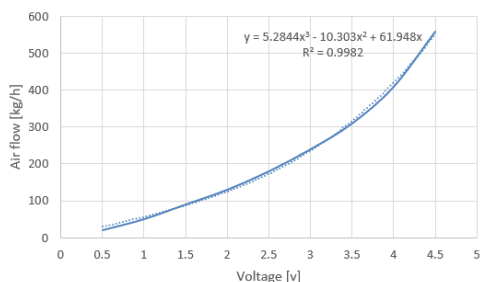


## Experimental Stand to Evaluate Engine Mass Air Flow (MAF) Sensor

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**Extended Abstract.** In this paper an experimental setup was designed and realized in laboratory to test and measure the engine mass air flow sensor used in engine applications. The MAF sensor is installed usually between air filter and the intake manifold of the engine and measure the amount of air entering the engine or the air flow. A contaminated and failed mass air flow sensor shows a lower or higher air flow readings causing various drivability problems. The stand simulates the condition of function of MAF sensor by various air flows and temperature recording the flow by a pitot tube. The experimental stand was designed and built in the laboratory of Elements of Mechatronics of Faculty of Mechanics of Craiova.

The curve variation is similar as a polynomial function of third order. The variation of voltage is limited at lower air flow and higher at high air flows. The experimental stand can be used to evaluate different MAF sensors. When the engine is idling a reduce amount of air pass around the hot wire (a low electric current is necessary to keep the wire hot) but at high loads the air cools the hot wire and more electrical current is needed to maintain it hot.



The stand can investigate if the MAF sensor is damaged or contaminated by measuring in different condition of temperature and air flows the voltage generated.

**Keywords:** Mass Air Flow, Air/Fuel Ratio, Engine Control Unit.

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## Aspects Relating to Operation of Transmission Provided with Torque Converter

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**Extended Abstract.** The paper presents some aspects regarding the mathematical modeling of the hydromechanical transmissions operation and a study of the dynamics of the vehicle. The characteristics of the torque converter and transmission with automatic gearbox type XC200-5C from Allison are established. Also there are presented performance curves for the internal combustion engine linked with this transmission. Static characteristic modeled with analytical expressions are part of the initial database for the dynamic study of the vehicle within the work.

**Keywords:** torque converter, gearbox, mathematical model, vehicle dynamics

