NATIONAL CENTRE FOR INFORMATION AND DOCUMENTATION

ADVANCES
IN
BULGARIAN SCIENCE

3 2007
SOFIA

Published by National Centre for Information and Documentation
52 A G. M. Dimitrov Blvd
1125 Sofia, Bulgaria,
Phone: +359 2 817 38 62
http: www.nacid.bg,
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ISSN: 1312-6164

DEVELOPMENT OF ECONOMY BASED ON KNOWLEDGE AND INNOVATION ACTIVITIES

Operative program "Development of Competitiveness of Bulgarian Economy 2007 – 2013" is one of the seven operative programs which will be financed by the Structural Funds of the European Union after Bulgaria's accession to the EU. The program will be financed by the European Regional Development Fund and by the national budget. Total amount of the public financial resources for the program is about 1.1 billion euros. The program contains strategic priorities and trends of development of Bulgarian economy. It aims to solve basic problems of economic development of the country and envisages measures and activities to overcome them and to successfully cope with the challenges of the Common market, as well as to develop strong sides of the economy through which Bulgaria will become an equal member of the European Union.

Activities on this priority are concentrated in the following groups of operations:

Support for Creation and Commercialization of Innovations in Enterprises

Creation of innovative firms for commercialization of scientific-applied results is one of the approaches for "providing" the economy with critical mass of such results. The priority supports starting companies at the initial stage of their existence, rendering them integrated assistance for different activities such as business consulting, initial investments in assets and introduction of their products on the market. As a result of these interventions an increase in the number of highly innovative market-oriented enterprises in Bulgarian economy is expected. Research and Development activities in the firms themselves are another important "generator" of innovations. On the one hand companies get financial support for realization of scientific research and development activities, including pre-project, industrial and market research, and on the other hand they get integrated support (consultations, investments, personnel training) necessary for introduction of product and process innovations into production or management practice. As a result of these activities successful projects of enterprises as well as total expenses of firms for research and development are being increased. Enterprises are supported in hiring scientists and other researchers working on their own research projects. The aim is to increase employment of researchers and highly qualified specialists. Programs for doctorands with high applied potential are being supported in order to intensify the process of implementation of the most innovative solutions and research results in the economy. Agreement signed in advance with an enterprise or a consortium of enterprises provides for their future application in case of successful result of the project. For protection of innovations developed by Bulgarian enterprises and research organizations support is afforded for protection of industrial rights through national and international applications and registrations of patents, trademarks and designs (including Community Trade Mark, Community Design, the Madrid Agreement and the Protocol to it, etc.).

Improvement of Pro-Innovative Infrastructure

The aim of this group of operations is creation of favourable conditions for development of innovative enterprises and strengthening the capacity of Bulgarian research organizations for introduction of applied R&D projects. Financing is directed to different types of organizations in support of business, which offer professional consulting services for the starting innovative firms and existing innovative enterprises. The funds are offered for creation and/or enlargement of centers for technological transfer, technology incubators, technological parks, etc. At offices for technological transfer and technology incubators the financial support covers the expenses for projects connected with creation of similar institutions, institutional building of the existing ones, development and delivery of new services for enterprises as well as connecting such institutions and organizations into networks in support of business and innovative enterprises. At accomplishment of projects for technological parks preparatory activities for creation of high technology parks (pre-project investigations, elaboration of technical documentation, engineering plans, etc.) are also financed. To ensure sufficient "flow" of innovative ideas in the economy, research organizations are supported to acquire and/or renew the existing equipment under condition that there is clearly expressed demand on the part of business in particular sphere, as well as proved necessity in such equipment and potential for wide application of the anticipated research results in the national economy. This activity improves the access of enterprises to quality pro-innovative services. Maximum effect from activities of separate "players" in the innovation system is achieved through realization of a group of connected operations, e.g. creation of national innovation network uniting innovative enterprises and organizations with high-speed wide-band infrastructure connecting all participators in the network.

NACID

National Centre for Information and Documentation

MAIN OBJECTIVES

NACID is a governmental institution affiliated to the Ministry of Education and Science. NACID collects, processes, maintains and disseminates reference and analytical information to support the national policy in the field of education, science and innovation as well as to support Bulgarian research bodies, individual researchers and SMEs

PRIMARY FIELDS OF ACTIVITIES

- Processing and disseminating bibliographic, reference data and analytical information.
- Maintaining specialized databases of scientific production and research resources in Bulgaria.
- Providing information about national, European and trans-European research programs.
- Providing information to support the process of harmonization of the Bulgarian education and research legislation with European Union ones.
- Performing the role of institutional contact point of the Sixth Framework Program in Bulgaria.

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  - Subject profiles;
  - Reviews;
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- *"SIRENA",* R&D reports and dissertations;
- *"Scientific and Technical Publications in Bulgaria";*
- *"Who is Who in Bulgarian Science" ;*
- *"Papers" ,* Number of Records.

" Science and Industry" Databases

- "*Partnership for Innovation and Development",* Information about the national research units.
- *"Knowledge for Innovations and Development" ,* Information about Bulgarian R&D activities.

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Abstract

Sustaining the life of a patient with chronic renal failure through haemodialysis (HD) is a great achievement of medicine. Unfortunately oxidative stress (OS) is a harmful companion of the curative process. A reduction of OS with these patients can improve the quality and extend duration of their lives.

INTRODUCTION

Free radicals (FR) containing highly reactive oxygen forms are known to generate during hemodialysis (HD) in acute or chronic renal- failure (ARF, CRF) patients: superoxide anion (O_2^-), hydroperoxide anion radical (- HOO^-), hydrogen peroxide (— HOOH or H_2O_2), hydroxyl radical (- HO^-) [3].

The process of FR formation involves body biological substrates such as lipids (Advanced lipid oxidation products, e.g. Ox-LDL), carbohydrates (Advanced glycosylation end-products), proteins (Advanced oxidation protein products), nucleic acids (Nucleic acids oxidation) whereby other reactive oxygen metabolites containing free radicals are also generated, such as alcoxide radical (-RO^-), peroxide radical (- ROO^-), hydroperoxides (ROOH), nitrogen oxide (NO), nitrogen dioxide (NO_2), peroxynitrate (- $ONOO^-$), hypochlorous acid (HOCl). The life of these free radicals is very short, as they bind actively to other metabolic, functional, and structural body elements, thereby damaging such elements [11]. Thus, a pathogenetic chain is set into motion at subcellular level in various body tissues, organs and systems, which thereafter is manifested at histological, pathophysiological, and, ultimately, at clinical level. The level of damage depends on the length and intensity of hemodialysis practice, as well as on the co-morbid conditions.

This phenomenon has been defined as oxidative stress (OS). Free radicals are formed by neutrophyl granulocytes in patient's blood upon its contact with hemodialysis filter membranes, which act as a "foreign body" in the body and are bioincompatible with the latter [6, 25]. OS develops also in patients on peritoneal dialysis via

other mechanisms.

Leucocyte sequestration, formation of proinflammatory cytokines (TNF-α, IL-1, IL-6, γ-IF, etc.) by monocytes (macrophages, respectively), complement system activation via an alternative pathological pathway (with C5a), platelet activation, etc., refer to the biocompatibility-related processes as well. They reproduce a continuous microinflammatory process in the body of end-stage renal failure patients on dialysis [1, 4, 8, 17, 18]. A conventional laboratory indicator of the above is the C-reactive protein (CRP) level consistently above the normal value.

Water used in HD and the concentrates for hemodialysis (CHDs) also may cause generation of FR and OS, and release of proinflammatory cytokines. This occurs whenever these materials are not properly purified and controlled, by LAL test inclusive, and contain endotoxins. HD with CHD from various manufacturers was found to generate different levels of statistically significant OS [2, 5, 7].

Early and delayed sequelae of OS in the body of ARF and CRF patients on HD are known. They are associated with accelerated impairment of the patient's organs and systems, which is clinically manifested by syndromes typical for these conditions, such as: anemia in CRF, faster development of atherosclerosis and cardiovascular complications, secondary dialysis-related amyloidosis, osteodystrophy, symptomatic polyneuropathy and encephalopathy, malnutrition, immune deficiency, etc. Development of these syndromes deteriorates patients' quality of life (QoL), increases their morbidity and mortality. Direct and indirect costs for treating and life sustaining of such patients increase [9, 10].

Attaining higher biocompatibility of HD filter membranes ("dialysers"), and of water and CHD is the priority aim of this area of science and medical industry.

Work is being done also in the area of reducing OS during HD procedures and in peritoneal dialysis by the use of appropriate antioxidants (AO).

The use of vitamin E and vitamin C as AO in dialysed patients, as well as of dialyser vitamin E-coated membranes, developed and tested by Japanese authors, is known [12].

Recently, there has been vigorous work done for testing N-acetylcysteine (ACC, NAC) as an effective AO in various areas of medicine [16, 19, 20, 22, 23]. The substance has been known and used for a long time as a mucolytic agent through administration by the oral or inhalatory routes. ACC is an established and successfully administered antidote in paracetamol intoxications. It has hepatoprotective properties.

The bioavailability of ACC after oral intake is very low due to the fast metabolism, liver first pass effect. N-acetylcysteine is hydrolyzed to cysteine, which is a precursor of glutathione. Plasma ACC traces have been detected up to 90 minutes after intake of a single dose of 600 mg. The volume of distribution Vd is 0.33 l/kg. Plasma elimination half-life t½ is 2.27 hours [25].

With its sulfhydryl group, N-acetylcysteine is defined as FR scavenger. The antioxidant effect of ACC occurs in several ways:

• By a redox mechanism, by increasing the level of cysteine, an antioxidant itself, oxidized to cystine.

• By a redox mechanism, increasing the level of gluthatione, also an antioxidant, which is oxidized to GSSG.

• By making bonds with the sulfhydryl groups (-SH) and cellular peptides.

These processes occur in the extracellular space and body fluids, as well as intracellularly.

The successful and effective use of N-acetylcysteine for the development of a drug appropriate for i.v. administration, and intended for protection of hemodialized patients from OS, is known. The drug is administered by an i.v. injection prior to the HD procedure, and in parallel infusion during the procedure. Thus, the entire patient's body is saturated by the drug [13].

The use of N-acetylcysteine in the form of a drug for intravenous administration for reducing OS effects in certain areas of intensive care and cardiology is known [21, 26].

A N-acetylcystein-containing peritoneal dialysis solution intended for reducing OS in CRF patients treated with peritoneal dialysis is known [14].

The attempt to use the antioxidant properties of N-acetylcysteine by administering its oral forms to hemodialized patients is known, how-

ever, according to some authors, this approach is disputable, possibly due to the existence of a pronounced first pass effect of N-acetylcysteine.

There is no known AO-containing CHD for prevention of OS and its delayed sequelae in ARH and CRF patients, as well as in intoxicated patients receiving acute or chronic HD.

OBJECTIVE

We set ourselves the objective:

• To invent AO-containing CHDs with antioxidant properties, i.e. CHDAOs with appropriate concentrations to be used for performing HD in adult and pediatric patients with ARF and CRF, CRF and diabetes, as well as in intoxicated patients in order to reduce OS and its delayed sequelae by interacting with the FR and neutralizing them right on the dialyser membrane surface where the latter form, as well as in the whole body of the patient.

• To research firstly the immediate, and then the long-term safety and efficacy of the CHDAOs in reducing OS during HD vs, the conventional CHD by monitoring the fluctuations of appropriate markers characterizing OS in hemodialized CRF patients.

MATERIAL AND METHOD

In order to reduce the degree of OS development during HD and its delayed sequelae, in UNIPHARM AD we developed concentrates for HD (CHDs) containing specified quantity of an antioxidant (AO), i.e. CHDAOs.

The used CHDAO was developed on the basis of CHD-A14® (ATC: B05ZA00).

N-acetylcysteine (ACC, NAC, m.w. 163.19) in the quantity of 2.5 g/l was included in it.

Its stabilization is an engineering secret.

The in-use ACC concentration is 0.073 g/l after dilution of CHDAO in the dialysis apparatus. CHDAO is patent protected and has a European patent.

Immediate CHDAO Efficacy

In order to find out the immediate antioxidant action of CHDAO vs. CHD, we conducted a crossover trial in ten hemodialised CRF patients: phase 1, HD with CHDAO, and phase 2, with CHD.

Phase 1 was conducted with the investigational CHDAO on safety grounds related to organizational and technical circumstances. In both phases, HDs were performed with the same dialyser (FB 150 "Nipro") in all patients. Patient blood malonedialdehyde (MDA) levels were measured and compared as an OS marker prior to HD onset (hour 0), at the end of hour 1 (hour 1), and at HD offset (hour 4). MDA was measured in Germany, Heidelberg.

RESULTS

HD procedures with CHDAO produced no adverse reactions, as well as no clinical complications different from those typical for such patients during HD with CHD.

We recorded the following results on MDA fluctuations during HD in both trial phases:

For phase 1, HD with CHDAO: MDA umol/l with CHDAO at hour 0 – 0.812, hour 1 – 0.632, hour 4 – 0.545.

We found MDA levels at hour 1 reduced (-Δ) by 0.173 vs. hour 0 (21.3%), -Δ at hour 4 vs. hour 0 was 0.267 (32.8%).

For phase 2, HD with CHD: MDA umol/l with CHD at hour 0 – 0.644, hour 1 – 0.831, hour 4 – 0.727.

We found MDA levels at hour 1 increased (+Δ) by 0.187 (29%) vs. hour 0, +Δ at hour 4 vs. hour 0 was 0.08 (12.8%), see Table 1.

Table 1. MDA Fluctuations in HD with CHDAO and CHD

Number of patients n = 10	HD with CHDAO MDA µmol/l	ΔMDA with CHDAO in %	HD with CHD MDA µmol/l	Δ MDA with CHD, in %
HD onset h 0	0.812		0.644*	
End of hour 1 h 1	0.639	- 0. 173 21.3%	0.831	+ 0.187 29%
HD offset h 4	0.545	- 0.267 32.8%	0.727	+ 0.083 12.8%

*See Discussion

DISCUSSION

MDA levels increased during HD with CHD, which is OS development sign.

MDA levels decreased during HD with CHDAO, i.e. OS intensity decreased.

During HD, after dilution to in-use solutions by the dialysis apparatus, CHDAOs infiltrate dialyser membranes and maintain consistently high, a kind of steady state, AO levels on their blood side, thus enabling AOs to neutralize FRs as early as at their formation site, and by diffusion through the dialyser membrane and entry into the patient's body, AOs continue to deliver their antioxidant effect there as well.

*It is noteworthy, that MDA baseline levels (hour 0) during phase 2 with HD with CHD were visibly lower (0.644 μmol/l) vs. the levels during phase 1 performed with CHDAO (0.812 μmol/l). In our opinion this was due to residual antioxidant effect of unused AO in CHDAO, which found expression in the trial due to the "reverse" crossover, i.e. to administer firstly the investigational concentrate.

We found that OS reduction was more pronounced in patients with lower body weight vs. those with higher body weight, i.e. the effect was dose-dependent.

Long-term CHDAO Efficacy

The positive results for the immediate antioxidant activity of CHDAO during HD gave us grounds to undertake monitoring and research on the long-term antioxidant efficacy by appropriate markers characterizing OS.

MATERIAL AND METHODS

Patient population

We studied 30 CRF patients on HD, 23 males and 7 females aged 59.36 ± 20.23 years and with HD history of 34.63 ± 30.40 months. Their pre-HD body weight was 71.7 ± 16.8 kg. CRF causes identified: Diabetes, Diabetic nephropathy – 15; Pyelonephritis – 7; Glomerulonephritis – 2; Birth defects of the urinary system – 3; Hypertensive nephroangiosclerosis – 1; Hemolytic-uremic syndrome – 1; Unspecified – 1.

Design

We conducted 4-hour HDs with CHDAO three times a week for a period of 30 days.

Prior to the HD with CHDAO phase onset, during HD with CHD, at HD onset, we tested the routine parameters typical for CRF, creatinine, haemoglobin, RBC count, as well as lipid status profile: TC, HDL, LDL, SdLDL, TG, Apo B.

At respective HDs onset and end, we tested the OS markers Ox-LDL, Hs-CRP, MPO, TNF-α and TMT.

At the end of the HD with CHDAO phase, we repeated the same tests according to the same schedule.

We processed the recorded results by Student's t-test.

Test Data

Hematology was performed on devices Mindray CB – 3000, Cobas Mira S and AVL 9130. Biochemistry by routine colorimetrical UV tests. Total cholesterol. Enzyme colorimetric method by Sentinel, Milan. Device: Cobas Mira S. Normal serum concentration - < 5.0 mmol/L. HDL-C by Direct homogeneous methods by Sentinel, Milan. Device: Cobas Mira S. Normal serum concentration, primary prevention >1.0 mmol/L. LDL-C by formula of Friedewald – Tg <4.5 mmol/L. Direct homogeneous methods – Tg > 4.5 mmol/L. Device: Cobas Mira S. Normal serum concentration - primary prevention <3.0 mmol/L. Triglycerides by Enzyme colorimetric method by Sentinel, Milan. Device: Cobas Mira S. Normal serum concentration - primary prevention < 1.7 mmol/L. Apolipoprotein B by Immunoturbidimetry method by Sentinel, Milan. Device: Cobas Mira S. Normal serum concentration: Men 6-133 mg/dl; Women 6-117 mg/dl. sdLDL in mg/dl (formula by Hattori Y). Normal serum concentration – 1.20 -1.30 mg/ml. *Quality control was performed for all lipid parameters by Randox Lipid control and Sentinel Lipids control.*

Oxidative Stress Markers

Oxidized LDL (OxLDL)

Mercodia Oxidized LDL ELISA. Device: Microwell system – Organon Technica 200 Elisa Reader and washer and shaker. Normal serum concentration: 26-117 U/L. Quality control: Ox LDL control, Mercodia.

Myeloperoxidase (MPO)

Mercodia MPO ELISA. Device: Microwell system – Organon Technica 200 Elisa Reader and washer and shaker. Normal plasma concentration : 170 – 498 μg/L; high risk > 350 μg/L

Quality control: no.

Tumor Necrosis Factor alpha (TNF-α)

Solid-phase, chemiluminescent immunometric assay. Device: Immulite 1000 (DPC). Normal serum concentration: 0- 8.1 pg/ml. Quality control: Cytocine Control module Immunoassay Bi-level control, DPC.

HsCRP

Solid-phase, chemiluminescent immunometric assay. Device: Immulite 1000 (DPC)

Normal serum concentration 1- 11.00 mg/L. Quality control: CRP Immunoassay Tri-level control, DPC.

Triple marker test (TMT) – formula by Johnston, Am. J. Cardiology, 2006/ Mercodia

Ox LDL / HDL x hs CRP. Normal serum concentration: no data.

RESULTS

For the duration of 30 days, HD procedures with CHDAO produced no adverse reactions, as well as no clinical complications different from those typical for such patients with CRF on HD. See Table 2.

The values of creatinine after the 30-day period of HD with ACC-containing CHDAO were significantly higher vs. those in HD without AO. This was due to the improved metabolism of patients, and was possibly associated with the import of amino (-NH) groups from ACC into CHDAO through the HD. We assume that this fact is of no clinical relevance. The haematological parameters demonstrated no significant change.

DISCUSSION

OS marker levels measured at procedure onset and end decreased as a result of HD with CHDAO for the duration of 30 days.

Ox LDL level demonstrated statistically significant decrease: $p < 0.001$.

We assumed that this was due to the direct antioxidant effect of CHDAO hindering LDL oxidation.

The MPO, TNF-α, Hs CRP and TMT markers depended on many factors and co-morbid conditions in the patients, etc. This was demonstrated by the large Standard Deviations (SD) derived from the calculations. Nevertheless, a trend of reducing their values was observed. We assumed that this was due to the indirect anti-inflammatory effect of CHDAO.

During HD, after dilution to in-use solutions by the dialysis apparatus, CHDAOs infiltrate dialyser membranes and maintain consistently high, steady state, AO levels of 0.073 g/l on their blood side. FR were neutralized at their formation site.

By diffusion through the dialyser membrane and entry into the patient's body, it continued to deliver its antioxidant effect there as well.

The antioxidant properties of ACC have been studied in the last 15 years. ACC is a cysteine derivative (a natural aminoacid in the body). It contains sulfhydryl group (-SH) capable of reducing FRs. ACC is metabolized *in vivo* to cysteine. Sulphur-containing metabolites are excreted with bile. Due to being essentially natural, ACC needs no bioavailability studies.

CONCLUSIONS

HD procedures with CHDAO produced no adverse reactions and no clinical complications different from those typical for this group of patients with CRF on HD.

The use of CHDAO reduced OS development in patient during HD. CHDAO may have residual antioxidant effect.

The use of CHDAO containing greater AO quantity per litre is appropriate in patients with higher body weight.

We accept the first results on the action of

Table 2. Parameters Typical for CRF Patients on HD (n 30)

	HD with CHD without AO	HD with CHDAO for 30 days	Student's t-test
Creatinine μmol/l	748.1±171.97	836.3±204.5	$p < 0.05$
Hb g/l	94.36±22.66	93.53±16.42	NS
Er T/l	3.28±0.87	3.38±0.63	NS

Table 3. Lipid Profile (n 30)

	HD with CHD without AO	HD with CHDAO for 30 days	Student's t-test
TC mmol/l	3.96±0.99	3.60±0.89	NS
HDL mmol/l	0.79±0.69	0.70±0.20	NS
LDL mmol/l	2.39±0.91	2.15±0.81	NS
Sd LDL mg/dl	1.62±0.42	1.29±0.25	$p < 0.05$
TG mmol/l	1.74±0.69	1.63±1.06	NS
Apo B mg/dl	75.79±16.09	81.53±18.59	NS

Sd LDL fraction decreased significantly after 30 days of HD with CHDAO.

Table 4. Oxidative Stress Markers (n 30)

	HD with CHD without AO	HD with CHDAO for 30 days	Student's t-test
Ox LDL U/l n	60.65±10.93	45.62±13.09	$p < 0.001$
Ox LDL U/l k	58.39±10.44	42.58±9.86	$p < 0.001$
MPO µg/l n	218±125.52	131.45±62.72	NS*
TNF-α pg/ml n	31.68±15.04	24.59±12.60	NS*
TNF-α pg/ml k	29.05±13.71	23.81±10.96	NS*
Hs CRP mg/l n	17.78±26.85	11.91±17.47	NS*
Hs CRP mg/l k	20.36±30.59	13.00±21.25	NS*
TMT n	1464±2247	1001±2015	NS*
TMT k	1291±2124	865±2292	NS*

HD with CHDAO on the OS markers as encouraging.

In the long-term, we expect the following results from the use of CHDAO and reduced OS during HD: 1. Improved general clinical condition of ARF and CRF patients on HD. 2. Improved anemic syndrome and reduced need for erythropoietic stimulants. 3. Delayed atherosclerosis development, by reduced formation of harmful oxidized fractions of cholesterol, carbohydrates and proteins inclusive, and thus, reduced cardiovascular risk. 4. Delayed renal amyloidosis and osteodystrophy development. 5. Improved symptomatic neuropathy. 6. Decreased morbidity and mortality of ARF and CRF patients on HD. 7. Improved quality of life of ARF and CRF patients on HD. 8. Reduced direct and indirect costs of treatment of patients on HD.

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OPTIMIZATION OF LIGHT DISTRIBUTION OF THE STREET LUMINAIRES

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Abstract

The formulation and the results of the most effective light distribution of the optimization task of street luminaries are described in the paper. The European requirements to the quantitative indexes and rules are introduced as limiting conditions. Received optimum solutions are graphical visualized and the influence of different parameters of optimum solutions are studied. The program product MATLAB 6.5 is used for solving of the task and appropriate software is applied.

INTRODUCTION

Determination of the optimal light distribution curve (LDC) of the street luminaires is an exceptionally important problem.

As criterion of optimization of light distribution of the street luminaires the maximal average visibility on the street pavement is submit i.e. the criterion V_{av} = max.

At present there are the following three indexes according to which optimization of light distribution curve (LDC) is possible:

- by illumination;

- by luminance;
- by visibility.

The task of determination of the optimal LDC on luminance and visibility is defined and worked out.

During the designing process of street lighting it is necessary to observe the following two conditions:

- to meet the requirements of the norm values of the lighting indicators for street lighting installations [1, 2, 3];
- to ensure maximum efficiency of the street lighting system.

By its nature the designing process appears to be a solution of an optimization task.

The efficiency of the obtained solution is strongly affected by the luminaire light distribution. This is the reason to consider the light distribution as a determinative factor for the degree of usefulness of the luminous flux.

The present work defines the optimization task for obtaining of regulated luminance values in the normalized standard valued with minimum luminous flux emitted by the luminaire.

BACKGROUND AND SOLUTION OF THE OPTIMIZATION TASK

The light-technical task for determination of the optimum light distribution of the street luminaire is formulated by using a street lighting system with the following parameters:

- width of the illuminated street surface - W;
- height of luminaire installation - H;
- distance between the poles – S.

The reflection characteristics of the roadway surface at different observation angels (corresponding to the different traffic rates) are determined.

Our approach is directed to looking for such a luminaire light distribution which helps to ensure the achievement of quantitative and quality normalized indicators at the lowest value of the necessary luminous flux of the light source – Φ_{LS} = min.

For resolving this task, it is necessary to solve the optimization task under the following limiting conditions:

- The average luminance on the observation area (Fig. 2) should be larger or equal to the normalized value according to the [Eq. 1, 2, 3];
- Total luminance uniformity should be larger than the preliminary given values, according to [1, 2, 3];
- The glare criterion should not be larger than the preliminary given value in accordance with [1, 2, 3];
- The maximum light intensity related to the luminous flux 1000lm should not be larger than the preliminary given value (technological limitations).

The indicated imitating conditions were selected during the process of resolving the optimization task, as all other limitations that do not significantly affect the optimum solution were rejected.

In equations [5, 6, 7, 8 and 9] the above optimization task is formulated as a linear one. The reason is to facilitate the solution. Under real conditions the defined optimization task is not linear because the luminance, uniformity and glare are nonlinear functions of the luminaire light distribution parameters. Because of these reasons the solution of the present optimization task is defined and resolved as a nonlinear one.

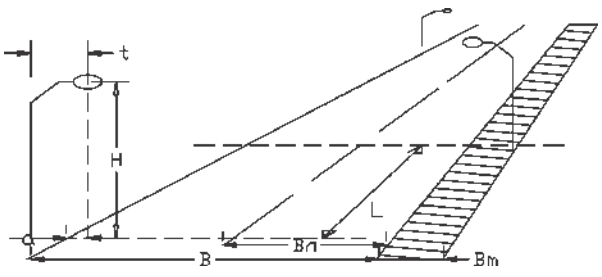

Fig. 1. General view of the field of street lighting

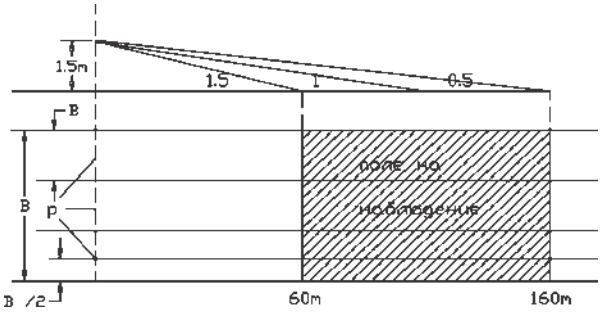

Fig. 2. Calculating field

Formulation of the optimization task

On the basis of additional studies in the field of the street lighting and new introduced rules, standards and codes in the USA and European countries we define the optimal Light Distribution Curve (LDC) in the following way:

Objective Function is:

$$\Phi o = \sum_{i=1}^{N} \sum_{j=1}^{M} Iij.\Delta\Omega ij = \min \quad (0.1)$$

under limiting conditions as follows:

1 $Lav \geq Lm$

2 $L\min / Lav > Uo$

3 $L^*\min / L^*\max \geq U_L$

4 $Iij \leq \mathrm{Im}\, ax$

5 $TI \leq TI\partial on$

where:

Φo - luminous flux emitting from the luminaire; lm;

N – number of calculating points on the street face;

Iij – luminous intensity of the j-th street luminaire to the i-th surface element of the street pavement in |cd|;

ℓij –distance point j and i in [m];

Lav –average luminance of the street surface in [cd/m^2];

Lm – exploration luminance [cd/m^2];

Lmin – minimal luminance on the street surface (on calculating points) in [cd/m^2];

Uo = Lmin/Lav – factor of general uniformity of luminance;

U_L = L*min / L* max –factor of longitude uniformity of luminance;

L*min and L* max are minimal and maximal luminance on the calculating points in longitudinal calculating field in [cd/m^2].

Imax –maximal permissible level of the luminous intensity in [cd] for Φ = 1000 lm;

TI – Threshold Increment;

TIn – permissible level of the TI factor.

During the formulation and resolving the task for optimum light distribution a considerable problem appears to be the inclusion of the light distribution function. In case, when the task is defined as a linear one, the light distribution is described by discrete values for definite γ angle and C plane. These values of the light intensity are unknown.

Since they are not connected in functional relation, it is possible to obtain the optimum solution with a lot of peaks and falls in the light distribution curve. The subsequent smoothing of the light distribution leads to deformation of the obtained optimum solution.

The approximation of the luminaire light distribution to smooth differential function appears to be a possible solution.

Such a solution could be a polynomial function, decomposed by Sin and Cos degrees, or orthogonal polynomial approximation. [8]

For the selection of an approximation function, a family of luminaries characterized by a specific light distribution was preliminarily selected. The General Electric luminaire is a typical example of such a selection. After the analysis of the luminaire light distribution the approximation function could be presented as follows:

$$\mathbf{f(\gamma,C) = \exp\left(d_0(\gamma_i) + d_1(\gamma_i)\hat{C}_j + d_2(\gamma_i)\hat{C}_j^2 + d_3(\gamma_i)\hat{C}_j^3 + d_4(\gamma_i)\hat{C}_j^4 + d_5(\gamma_i)\hat{C}_j^5 + d_6(\gamma_i)\hat{C}_j^6 + d_7(\gamma_i)\hat{C}_j^7\right)}$$

where the $d_p(\gamma_i)$ coefficients are expressed by orthogonal Legender polynomials and

$$\hat{\mathbf{C}} = \frac{\mathbf{C}}{\mathbf{Max(C)}}$$

varies after normalization in the [0.1] /interval/. The index (i) is used for designation of a row, and index (j) for designation of a column. Respectively, angle γ is related to rows of the light characteristics and angle C is related to the columns of the characteristics.

The coefficient $d_p(\gamma_i)$ (*p=0, 1, 2, 3, 4, 5, 6, 7*) is of the type presented below:

$$\mathbf{d_p(\gamma_i) = q_{p1}S_1(T_i) + q_{p2}S_2(T_i) + \ldots + q_{pm}S_m(T_i),}$$

Where: $\mathbf{q_{pk}}$ are the unknown factors estimated by the method of smallest (p=0, 1, 2, 3, 4, 5, 6, 7), S_k – is orthogonal Legender polynomials of rank k (k = 1 ...m), argument T_i calculated as follows:

$$\mathbf{T_i = \frac{2\gamma_i - \gamma(1) - \gamma(n)}{\gamma(n) - \gamma(1)}}$$

The angles γ(1) and γ(n) present the first and the last value of γ angle. This transformation corresponds to γ angle in the [0, 1] interval.

The orthogonal Legender polynomials from first to fifteen rank could be presented as follows:

$S\{1\}=1$

$S\{2\}= T$

$S\{3\}= (3/2)*T^2-1/2$

$S\{4\}= (1/2)*T*(5*T^2-3)$

$S\{5\}= (35/8)*T^4-(15/4)*T^2+(3/8)$

$S\{6\}= (1/8)*T*((63*T^4)-(70*T^2)+15)$

$S\{7\}= (231/16)*T^6-(315/16)*T^4+(105/16)*T^2-(5/16)$

$S\{8\}= (1/16)*T*((429*T^6)-(693*T^4)+(315*T^2) - 35)$

$S\{9\}= (6435/128)*T^8-(3003/32)*T^6+(3465/64)*T^4-(315/32)*T^2+(35/128)$

$S\{10\}= (1/128)*T*((12155*T^8)-(25740*T^6)+(18018*T^4)-(4620*T^2) +315)$

$S\{11\}=(46189/256)*T^{10}-(109395/256)*T^8+(45045/128)*T^6- (15015/128)*T^4+(3465/256)*T^2- (63/256)$

$S\{12\}=(1/256)*T*((88179*T^{10})-(230945*T^8)+(218790*T^6)-(90090*T^4)+(15015*T^2)-693)$

$S\{13\}=(676039/1024)*T^{12}-(969969/512)*T^{10}+ (2078505/1024)*T^8-(255255/256)*T^6+ (225225/1024)*T^4-(9009/512)*T^2+ (231/1024)$

$S\{14\}=(1/1024)*T*((-90090*T^2)+(765765*T^4)+ 3003+ (1300075*T^{12})+(4849845*T^8)- (2771340*T^6)-(4056234*T^{10}))$

$S\{15\}=(-765765/2048)*T^4-(16900975/2048)*T^{12}+(45045/2048)*T^2+(22309287/2048)*T^{10}+(4849845/2048)*T^6-(14549535/2048)*T^8-(429/2048)+(5014575/2048)*T^{14}$

These polynomials are used during the approximation of $d_p(\gamma_i)$ coefficients. (*p=0, 1, 2, 3, 4, 5, 6, 7*).

Four variants of approximation of the lighting characteristics are developed.

The variants differentiate by the series of coefficients approximation $d_p(\gamma_i)$ (*p=0, 1, 2, 3, 4, 5, 6, 7*), by orthogonal Legender polynomials, namely the choice of $m = 9, 11, 13, 15$.

The approximation of the light distribution curve of the General Electric luminaire by the polynomial from ninth to thirteenth rank are presented in figure 3. Below three solutions of a street installation with original General Electric luminaire and approximation curves with polynomial from ninth to thirteen rank are presented. It is seen that in both cases, the error (the approximation by polynomial from ninth to thirteenth degree), in the calculations of the original curve is in admissible limits.

With an approximation of a polynomial from 7^{th} rank, the accuracy was not satisfying, and with an approximation with a polynomial of the fifteenth rank the number of coefficients was larger.

Obtained parameters:

Average pavement luminance	GE original	GE-9	GE-13
Average pavement luminance [cd/m^2]	0.64	0.60	0.62
Average pavement illuminance, lx	6.7	6.6	6.6
Glare criterion (TI), %	3.98	1.73	3.20
Discomfort coefficient	4.84	6.65	5.37
Total nonuniformity	0.53	0.52	0.54

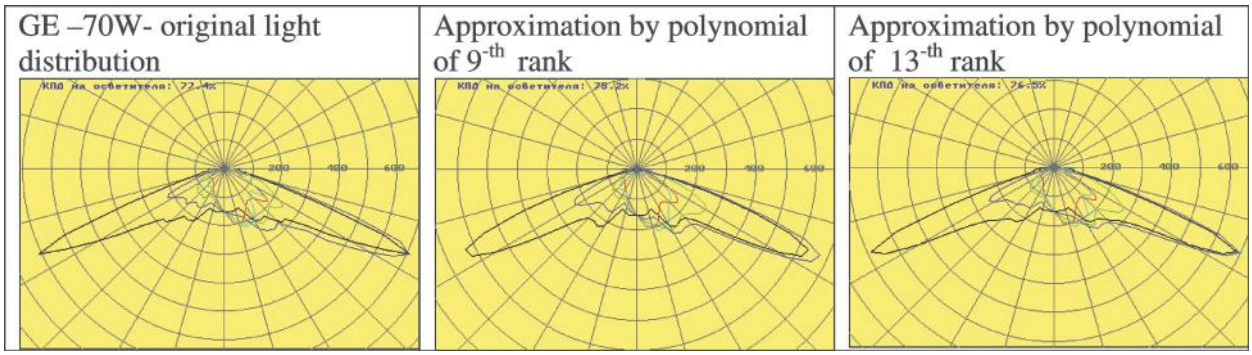

Fig. 3. Some results of optimization of light distribution

$\Phi_{lamp} = \Sigma\Sigma I\gamma c \,.\, \Delta\Omega\gamma c = MIN \;\; \gamma = 0\text{-}\pi/2,\; C = 0\text{-}\pi$

Under following final conditions:

$L_{min} / L_{average} > Go$

$E_{min} / E_{aver} > Geo$

$I\gamma c \; max \; (\Phi_{lamp} = 1000 \; lm) < Io$

$TI < TIo$ for given values

Where:

$L_{average}$ –average pavement luminance,

L_{min} is minimum pavement luminance

Φ_{lamp} is a luminaire flux

$\Delta\Omega\gamma c$ are γ and c solid angles.

TI – Glare factor.

The limiting conditions are complex functions of unknown functions, as shown below:

$L_{average} = 1/M \; \Sigma \; Li$

$Li = f1(I\gamma c)$

$I\gamma c = f2(X_k) \Rightarrow X_k$ are unknown (coefficients ahead the orthogonal Legender polynomials)

The number of coefficients (the known ones) of polynomials of 9^{th} degree is 72.

The optimization task has to find out the value of these coefficients, taking as an initial point the values obtained during the approximation of GE (General Electric) luminaire light distribution.

The above optimization task was resolved for the following geometry of the lighting installation.

Distance between the poles: 30, 35 and 40 m;

Width of the roadway 7 and 9 m;

Height of the pole 7 and 9 m.

The following values were given to the limiting conditions:

Go =0.4 and 0.5; Geo = 0.5 and 0.6; Io = 500, 600, 700, 900, 1200 and 1500cd/1000lm, TIo = 10

For resolving the above optimization task the parameter function of MATLAB package was used. The resolving time for the AMD Athlon 64 Dual Core/3800*MHz processor is from 20 up to 50 minutes for a variant. 80 optimum solutions have been obtained for given various values of limiting conditions. Part of these solutions are presented in Table 1 and Appendix1 after results processing. This process could be presented as follows:

On the basis of the obtained optimum solution for the corresponding parameters the light distribution in accordance with the requirements of Publication N 34 of CIE is created.

The light distribution is introduced in the catalog of EPS 1 4 3 program and the calculation of quantitative and quality parameters for the lighting installation is performed by varying the given geometry parameters in narrow limits. The used light distribution curve is graphically presented.

VIZUAL PRESENTAION OF THE RESULTS OBTAINED

Case 1. Obtained average pavement luminance cd/sqm (the values are presented on the ordinate axis of the graph) in dependence on the light distribution of the luminaire with the following parameters:

Lamp luminous flux = 6600 lm, depreciation factor -1,3

Given maximum light intensity for 1000 lm conditional flux (the parameter is presented on the abscissa of the graph)

Distance between the poles - L= 30, 35 and 40m

Given glare parameter TI<10%, G=0,5

Number of luminaires included in the calculations 2+3

Roadway width = 7m, hpole = 7 m

Light distribution № 40, 41, 42

The visualization of the average luminance of the case is shown on Fig. 4.

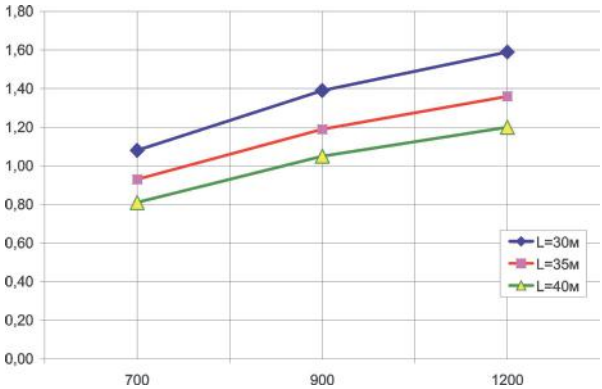

Fig. 4. Visualization of the result of Case 1

Case 2. The obtained average pavement luminance cd/sqm (the values are presented on the ordinate axis of the graph) in dependence on the light distribution of the luminaire with the following parameters:

Lamp luminous flux =6600 lm, allowance coefficient -1.3

Given maximum light intensity for 1000 lm

Table 1. Realized average pavement luminance cd/sqm in dependence on the light distribution of the luminaire for the following parameters: Lamp Luminous flux= 6600 lm, depreciation factor =1, 3

LVK №	Road width	Pole Height	Given value	Obtained value	Given value	Obtained value	Obtained value	Obtained value	Obtained	Average
			Go=Lmin/ Lav	Go=Lmin/ Lav	Imax-1000	Imax-1000	TI %	Laverage	Laverage	Laverage
	m	m			cd/1000lm	cd/1000lm		cd/sqm	cd/sqm	cd/sqm
								Distance between poles L=30м	Distance between poles L=35м	Distance between poles L=40м
40	7	7	0,5	**0,52**	1200	1200	**9,2**	**1,59**	**1,36**	**1,20**
41	7	7	0,5	**0,48**	900	900	**15,0**	**1,39**	**1,19**	**1,05**
42	7	7	0,5	**0,48**	700	700	**12,9**	**1,08**	**0,93**	**0,81**
43	9	7	0,5	**0,54**	1200	1200	**5,4**	**1,06**	**0,91**	**0,80**
44	9	7	0,5	**0,53**	900	900	**8,6**	**0,97**	**0,83**	**0,73**
45	9	7	0,5	**0,48**	700	700	**8,8**	**0,82**	**0,71**	**0,62**
46	9	9	0,5	**0,48**	1200	1200	**9,2**	**1,15**	**0,99**	**0,87**
47	9	9	0,5	**0,46**	900	900	**9,9**	**0,79**	**0,68**	**0,60**
48	9	9	0,5	**0,59**	700	700	**5,6**	**0,76**	**0,65**	**0,57**
49	9	9	0,4	**0,38**	1200	1200	**9,6**	**1,31**	**1,13**	**0,99**
50	9	9	0,4	**0,37**	900	900	**9,1**	**1,09**	**0,93**	**0,82**
51	9	9	0,4	**0,48**	700	700	**9,2**	**1,15**	**0,99**	**0,87**

(the parameter is presented on the abscissa of the graph).

Distance between poles - L= 30m

Given glare criterion TI<10%

Number of luminaries participating in the calculations 2 + 3

Roadway width = 9 m, hpole = 9 m

Light distribution №46, 47, and 48,49,50,51

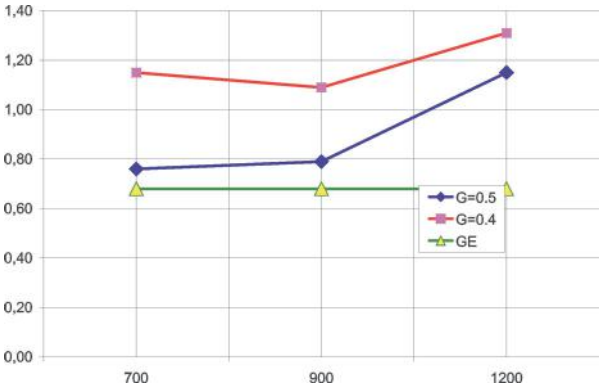

Fig. 5. Visualization of the result of Case 2

Case 3. Obtained average pavement luminance cd/sqm (the values are presented on the ordinate axis of the graph) in dependence on the light distribution of the luminaire with the following parameters:

Lamp luminous flux =6600 lm, depreciation factor -1, 3

Given maximum light intensity for 1000 lm (the parameter is presented on the abscissa of the graph).

Distance between poles - L= 35 m

Given glare criterion TI<10%

Number of luminaries participating in the calculations 2 + 3

Roadway width = 9 m, hpole = 9 m

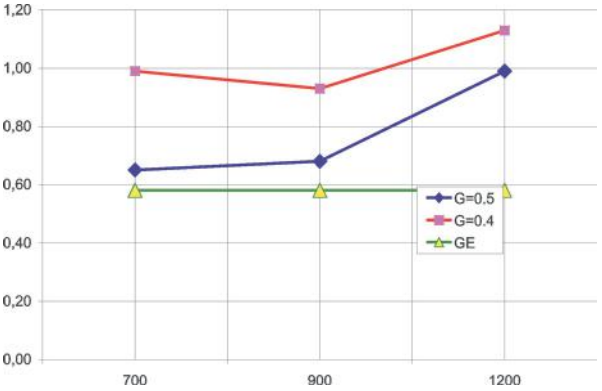

Fig. 6. Visualization of the result of Case 3

Case 4. Obtained average pavement luminance cd/sqm (the values are presented on the ordinate axis of the graph) in dependence on the light distribution of the luminaire with the following parameters:

Lamp luminous flux = 6600 lm, depreciation factor - 1,3.

Given maximum light intensity for 1000 lm (the parameter is presented on the abscissa of the graph).

Distance between poles - L= 40 m

Given glare criterion TI<10%

Number of luminaries participating in the calculations 2 + 3

Road width = 9 m, h_{pole} = 9 m

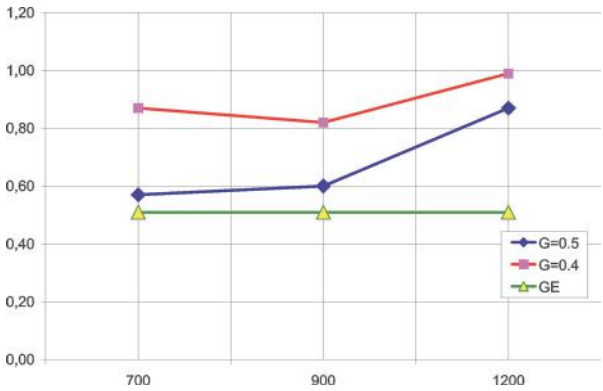

Fig. 7. Visualization of the result of Case 4

Case 5. Obtained average pavement luminance cd/sqm (the values are presented on the ordinate axis of the graph) in dependence on the light distribution of the luminaire with the following parameters:

Lamp luminous flux =6600 lm, depreciation factor -1,3

Given maximum light intensity for 1000 lm (the parameter is presented on the abscissa of the graph)

Distance between poles - L= 40m

Given glare criterion TI<10% G=0.5

Number of luminaries participating in the calculations 2+ 3

Road width = 9 m, hpole = 7 m

Light distribution № 43,44,45

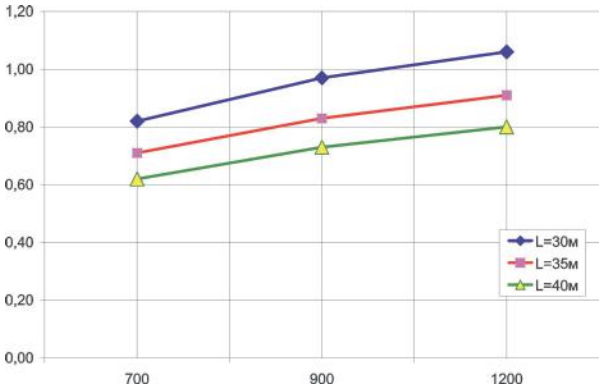

Fig. 8. Visualization of the result of Case 5

CONCLUSIONS

1. For the achievement of light distribution for efficient roadway (street) lighting it is necessary to define the corresponding optimization task. This task is nonlinear because of the luminaire light distribution parameters and its resolving needs the use of the methods of nonlinear optimization.

2. Aiming to receive a functional relationship between the light intensity in different directions it is reasonable to simulate by using continuous differentiable function.

3. The selection of an approximation function should help the achievement of a good approximation of light distributions of the existing luminaries.

4. During the resolving of the nonlinear optimization task, it is reasonable to use the light distribution parameters of a highly efficient existing luminaire as an initial point.

5. The reduction of the maximum light intensity below 700 cd for 1000 lm conditional luminous flux does not allow the achievement of an efficient solution.

6. The inclusion of limitation condition - for the glare parameter affects very restrictively the

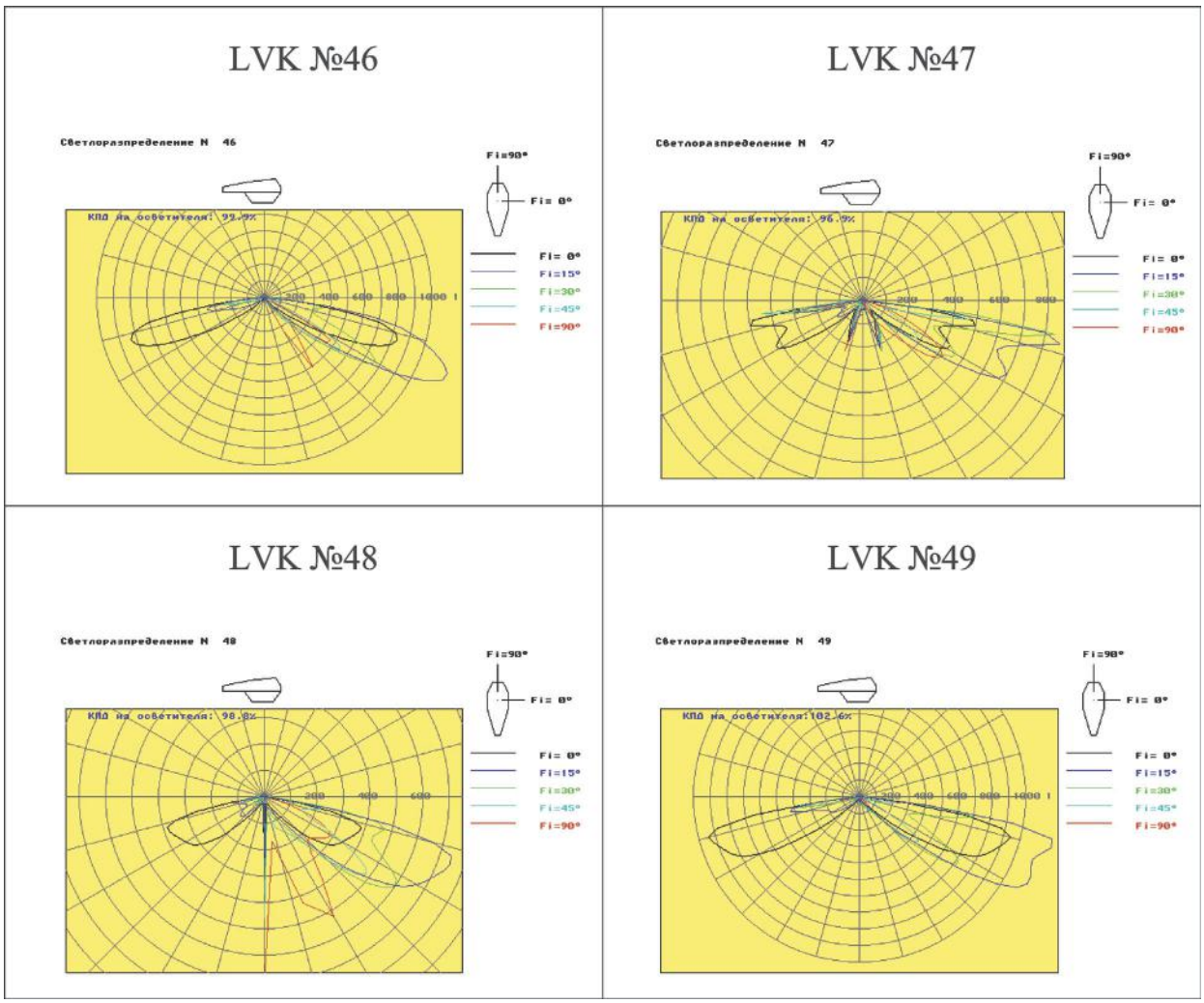

Fig. 9. Four samples of optimal light distribution of street luminaires

light emission in $\gamma = 75 - 90$ degree range and diminishes the efficiency of the obtained solution.

7. It is possible to obtain highly efficient solutions for a given value of glare uniformity Lmin/Lav > 0, 6.

8. Creation of a method of modeling of luminaire optical system allowing the achievement of light intensity higher than 1200 cd for 1000 lm conditional luminous flux is recommended.

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BULGARIAN ADDED VALUE TO ERA

INNOVATION IN DENIMA 2001 Ltd.

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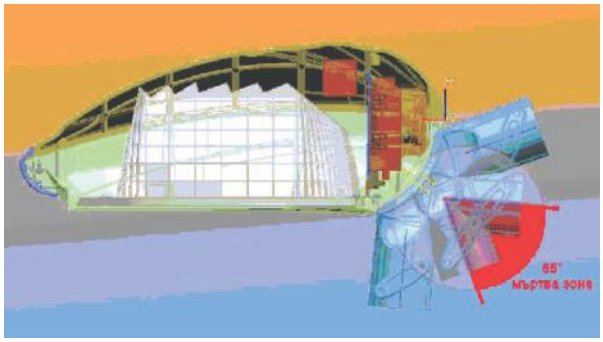
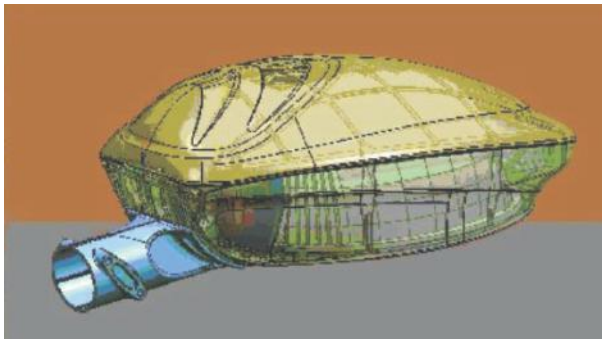
Innovation technologies are not only in the computer and communication technologies. Really development of these technologies is in full force during the last ten years, most investments are directed to these branches, and really the markets in these branches make rapid progress and many many "most".

But we have to remind that the **Energy**-basic pillars of the economics and the society are before communication and computers. End illumination, like the first application in large scale of the electricity is in leading position in present days in the field of energy consumption, especially in the daily wants, in illumination of offices, administrative buildings, scholar lighting, industrial lighting and street lighting, etc.

Today under "lighting" we understand not only "electric bulb" but also modern, comfortable,



Street luminaires "Evrolight" was constructed by 3D software

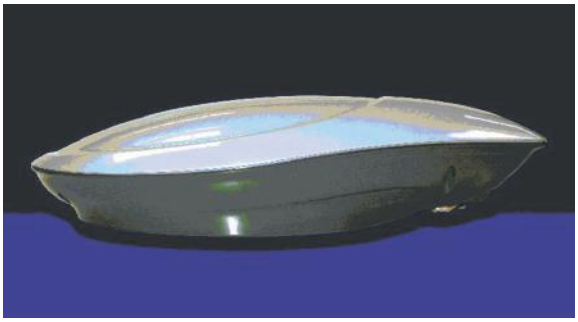


"Evrolight"-MIDI is one of the luminaires with original design

Prototype of "Evrolight" – Baby - street luminaire for 30-50 W lamp

Final view of Baby with HPSL-30 W

3D Prototiping speed up development of the new line street luminaires in Denima 2001 Ltd.



Evrolight – new design and new technology

Denima 2001 create a Photovoltaic station supplying the street lighting in Gorno Osenovo village on 1000 m height in Pirin mountain.

energy efficient lighting, closely approaching to the labour conditions similar to those in natural daily light.

Denima 2001 Ltd. is one of Bulgarian firms, which not only produces lighting technics and builds lighting systems for interior and exterior lighting but also gives its own contribution to the development of up-to-date technologies in the field of light techniques.

Several important tasks were defined in the development of a range of street luminaires:

• to achieve optimal light distribution in order to realize the requirements of standard illumination levels (or luminance level) for the respective category of streets in minimal energy consumption;

• to increase the reflection factor of the light from the reflector i.e. to increase efficiency factor;

• to create street luminaires with gradational or multistage diming of the luminous flux;

• to achieve high level of protection against water and dust (IP 65);

• to achieve acceptable price;

• to afford an opportunity for beautifying of the towns and country's environment.

These are the basic problems resolved by Denima 2001 Ltd. during the last three years in connection with elaboration of street lighting.

Other directions developed in the field of innovation in lighting are diming lighting systems, elaboration of interior lighting systems including diming, introducing of biodynamic illumination to practice, development of a pilot project for street and park lighting supplied by Photovoltaic batteries, etc.

MARKET BREAKTHROUGH OF BULGARIAN LEADER IN TELECOMMUNICATIONS EQUIPMENT MANUFACTURING

Boris Jowtschew, **PhD**; ELTA-R Chenkin & Co.
2, Kukush Str., 1309 Sofia, Bulgaria

COMPANY PROFILE

General Partnership *ELTA-R Chenkin & Co.* is a private Bulgarian company with the following subject of activity: development, design, manufacturing, engineering and trade in products for the communications industry, *turnkey* delivery of sites, warranty and post-warranty service maintenance.

Atanas Chenkin
Executive director of ELTA-R Chenkin & Co.;
Vice president of International Academy of Quality in Telecommunications.

Incorporated in 1990, for 17 years now, as a continuator of the traditions of Bulgarian industry in this field, the company has specialized in the development of digital telecommunications equipment for modernization of telephone networks in the rural and hilly areas with sparse population.

The company has 132 employees, where 34 of them are R&D, 10 are SW, and as far as their qualification is concerned 63 of them have university degrees and 34 have undergone vocational training.

Head of the company is its President and Executive Director, eng. Atanas Penchev Chenkin.

Updated product list

- Office automatic exchange;
- ISDN digital automatic private exchange with capacity of up to 7000 terminals;
- Digital system with distributed capacity for telephonization of rural areas sparsely populated regions;
- Digital settlement automatic exchanges for up to 24 000 subscribers;
- NGN switchboards and multiplexers;
- Telephone concentrators and multiplexers;
- Transmission equipment, with in-built transmission of Ethernet, TDMoIP;
- Signalization convertors;
- Specialized telephone systems in accordance with the technical requirements of the Ministry of Defence, the Ministry of Interior, Bulgarian State Railways and other organizations and administrations.

Since its incorporation to the present the company has successfully managed to overcome numerous difficulties. The most significant among them concerned the need for:

– on-going technological update of the products, services and manufacturing process;

– significant additional loading of the research and development capacity for implementation of the constant technical and technological maintenance for the clients and satisfaction of specific requirements for each of the telecommunication operators;

– constant implementation of activities related to testing and certification of each new product and for each new market;

– maintenance of sales and engineering structures in each country wherefore even minimum market has been ensured;

– on-going search and provision of new sources of funding;

– staff recruitment and carrying out of an on-going qualification training process, etc.

INNOVATION STRATEGY

The company's style of business is an innovative approach based on a clear technical policy and market strategy.

Since 1995 ELTA-R surveyed for seven years the economic, social and technical conditions in the rural areas in Bulgaria and in some republics of the Russian Federation in order to define the needs for information services and to design and develop an efficient digital telecommunications system, with implementation of which the losing rural networks shall turn into profitable ones, and which on its part is to encourage them to improve further.

Three main lines of design and construction developments were determined:

1st line

Creation of concentrators of small capacity with in-built equipment for digital transmission, remote supply and maximum utilization of the existing linear cable structures.

2st line

Creation of switching facilities intended for reconstruction and development of the Settlement Telephone Network with and without modification of the networks structure and preserving the price of a telephone within the limited financial capacity of rural customers.

3st line

Creation of a new generation of transmission systems allowing transmission of large enough data files and speed that are actually needed by the rural customers.

In accordance with the conclusions above, ELTA-R streamlined its efforts in the development of a significant variety of devices included in a unified system.

At present the company offers a large complex of equipment on the market by means of which modernization of the telecommunications network of a given settlement area can be done most efficiently.

The company has been active in development of foreign markets; it has been building testing grounds and constructions in different areas and republics of the Russian Federation (RF). The company's sales department has representative offices in Russia (Moscow), Moldova (Kishinev), Ukraine (Kiev), Kazakhstan (Alma Ata), Azerbaijan (Baku), Armenia (Yerevan), and Great Britain (London).

In 2006 the list of manufactured articles was renewed by means of development of new and specialized equipment for provision of broadband Internet access in rural schools and of the most efficient solutions to a great part of the problems of the rural networks digitalization in the Russian Federation.

For the provision of broadband access and Internet to the schools, population and administration in the rural areas, 13 scheme types were developed by the company on the basis of 15 devices which allow for the advanced technologies to be implemented in these areas in very short terms.

Turnkey pilot projects have been completed regarding the provision of Internet access to 128 schools in the Kirov District and 88 schools in the Kostroma District. New contracts are to be concluded, and there has also been interest on the part of telecommunications operators in Moldova, Armenia, Azerbaijan and Kazakhstan.

With its patience, consistency and will to hold a constant policy of innovations, ELTA-R has made a breakthrough on the international market and has gained its recognition as a leader in telecommunications manufacturing in Bulgaria.

The company has concluded cooperation agreements with renowned world companies in the field of information technologies. In Bulgaria it is a subcontractor under the contracts of the company HUAWEI with the Bulgarian Telecommunications Company AD (BTC AD).

– The production capacity of the company is for 100,000 lines per year.

– The equipment produced by the company until now amounts to over 750,000 subscriber lines.

– Over 7000 sites, including in enterprises, banks, ministries, embassies, hotels and other institutions, organizations and companies have been constructed in Bulgaria.

– The products are provided with warranty service and subscriber post-warranty service via organized service network in the country. Except for the service centers in the country, to the engineering organization of the company are also constructed a testing ground and a center for

ELTA Eqipment- complex for building of digital telecommunication networks in rural and mountain areas

remote management of the telecommunication networks constructed at the client in the country and abroad with equipment of ELTA-R.

– Quality control under the requirements of ISO 9001 and AQAP 2210 pursuant to the requirements of NATO has been implemented.

– The President of the company, Mr. Chenkin, is a vice-president of the International Academy of Quality in Telecommunications.

Currently the main markets of the company are: Bulgaria, the Russian Federation, the Ukraine, Moldova, Kazakhstan, Armenia, Azerbaijan, Uzbekistan, Macedonia, Zambia, Kenya, the Republic of South Africa, etc. with a tendency toward expansion.

Many sites are telephonized with equipment of the ELTA type in the republics: Mordovia, Mari El, Tatarstan, Chuvashia, Bashkortostan and the Kaluga, Yaroslavl, Kostroma, Tambov, Nizhny Novgorod and Astrakhan regions.

Since 2000 the company ELTA-R has delivered equipment for BTC AD intended for modernization and digitalization of the rural areas; according to a project completed in 2003 over 1,300 sites with a total capacity of 43,000 lines have been implemented. By doing this over 1,000 villages in the Republic of Bulgaria have been prepared for complete digitalization and opportunity for Internet connectivity with comparatively very low investment costs.

Usually the company applies a complex approach upon execution of its *turnkey* projects which includes: survey of the area, design, delivery, construction and installation, commissioning, training of the client's personnel, warranty and post-warranty service for the entire life cycle of the commissioned system.

The results of the construction and operation of the sites prove effectiveness of this approach.

In 2000 development of complex equipment

under the ELTA 200D trademark was initiated. Full set of functional capabilities with the assistance of modules of products shown on the diagram was realized during the period 2002-2004.

Depending on the specific character of the relevant site the specialists of the R&D Department of the company are developing additional hardware and software modules for expansion of functional capabilities of the complex system and addition of new services. In this way the competitiveness of the company and the stability of the market positions are increased.

In 2005 the company was awarded a national prize for the most innovative enterprise of the year.

The prize was awarded for the development of the ELTA 200D system – a complex solution for construction of digital telecommunications networks in rural mountain areas. This solution has higher technical and economic parameters compared to the other ones on the market and it is protected by patent and trademark.

The advantages of this innovative development – the ELTA 200D system – are:

– Capability for change of the connections' topology depending on the customer necessity without additional costs;

– Up to triple decrease (70%) of the costs for operation and training compared to the classic established technology;

– Capability for use of integrated center for remote management, service and charging;

– Double or triple increase of traffic;

– Capability for construction along the existing cable structures of a network with cellular or circular structure with which the reliability of the connections used is increased.

Currently new developments for expansion of the complexity of the system by integration of equipment for radio access WiMax for provision of new services – VoIP, Internet, etc. have been initiated and financed.

It is no secret that since 1994 ELTA-R has also invested in the field of defense telecommunications. The company is responsible for the execution of the project for modernization of the tactical signaling system of the Bulgarian army (PIKIS – Field Integrated Communications and Information System) for provision of operational compatibility with the NATO member states and in compliance with the relevant military standards. ELTA-R is currently performing a contract with the Ministry of Defense for service of this system during its life cycle for a period of 15 years.

The creation of National Innovation Fund and the expected distribution of the financing envisaged under the structural funds of the European Union may stimulate the innovative companies and give an impulse to the processes of carrying out of their research and development activities.

Being an innovative middle-sized enterprise, ELTA-R successfully and actively participates with its own projects in the competitions organized by the state administration.

However it shall be admitted that due to the great slowness and bureaucracy in the organization and management of these funds this participation takes a lot of energy,efforts and time of small and middle-sized enterprises, which fight for their survival, and to a certain degree the effectiveness of the received support is decreased.

In order to increase the effectiveness and to accelerate the pace of utilization of the financing from the European funds and of development of the country's economy, the work of the state administration with regard to the effective stimulation of the innovative activity of small and middle-sized enterprises shall be reviewed.

The management of ELTA-R proposes organization of a round table with representatives of innovative small and middle-sized enterprises and the government for formulation of effective solutions.

SATURN ENGINEERING Ltd.
NATIONAL WINNER OF THE INNOVATION AWARD, 2006

Nikola Vasilev, General Manager of Saturn Engineering Ltd.
152, Tsvetan Lazarov Blvd., 1582 Sofia, Bulgaria

Saturn Engineering is a full service engineering design, product development and contract manufacturing company. The company's area of expertise covers industrial, medical and consumer markets.

Saturn Engineering is a privately held corporation founded by Mr. Mario Metodiev in 1998 as an engineering consulting firm. In the following years the company has become a successful extension to the engineering teams of many companies around the worlds, helping them to compete in a global economy by significantly reducing their time-to-market and development costs.

The company has its own product line of versatile and reliable induction power supplies, with applications in all inductional heating solutions, including bonding, brazing, sealing, melting and more.

In 2005 Saturn Engineering started the Techno Park Sofia's Project with the vision to provide nurtuting environment for small to medium size technology and innovation-based companies in Sofia and to encourage the growth and recognition of the high-tech sector in Bulgaria.

During the 3rd National Innovation Forum, Saturn Engineering received the award "Innovative Enterprise" for 2006 in Small to Medium Enterprises category.

The Saturn Advantage

Saturn functions as a strong engineering department, enhancing productivity and adding value at every turn. As a matter of fact, the company is recognized worldwide as a leader for its broad engineering talents, quantity of patents and innovations that span many fields. Normally companies pay a premium for firms with similar experience, but Saturn has developed a unique internal structure that is exceptionally cost-efficient yet flexible and powerful.

As an agile organization able to respond to the needs of each project individually, Saturn consistently delivers the ultimate in personalized service regardless of project complexity or distinct industry traits.

The Saturn Product Lifecycle

From concept to post-production support, Saturn is dedicated to the success of the products throughout the entire process. To ensure the highest level of integration between the engineering groups, Saturn has developed a proprietary process that utilizes a powerful Online Project Management and Team Collaboration System for flawless execution. The process has proven so successful that it has been able to reduce development costs by as much as 50%.

Modern Manufacturing Facility

Whether a customer needs a prototype, pilot production, or full production, Saturn Engineer-

Certificate of Registration

Quality Management System

American Systems Registrar, a provider of ISO 9000 third-party system registration and accredited by the ANSI-ASQ National Accreditation Board, attests that:

SATURN ENGINEERING LTD
152 TSVETAN LAZAROV BLVD.
TECHNO PARK
1582 SOFIA, BULGARIA

with a scope of:

DESIGN, DEVELOPMENT AND PRODUCTION OF EMBEDDED ELECTRONIC MODULES, DEVELOPMENT OF INTERNET APPLICATIONS

has established a quality management system that is in conformance with the International Quality System Standard ISO 9001:2000.

SEPTEMBER 18, 2008
Registration Period Ending

President, ASR

1771
Certificate No

SEPTEMBER 19, 2005
Registration Date

IAF Code: 33
Initial Registration: July 1, 2002

ASR American Systems Registrar

ANAB

QMSCERT® CERTIFICATE

QMS Ltd, an accredited provider of third-party system certification organization for ISO 9001 acting in accordance with the requirements of ISO Guide 62/EN 45012 for registrars attests that:

SATURN ENGINEERING LTD
10 Tsvetan Lazarov Blvd.
ROSSA Building Floor 3
1582 Sofia, Bulgaria

with a scope of:

Design, Development & Production of Embedded Electronic Modules
Development of Internet Applications

has established a quality management system that is in conformance with the International Management System Standard

EN ISO 9001:2000

August 29th, 2008
Certification Period Ending

August 29th, 2005
Certification Date

IAF/EA Code:33

For the QMS Ltd Board

CERT Quality Assurance ISO 9001

ESYD

ing's state-of-the-art facility is eminently capable of realizing their vision. Located in Sofia, Bulgaria, the ISO 9001-2000 certified facility can handle full-scale assembly final production and fulfillment.

The Saturn manufacturing facility is capable of fabricating complex printed circuit boards using surface mount or through-hole technology, producing all of the required electromechanical assemblies, cabling, and final assembly. Once complete, each product is thoroughly tested using our rigorous quality control program before it ever leaves the site.

Solid Engineering Capabilities

The effectiveness of any high-tech product is dependent on utilization of the most advanced technological solutions. Saturn prides itself on having one of the most capable teams of software and hardware engineers available anywhere. The company experience includes developing complex electronic circuits and devices utilizing the latest microprocessors, programmable logic devices, and digital signal processors. Whether a product is stand-alone or integrated with other devices, the Saturn's engineers can develop robust process control and data acquisition software using RFID, wireless, USB and serial connectivity.

Excellence in Industrial Equipment

Saturn has consistently been the dependable choice for many industrial companies. For industrial equipment,an engineering and manufacturing firm must be able to deliver long-term reliability and durability. Saturn has extensive experience and a long track record of success in the industrial sector.

Representative Products:

- Process Control and Container Inspection Systems
- Advanced Induction Cap Sealing Equipment
- Induction Heating Power Supplies
- Modular PC Programmable Power Supplies

Industrial Control Panels

Superior Medical, Dental & Lab Equipment

Saturn excels at the development and manufacturing of medical devices and lab equipment for companies around the world. Our design and engineering teams apply strict practices in compliance with FDA documentation and software validation requirement. In addition, Saturn manufacturing facility is registered with the FDA to produce medical-grade products.

Representative Medical Products:
- Drug Nebulizers
- Dose Counters
- Respiratory Ventilators
- Medication Warmers
- Hearing Aid Devices

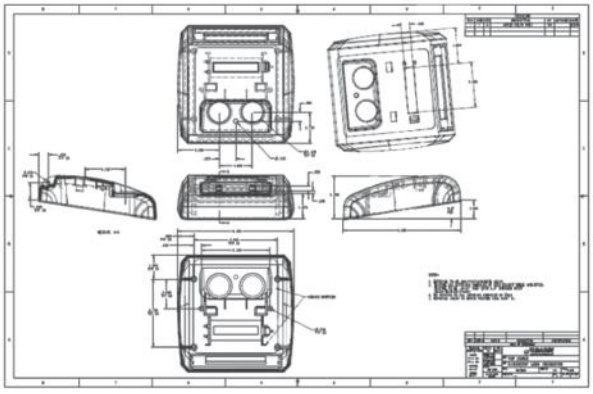
Representative Dental and Lab Products:
- Vacuum /Thermal Curing Chamber
- Halogen Light Curing Booth
- Induction Melting & Pressure Casting Equipment
- Magnetic Laboratory Stirrers and Mixers
- Environmental Chambers and Incubators

Effective development process – the case of Discovery Labs

Reducing the time to market a new or redesigned electronic product is always important, and outsourcing to an expert electronics manufacturing services company may be the ideal solution.

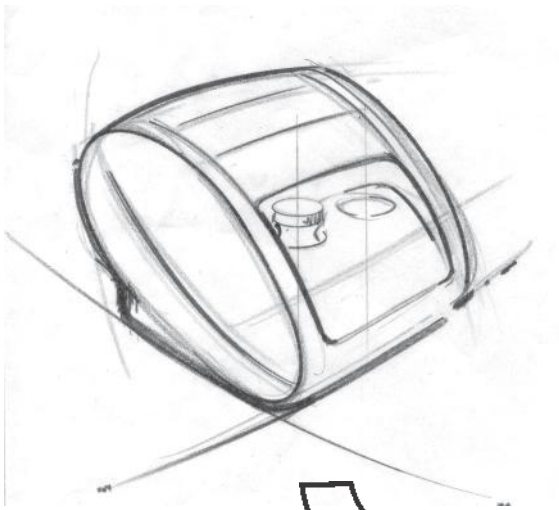
Discovery Labs, Inc., a leading biotechnology company based in Warrington, Pennsylvania, recognized the need in the market for a new product to heat vials of its flagship drug Surfaxin. To achieve the goal of a rapid development, Discovery Labs chose Saturn Engineering. Saturn was charged with improving upon the industrial design of the Warming Cradle, facilitating approvals by regulatory agencies, handling all aspects of the product manufacturing and executing a successful launch.

Saturn instituted a feasibility study and cost analysis. Utilizing its vast expertise in developing highly advanced medical and laboratory equipment, Saturn reviewed a number of different technological approaches. Experienced team of electrical and mechanical engineers developed a detailed specification for the Warming Cradle's industrial design, user interface, and mechanical and electrical components. The entire process



of collaborating with Discovery Labs on the detailed specifications was quickly executed through Saturn's unique web-based collaboration system.

Once the detailed specifications were completed,Saturn's interdisciplinary engineering team developed a number of initial ideas and concepts for the Warming Cradle. Upon review by Discovery Labs, Saturn's innovative design approach for the product was approved.



Conceptual Drawing

Final Poduct

Saturn's engineers expertly developed the electrical and mechanical design of the Warming Cradle, including detailed electrical schematics, printed circuit board layouts, firmware development, mechanical drawings and bill of materials. In addition, thermal and finite element analyses confirmed the soundness of the product's design.

To prove the concept, Saturn created an assembly prototype containing all the electrical and mechanical components for Discovery Labs to review. Once approved, a number of attractive industrial designs were presented for the Warming Cradle.

In the pilot run, Saturn completed all the design documentation and procured the necessary parts for the final assembly prototype. A thorough evaluation was performed on all hardware and software to ensure product quality and reliability. The product, along with its mechanical drawings, schematics and printed circuit board diagrams, was submitted to regulatory agencies for testing and review.

Prior to production, Saturn further refined the design based on customer feedback and regulatory test results. Then, final casts and molds were created for all plastic and metal parts of the Warming Cradle. Once ready for production, Saturn tested and implemented the entire manufacturing process. The final packaging, cardboard box design, printed and interactive User Manual (in multiple languages) and release documentation were also produced by Saturn.

Following the successful launch of the Warming Cradle, Saturn continues to play a crucial role. Discovery Labs relies upon Saturn to provide technical and warranty support, repair services and product improvements and upgrades.

Saturn's highly efficient development process has proven integral to achieving quick product launches. For Discovery Labs, the entire process from initial concept to final production was seamlessly executed in 6 months.

MADE IN BULGARIA WITH EUROPEAN SUPPORT

REGIONAL INNOVATION STRATEGY OF THE NORTH–EAST PLANNING REGION

Dimitar Radev, Angel Angelov, Svetoslav Stamenov,
Regional Agency for Entrepreneurship and Innovations, Varna
Kiril Georgiev, Technical University, Varna

Abstract

The elaboration of Regional Innovation Strategy (RIS), respectively for the North-East Planning Region (NEPR), is one of the basic instruments for achievement of the goals set in Lisbon Agenda for development of knowledge-based economy.

The structure and the objectives of the project are presented here, as well as the events held, the performed research and analyses that led to consensus building among the stakeholders in the regional innovation process.

The choice and the basic principles of the methodology for project realization are reasoned. The adopted directions for studying the innovativeness and the competitiveness of the enterprises from the region and the methods for the research performance are presented.

As a result of the performed activities under this project initial outputs are derived, which give basic characteristics of the regional innovation system.

INTRODUCTION

Adoption of the Lisbon strategy [1] at the EU meeting at the top in March 2000 has for its goal to present both the deep conviction of the Member States to start a principle reform of the social-economic system and to give evidence of their ambition, optimism and faith that it is realizable. Thorough economic analysis establishes definite lagging behind of the EU in comparison with the development of the USA economy – slower rates and smaller opportunities for creation and implementation of new technologies, particularly in the field of information and communication innovations. The Lisbon strategy has an ambitiously defined target for radical transformation of European economy in 2010 as "the most competitive and the most dynamic knowledge-based economy in the world, capable of sustainable economic growth with more and better jobs and greater social cohesion". With a view to achieving this objective the following regulatory activities and concentration of public finance are envisaged:

- fast transition to knowledge-based economy including development of information society, R&D, qualification and skills improvement;
- liberalization and integration of these sectors and markets that have not been taken in by the common market: telecommunications, power engineering, transport, posts and financial services;
- development of entrepreneurship,deregulation and bigger support on the part of administration, easier access to funds and technologies, provision of conditions for real competition and restriction of possibilities for state subsidies;
- increasing the number of jobs and change in the social model: increase of professional activity, flexibility of labour market, improvement of education, modernization of the social insurance system, reduction of poverty and social isolation;
- protection of the environment: restriction of factors leading to climate changes and preservation of natural resources.

Beneficiaries of the Lisbon strategy are all Member States of the EU. Its realization is carried out through open method of coordination, which includes:

- coordination of common goals;
- including these goals into national and regional programs taking into consideration specific ways of attaining them;
- coordination of common methods for evaluation of the degree of realization of goals (indicators, benchmarking);
- monitoring, evaluation, comparison and exchange of good practices.

In 2005 the EU analyzed the achievements of the Lisbon strategy and came to the conclusion that lagging behind was at hand in some of its basic parameters and that differences between the EU and leading innovative economies in the world were not overcome. To overcome this lagging behind, as well as taking into considerations the new realities in the Community – enlargement of the EU with 10 new states and the accession of Bulgaria and Romania in 2007, the European Council adopted "A New Start for Lisbon Strategy" [2]. By this document the EU reforms the rules for distribution of resources in the Structural and Cohesive funds during the period of 2007-2013, by means of which the cohesive policy in support of growth and employment will be implemented. This policy is based on:

- priority for growth, employment and innovations;
- decreasing financial instruments from 6 to 3 and the aims of intervention from 9 to 3;
- improvement of cohesive policy management through:

i. elaboration of strategic guidelines of the EU;

ii. elaboration of the national strategic referent framework for realization of cohesive policy on the national level;

iii. elaboration of operative programs (OP) for determining particular actions and measures in accordance with priorities and financial instruments;

iv. management and selection of projects financed according to different OP;

v. annual monitoring, evaluation and actualization.

Lisbon strategy is based on steady, homogeneous and one-way development of all regions of Europe on the knowledge-based economy. Some of the major instruments for attaining this goal are "Regional Innovation Strategy" projects. Their realization aims at increasing the innovation potential of separate regions' economies giving an account of their specific conditions and strong sides. More than 100 regional strategies have been worked out, and 33 new projects started in 2005. In Bulgaria a project for elaboration of Regional Innovation Strategy was realized during the period 2002 – 2004 for the South Central Region. At present all planning regions in the country develop projects for creation of regional innovative strategies – in total 4 for North-east, South-east, South-west and joint project for North-west and North-Central regions. The present publication presents the structure, methodology and primary results of the "Regional Innovation Strategy of the North-East Planning Region" project.

STRUCTURE OF THE PROJECT

Project № 014664 Regional Innovation Strategy of the North-East Planning Region" (NE-BG RIS) is within the Sixth Framework Program of the EU, "Research and Innovations" directorate, with total duration of 32 months during which innovation needs and innovation potential of the region are analyzed and strategy for fostering innovations and technology transfer is developed. The project terminates with particular action plan that includes a list of pilot projects and suitable programs for funding them as well as of organizations, which can undertake their realization.

➢ **Objectives:**

General objectives:

• Development of Regional Innovation Strategy for the North-East Planning Region;

• Building up of steady environment stimulating innovations in the North-East Planning Region through development and improvement of the regional innovation policy.

Specific objectives:

• Development of an Action Plan for realization of RIS in NEPR through pilot projects;

• Attaining regional consensus through par-

ticipation of all regional actors in the development and implementation of the Regional Innovation Strategy;

• Promotion of innovations in the public sector, small and medium enterprises and scientific and research institutions in the North-East Planning Region;

• Creation of a mechanism for coordination and permanent monitoring of the Regional Innovation Strategy;

• Creation of a frame for medium- and long-term interregional cooperation in the sphere of innovations on the national and international level;

• Improving the region's capacity to govern possibilities for financing projects on the Structural Funds.

Regional Innovation Strategy can at the same time be considered as a process, analysis, result and action:

- process: becoming aware of the need of development of the region's innovation potential, bringing closer the main actors – business, science, local and central authorities, and establishing regional consensus;

- analysis of the region's research potential, the level of technological development of firms and their needs of innovations, capacity of intermediary organisations;

- document including diagnostics (SWOT analysis), a set of goals at different levels and a program for their realization;

- actions leading to practical realization of the objectives of RIS, including institutionalization of the strategy through its inclusion into the regional development plans.

➢ **Organizational structure of the project**

Steering Committee (SC) – 24 members, including 6 regional managers, 5 university rectors, representatives of business and intermediary organizations.

National and regional consultant

Working groups:

- Management unit (MU).
- Operative working group for NEPR
- 6 regional working groups (RWG).
- 10 sector working groups (SWG) with 56 consultants.
- Interviewers- 43.

Partners:

- Regional Agency for Entrepreneurship and Innovations – Varna (coordinator)
- Alliance of the Regional Authorities in the North-East Planning Region (ANEPR);
- Ministry of Regional Development and Public Works;
- University of West Macedonia, Greece;
- Regional Administration of Region Liguria, Italy;
- Regional Administration of Region Abruzzo, Italy.

➢ **Stages of the project**

Activities on the project are realized within three stages: zero, first and second.

Stage 0: Organizational stage.

- Creating governing structures of the project.
- Establishing regional consensus between regional key actors in the field of innovations.
- Increasing informability and mobilization of regional key actors and small and medium enterprises.

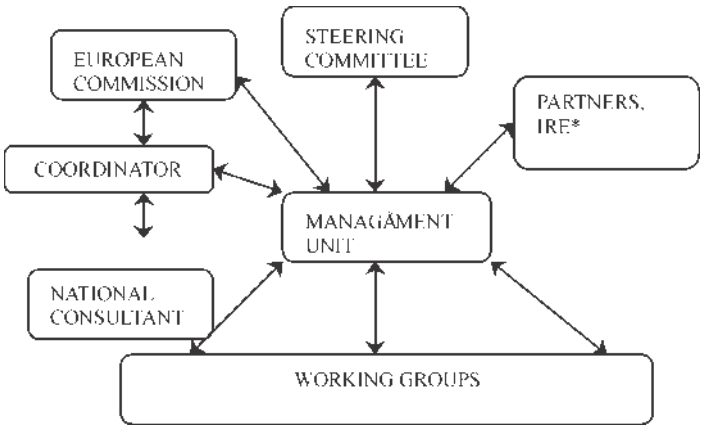


Fig. 1. Organizational structure of the project

** IRE – Innovating Regions in Europe*

- Defining the project methodology and conducting regional investigation.

- Elaborating detailed work program describing tasks, stages and results of the envisaged activities. Report to the European Commission on Stage 0.

Stage 1: Stage of implementation.

- SWOT analysis of the regional economy.

- Analysis of the regional demand – identification of needs of firms.

- Analysis of the regional supply – identification of the regional innovation infrastructure and local and regional technological experience in the innovation process.

- Enunciation of the first conclusions for elaboration of a strategic framework and specific action plan. Report to the European Commission on Stage 1.

Stage 2: Estimation and monitoring, evaluation of effectiveness of measures.

- Elaboration of a strategic framework – Regional Innovation Strategy for the North-East Planning Region.

- Defining, accomplishing and testing of specific activities on the strategy.

- Creation of a monitoring system for control and assessment of the strategy and activities.

- Network cooperation.

- Distribution of results. Report to the European Commission on Stage 2 and final report.

METHODOLOGY

The adopted approach for elaboration of the Regional Innovation Strategy of the North-East Planning Region includes the following stages in chronological order:

1. Forming a managing team and determining the structure and methodology of the project.

2. Forming a Steering Committee aiming to observe the elaboration of RIS.

3. Selection and formation of working groups (WG) and training:

- regional working groups;
- sector working groups;
- working group of regional coordinators;
- focus groups;
- interviewers.

4. Collection of "secondary" data: regular work meeting of WG.

5. Collection of "primary data": elaboration of inquiries and selection of objects for investigation with further interview:

- Investigation of competitiveness of the firms from NEPR aiming at determining the needs and demand of innovations;

- Investigation of organizations creating and fostering innovations with the aim to determine the supply of innovations in the region.

6. Data processing.

7. Elaboration of sector analyses and sector SWOT by SWG.

8. Primary recommendations and conclusions about RIS of NEPR.

9. Determination of pilot projects.

10. Determination of the strategic framework and action plan.

11. Elaboration of a monitoring system.

Basic moments, balanced solution of which should be formulated and achieved in the process of realization of the project, are as follows: establishing of regional consensus; identification of principal participators in the process of creation of RIS; evaluation of the present status from the point of view of demand and supply of innovations; determination of strategic priorities and pilot projects; evaluation of the progress and results of the project.

Methodology of the investigation requires preliminary determination of the following components:

1. Problem of the investigation: Low innovativeness of enterprises from NEPR, insufficient stimulation and use of the innovative potential of NEPR.

2. Object of investigation: Regional innovation system of NEPR that includes firms, institutions, administration, intermediary organizations, which interact in the process of demand and supply of innovations as well as in their realization.

3. Subject of analysis: determination of basic characteristics of the regional innovation system and possibilities for its improvement and management.

4. Goals and expected results: Elaboration of the strategy, measures and action plan for enhancing of the innovation potential of NEPR and innovation activity in the region.

5. Conceptual model: it is a holistic mix in-

cluding the known M. Friedman's model of innovation system, M. Porter's concept on competitiveness based on clusters, K. Pavitt's [3], [4] taxonomy dividing firms into three groups according to their behaviour at acquisition of knowledge and making of innovations, etc.

6. Research hypotheses.

Research hypotheses are suppositions concerning the state and connections between the variables and the participants describing the problem. Examples of hypotheses:

6.1. Factors hindering innovations: Preliminary expectations are that in answer to the questions during the interviews the firms will repeat to a great extent the same factors that were pointed out as reasons for difficulties in making innovations in some previous inquiries, such as: high costs of innovations, lack of qualified personnel, etc.

6.2. Hypotheses connected with innovation regimes: preliminary expectations are that the firms in NEPR are mainly of "product-engineering" and "traditional" type of innovation regime [3].

The methodology includes the following stages:

Selection of a strategy and methods for collection of empirical data

The most appropriate variant at the start of the investigation is to adopt "formulative" strategy, i.e. preliminary "examination" of the object and formulation of questions and hypotheses, then to pass to "experimental" strategy, i.e. to establish essential causal-consequential connections between the variables or factors describing an object.

Methods for collecting and processing of empirical data in general are as under:

- collection and processing of "secondary" data (reviews, analyses, statistics, cases, examples, etc.);

- collection and processing of "primary" data (through inquiries, interviews, discussions, observations, experiments, etc.)

From methods of investigation at the initial stage inquiry by post was used (sending a questionnaire to a firm after notification in advance) as well as by Internet with subsequent interview at the spot.

While elaboration of questionnaires Likert's scale (3-5 point scale estimation of preliminarily suggested statement: "Agree, ...It is probably so, ... Disagree") is used or semantic differential (3-5 point scale at comparing, expressing preferences, opinion, etc. regarding the presented facts: "High/Good ... Fair ... Bad/Low").

Model of the extract

Surveys connected with collection and analysis of "primary" data are most often based on the so-called extract approach, when the target totality (general totality, population) of specimens of the object is studied through analysis of a definite number of its representatives.

As a result of collecting and processing of "secondary" data a model of an extract is chosen and the extract is built up. In the present investigation a "stratified" extract is used, i.e. a casual extract with certain inner differentiation in the target totality (dividing the firms according to branches, number of personnel, scope of sales/incomes, etc.).

Scope of the extract

The scope of an extract can be calculated at definite preliminary requirements – it is different depending on the put questions, which require evaluation of average quantities or percentages. It should be mentioned that for evaluation of average quantities at equal guarantee probability and maximum admissible error a smaller volume of an extract is necessary than at evaluation of proportions (percentages).

For the purpose of the investigation it is accepted that in responses percentages of accepting/not accepting or determining their agreement/disagreement according to 3, 5 or 7-point scale respondents to the survey are evaluated. Then the scope of the extract may be determined according to the formula:

$$(1) \quad n \geq \frac{N.p.(1-p)}{(N-1).D + p.(1-p)}$$

where N - is a number of objects of the general totality. In our case it is the number of SMEs economically active in NEPR. In the case we accept N = 40000.

p and *1-p* are percentages. The product *p.(1-p)* has a maximum value 0,25

$$(2) \quad D = \frac{(ME)^2}{Z^2_{\alpha/2}}$$

where $Z^2_{\alpha/2}$ is the square of the so-called guarantee coefficient Z at the given guarantee probability 1-α. This coefficient is taken from the standard normal distribution, and at guarantee probability of 95 %, i.e. toleration of 5 % maximum allowable error it has the value of *Z = 1.96*, whereas at guarantee probability of 90% it has the value of *Z = 1.645*.

ME (margin of error) is a maximum allowable error of evaluation. We can accept *ME = 0,05* (5%)

Then the scope of the extract will be:
n>=40000*0,25/[39999*(0,05/1,96)^2+0,25] = 380,52
n = 381

Constructing of the extract

Minimum scope of the extract with n = 400 firms is accepted and its duplicating, i.e. 800 firms due to the risk of a big % of not respondents. The extract is "stratified " in the following way:

(1) It is divided according to geographical principle, depending on the percentage the 6 regions have in the formation of the Gross domestic product (GDP) of NEPR. with slight priority of the rest of the regions in relation to Varna:

- Varna 40% (320 firms); 43,1% of GDP of NEPR
- Dobrich 15% (120 firms); 14,7% of GDP
- Shumen 15% (120 firms); 13,2% of GDP
- Razgrad 10% (80 firms); 10,5% of GDP
- Silistra 10% (80 firms); 9,7% of GDP
- Targovishte 10% (80 firms); 8,8% of GDP

(2) Divided on the branch principle, depending on importance/percentage, where it is accepted that there are 10 priority sectors in the economy of NEPR.

- Energetics, energy efficiency, environment (EEEE);
- Information and communication technologies (ICT);
- Machine-building, electrotechnical industry and electronics (MBEIE);
- Sea industry (SI);
- Processing industry (PI);
- Agriculture (A);
- Construction and transport – by transport we mean transport infrastructure (CT);
- Tourism (T);
- Services – financial, logistic, etc. (S);
- Chemistry, biotechnologies, pharmaceutics (CBP).

Table 1 shows the suggestion for distribution of the firms from the extract by regions and sectors.

Table 1.

Regions Sectors	Percentage	Varna 40%	Shumen 15%	Dobrich 15%	Razgrad 10%	Silistra 10%	Targovi-shte 10%	Sum
EEEE	5%	15	5	5	5	5	5	**40**
ICT	10%	50	8	7	5	5	5	**80**
MBIE	5%	15	5	5	5	5	5	**40**
SI	10%	70	2	2	2	2	2	**80**
PI	10%	30	15	15	8	7	5	**80**
A	15%	10	30	30	10	20	20	**120**
CT	10%	35	10	10	8	10	7	**80**
T	15%	50	20	25	9	8	8	**120**
S	10%	30	10	11	13	8	8	**80**
SBP	10%	15	15	10	15	10	15	**80**
Sum	**100%**	**320**	**120**	**120**	**80**	**80**	**80**	**800**

Selection of firms

The firms for inquiry are selected by chance (through numbering and pulling out) from the list of suggestions prepared in advance with firms from the relevant 6 regions distributed according to the 10 priority sectors.

Plan for data processing and analysis

Processing and analysis of the survey data is carried out with the help of the program system SPSS [5].

Creation of databases (DB) in MS Access

For all firms included in the lists for selection presented by the regions, as well as for the selected ones included in the extract, entries in specially created and maintained DB in MS Access were made. The latter was chosen because of its widespread character and compatibility with most of the big DB of SQL type.

Preparation of the data for analysis

- Initial checking the data.
- Editing the data.
- Coding the data.
- Entering the data.
- Clearing the data.
- Adjusting the data: in case of necessity it includes "balancing" of the extract – assessing according to certain indications.
- Transforming the data: transformation of some variables into other ones, if necessary – e.g. normalization (division into square root of the sum of roots of all elements in the column) or standardization.

Preliminary data analysis: description of the data through calculation of frequencies, percentages, average values, diffusion measurers and data presentation in cross-tables, histograms and other graphics. It is made automatically by SPSS.

Checking of hypotheses.

Analysis of dependencies and interdependencies between the data.

The last two operations are made automatically by SPSS.

Organizational plan of surveys includes:

- Collecting and analyzing "secondary" data.
- Final formulation of the survey components – problem, object, subject, goals, questions and hypotheses, including finalization of the lists, percentage of significant participators.
- Working out of the survey documentation: forms and ways of conducting for collection of "primary" data.
- Selection and training of interviewers.
- Outline of collecting "primary data".
- Control over the "field" work during the survey: operative control; receiving control; error and omissions detection and removal.
- Data processing and analysis.
- Formulation of conclusions and suggestions.

ORIGINAL RESULTS

Distribution of investigated firms according to regions and sectors is shown on Fig. 2 and 3.

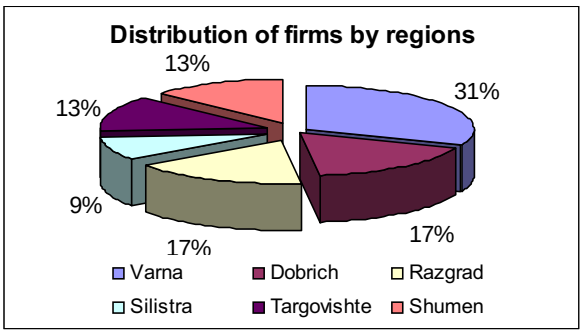


Fig. 2. Distribution of firms by region

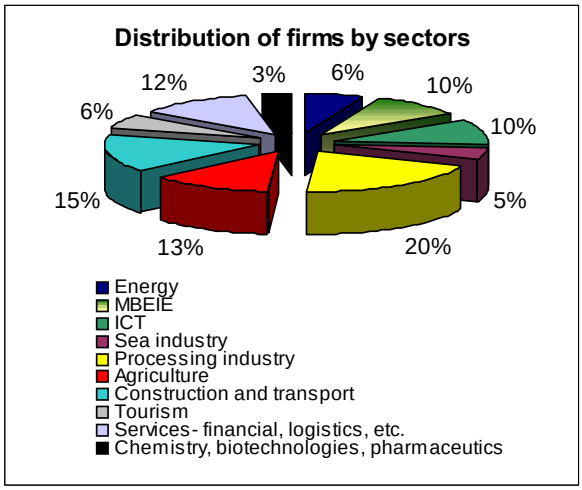


Fig. 3. Distribution of firms by sectors

On figure 4 it is clearly seen that 70% of the firms spare less than 6% of the realized turnover for research and development activities, and some of the reasons admitted in the hypotheses are confirmed by the survey research: high expenditure for innovations, lack of qualified personnel, etc. Leading sectors sparing over 20 % of the turnover for R&D are ICT, MBEIE and CBP.

On figures 5 and 6 insufficient activity of

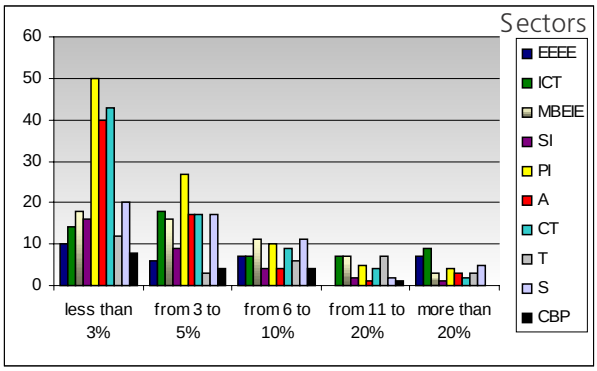


Fig. 4. Expenses for R&D compared to turnover

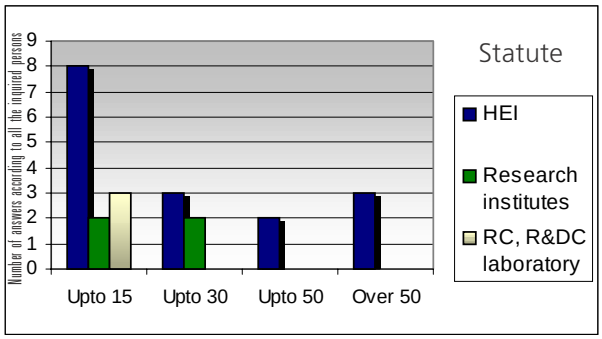


Fig. 6. Realized research projects during the last 5 years

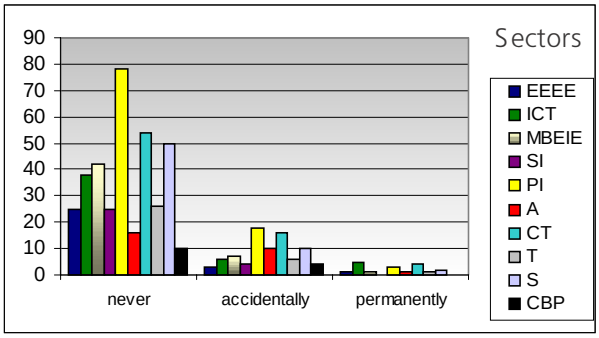


Fig. 5. Cooperation with universities and incubators

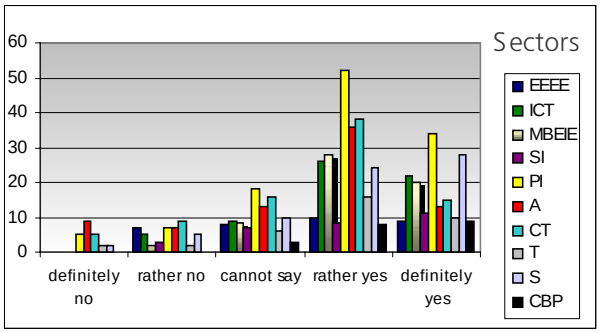


Fig. 7. Introduction of new products and services – main factor for competitiveness

business and academic society is seen in realization of joint projects, as well as weak partnership of firms with organizations creating and fostering innovations.

The results in fig. 7 confirm the hypothesis that greater part of the firms in the region fall into the group of "product-engineering" and "traditional" innovation regime characterized by: necessity of support of entrepreneurship, need of applied knowledge, support at scanning of technological environment, lacking assessment of inner technological needs, need of specific technological support.

CONCLUSION

Preliminary analyses disclose weak points and possibilities for purposeful actions for boosting innovational potential of the region and innovation activity of the firms, institutions, administration and intermediaries.

As a result of realization of the project the following results will be achieved:

- Elaboration of the Regional Innovation Strategy with particular action plan for the North-East Planning Region.

- Creation of a framework for realization of particular projects.

- Available analysis of innovational and technological needs of SMEs in ten priority sectors of the North-East Planning Region, as well as technological proposal and research potential of the region for estimation of technological and innovational infrastructure.

- Creation of conditions for permanent and steady innovation process that will broaden the innovation capacity of the region and facilitate integration of NEPR into the network of European Innovative Regions.

- Increased flexibility of the labour market and attractiveness of the region for foreign investments.

- Laid foundations for future planning of investments in innovations.

- Formation of conditions for creation and development of innovation culture.

- Better interaction and cooperation on the regional and national level with participation of public sector, small and medium enterprises, re-

search environment.

- Conditions for transition to economy based on knowledge and innovations.

Web Site of the Regional Innovation Strategy for the North–East Planning Region:

www.nebg-ris.net

References:

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2. Working together for growth and jobs: A new start for the Lisbon strategy, COM 2005.

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5. Page, M., Braver, S. and MacKinnon, D. Levine's Guide to SPSS for Analysis of Variance, LEA Publishers, London 2003.

PROJECT FOR CONSTRUCTION OF AN INSTALLATION INTENDED TO PRODUCE ELECTRICAL ENERGY WITH THE HELP OF PHOTOVOLTAIC MODULES IN BULGARIA

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When it comes to production of electrical energy having the solar energy as a primary source, the Bulgarian market is rather undeveloped due to lack of operational installations of this kind. This situation comes to create particular advantages according to the "effect of the order", i.e., each investment in conditions of undeveloped competition has certain economic advantages. Presently the construction of such a type of installations is being stimulated by preferential buying price, which shall not only cover reasonable economic costs and their rate of return, but also encourage reasonable investment costs. As in each innovative investment, in the process of preparation of projects for photovoltaic installations construction the immanent risks will be taken into account:

• **The technological risk:**

Running of energy producing projects intended to use new and not well developed technologies on the ground of renewable energy sources as a whole is more expensive. On the other hand, we shall not forget that the primary energy source is free of charge (in our case this is the solar energy), what in a long-term perspective is undoubtedly an advantage in comparison with the traditional energy producing projects.

• **Risks connected with the nature of the primary energy source:**

These risks arise from the nature of solar energy, the average annual value of which not always responds to the necessary criteria, which subsequently would reflect on the operational and technical maintenance costs, and respectively would lead to a decreased generation of electrical energy and decreased incomes from selling of electrical energy. This type of risk is estimable and it is even possible that solar resources turn out to be greater than in the preliminary calcu-

lations.

• **The business risk**

This type of risk concerns possible unfavourable changes to market and economy conditions in which the installation operates, including some over-expenditures during its construction, especially when the technology is new for the marketplace in question. Although taking into account heavy ecological problems, continuous increase can be expected with regards to various kinds of incentives for such types of projects.

In determining of preferential price for production of electrical energy by photovoltaic installations the State Energy and Water Regulatory Commission has calculated the cost of realization and running of such type of investment project.

The main factors determining the level of prices of electrical energy produced by photovoltaic installations are as follows:

a) The scope of investment expenses, including the expenses for connecting to the respective transferring or distributing nets;

b) The average annual output;

Aiming at output increase it is necessary to secure optimum parameters of the projected total annual solar radiation, depending on the location for construction of the photovoltaic energy installation.

c) The level of operating expenses;

d) Lifecycle of the assets necessary for electrical energy production;

e) The permitted investment rate of return.

• **Investment costs**

The level of investment costs for construction of photovoltaic modules is different in different countries depending on particular conditions – possibility for local manufacture of the necessary equipment,development of new technology, etc. In 2006 the European Commission published a report on the Energy Efficiency in which average investment expenses equal to 5.45 EUR/ Wp operational capacity.

Photovoltaic cells are not being produced in Bulgaria, which is the reason for additional investment costs connected with the import of equipment which could not be manufactured in the country, development of new technology, which up to now was not active on the market, as well as with the setting up of a monitoring system. Due to these reasons when calculating production costs for electrical energy produced by photovoltaic generators for a unit of operational capacity, the following averaged values of investment are accepted:

• With operational capacity **up to 5 kW** – averaged value of the investment of **5 EUR/ Wp** (fixed setting);

• With operational capacity **over 5 kW** – averaged value of the investment of **4.6 EUR/ Wp** (fixed setting).

The admissible operating costs for electrical energy production by photovoltaic generators are accepted as follows:

• With operational capacity **up to 5 kW** – equal to **0.015 EUR/ Wh**

• With operational capacity **over 5 kW** – equal to **0.013 EUR/ Wh**

Presently the valid for the Republic of Bulgaria Ordinance of the State Energy and Water Regulatory Commission (in effect from 1st of January 2007) determines preferential prices for buying of electrical energy produced by photovoltaic installation VAT excl., as follows:

• For photovoltaic installations with capacity up to 5 kW – 782 lv./ MWh

• For photovoltaic installations with capacity over 5 kW – total 718 lv./ MWh

EQUAL IN EUROPEAN RESEARCH AREA

BULGARIAN VIPs

Assoc. Prof. HRISTO VASSILEV
Executive Director of Denima 2001 Ltd.

More than 100 publications in the field of illumination techniques and illumination – interior and exterior lighting, tunnel lighting etc., and in the field of optimization of street luminaries, maintenance of street lighting etc.

Assoc. Prof. Dr. Hristo Vassilev is an executive Director of Denima 2001 Ltd., created in 1989 as a firm for engineering in the field of illumination techniques. Today Denima is one of the most advanced firms in the branch and steadfast follows its own innovation policy in the technologies of the light techniques. Dr. Vassilev is a basic ideologist and generator of ideas in the field of innovation technologies. According to ideas Denima takes part in Phare programs. By his initiation and formulation of the basic direction, Denima 2001 applies in the National Innovation Fund with the project for new technologies in the light techniques and another project – for development of technology for production of photovoltaic modules for supplying street lighting in remote villages and other places without electricity feed.

Dr. Hristo Vassilev is an ex-president of the national Committee of Illumination of Bulgaria, a member of International Committee of Illumination, member of the FNTS. This is his own idea to install street lighting supplied by PV batteries in the village of Gorno Osenovo, the installing of a new park illumination supplied by PV batteries and the creation of a new design for park luminaires and pools.

The innovation policy of Denima 2001 is a policy of its leader, Dr. Vassilev.

Dr. Hristo Vassilev is an Assoc. Professor at the Technical University in Sofia and gives lectures to the students of the specialty "Engineering design" in the Economical Faculty of the Technical University on the Illumination. During his practical trainings, students earn knowledge and experience by design and working on the PC with software for 3D design – Solid Works, OptisSolid, I-deas by working on the 3D printer for prototyping of new models, by working on laser cutting machine and other metal ware machines by CNC control.

This complies with the present day conceptions for engineering education combining theory and practice.

Hristo Vassilev has more than 100 publications in the field of illumination techniques and illumination – interior and exterior lighting, tunnel lighting etc., and in the field of optimization of street luminaries, maintenance of street lighting etc.

NIKOLA VASILEV

General Manager of Saturn Engineering Ltd.

Awarded with master's degree in Electronics. Participates in several projects under the aegis of the electronic department of the Technical University.

Nikola Vasilev, MSc is a CEO and the General Manager of Saturn Engineering Ltd. since 2002. Under his leadership, Saturn grew from 6 employees in 2002 to 53 in 2006 with more then 80% per year gross profit growth and was awarded as the most innovative SME in Bulgaria for 2006.

Nikola Vasilev has master's degree in Electronics and bachelor's degree in management; he graduated from Technical University of Sofia, branch Plovdiv. Then and there he participated in several projects under the aegis of the electronic department of the university.

A year before his graduation in 1996, he started his professional career as an embedded software programmer and later as a R&D manager in a private engineering company in Plovdiv, specialized in industrial automation and laboratory devices. He managed and took part in many projects with more than hundred devices in production.

After his joining Saturn Engineering in 2001, the company changed its business model from trade to engineering-oriented company and started ISO9001 certification procedure, successfully completed in 2002. In 2004 the company invested in a modern design and manufacturing facility in Sofia, opened in 2005 and became a part of the Techno Park Sofia project.

At present, Saturn Engineering has many customers from different countries and takes part in several EU projects as a technical and user partner.

AWARDS

COMPETITION OF SCIENTIFIC ACHIEVEMENTS OF DOCTORANDS AGED UPTO 35, DEFENDED THESES IN 2006

A DIPLOMA AND A CASH PRIZE

ANDRONIKA MARTONOVA, PhD from the Institute of Art Science at the Bulgarian Academy of Sciences (BAS) for the thesis " Cinema of the Far East: Genre-Narrative Structures and Cultural-Aesthetic Interactions (the end of the XX and beginning of the XXI Century) ".

BOYAN IVANOV KOLEV, PhD from the Central Laboratory of Biomedical Engineering "Prof. Iv. Daskalov" at the BAS for the thesis "Generalized Network Models of Processes in the Systems of Management of Relational Databases and Intuitionistic Fuzzy Relational Databases".

ELITZA KUZDOVA DIMITROVA, PhD from the Center for Population Studies at the BAS for the thesis "Second Demographic Transition in Bulgaria: Pre-conditions, Transformations, Consequences".

KOSTADIN STOYANOV BEEV, PhD from the Central Laboratory for Optical Recording and Processing of Information at the BAS for the thesis "Holographic Recording of Attenuating Light Waves".

RAINA KIRILOVA NACHEVA, PhD from the Institute of Botany at the BAS for the thesis "Evolutional Processes and Hybridization at Peat Mosses".

YANA ATANASOVA ROULAND, PhD from Plovdiv University "P. Hilendarski" for the thesis "The Problem of Perishability and Death in the Poetry of the Bronte Sisters".

A DIPLOMA

BORIS DIMITROV GROZDANOV, PhD from the Institute of Philosophical Research at the BAS for the thesis "Techno and Theory: the Role of Mental Experiments for the Development of Scientific Theories".

VIKTORIA MILKOVA NAKOVA, PhD from the Institute of Physical Chemistry at the BAS for the thesis "Electro-optical Investigation of the Structure and Electrical Properties of Polyelectrolytic Multilayers on Colloid Particles".

GALINA DINKOVA STOYANCHEVA, PhD from the Institute of Microbiology at the BAS for the thesis "Combined Approach for Molecular-Taxonomic Characteristics of Lactobacilli".

DONKA PETROVA BODUROVA, PhD from University of Food Technology for the thesis "Cavitational Processing of Liquid Media".

SOREN BOHOS HAIRABEDYAN, PhD from the Institute of Biology and Immunology of Reproduction at the BAS for the thesis "Studies on the Expression of Angiogenic Factors and Tumor Markers at Endometriosis".

TEODORA SPASOVA ANGELOVA, PhD from Agricultural Institute – Stara Zagora for the thesis "Breeding of Farming Animals, Biology and Biotechnology of Reproduction".

ARTICLES

RECENT PUBLICATIONS OF BULGARIAN SCIENTISTS

Title: **Model-checking the Preservation of Temporal Properties upon Feature Integration**.
Authors: Guelev, Dimitar[1], Ryan, Mark[2] mdr@cs.bham.ca.uk, Schobbens, Pierre[3]
Source: International Journal on Software Tools for Technology Transfer, Vol. 9, 1, (Feb. 2007), 53-62, 3 graphs
Document Type: Article
Author Affiliations: [1]Section of Logics,Institute of Mathematics and Informatics, Acad. G. Bonchev str., bl. 8. 1113 Sofia, Bulgaria;
[2]School of Computer Science, University of Birmingham, Birmingham B15 2TT UK;
[3]Institut d'Informatique, Facultés Universitaires de Namur, Namur Belgium.
ISSN: 1433-2779

Title: **The Differential Effect of Men and Women Entrepreneurs' Human Capital and Networking on Growth Expectancies in Bulgaria.**
Authors: Manolova, Tatiana S., Carter, Nancy M.[1,] Manev, Ivan M., Gyoshev, Bojidar S.[3]
Source: Theory & Practice, Vol. 31, 3, (May 2007), 407-426
Document Type: Article
Author Affiliations: [1]University of St. Thomas;
[2]University of Maine Business School;
[3]International Business School, Botevgrad, Bulgaria.
ISSN: 1042-2587

Title: **Ownership Categories and Investment Patterns after Mass Privatization in Bulgaria and the Czech Republic**
Authors: Peev, Eugeni[1]
Source: Corporate Ownership & Control,Vol. 4,3,(Spring 2007),53-63,
Document Type: Article
Author Affiliations: [1]Department of Economics, University of Vienna, BWZ, Bruenner str. 72, A-1210 Vienna, Austria
ISSN: 1727-9232

Title: **Reinventing Strategic Planning in Post-socialist Cities: Experiences from Sofia**.
Authors: Tsenkova, Sasha[1] tsenkova@ucalgary.ca,
Source: European Planning Studies, Vol. 15, 3, (Apr. 2007), 295-317, 3 charts, 4 diagrams, 2 graphs
Document Type: Article
Author Affiliations: [1]Faculty of Environmental Design, University of Calgary. Calgary. Canada
ISSN: 0965-4313

Title: **Age-specific Dynamic Labor Demand and Human Capital Investment.**

Authors: Prskawetz, Alexia[1] alexia.fuernkranz-prskawetz@oeaw.ac.at, Veliov, Vladimir M.[2,3], vveliov@eos.tuwien.ac.at,

Source: Journal of Economic Dynamics & Control, Vol. 31, 12, (Dec. 2007), 3741-3777,
Document Type: Article

Author Affiliations: [1]Vienna Institute of Demography, Prinz Eugenstr. 8-10, 1040 Vienna, Austria;
[2]Institute of Mathematical Methods in Economics (Research Group on Operations Research and Nonlinear Dynamical Systems), Vienna University of Technology, Argentinierstrasse 8, A-1040 Vienna, Austria

ISSN: 0165-1889

Title: **Between Strategy and Change: Reformulating the Medicines Industry in an Enlarged Europe**.

Authors: Kazakov, Rossen[1] rkazakov@abphm.bg,

Source: Journal of Medical Marketing, Vol. 7, 3, (Jun. 2007), 245-253, 4 graphs
Document Type: Article

Author Affiliations: [1]Executive Director of the Association of Bulgarian Pharmaceutical Manufacturers (ABPhM)

ISSN: 1745-7912

Title: **Research and Innovation in Bulgaria.**

Authors: Simeonova, Kostadinka[1], simeonova@netissat.bg

Source: Science & Public Policy (SPP), Vol. 33, 5, (Jun. 2006), 351-363
Document Type: Article

Author Affiliations: [1]Director, Center for Science Studies and History of Science, Bulgarian Academy of Sciences,4 Serdika,1000 Sofia,Bulgaria

ISSN: 0302-3427

Title: **Sliding Mode Neuro-Adäptive Control of Electric Drive**s.

Authors: Topalov, Andon Venelinov[1], topalov@tu-plovdiv.bg, Cascella, Giuseppe Leonardo[2], cascella@deemail.poliba.it, Giordano, Vincenzo[2], giordano@deemail.poliba.it,Cupertino, Francesco[2], cupertino@deemail.poliba.it, Kaynak, Okyay[3], okyay.kaynak@boun.edu.tr

Source: IEEE Transactions on Industrial Electronics, Vol. 54, 1, (Feb. 2007), 671-679, 1 chart, 4 diagrams, 3 graphs
Document Type: Article

Author Affiliations: [1]Control Systems Department, Technical University of Sofia, 4000 Plovdiv, Bulgaria,
[2]Dipartimento di Elettrotecnica ed Elettronica, Politecnico di Ban, via Re David 200-70125 Ban, Italy,
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ISSN: 0278-0046

EVENTS

FORTH NATIONAL CONTEST FOR INNOVATIVE ENTERPRISE OF THE YEAR 2007

ARC Fund jointly with the Ministry of Economy and Energy, the Bulgarian Industry Association and the Bulgarian Academy of Sciences, the World Bank office in Bulgaria and with the kind support of the Bulgarian Small and Medium Enterprises Promotion Agency organizes for the fourth time a **National Contest for Innovative Enterprise of the Year 2007**.

The annual Innovative Enterprise of the Year Award acknowledges Bulgarian enterprises that have successfully introduced innovations or scientific accomplishments, thus transforming their operation mode and achieving sustainable economic effect.

The entrepreneurship and business environment in Bulgaria continue improving in line with the overall growth of the Bulgarian economy. Lasting macroeconomic stability has provided conditions for company growth and establishment of productive partnerships for innovation. Yet, certain microeconomic factors, such as high entry barriers, low competitiveness and unfair competition, high market concentration, low protection of property rights, etc. continue to hinder the development of the Bulgarian innovation system and thus the competitiveness of Bulgarian enterprises in the EU.

The **Innovation Index of Bulgarian enterprises** (developed by ARC Fund) indicates that most of them (**over 65%**) **have not implemented any innovations** over the last year. The index illustrates low ability of Bulgarian companies to combine several types of innovations, it likewise illustrates that mostly innovations with low degree of novelty are introduced (novelties primarily within the company or on the national market but not on the international one). The **average value of the innovation index** for Bulgarian innovative companies is **56.1**. **Highly innovative companies**, i.e. those that score above 56.1, are less than **4%** of all Bulgarian enterprises.

A company is considered to be innovative if it has developed and marketed new or advanced products (goods or services) and/or processes over the last three years. Innovation is defined in broader terms as application of new approaches or technologies that improve economic performance and competitiveness of a respective company.

Evaluation

The ranking of participant companies is grounded on applying a specially designed methodology on the basis of a set of criteria combining quantitative and qualitative indicators.

The ranking of companies evaluation will ultimately be thoroughly analyzed by the expert panel. The top 10 applicants will be visited by ARC Fund's experts.

Awards

According to the EU enterprise categories, **two groups** of companies have been defined:

- innovative small enterprises (*of up to 50 employees*);

- innovative medium-sized or large enterprises (*of over 50 employees*).

START UP 2007 NATIONAL CONFERENCE ON ENTREPRENEURSHIP

A conference for starting up and development of own business was held in November for the first time in Bulgaria. The aim of Start Up was to promote the entrepreneurial spirit in Bulgaria and to show how ideas can turn into successful business. Entrepreneurs, investors, companies and institutions stimulating starting-up firms met at the forum.

The program of the conference included:

• Lectures of managers and consultants giving practical advice in different fields;

• Exhibition for entrepreneurs – companies from different spheres presented their services for starting-up small and medium firms;

• Entrepreneurs' successful stories.

Start UP 2007 was organized with the assistance of the Executive Agency for SME Promotion, Inter-university Center for Career Development at University of National and World Economy (UNWE) and Association for Promotion of Public Activities.

WEEK OF SCIENCE

From September 20 to 29,2007 different organisations from the country presented various events aiming to introduce science to the society as an interesting, amusing and spectacular event and to overcome the negative stereotypes about scientists. The program passed under the motto: **See the beauty of science, learn about wonders of science, go through the night of scientists.**

The activities during the Week of Science were on three projects:

• "Beautiful Science" – regional project of the British Council in the South-east Europe, in Bulgaria with the partnership of the Ministry of Education and Science

• European festival on science WONDERS 2007 – "Wonder called systematics, or is it difficult to put in order the richest biodiversity in Europe?"

• European Night of Scientists 2007 - project REGGAE

TENTH-GRADE STUDENT WITH AWARD FROM THE EUROPEAN PATENT OFFICE

On the 19th European Union Contest for Young Scientists held this year in Valencia, Spain from September 14 to 19,2007 **Slaveya Angelova Angelska** from "Vasil Levski" High School in the city of Sevlievo got a prize of the European Patent Office for her project in the field of social sciences on the topic: "Possibilities of people with hearing loss to perceive sounds".

WINNERS IN THE SECOND NATIONAL STUDENTS' CONTEST FOR THE BEST GROUP IN GAS INSTALLATIONS CONSTRUCTING RECEIVED ONE-YEAR SCOLARSHIPS

Winners in the Second National Contest for the best group in gas installations constructing are **Georgi Enchev, Nikolai Kraev and Todor Todorov** from Professional High School of Mechanoelectronics, the city of Lovech. The students got scholarships for one school year.

The team of **Todor Kanev, Kalin Penchev and Dimitar Nikov** from Professional Technical School "Ivan Rainov" from the city of Yambol ranked second. They received portable computers.

Representatives of Professional High School of Transport "Henry Ford" from Sofia – **Denislav Terziev, Emil Atanasov and Svetoslav Petrov** ranked third. They received sets of professional instruments.