

## FROM THE HISTORY OF NON-CONVENTIONAL TECHNOLOGIES IN ROMANIA

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### ABSTRACT

In this paper are presented the main events connected to the beginning of the scientifically research in domain of non-conventional technologies in Romania, the evolution in time of the activity from domain, the actual stage and the future perspectives of ARTN.

**KEYWORDS:** Non-conventional technologies

In the year 1950, as a young assistant professor, was teaching Materials Technology and Electronic Materials at the Electrotechnic Faculty of the Politechnic Institute from Timisoara, today, University „Politehnica” from Timisoara.

In my profesional education it was very clear that every teacher from the superior education must to have a scientific activity. So, I have decided to choose a research domain. Because I was teaching at the Electrotechnic Faculty some disciplines with electrotechnic and mechanic character, the research domain that I was able to choose had to have an electrotechnic and a mechanic component, with a mathematical configuration.

I was graduated the Electromechanic Faculty of Poltechnical School from Timisoara. I had done also the courses of a Mathematic Faculty from Cluj University refuged in Timisoara.

I read some Russian magazines about the first ideas about processing by electric erosion of the metallic materials.

I thought that this will be a proper domain for research that requests knowledge of electro-technique, mechanic and mathematic.

The domain was since the beginning on the international plan. There weren't existed proper knowledge about this phenomenon, proper equipments and apparatus. There didn't exist a research experience in the domain. I thought: if I choose this research domain there will be a provocation for me but I have only general information. All must have be done since the beginning. If I succeed in

research I will have many satisfactions. If I don't succeed means that I worked in vain. I took the risk and choose the domain of Non-Conventional Technologies in my scientific research.

Non-Conventional Technologies are refereeing at the dimensional processing of the materials using energetic "tools" and not mechanic ones.

I was obliged to study the phenomenon of each processing procedure. At the electrical erosion: electrical discharge in impulse, the effect of the electrical discharges on the metallic materials, the mechanism of removing of the processed material, automatization and centralized supervising of the process.

All these I have done between 1950-1960 having as collaborators my assistants and some special students to whom I gave as diploma projects, problems from the domain of Non-Conventional Technologies. I studied problems of electrical erosion, electrochemical erosion, erosion with ultra-sonic waves and laser erosion.

A special attention was given at the dimensional processing by electric and electrochemical erosion called anodic - mechanic processing, but I have called it complex erosion electric and electrochemical.

Since 1960 I have been transferred at the chair in Mechanic Technology from the Mechanical Faculty in Timisoara. Of course I transferred also the scientifically research from domain of Non-Conventional Technologies at the Mechanical Faculty.

In 1965 a part from the teachers from the

chair of Machines Construction from Mechanical Faculty were associated in scientifically research in domain of Non-Conventional Technologies (prof.Gheorghe Savii and his research team ).

Also in 1965 at the University from Brasov were studied in the scientifically research, problems about processing with electric and electrochemical erosion (prof. Gheorghe Obaciu and prof. I.Ivan ).

In 1970 at the Craiova University, Mechanical Faculty, were studied problems of new technologies from the domain of aggregation of metallic powders (prof.S.Şontea).

In the same period, at the Polytechnic University Bucuresti, Faculty of Machines Construction Technology, chair of Material Technology and Welding ( prof.D.Drimer) and chair of Machines Construction Technology (prof.I.Gavrilaşi) were beginning the researching in the domain of Non-Conventional Technologies.

Also in 1970 at the Technic University Cluj Napoca, is researched the processing with beam fascicle (E.Tătar and prof.O.Tătar).

In 1975 at Technic University Iaşi are studied in the scientifically research problems connected to the non-conventional technologies. (C.Picoş and L.Slătineanu ).

In the same period at University "Lucian Blaga" from Sibiu at the Engineering Faculty had been continuing the researching in the domain of non-conventional technologies that were began in Timișoara (prof.I.Isarie and prof.D.Nanu).

About 1980, University from Suceava was presented to the scientifically conferences with works from domain of electrochemic processings (prof.Gheorghe Gut ).

Processings by electrical erosion were studied in the same period at the Oradea University (prof.I.Mihăilă ).

During 1980-1985 also University "Dunărea de Jos" from Galați had began the researching in this new domain of non-conventional technologies (prof.M.Teodorescu ).

The research in domain of non-conventional technologies were developing in all the country and as a result of this fact The Research and Education Minister from Romania founded by order nr. 7422A/02.08.1974, at the Polytechnic Institute from Timișoara, Mechanical Faculty,

the Center of Research in domain of Non-Conventional Technologies. Director was named professor A.Nanu.

This center focalized a great number of scientific researchers and trainers for a doctor's degree. By the center's activity was achieved a partially control of the research activity from the domain of non-conventional technologies. I say "partially" because the scientific research from the Institute of Scientific Research and Industry haven't been treated properly.

As a result of consulting with Industries Minister it was established that the organized work from the domain of non-conventional technologies to be done by a research institute. It was chosen ICTCM (Institute of researching in Machines Constructions Technology from București).

In 1984 as a result of valouros results obtained in Timisoara in this new science's domain, Romanian Academy founded in the Timisoara's branch „ Commision of Research in Non-Conventional Technologies" professor A.Nanu having been named as the commision's president. The commision had the goal to control the research in this domain.

There have been during 1985-1990 in Romania two centers of this domain: ICTCM as an organizatoric shape and Romanian Academy as scientific coordinator.

In year 1993 with the occasion of the 7-th International Conferece of Non-Conventional Technologies from Timișoara, where have been analysed the research activities in non-conventional technologies, it was established the foundation of a profesional association to coordinate all the activity of non-conventional technologies from Romania. So was founded the Romanian Association for Non-Conventional Technologies ( ARTN).

The association was registred at the Court of Law Timisoara with the civil sentence nr.167/P.J. from 20.12.1993. Also in this conference was chosen the first president of association, prof. A.Nanu.

In 2002 in the Academy of Technic Study from Romania, branch Timișoara, was founded Collective of Non-Conventional Technologies coordinated by prof A.Nanu , honour's membre of Technic Academy from Romania.

Romanian Association of Non-Conventional Technologies (ARTN) is a

professional organisation of specialists in domain of Non-Conventional Technologies, autonom, non-politic, non-governamental, independent founded on unlimited period as a juridic person.

The main office of association is at University Politehnica from Timișoara, Mechanical Faculty, chair of Mechanical Technology, boulevard Mihai Viteazu no.1.

ARTN members can be particular person (engineers, mathematicians, fizicians, chemists, economists and other specialists from reserach and production and/or juridic persons that have connections with the domain), that wants to take part to association.

The purpose and objectives of this association are:

- Assuring of a proper situation for exchanging information and experience between their's members as well as with other organizations from technic's domain.

- Valorification of the scientific's results of the assocation members, promoting and coordinating the scientifically activities of it's members;

- Increasing of the qualification's degree;

- Organization of actions for scientific assistance at the education institutes, for researching as well as at other institutes;

- The coordonation organs of ARTN, at high level are:

- The Director Committee of ARTN, that fullfils the requirements of National Conference of Non-Conventional technologies and that consists from an honour president, an executive president, 4 vice-presidents, a general secretary and members.

- The Executive Office, that achives the curent activity and leads the activity being constituted from a president of the executive office, 4 vice-presidents, a general secretary, 1 tresurer, 3-5 members.

- Cenzors Commision, that controls the financial administration and of patrimonies, composed from 3 members.

**Table 1. Office's members of Romanian Association for Non-Conventional Technologies- A.R.T.N.**

| No. | Name and surname<br>Function in office   |
|-----|--|
| 1   | prof. dr. doc. șt. d.h.c. ing. Aurel NANU<br>Honour President  |
| 2   | prof. dr. ing. Dan NANU<br>Executive President, coordonator of branches from Cluj-Napoca and sibiu                                       |
| 3   | prof. dr. ing. Richard HERMAN<br>Vicepresident, coordonator of branches from Cluj-Napoca and Sibiu                                       |
| 4   | prof. dr. ing. Nicolae MARINESCU<br>Vicepresident, coordonator of brances from Bucuresti, Craiova, Galați, president of branch București |
| 5   | prof. dr. ing. Gheorghe OBACIU<br>Vicepresident, coordonator of branches from Brașov, Iași and Suceava                                   |
| 6   | prof. dr. ing. Ion POPOVICI<br>Vicepresident, coordonator of branches from Oradea, Timisoara, Târgu Mureș                                |
| 7   | prof. dr. ing. Mircea IVAN<br>Member, president of branch Brașov   |
| 8   | prof. dr. ing. Șerban DOMȘA<br>Member, president of branch Cluj-Napoca   |
| 9   | conf. dr. ing. Marin DIDU<br>Member, president of branch Craiova   |
| 10  | prof. dr. ing. Valentin TĂBĂCARU<br>Member, president of branch Galați   |
| 11  | prof. dr. ing. Laurențiu SLĂTINEANU<br>Member, president of branch Iasi  |
| 12  | prof. dr. ing. Ioan MIHĂILĂ<br>Member, president of branch Oradea  |
| 13  | prof. dr. ing. Gheorghe GUTT<br>Member, president of branch Suceava  |
| 14  | prof. dr. ing. Vasile POPOVICI<br>Member, president of branch Timișoara  |
| 15  | prof. dr. ing. Dumitru ȘOAITĂ<br>Member, president of branch Tirgu Mureș   |
| 16  | dr. ing. Augustin RODINA<br>Member   |
| 17  | conf. dr. ing. Mircea OLARIU<br>General Secretary  |
| 18  | prof. dr. ing. Dumitru MNERIE<br>Treasurer   |

The activity in domain of Non-Conventioanl Technologies from Romania is organised on 11 branches in country of ARTN, 11 research comissions in Non-Conventional Technologies of Romanian Academy and 11 comitees of Academy of Technic Science from Romania.

In the following are presented in tables, the Director Comitee of ARTN, of the comission of Romanian Academy and of ASTR collective, that presently activated the comissions, respectively the branches from country, with the specification of the person's name that leads the respectively comision.

**Table 2 Members of the Leading Office of the Commision of Research in Non-Conventional Technologies from**

**Romanian Academy- Timișoara branch**

| No. | Name and surname<br>Function in office                 |
|-----|--|
| 1   | prof. dr. doc. șt. d.h.c. ing. Aurel NANU<br>President |
| 2   | prof. dr. ing. Dan NANU<br>Member                      |
| 3   | prof. dr. ing. Nicolae MARINESCU<br>Member             |
| 4   | prof. dr. ing. Richard HERMAN<br>Member                |
| 5   | prof. dr. ing. Ion POPOVICI<br>Treasurer               |

**Table 3 Members of the Leading Comitee of the Research Collective of the Academy of Technic Science from Romania A.S.T.R.- branch Timisoara**

| No. | Name and surname<br>Function in office                 |
|-----|--|
| 1   | prof. dr. doc. șt. d.h.c. ing. Aurel NANU<br>President |
| 2   | prof. dr. ing. Richard HERMAN<br>Vicepresiden          |
| 3   | prof. dr. ing. Ioan ȘORA<br>Member                     |
| 4   | prof. dr. ing. Dan NANU<br>Member                      |
| 5   | prof. dr. ing. Gheorghe OBACIU<br>Member               |
| 6   | prof. dr. ing. Nicolae MARINESCU<br>Member             |
| 7   | prof. dr. ing. Titus SLAVICI<br>Member                 |
| 8   | conf. dr. ing. Antoniu REVICZKY<br>Member              |
| 9   | ș. l. dr. ing. Ioan GROZA<br>Secretary                 |

**Table 4 Branches of Romanian Association for Non-Conventional Technologies-A.R.T.N.**

| nr. crt. | Branch President                              |
|----------|---|
| 1        | Brașov<br>prof. dr. ing. Mircea IVAN          |
| 2        | București<br>prof. dr. ing. Nicolae MARINESCU |
| 3        | Cluj-Napoca<br>prof. dr. ing. Șerban DOMȘA    |
| 4        | Craiova<br>conf. dr. ing. Marin DIDU          |
| 5        | Galați<br>prof. dr. ing. Nicolae TĂBĂCARU     |
| 6        | Iași<br>prof. dr. ing. Laurențiu SLĂTINEANU   |
| 7        | Oradea<br>prof. dr. ing. Ioan MIHĂILĂ         |
| 8        | Sibiu<br>prof. dr. ing. Dan NANU              |
| 9        | Suceava<br>prof. dr. ing. Gheorghe GUTT       |
| 10       | Timișoara<br>prof. dr. ing. Vasile POPOVICI   |
| 11       | Târgu Mureș<br>prof.dr.ing. Dumitru ȘOAITĂ    |

**Table 5 Under-commissions of Reseach Commissions in Non-Conventional Technologies of the Romanian Academy**

| No. | Under-commission | President                           |
|-----|------------------|-------------------------------------|
| 1   | Brașov           | prof. dr. ing. Gheorghe OBACIU      |
| 2   | București        | prof. dr. ing. Nicolae MARINESCU    |
| 3   | Cluj             | prof. dr. ing. Șerban DOMȘA         |
| 4   | Craiova          | prof. dr. ing. Sever ȘONTEA         |
| 5   | Galați           | prof. dr. ing. Valentin TĂBĂCARU    |
| 6   | Iași             | prof. dr. ing. Laurențiu SLĂTINEANU |
| 7   | Oradea           | prof. dr. ing. Ioan MIHĂILĂ         |
| 8   | Sibiu            | prof. dr. ing. Dan NANU             |
| 9   | Suceava          | prof. dr. ing. Gheorghe GUTT        |
| 10  | Timișoara        | prof. dr. ing. Ion POPOVICI         |
| 11  | Târgu Mureș      | prof.dr.ing. Dumitru ȘOAITĂ         |

**Table 6 Under-commissions of the Research Collective of the Academy of Technic Science from Romania A.S.T.R.- Timisoara's branch**

| No. | Under-commission | President                           |
|-----|------------------|-------------------------------------|
| 1   | Brașov           | prof. dr. ing. Gheorghe OBACIU      |
| 2   | București        | prof. dr. ing. Nicolae MARINESCU    |
| 3   | Cluj-Napoca      | prof. dr. ing. Radu ORBAN           |
| 4   | Craiova          | conf. dr. ing. Marin DIDU           |
| 5   | Galați           | prof. dr. ing. Valentin TĂBĂCARU    |
| 6   | Iași             | prof. dr. ing. Laurențiu SLĂTINEANU |
| 7   | Oradea           | prof. dr. ing. Ioan MIHĂILĂ         |
| 8   | Sibiu            | prof. dr. ing. Dan NANU             |
| 9   | Suceava          | prof. dr. ing. Gheorghe GUTT        |
| 10  | Timișoara        | conf. dr. ing. Mircea OLARIU        |
| 11  | Târgu Mureș      | prof.dr.ing. Dumitru ȘOAITĂ         |

From the existent statistics at the present results that the non-conventional technologies represents 15-20% from the global advanced technologies that are known until today. In Romania they represents toward the other technologies, only 2-3% that is totally unacceptable.

To increase the importance of non-conventional technologies in the romanian economy, ARTN had devised and applied the following actions:

- Specialists formation at the engineers level in non-conventional technologies;
- Organization of national and international conferences in non-conventional domain;
- Founding and publishing of magazines and publications in non-conventional domain;
- Elaboration and creation of a treatise in non-conventional technologies composed from 11 volumes ( each of them between 300 to 600 pages);
- Superior calification by master and doctorate.

In the following section are made some statements about the described action.

Since 1972 it was created at Politehnica University Timisoara, Mechanical Faculty,

chair of Mechanical Technology and Machines Construction Technologies , a group of specialization in non-conventional technologies. Since 1976 with the aproval of Education Minister, the group was transformed in section of Non-Conventional Technologies. This section was functioning till 2004 as Non-Conventional Equipments and Technologies (ETN).

In 2004 the specialization of Non-Conventional Technologies has been eliminated from the table of specializations from the technical superior education system from Romania. I consider that is a big mistake which I had mentioned in a speciall letter adressed to the Education Minister at that time.

I consider that the technical superior education system must to have new specializations that will promote the technical progress in economy. Specialization of Non-Conventional Technologies that has existed at the Politehica University Bucuresti, Politehnica University Timisoara, Technic University Iasi and University „Lucian Blaga” Sibiu during more decades, had given beautiful results necessary for development of the romanian economy.

In 2005 the mistake has been repaired by founding of a new specialization: Nanotechnologies and Non-conventional Technologies. After the size of the processed work-pieces, technologies are divided in four categories:

- Macro-technologies for processing the work-pieces with great dimensions of tones order/piece;
- Normal technologies for the processing of work-pieces with weight of kg/piece;
- Micro-technologies for processing of work-pieces with weight of g/piece;
- Nanotechnologies for processing the work-pieces with weight smaller than 1 g until at the level of molecule/piece.

To give possibilities to the specialists from Romania and abroad to do an useful exchange of experience, there have been organised and hold the papers of 12 international conferences in domain.

**Table 7 Conferences in domain of non-conventional technologies**

| No | Conferen<br>ce | Year | Town | Sec<br>tion<br>s | Scientific<br>ally<br>works |
|----|----------------|------|------|------------------|-----------------------------|
|----|----------------|------|------|------------------|-----------------------------|

|    |                  |      |           |   |     |
|----|------------------|------|-----------|---|-----|
| 1  | C. N. T. N. I    | 1971 | Timișoara | 5 | 91  |
| 2  | C. N. T. N. II   | 1977 | București | 2 | 62  |
| 3  | C. N. T. N. III  | 1982 | Sibiu     | 6 | 199 |
| 4  | C. N. T. N. IV   | 1983 | Timișoara | 4 | 127 |
| 5  | C. N. T. N. V    | 1989 | Timișoara | 4 | 66  |
| 6  | C. N. T. N. VI   | 1993 | Timișoara | 5 | 114 |
| 7  | C. I. T. N. VII  | 1997 | Timișoara | 2 | 130 |
| 8  | C. I. T. N. VIII | 1999 | Timișoara | 2 | 125 |
| 9  | C. I. T. N. IX   | 2000 | Brașov    | 3 | 89  |
| 10 | C. I. T. N. X    | 2001 | Timișoara | 3 | 117 |
| 11 | C. I. T. N. XI   | 2003 | Sibiu     | 3 | 111 |
| 12 | C. I. T. N. XII  | 2005 | București | 3 | 142 |

The 13-th International Conference of Non-Conventional technologies will be organized by the branch of Iasi of ARTN during 17-19 may 2007.

All the communicated papers at the ARTN conferences had been published or in special volumes of the conference or in the magazine of Non-Conventional Technologies of ARTN.

Beginning from the reality: “ to do a thing well you must to know what to do, to know you must to learn, to learn you must to have the material”.

Beyond the learning of knowledge from domain of non-conventional technologies, at the specialization sections from the superior technical education system must to exist a proper actualized documentation in a treatise of Non-Conventional Technologies.

The treatise that has been devised has 11 volumes:

- Volume 1 – Non-Conventional Technologies at the beginning of millennium (TNCIM)
- Volume 2- Processing by Electric Erosion (E.E)
- Volume 3 – Processing by Electric Erosion with contact breaking (EERC)
- Volume 4- Processing by Electrochemical Erosion (EECH)
- Volume 5 –Processing by Electrical Complex Erosion (ECS)
- Volume 6- Processing by Erosion with Electrons Fascicle (EFE)
- Volume 7 – Processing by Erosion with Laser Radiations (ERL)

- Volume 8- Processing by Erosion with Ultrasonic Waves (EUUS)

- Volume 9- Processing by Plasma Erosion (EP)

- Volume 10- Processing by Fluids Kinetic Activated (EFA)

- Volume 11- Processing of Non-Conventional Materials

In the future there will be elaborated volumes about specifically non-conventional technologies (elaboration, casting, plastic deformations, cutting, treatment, etc.).

Each volume has especially a typical structure with the following content: theoretical basis, specifically technologies, problems for optimization, experimental results, economical problems, the future trend of the process and bibliography.

It is established that each volume contains between 300 and 700 pages.

Each volume is redacted by specialized engineers, coordinated by a specialist in domain.

The general coordination of the treatise is achieved by ARTN through the honour president of it, prof.dr.eng.dr.doc.DHC. Aurel NANU.

Until present there have been edited 8 from the 11 planned volumes. The other 3 volumes and some special volumes will be edited the next years.

The treatise of Non-Conventional Technologies that has been designed and achieved as I said is the first treatise of Non-Conventional Technologies edited in Romania, and after our knowledge also in the world.

It is a treatise with a high scientifically content that sure will lead to a quantitative and qualitative increasing of the specialists in domain.

On this way I want to bring the most

heartily thanks to all the authors that have been engaged in the achieving of a scientifically work with a highest level.

For the special training in the education units from our country have been created course of master and a special qualification through doctorate. Until now the title of doctor engineer in the speciality of Non-Conventional Technologies was received by 158 engineers.

ARTN achieved especially till this moment, those facts that have been presented in this paper.

We succeeded to implement in the Romanian industry new procedures for processing by non-conventional technologies. We have to accentuated that the Romanian industry must to use much more these technologies.

Another direction in which ARTN have to activate is that's of professional formation of the technicians in domain.

The necessary efforts for the future must to be concentrated in implementation of non-conventional technologies with a higher contribution in the Romanian industry.

At the finish I shall present my prevision about the dimensional processing technologies of the future in Romania and in the world.

Presently, on national and international plane, non –conventional technologies are presented in industry in a percent between 1-20%.

Non-Conventional technologies, that use as a "tool" the energy, I called them energetic technologies and technologies that use as a "tool" the mechanical tools, mechanical technologies.

I consider that the future of the dimensional processing is in the favour of energetic technologies.