

IX CONFERENCE – SEMINAR

**INTERNATIONAL SCHOOL ON NONSINUSOIDAL
CURRENTS AND COMPENSATION**

ISNCC 2008

**Łagów, Poland
10-13 June 2008**

FINAL PROGRAM

www.ISNCC2008.iee.uz.zgora.pl

University of Zielona Góra
Institute of Electrical Engineering
Institute of Electrical Metrology

Contents

Welcome to Łagów	3
ISNCC Committees	4
Conference Subject Matter	5
Practical Information	6
Tutorials	8
Wednesday 11th June 2008	11
Welcome Addresses	11
Tutorials T1 & T2	11
Lecture Session S1	12
Lecture Session S2	12
Lecture Session S3	13
Lecture Session S4	14
Thursday 12th June 2008	15
Tutorials T3 & T4	15
Lecture Session S5	15
Lecture Session S6	16
Lecture Session S7	17
Lecture Session S8	18
Friday 13th June 2008	19
Tutorial T5	19
Closing Session	19

Welcome to Łagów

Dear colleagues,
dear participants,

On behalf of the ISNCC Scientific and Organizing Committees, I welcome you to the 9th International School on Nonsinusoidal Currents and Compensation in Łagów, Poland.

The conference, which is a continuation, in a reorganized form, of the former Seminar on Nonsinusoidal Currents, will provide you with the opportunity to network, share, and learn about the latest advances on power properties, power theory and compensation under nonsinusoidal conditions. ISNCC includes technical sessions and tutorials, gives also tremendous opportunity for old friends and colleagues to get together and share during informal discussions their experiences. Topics cover theoretical analysis, design, control, modelling and simulation of systems with nonsinusoidal voltages and currents as well as implementation of power electronic systems for an improved energy conversion.

I hope that you will experience a great time, as Łagów is a popular tourist centre, known as the Pearl of Ziemia Lubuska. It is situated in the middle of the Łagów Park Landscape, among picturesque hills, by two deep and crystal clear lakes, Łagów and Trześniów. I do know that Łagów has what it takes to make your ISNCC 2008 experience a memorable one.

Best Regards, I am very proud and glad to be the host of this conference, and I wish you all a successful conference and a pleasant time in Łagów.

Welcome to Łagów!

Leszek Czarnecki
General Chair

ISNCC Committees

Honorary Chair

Hirofumi Akagi (Japan)

Honorary Guest

Manfred Depenbrock (Germany)

General Chair

Leszek Czarnecki (USA)

Scientific Committee

Frede Blaabjerg (Denmark)

Marian Pasko (Poland)

Guangda Chen (China)

Stanisław Piróg (Poland)

Johan Driesen (Belgium)

Jan-Harm Pretorius (South Africa)

Zbigniew Fedyczak (Poland)

Volker Staudt (Germany)

Bogusław Grzesik (Poland)

Ryszard Strzelecki (Poland)

Zbigniew Hanzelka (Poland)

Paolo Tenti (Italy)

Marian Kaźmierkowski (Poland)

Edson H. Watanabe (Brazil)

Wiesław Miczulski (Poland)

Jacques L. Willems (Belgium)

Kazimierz Mikołajuk (Poland)

Igor U. Żeżelenko (Ukraine)

Marian Miłek (Poland)

Advisory Committee

Leszek Frąckowiak (Poland)

Henryk Tunia (Poland)

Organizing Committee

General Chair

Zbigniew Fedyczak (Poland)

General Secretary

Grzegorz Kobyłecki (Poland)

Organizing Board

Grzegorz Benysek (Poland)

Radosław Kłosiński (Poland)

Mirosław Koziół (Poland)

Conference Subject Matter

International School on Nonsinusoidal Currents and Compensation (ISNCC) is a continuation, in a reorganized form, of the former Seminar on Nonsinusoidal Currents. The conference shall focus the attention on compensation under nonsinusoidal conditions, with half of the conference time devoted to tutorials on power properties of systems with nonsinusoidal voltages and currents (NSV&C), their metrological identification and compensation. It shall provide a forum for presentation of new ideas and research results as well as an opportunity for a transfer of the existing knowledge on nonsinusoidal systems, their identification and compensation to the younger generation of engineers and researchers. The conference shall provide an opportunity for discussion and exchange of experience between theoreticians, practitioners, experienced and beginner scientists interested in systems with NSV&C as well as in identification and compensation in such systems.

The main topics of the conference include:

- power properties and power theory of systems with NSV&C,
- metrological identification of systems with NSV&C,
- compensation in systems with NSV&C,
- implementation of Power Electronics for an improved electrical energy conversion.

Practical Information

Conference Venue

The event will be held at the "Pod Basztą" (Under the Keep) and "Zamek Joannitów" (Joannitów Castle), both located in the heart of Łagów. Buildings ensure an intimate atmosphere and are about 3 minutes walking distance apart.

Conference Registration

The conference registration desk will be open during the following times:

Tuesday 10 June 2008 3.30 PM – 8.30 PM

Wednesday 11 June 2008 7.30 AM – 7.30 PM

Conference delegates who have registered can pick up their materials, badges and other items from the registration desk which is located in "OW Leśnik" (Holiday House Leśnik) (4 minutes walking distance from "Zamek Joannitów" (Joannitów Castle)).

All conference participants are issued with a personal badge showing their name and delegation. Please observe that for security reasons the badge must be worn at all times during the conference and the social events. Access may be denied to participants not wearing their badge.

Hotel Information

All conference participants will be accommodated in "Zamek Joannitów" (Joannitów Castle) or "OW Leśnik" (Holiday House Leśnik). Accommodation is included in the registration fee.

Coffee Break

Every day from 12.00 AM – 0.30 PM and 5.30 PM – 6.00 PM, in the "Pod Basztą" (Under the Keep) and "Zamek Joannitów" (Joannitów Castle), there will be scheduled coffee break – just to meet friends.

Dinner

A dinner will be served each day from 2.00 PM – 3.30 PM in "Zamek Joannitów" (Joannitów Castle) or "OW Leśnik" (Holiday House Leśnik), depending on accommodation place. Dinner is included in the registration fee.

Practical Information

Welcome Party

A welcome party will be held on Wednesday 11 June 2008 from 7.00 PM in “OW Leśnik” (Holiday House Leśnik). We have planned an enjoyable evening with nice food (among others roasted wild boar) and good beer. All participant and partners are welcome to attend.

Gala Dinner

Our gala dinner will take place in “Zamek Joannitów” (Joannitów Castle) Thursday June 12. We start at 6.00 PM with the Lubuskie Wine Tradition Event and hope to see you all at that time. We have planned an enjoyable evening with nice food, good wine and a short stringed quartet concert with professional staff to make the evening successful. The gala dinner is included in the registration fee.

Social Tour

The 9th ISNCC Organizing Committee has arranged the following special tour for the participants and their companions:

Half day tour to the National Park “Estuary of Warta”

Detailed information about the tour one can find on the following web site <http://www.pnujsciewarty.gov.pl/> and at the registration desk. The social tour is not included in the registration fee and will take place if enough participants apply.

Oral Presentations

Oral presentation includes a 10-15 minutes presentation time plus 5 minutes for questions and answers.

Show up at least 10 minutes before the session starts and meet the session chairman so you have the possibility to inspect the lecture hall and its facilities (computers and digital projectors). At the session speak simple as possible and stick to the time limit so questions can be raised.

Tutorial T1:

Instantaneous p-q power theory for compensating nonsinusoidal systems

Wednesday, 11 June 2008, 9.00 AM – 10.30 AM,

Location: "Pod Basztą" (Under the Keep)

Authors: E.H. Watanabe, Federal University of Rio de Janeiro
H. Akagi, Tokyo Institute of Technology
M. Aredes, Federal University of Rio de Janeiro

This is a tutorial about compensation of nonsinusoidal systems based on the instantaneous active and reactive power theory or the p-q Theory. The history related to this theory is presented and then the definitions of real, imaginary and zero-sequence powers are introduced. The physical meanings of each of these powers are explained and some basic compensation examples are shown considering different active power conditioners. It is shown that this theory can be very practical for understanding problems due to nonsinusoidal voltages or currents. It is especially interesting for the design of power conditioners for three-wire or four-wire three-phase system with or without distortions in voltages and currents.

Tutorial T2:

Fryze – Buchholz – Depenbrock: a time-domain power theory

Wednesday, 11 June 2008, 10.30 AM – 12.00 AM,

Location: "Pod Basztą" (Under the Keep)

Author: V. Staudt, Ruhr University of Bochum

Several power theories trying to explain the difference between the physically defined active power and the apparent power are known – and under discussion. This paper gives an overview of a universal time-domain power theory mainly developed by Fryze, Buchholz and Depenbrock. It is verified by theoretical considerations and explained by examples. The theory allows the assessment of loads concerning effectivity of energy transfer and the application-specific splitting of currents into desirable and undesirable components – which in turn can, e.g., be compensated.

Tutorial T3:

Cooperative design and control of distributed harmonic and reactive compensators

Thursday, 12 June 2008, 9.00 AM – 10.30 AM,

Location: "Pod Basztą" (Under the Keep)

Authors: E. Tedeschi, Padova University

P. Tenti, Padova University

A theoretical background for the design and coordinated control of multiple compensation equipment acting in the same network is presented. It makes use of instantaneous power terms which are conservative in every network and naturally extend the usual power definitions to the case of distorted voltages and currents. Based on the theoretical approach, a system-level and equipment-level control algorithm is developed, which allows cooperative operation of Static VAR Compensators (SVC) and Active Power Filters (APF).

Tutorial T4:

Currents' Physical Components (CPC) concept: a fundamental of power theory

Thursday, 12 June 2008, 10.30 AM – 12.00 AM,

Location: "Pod Basztą" (Under the Keep)

Author: L.S. Czarnecki, Louisiana State University

This is a tutorial about currently the most advanced power theory of electrical systems with non-sinusoidal voltages and currents, along with fundamentals of their compensation, based on the concept of Currents' Physical Components (CPC). It includes single-phase systems and unbalanced three-phase systems with linear, time-invariant (LTI) and harmonic generating loads (HGLs).

Tutorial T5:

Switching compensator control strategy based on the CPC power theory

Friday, 13 June 2008, 9.00 AM – 10.30 AM,

Location: "Pod Baszta" (Under the Keep)

Authors: G. Chen, Wuhan University

H. Ginn, Mississippi State University

A reference generation technique for shunt switching compensators based on Currents' Physical Components (CPC) power theory is presented that utilizes a computationally efficient moving-window DFT along with the CPC orthogonal decomposition of the current instead of the filters typically used to extract the desired components of the current. Each orthogonal component of the current can be adjusted independently in any percentage, thus providing selective current compensation. Details of a prototype compensator and experimental results are also presented.

Wednesday 11th June 2008

Welcome Addresses

8:30 AM – 9:00 AM

Location: "Pod Basztą" (Under the Keep)

Welcome address from the ISNCC 2008 chairpersons:

Prof. L.S. Czarnecki, Louisiana State University
Prof. Z. Fedyczak, University of Zielona Góra

The conference opening ceremony:

Prof. M. Depenbrock (Germany)

Tutorial T1

9:00 AM – 10:30 AM

Location: "Pod Basztą" (Under the Keep)

Instantaneous p - q power theory for compensating nonsinusoidal systems

E.H. Watanabe, Federal University of Rio de Janeiro
H. Akagi, Tokyo Institute of Technology
M. Aredes, Federal University of Rio de Janeiro

Tutorial T2

10:30 AM – 12:00 AM

Location: "Pod Basztą" (Under the Keep)

Fryze – Buchholz – Depenbrock: a time-domain power theory

V. Staudt, Ruhr University of Bochum

Coffee Break

12:00 AM – 0:30 PM

Location: "Pod Basztą" (Under the Keep)

Wednesday 11th June 2008

Lecture Session S1

0:30 PM – 2:00 PM

Location: "Pod Basztą" (Under the Keep)

Chair: G. Chen, Wuhan University

- ID46 ***Critical analysis of different current decomposition and compensation schemes***
J.L. Willems, Ghent University
- ID61 ***The geometric algebra as a power theory analysis tool***
M. Castilla, J.C. Bravo, M. Ordóñez, D. Borrás, A. López, J. Gutierrez, University of Sevilla
J.C. Montaño, Spanish Research Council
- ID331 ***Analysis of instantaneous NSV&C in polyphase systems***
M. Castilla, J.C. Bravo, D. Borrás, J. Gutierrez, A. López, University of Sevilla
J.C. Montaño, Spanish Research Council
- ID161 ***Symmetrization of asymmetrical three-phase load supplied from asymmetrical non-ideal voltage source with periodic nonsinusoidal waveforms***
K. Dębowski, M. Pasko, Silesian University of Technology

Lecture Session S2

0:30 PM – 2:00 PM

Location: "Sala Rycerska" (Knights Hall)

Chair: P. Tenti, Padova University

- ID76 ***Discussion on existing methodologies for the responsibilities assignment problem***
A. Pavas, H. Torres-Sanchez, National University of Colombia
V. Staudt, Ruhr University Bochum
- ID126 ***Natural doubling of the apparent switching frequency using three-level ANPC converter***
D. Florica, E. Florica, Politehnica University of Bucharest
M. Dumitrescu, Dunarea de Jos – University of Galati
- ID301 ***Series voltage restoration under distorted supply voltage condition***
K. Piątek, University of Science and Technology
- ID306 ***Steady and transient state analysis of a matrix-reactance frequency converter based on a boost PWM AC matrix-reactance chopper***
I. Korotyeyev, Z. Fedyczak, P. Szcześniak, University of Zielona Góra

Wednesday 11th June 2008

Dinner

2:00 PM – 3:30 PM

Locations: “Zamek Joannitów” (Joannitów Castle) & “OW Leśnik” (Holiday House Leśnik)

Lecture Session S3

3:30 PM – 5:30 PM

**Location: ”Pod Basztą” (Under the Keep)
Chair: J. L. Willems, Ghent University**

- ID41 ***A few remarks on the analysis of energy transfer through any periodic current and voltage waveforms***
M.T. Hartman, M. Hashad, Gdynia Maritime University
- ID42 ***The correlation functions of power as a new proposition to describe power states in circuits with periodical voltage and current waveforms***
M.T. Hartman, M. Hashad, Gdynia Maritime University
- ID236 ***Instantaneous single-phase system power demonstration using virtual two phase theory***
B. Dobrucky, M. Pokorny, University of Zilina
- ID291 ***Nonsinusoidal power caused by grid impedance measurement at unbalanced grid voltage***
T. do Thanh, S. Schostan, K.D. Dettmann, D. Schulz, Helmut Schmidt University Hamburg
- ID351 ***Application of neural networks to voltage fluctuations measurement – neural networks flickermeter***
M. Szlosek, B. Świątek, Z. Hanzelka, University of Science and Technology
- ID392 ***The source optimal current calculation according to the instant power exceed criterion***
M. Siwczyński, M. Jaraczewski, Cracow University of Technology

Wednesday 11th June 2008

Lecture Session S4

3:30 PM – 5:30 PM

**Location: “Sala Rycerska” (Knights Hall)
Chair: J.H. Pretorius, University of Johannesburg**

- ID51 ***The effect of earth fault current harmonics on tripping of residual current devices***
S. Czapp, Gdańsk University of Technology
- ID131 ***New algorithm for estimation of correctness of active and reactive power distribution among generating sets operating in parallel***
M. Hashad, J. Mindykowski, Gdynia Maritime University
- ID156 ***Modelling and analysis of a three-phase quadrature phase shifter with a hybrid transformer***
J. Kaniewski, Z. Fedyczak, University of Zielona Góra
- ID286 ***Conditions of CM voltage cancellation in cascaded multilevel inverters with conventional and improved carrier-based SVPWM***
A. Kempski, R. Smoleński, P. Leżyński, University of Zielona Góra
- ID381 ***Modelling of voltage transformer performance in power system harmonic frequency range***
J. Łuszcz, I. Moson, Gdańsk University of Technology

Coffee Break

5:30 PM – 6:00 PM

**Locations: “Sala Rycerska” (Knights Hall) & “Pod Basztą”
(Under the Keep)**

Scientific Committee Meeting

6:00 PM – 7:00 PM

Locations: “OW Leśnik” (Holiday House Leśnik)

Welcome Party

7:00 PM

Location: “OW Leśnik” (Holiday House Leśnik)

Thursday 12th June 2008

Tutorial T3 **9:00 AM – 10:30 AM**

Location: "Pod Basztą" (Under the Keep)

Cooperative design and control of distributed harmonic and reactive compensators

E. Tedeschi, Padova University

P. Tenti, Padova University

Tutorial T4 **10:30 AM – 12:00 AM**

Location: "Pod Basztą" (Under the Keep)

Currents' Physical Components (CPC) concept: a fundamental of power theory

L.S. Czarnecki, Louisiana State University

Coffee Break **12:00 AM – 0:30 PM**

Location: "Pod Basztą" (Under the Keep)

Lecture Session S5 **0:30 PM – 2:00 PM**

Location: "Pod Basztą" (Under the Keep)

Chair: E. H. Watanabe, Federal University of Rio de Janeiro

Power delivery system nonsinusoidal regime analysis

ID81 M. Dumitrescu, T. Munteanu, G. Gurguiatu, C. Vlad, Dunarea de Jos – University of Galati

D. Floricau, University Politehnica Bucharest

Distributed system for electrical power quality

ID221 ***improvement***

R. Klempka, University of Science and Technology

Analysis of the generalized instantaneous reactive power theory within the framework of the CPC power theory

ID66

Y.A. Sirotin, National Technical University Kharkov

Thursday 12th June 2008

Lecture Session S6

0:30 PM – 2:00 PM

Location: “Sala Rycerska” (Knights Hall)

Chair: D. Schultz, Helmut Schmidt University Hamburg

ID191 ***Performance and accuracy comparison of fixed and floating-point realizations of the active power filter control algorithm***

M. Pasko, M. Maciążek, D. Buła, Silesian University of Technology

ID211 ***Power quality conditioners with minimum number of current sensor requirement***

R. Strzelecki, Gdynia Maritime University

G. Benysek, M. Jarnut, University of Zielona Góra

ID326 ***Improved shunt active power filters***

K.P. Sozański, University of Zielona Góra

ID376 ***Power electronics active filter with controlled dynamics***

M. Gwóźdź, Poznań University of Technology

Dinner

2:00 PM – 3:30 PM

Locations: “Zamek Joannitów” (Joannitów Castle) & “OW Leśnik” (Holiday House Leśnik)

Thursday 12th June 2008

Lecture Session S7

3:30 PM – 5:30 PM

**Location: "Pod Basztą" (Under the Keep)
Chair: V. Staudt, Ruhr University of Bochum**

- ID96 ***Influence of the nonlinearity of measurement transformers on effectiveness of module error correction***
L. Furmankiewicz, University of Zielona Góra
- ID162 ***Fuzzy mathematical programming as a tool in optimization of one-phase electrical circuits***
K. Dębowski, Silesian University of Technology
- ID206 ***Reconstruction of spectrum of the nonlinearly distorted periodic signals sampled non-coherently***
R. Kłosiński, University of Zielona Góra
- ID231 ***The Hilbert transform adaptation for measuring amplitude and phase low-frequency disturbances in power system voltage***
A. Bień, University of Science and Technology
- ID276 ***A Hilbert transform based algorithm for detection of a complex envelope of a power grid signals – an implementation***
A. Wetula, University of Science and Technology
- ID391 ***Calculus of the operators of fractional order in a discrete time domain***
M. Siwczyński, Z. Siwczyńska, P. Krzyk, Cracow University of Technology

Thursday 12th June 2008

Lecture Session S8

3:30 PM – 5:30 PM

Location: “Sala Rycerska” (Knights Hall)

Chair: Z. Hanzelka, University of Science and Technology

- Numerical detection of the current instability phenomena due to the balance of the electric machines***
ID116 D. Olaru, D. Floricau, Politehnica University of Bucharest
- Harmonic digital simulation technique on an industrial environment***
ID82 M. Dumitrescu, Dunarea de Jos – University of Galati
- Complete harmonic-domain modeling and performance evaluation of an optimal-PWM-modulated STATCOM in a realistic distribution network***
ID152 H. Valizadeh Haghi, M. Tavakoli Bina, K.N. Toosi University of Technology
- The effectiveness of improvement of energy transformation quality by the diode rectifiers with current modulation in DC output circuit***
ID311 M. Krystkowiak, M. Gwóźdź, Poznań University of Technology
- New control system of the shunt active power filter***
ID461 R. Strzelecki, M. Wojciechowski, Gdynia Maritime University

Coffee Break

5:30 PM – 6:00 PM

**Locations: “Sala Rycerska” (Knights Hall) & “Pod Basztą”
(Under the Keep)**

Lubuskie Wine Tradition

6:00 PM – 7:00 PM

**Location: “Zamek Joannitów” (Joannitów Castle) – The Main
Hall**

Gala Dinner

7:00 PM

**Location: “Zamek Joannitów” (Joannitów Castle) – The Main
Hall**

Friday 13th June 2008

Tutorial T5 **9:00 AM – 10:30 AM**

Location: "Pod Basztą" (Under the Keep)

***Switching compensator control strategy based on the
CPC power theory***

G. Chen, Wuhan University

H. Ginn, Mississippi State University

Coffee Break **10:30 AM – 11:00 AM**

Location: "Pod Basztą" (Under the Keep)

Closing Session **11:00 AM – 11:30 AM**

Location: "Pod Basztą" (Under the Keep)

Closing address from the ISNCC 2008 General Chair:

Prof. L.S. Czarnecki, Louisiana State University

Dinner **12:00 AM – 1:00 PM**

**Locations: "Zamek Joannitów" (Joannitów Castle) & "OW
Leśnik" (Holiday House Leśnik)**

Notes