台俄合作計劃專欄

尋求事業合作夥伴！
INTRODUCTION

撰文 / 黃怡瑛

俄羅斯國際工程院、俄羅斯工程院與台灣分會自2009年建立良好互信關係以來，始終不斷嘗試並積極在下述領域進行合作，包括：

- 共同開發創新計劃、製造標準技術性產品、進行教育性活動；
- 針對技術與科技領域方面的各種問題，進行研討會、論壇及諮商的工作；
- 在俄羅斯國際工程院、俄羅斯工程院及台灣分會三方的協議合作框架下，幫助台俄雙方各大專院校建立校際合作關係，包括教授、研究生及大學生的交換計劃等；
- 協助俄羅斯及台灣的學術機構 / 研究人員，申請政府部門與基金會的經費補助（台灣 - 科技部；俄羅斯 - 俄羅斯基礎科學基金會、俄羅斯人文基金會、俄羅斯科學院西伯利亞分院、俄羅斯科學院遠東分院），共同進行台俄雙邊研究計劃；
- 以俄文、英文、中文形式出版各種工程活動的專書及手冊，並包括工程院內有名之學者及工程師的傳記等；
- 技術及工程領域方面之教科書的撰寫工作，亦或各別大學之課程的設立，並與各大學（即俄羅斯國際工程院的團體會員）協議，以英文、中文及俄文形式出版；

- 在互利的基礎上，建立技術、醫學（藥學）及顧問活動領域的合資企業，包括開發共同專利，以吸引俄羅斯及台灣的企業及組織；
- 每年進行俄羅斯及台灣 1 至 2 次的互訪活動。接待安排台灣代表團訪問俄羅斯（包括其他獨立國家國協成員），邀請並參加俄羅斯或其他獨立國協成員國所舉辦之研討會及論壇；
- 科技發展的主要領域方面，以較為迫切及具前瞻性的問題優先開發共同研究計劃；
- 籌組開發研究團隊，領域包括：由有機廢料取得生物氣體之研究、建物剩餘壽命的研究、使用陶瓷及其他材料之過濾器所作的淨水處理；研究 2015-2020 年科技及工程發展較具前瞻性的領域，並準備共同發展計劃，領域包括：評估物體狀態的雷射掃描技術、奈米結構材料的粉末、加熱及冷卻的有效系統、開發防火合成材料等。

上述皆為總院與台灣分會所積極努力的工作項目，今年俄羅斯方面亦提供五項合作計畫的詳細資料內容，歡迎有興趣的相關企業、研究單位進行合作，意者請洽本會。

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BIOGAS REACTOR

ABSTRACT

The technology implements obtaining synthesis-gas by deep processing of organic raw material, including technological wastes, by physical methods. The new solutions are based on the method of catalytic hydrocracking of liquid biomass under high pressures and critical thermodynamic conditions. One of the perspective usages of reactor is efficient utilization of liquid organic wastes (washouts) of nuclear power plants.

PURPOSES OF THE PROJECTS

= creation and certification of experimental-industrial installation of deep processing of wastes of agricultural production (liquid organic mass);

= organizing of design and cooperative production of energy installations based on biogas reactors;

= organizing joint business in the field of renewable energy sources on the basis of environmental friendly energy-saving technologies of utilization of organic waste.

PROPOSALS FOR FOREIGN INVESTOR

- Creation of joint enterprise for completing design;
- Organizing production of biogas reactors and energy installations on their basis;
- Sale of product.

* Volume of investments in the pilot project on creating pre-serial model with capacity is $1 - 3 million. The project is now on the stage of laboratory testing of prototype and is ready for implementation.

* Volume of Russian market is estimated $960 million annually during five years (500 installations of Biogas reactor).

The project is proposed by International Academy of Engineering (IAE) in cooperation with Taiwan Chapter of IAE.

BIOGAS REACTOR

Biomass is virtually inexhaustible heat and electric energy source for humanity for the next few centuries. At the present time, the main way of processing of liquid organic wastes is implemented in biogas technologies. As a home-grown method it has been known for thousands years. During last decades, it obtained completed hardware design. Unlike the other ways of biomass utilization, it does not require preliminary drying. During the fermentation process, biogas is being formed (mixture of methane and carbon dioxide). Among the drawbacks of this method are: a) long period of fermentation (about one month), which prevents from creating compact high-productive installations; b) small, usually not over 20%, level of usage raw materials for obtaining biogas, with putting the rest of organic mass of waste to the fields; c) high prices of making installations and high operational costs; d) principal absence of opportunity of complete utilization does not solve the problems of environmental safety.

A new class of compact high-production equipment on the basis of physical-chemical processing of biomass with catalytic hydrocracking method is being developed. Such method makes it possible to efficiently use, in environmentally safe way, natural biological substances such as peat and algae, to completely recycle liquid and semi-liquid organic animal waste, poultry waste, wastes of paper-making, hydrolysis and food industry, as well as other types of organic raw materials for production of fuel gases, heat and electric power. The capacity of such equipment may be from 5 to 2,500 m^3 per day, and produced electric power, respectively, from 0.1 to 50 MW, what makes it possible to solve ecological problems of any agricultural enterprises.

In comparison with well-known biogas installations, the new equipment is dozens times smaller, and may be placed in 20- and 40-feet sea containers (mobile version), without requirements of big room; the new equipment is also has considerably lower cost (from three to ten times). The equipment operation does not require external heat, electricity and other technological supply, i.e., it is carried out in completely autonomous mode with remote control through cell or satellite communications. The products obtained during the processing are technically pure water, minerals in kind of ash, and fuel gases w/o sulfur. These products are not dangerous and do not have any harmful influence on the environment.

The principle of the equipment operation is thermochemical processing of waste under high pressures with further separation of products onto organic component (fuel gases and CO_2), technically pure water and mineral substances (organic fertilizers and ash).

Nowadays, an experimental installation with production capacity 5 m^3 per day is being built. For the completion of research and development work, investments are required about $3 million. The price of series-produced biogas reactor with capacity 25 m^3 per day may be up to $1.8 million.

莫斯科地鐵

WASTE RECYCLING: A SOCIAL PROBLEM

(From a marketing report not for publishing)

Actuality of the work

Livestock breeding complexes and poultry enterprises nowadays face serious problem of manure and other wastes recycling, including wastes of slaughter. One hen produces about 0,6 kg of manure per day, one pig produces about 12 kg of manure, and one cow produces about 60 kg! Experience shows that an average-size cattle farm (4,500 heads) produces about 175,000 tons of manure flows per year (or 500 tons per day), even with washing. One average poultry farm (40 thousand laying hens, or 10 million broiler chickens) annually produces from 35 to 83 thousand tons of manure and over 4,000 thousand m^3 (or 1,100 tons per day) sewage waters with high concentration of organic components. Most enterprises still place waste flows to the reservoirs, where they undergo separation onto liquid and solid parts, and then they are being put as fertilizers to the fields. Some other enterprises send waste to the closest city purification plants, if they are exist. Another problem is disposal of remnants of dead-off animals, number of which sometimes reach 8-9% of total stock of cattle breeding enterprise.

The requirements for processing and recycling of wastes of livestock breeding enterprises are given in Technological design standards NTP-17-99. These standards are rather strict, and not always implementable. For example, in the NTP-17-99, the time of holding of manure in the reservoir is mentioned as at least 6 months. Cattle farms with livestock over 4,500 heads, producing 175,000 m^3 of liquid manure flows, must have for storage and recycling of these flows at least 7 reservoirs with capacity 12 thousand m^3, filling by turns, with general area about 20 thousands m^2. After filling the seventh reservoir, 6 months of keeping flows in the first reservoir will pass, and necessity of its emptying will appear.

The same standards NTP-17-99 prescribe that liquid manure from the reservoirs may be put to the same field not over 1 time per 4 years; otherwise it may be a risk of salinization of soil with nitrogen compounds. Besides this, liquid manure, poured to the fields, must be treated with disk cultivator in two hours at the latest, to avoid contamination of air. For emptying of one reservoir with an 11 m^3 tank, 1,091 runs, or 409 working days will be required. Using four tanks simultaneously will require not less than 3.5 months. Filling of one reservoir with flows takes 3 months; only the cost of transporting of processed flows to the fields and burying them into the ground will be about 1 million rubles annually.

It should be mentioned that in any case, the owner of the enterprise, to match with the mentioned standards, will have to build concrete reservoirs, keep a massive staff of trucks and workers (or invite transport companies). Besides this, the areas necessary for concrete reservoirs, actually, are being excluded from the agricultural usage.

Total area of agricultural ground, assigned for manure storages, according the preliminary estimate of the Ministry of Agriculture of Russia, is 5,000,000 (five million) hectares.

Cost of recycling of wastes of agricultural enterprises of agricultural sector is 450 rubles per ton, cost of recycling of wastes of oil-producing and oil-processing enterprises of Russian Federation varies from 1,000 (one thousand) rubles per ton, to 4,000 (four thousand) rubles per ton.

With annual accumulation in Russian Federation of wastes of cattle breeding and poultry in volume of 5,000,000 tons, the amount of money spent for these wastes recycling must reach 2,250,000,000 (two billion 250 million rubles per year). This number is given without account of wastes already kept in storages (roughly speaking, the above-mentioned number should be increased at least two times).

Besides the issues of the ecology on the agricultural complex enterprises, there is the issue of recycling of oil-slimes accumulated on the territory of Russian Federation. The amount of these oil-slimes, according to the estimates of EMERCOM of Russia and of Natural Resources Committee of Russia, is from 50,000,000 to 500,000,000 tons. The study of possible usage for combined utilization of these components as fuel oil is also a topical task.

Wastes of oil companies accumulate for decades, and should be considered as a separate ecological factor, influencing on the environment. The supposed costs for disposal of these wastes with traditional technologies reach vast sums of money.

The necessity of recycling of big volumes of biomass wastes in agriculture (straw, rot), food industry (alcohol grains, brewing waste, hydrolysis waste etc.), paper and wood processing industry etc should be also mentioned.

At the present time, there is no other technology available in the world, which makes it possible to recycle and dispose of liquid organic wastes more efficiently than traditional biological method.

The new technology which is being developed by the Russian Academy of Engineering, is based on the usage of physical-chemical methods, namely, of supercritical fluids, makes it possible to dispose of manure flows immediately after their forming (during 10 minutes) instead of 6 months of their keeping in reservoirs and further putting to the fields. The equipment is compact and is produced in mobile versions.

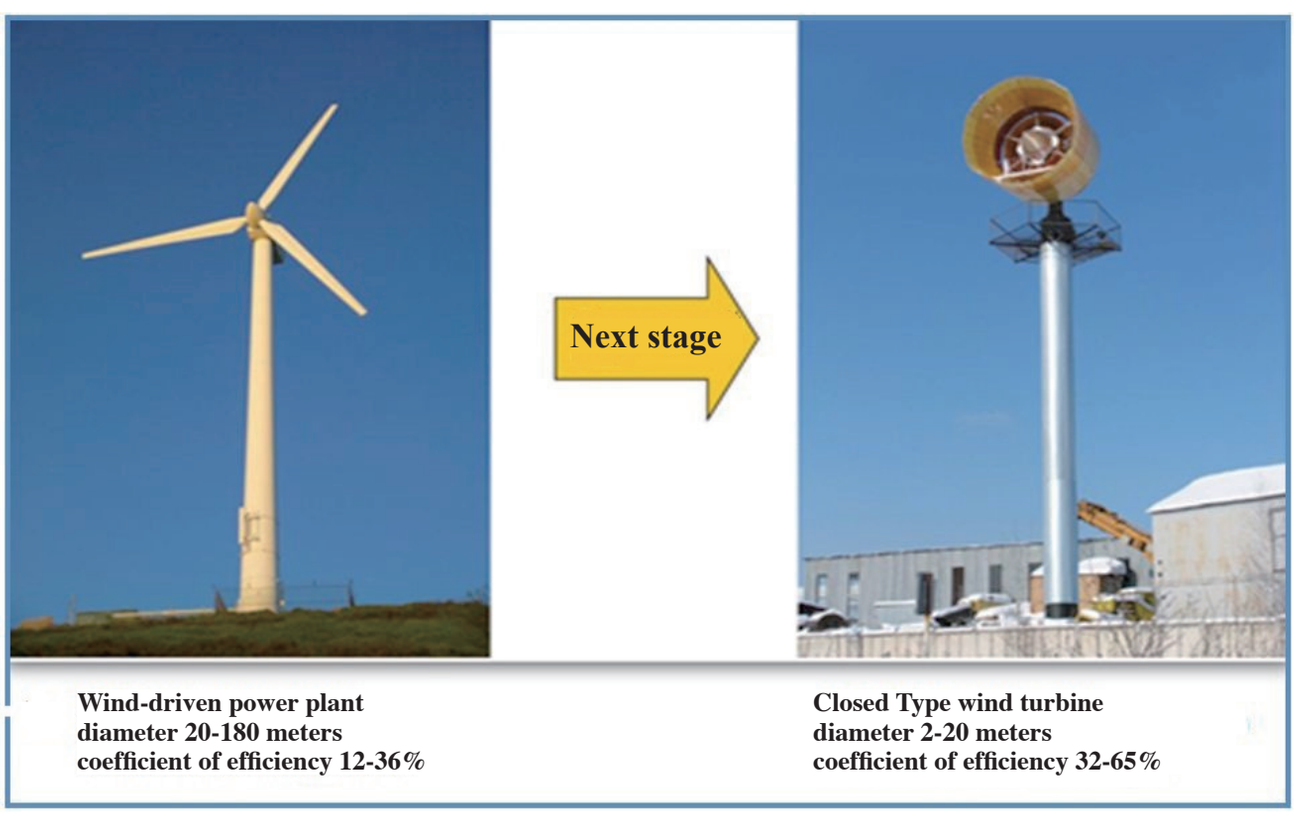
More detailed analysis may be found in the works of «All-Russian Scientific Research Institute for Electrification of agriculture – VIESKH» and All-Russian Institute for cattle breeding.

Note. *As the estimates show, for the solution of the issue of liquid agricultural wastes recycling, hundreds of mobile installations are required, with feed capacity from 25 to 250 tons per day. As a bonus, farms may get hot water, fuel gas and electric power from the processed wastes. All this is independent subject for business incentive.*

Conclusion: From the business point of view, the new technology is rather topical, and the market is virtually unlimited.

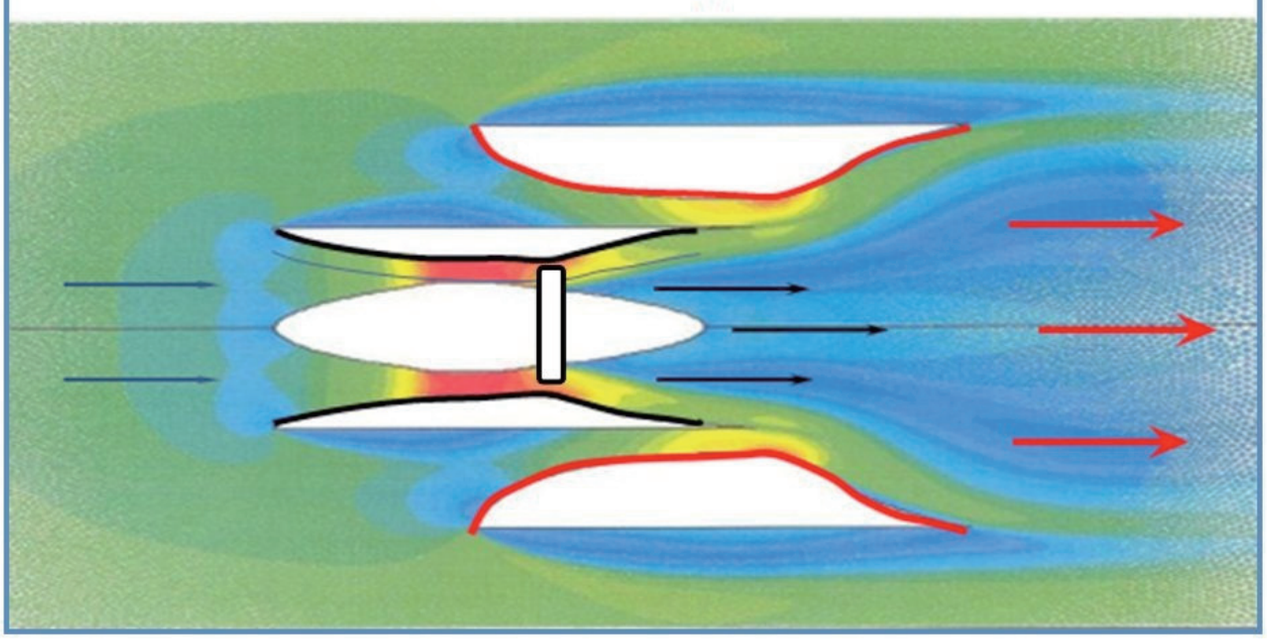
CLOSED-TYPE WIND TURBINES

Efficiency of usage of wind power as renewable energy source is universally recognized. At the same time, traditional series-produced constructions, blade wind-power installations have some principal drawbacks, of which the main ones are considerable mass-dimensional parameters, existence in the range of dangerous for man and for animals infrasonic oscillations, considerable territories for providing technical efficiency and safety, technological complicatedness of operation and production.



The technology of **closed-type wind turbines**, developed under the direction of A.I.Ovchinnikov, is based on fundamental thermodynamic principles. The installation represents a completely new generation of up-to-date wind turbines, radically different from traditional wind power plants by higher operational characteristics, operational effectiveness and ecological/technical safety. Acceleration of air stream in Laval nozzle and sail-formed configuration of turbine blades make it possible to increase power transfer coefficient of kinetic energy of wind and its energy intensity. The absence of multiplier in the installation and usage of low-speed valve-inductor generator considerably increase the integral figure (coefficient) of usage of wind flow.

Closed type wind turbine: increasing kinetic energy of wind due to potential energy of flow in nozzle



Benchmark and full-scale tests with usage of up-to-date spatio-temporal instruments of estimate of resource indicators of structural dynamic strength, designed by the International Academy of Engineering (IAE) **prove high innovative potential of the work and features of "closing technology".**

Closed-type wind turbine has high-level technological characteristics:

= possible for installation in living areas, for mounting on houses and industrial structures;

= high power capacity with equal diameters;

= higher service life without components change, very low noise level, no infra sounds and radio interference, no radio wave screening;

= no open moving components, no visual irritation, minimum discord with landscape; may be used in conservation areas and in parks;

= no reducer, no parasitic components, may be mounted without masts, by «package»;

= self-orientation to wind, may be used during winds over 25 meters per second, resistant to wind blasts, whirlwinds and turbulence;

= accessible and affordable, easy to change materials; easy to repair and to upgrade;

= low prime cost and maintenance charges;

The project is being presented by International Academy of Engineering (IAE) in cooperation with Taiwan Chapter of IAE.

NANOCOMPOSITE HEAT EXCHANGERS

There are practically tested technical methods for generation and supply of heat for customer. These methods make it possible to sharply reduce losses of centralized heat supply. Among their qualities which have already been proved, are reliability, easy way of usage, much lower accident rate (many times lower), much lower prices of the heat energy for people.

Heat system with low level of heat energy losses has been developed. **This system is based on tubeless energy-saving nanocomposite convectors**, designated for up-to-date heat systems and systems of hot-water supply, for providing population with heat with maximum comfort and with much lower rate of accidents. Convectors (heat exchangers) are developed on the basis of advanced aviation technologies with unique performance parameters:

= Minimum specific weight on 1 kilowatt of heat power. Volume of heat exchanger is 2 – 5 times smaller than that of typical constructions.

= Heat transfer coefficient is 40-70 W/m², what is twice higher than traditional ones. Thermal utilization factor increases from 12% to 45%. Generating capacity of the individual boiler is 40% lower.

= Minimum inner volume of filling by the heat carrier: heat exchanger with power 1 kW is 0,5 litres in volume.

= Working pressure is 5 – 10 times higher than traditional ones. Standard is 60 atmospheres. Convector is resistant to water hammering, to mechanical impact loads.

= Enegry-saving nanocomposite convectors are not being defreezed in a set with metal polymeric pipes and fittings of special structure.

= Service life increased to 25 years.

= May be used in corrosive mediums.

= Highest coefficient of efficiency for convectors (over 90%).

= operating temperature up to 700 C^{o}.

Designated for energy-saving heat systems during capital repair and construction. Without temperature reduction in the room, costs for heat-carrier warm-up is 30 – 60% lower!!!

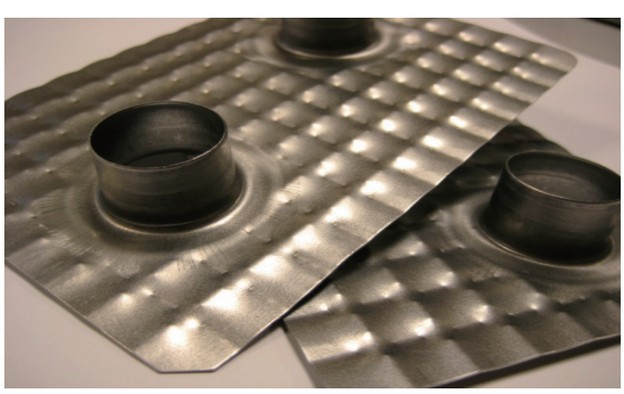
Pipeless construction of energy-saving nanocomposite convectors supposes usage of inexpensive packaging steels 08KP for bulk forging, treated by special coverage of copper soldering paste.

= Energy-saving nanocomposite convectors are recommended for usage on moving objects. Convector may work in all positions, it is resistant to vibrations and impact loads. May be used as load-bearing element of product's body.

= May be used with any type of boiler houses, domestic boilers and heat carriers.

= Production is 90% automated. Small amount of operations. Minimum personnel and minimum technological equipment required.

= Energy-saving nanocomposite convectors have the least prime cost of production.



The elements are being sintered by the light soldering method in furnaces.

Briefly on production technology: Nanocomposite heat exchangers are made from steel ribbon 0,5-2,0 mm by the method of thin-plate closed-die forging with "high" stretching-out of channeling cones. Then they are being put into packages, depending on type of product, and are being soldered by soldering flux based on copper oxide by the "bright soldering" method in special furnaces with restorative and protective atmosphere.

Designing and making of the Energy-saving nanocomposite convectors complies with most up-to date trends of interior design.

Energy-saving nanocomposite convector in Hi-Tech style may be suitable for any style of interior and construction according to requirements of designer. Exterior of the heat exchanger may be simply modified or transformed by the change of decorative cover.

The project is being presented by International Academy of Engineering (IAE) in cooperation with Taiwan Chapter of IAE.

ROTOR ELECTRIC POWER INSTALLATION

ABSTRACT

Russian scientists, constructors and technologists designed and industrially tested perspective technology based on rotor engine-gas-generator and power expansion machine with electric generator on a shaft. The power plant includes stabilizing inverter, system of spatial monitoring of dynamic strength of power machines and ceramic membrane system of full purification of exhaust. With the similar power capacity, rotor engine (Vankel) has two times lower weight than Diesel engine. In comparison with free-piston engine with similar fuel consumption, rotor engine consumes less machine oil, has longer working life, easier to operate, dynamically balanced, has less impact on environment.

Maximum fuel combustion pressure in rotor-engine gas generator exceeds the combustion pressure of usual free-piston engine, where pressure is limited due to presence of connecting-rods and bearings of crankshaft, and due to unfavourable distribution of forces in top dead center of piston in fuel combustion cycle. Rotor engine has high frequency of rotation, has no dead centers (halts in the process of operation), its main purpose is to provide necessary amount of gas with high temperature and pressure at the entry of expansion machine. Frequency of work cycles of fuel combustion reaches 10000 cycles per minute of 160 cycles per second.

In comparison with electric power plants based on gas Capstone type mini-turbines with capacity 30KW, rotor power generating installations with yearly output over 1500 units may have advantage in price up to 15-20 times. With taking into account of complicated and expensive service regulations of gas turbine machines, Rotor power installations even more cost-saving. But the main

advantage is that **efficiency of Rotor power installations may be 2-2,5 times higher** than the best gas mini-turbines have, and this efficiency reaches 60%.

Industrial models of Rotor engine-321 have been designed, patented, made and tested. A module has been made with injection system, which makes it possible to design 1,2,3 and 4-section engines where parts and units are unified up to 85%; these engines are possible for adaptation for any **energy, aviation, ship and automotive equipment** without changing main parts of rotor engine. A range of engines with variety of power capacities has been designed; these engines are made on unified sections with useful capacity 149, 349, 654, 981 cm3, which makes it possible to get engines with capacity from 10 to 1000 horsepowers. Considerable work have been made to implement new innovative technologies and materials for cost reduction and increasing of engine parameters in cooperation with Russian machine-building centres and enterprises, which makes it possible to develop up-to-date engine branch, having no European analogues.

Rotor engine (base IV RD-321)

1. Area of application

- various purpose flying vehicles

2. Advantages of Rotor engine

The main advantages of Rotor engines in comparison with free-piston engines of existing types are:

- small specific weight and small size of engine
- smaller labour-intensiveness for making
- low vibration level
- low labour-intensiveness for service

3. Short description of engine design

Differences in operation principles of rotor engine and free-piston internal combustion engine.

Main difference in operation principle of rotor engine from free-piston engine is the absence of reciprocal motion. Fid. 1 shows main differences in both operation principles and designs of rotor and free-piston engine.

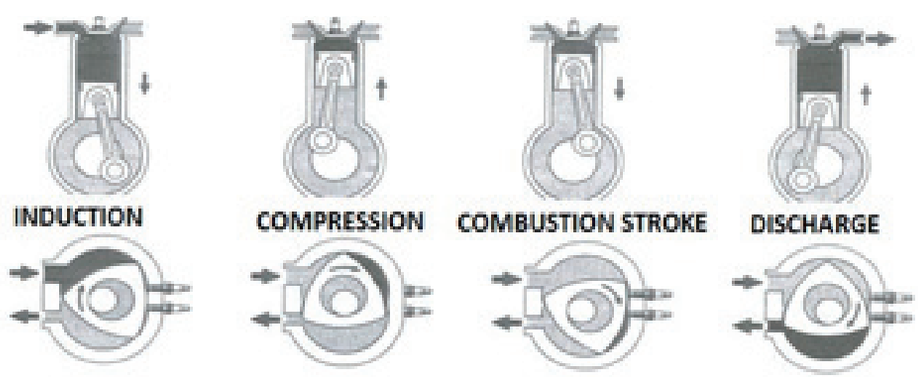


FIG.1. OPERATION PRINCIPLES OF ROTOR AND FREE-PISTON ENGINE

4. Main components of the engine and its systems

- engine body
- rotor-eccentric mechanism
- driving gears of component units
- nlet and control system

ANALYTICAL INFORMATION

The engine Rx-8 Mazda, with production 300.000 units per year, costs $15,5 thousand. The estimated cost of Russian Rotor engine is: two-section Rotor engine-321 (RD-321) with production 15.000 units per year is $5,7 thousand (150-230 horsepowers); three-section RD-331 with production 3000 units per year is $7,2 thousands (250-330 horsepowers); RD-341 and RD-345 are being developed, 4-section version V~2.6 litres, N=400 ÷ 450 horsepowers.

In USA, works were held on creation of Rotor engine of high capacity up to 3000 horsepowers with specific weight 0,8kg/horsepower for U.S. Navy, in diesel and gas versions, but since 2003 these works have been classified as secret. China has begun development of Rotor engine for armed forces, over 100 scientific-research institutes are participating in the project.

BUSINESS PROPOSAL

Organizing certified series production of variety of Rotor engines of various purpose and integration.

Project is presented by International Academy of Engineering (IAE) in cooperation with Taiwan Chapter of IAE.

WAVE MONITORING OF STATE OF STRUCTURES

ABSTRACT

Russian scientists developed and implemented in the industry a universal **information technology** of reliable monitoring of physical parameters of current durability operation life.

The technology makes it possible to carry out direct and real-time measurements of parameters of stressedly-deformed states for reliable estimate of current performance data of durability resource of natural-technical systems and objective prognostication of **safe operation of critically important object of human environment**.

Instrumental soft hardware for efficient monitoring of power machines, mechanisms and constructions have been made and successfully tested. Information technology of technogenic safety makes it possible to considerably reduce losses from emergency situations, which may arise due to lack of operational discipline in industry and construction, decreases risks of terrorist actions, exceeds by several parameters the world science and technological level.

Innovation is very actual in the most important branches of economy: heat and nuclear energy, extraction and transportation of fuel, space and aviation, sea and ground transport, industrial, civil and military construction, all kinds of general and heavy machine-building, transport natural-technical systems and earthquake objects, geodynamic, hydroacoustic and bioenergenic systems, geological survey, risk insurance of emergency situations, construction nanomaterials science.

PURPOSES OF THE PROJECT

= technical and instrumental control, monitoring of state of infrastructure objects and natural-technical systems;

= ecological and technological monitoring of potentially dangerous objects in machine-building, energy, hydroacoustics, construction and other areas.

The project is presented by International Academy of Engineering (IAE) in cooperation with Taiwan Chapter of IAE.

台俄合作
計劃專欄

特別報導

COLLABORATION

資料來源：俄羅斯科學院

Over twenty years ago, the first delegation from the Siberian Branch of the Russian Academy of Sciences visited Taiwan and participated in the conference on air-space researches held by NCKU. This visit meant the start of cooperation between our researchers who now meet regularly in Taiwan and Siberia. Some Novosibirsk scientists were invited for a long period as visiting professors or for the post-doctorate program, students of Novosibirsk universities participated in under-graduate, master, and post-graduate programs. The official collaboration however started upon signing the Memorandum between SB RAS and NSC which stipulated joint researches on various topics, symposia in Siberia and Taiwan, exchange of visits and other events.

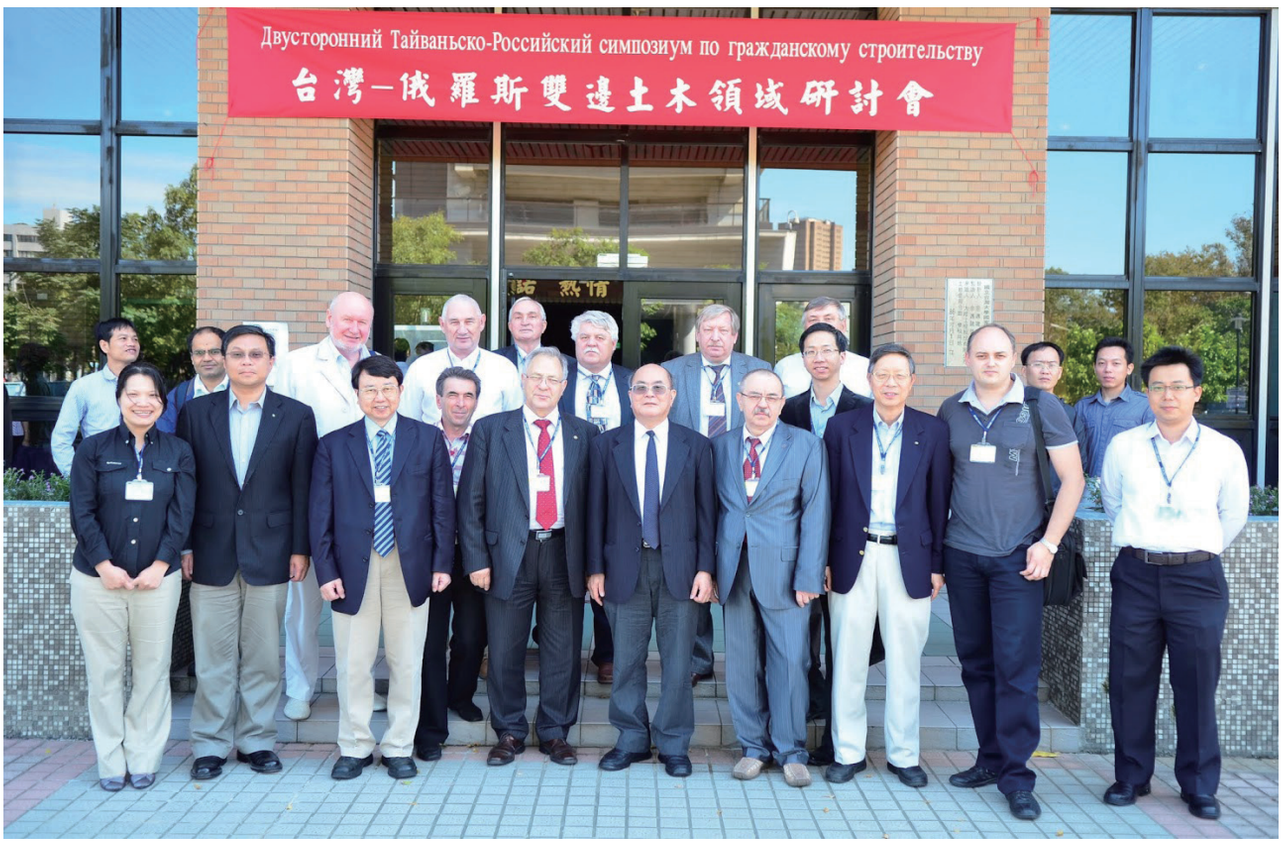
Every yearcompetition is held in various fields such as semiconductor physics, geology, biophysics, air-space investigations, material sciences, etc.

台俄雙邊土木領域研討會　　2012/11/03 攝於國家地震中心

The new trend occurred in the collaboration line after the meeting with Prof. Yen-Liang Samuel Yin and delegation led by Academician Vasily Fomin in 2010 in Taipei. Academician Fomin was interested in the problems of concrete reinforcement and its application in seismic-resistant construction. Great attention is focused on these issues in ITAM SB RAS and Geophysical Service SB RAS. In 2012, there was a symposium in Taiwan ("Innovative Technologies for Seismic Applications in Civil Engineering") performed within the framework of the collaboration between SB RAS and NSC; the chairmen were Director of NCREE Prof. Kuo-Chun Chang and Academician V. Fomin.

Not only Taiwanese experts on seismology, construction took part in the symposium, but also researchers dealing with associate issues such as material strength, material sciences, mathematical simulation, nanotechnologies, measuring systems; among them there were Samuel Yin, C.C. Chou (NTU), S.J. Huang (NTUST), K.N. Chiang (NCHC), Y.R. Jeng (NCYU), K.L. Wen (NCU), and many others. The Russian side was represented by the researchers from several institutes of SB RAS: V. S. Seleznev (GS), Yu. V. Chuguy (Technological Design Institute of Scientific Instrument Engineering), A.F. Emanov (Altaj-Sajan Branch GS), V.V. Moskvichev (Special Design and Technological Office "Nauka", Krasnoyarsk Scientific Center), A.V. Fedorov, E.I. Kraus (ITAM SB RAS) and others.

It was noted that there were many issues of common interest when the results could complement each other, and experimental findings of each side could be commonly utilized in calculation activities. Combination of the achievements of Taiwan seismologists and large developments of specialists from SB RAS can play important role in the development of seismological monitoring technologies; among them, above all, are the standing-wave analysis in engineering seismology, and vibration seismological investigations with powerful sources created in SB RAS.



台俄雙邊土木領域研討會報告者合影　　2012/11/03 攝於國家地震中心

In July, 2012, the delegation led by Prof. K.C. Chang, Director of NCREE, visited some institutes of the Novosibirsk Scientific Center. In ITAM SB RAS, the Taiwan visitors got acquainted with the works on mathematical simulation of the deformation and breakage of various materials.

The leaders of the Geophysical Service SB RAS organized a tour to a special field near Akademgorodok, on the shore the Ob' reservoir. This vibroseis field was created in 1979 to test the non-explosive driven sources of seismic waves – powerful vibrators are designed to study the Earth's crust and mantle, experimental studies on a number of fundamental problems in geophysics, such as the investigation of the stress-strain state of the geological environment, development and testing of new methods for detecting precursors of dangerous seismic events, the study of nonlinear interaction of geophysical fields and different nature etc. The visitors observed the performance of powerful earthquake simulators and saw the obtained results of fundamental researches.

All these meetings in Siberia and Taiwan, opinion exchange, discussions and negotiations resulted in the agreement for common researches on innovative calculation concepts and design of reinforced structures, sublimation of concrete behavior under different loadings, performed in ITAM under the supervision of Prof. Yu. Nemirovsky. The contract was concluded between ITAM and NCREE; the purpose of the contract was the creation of new models of reinforced framing deformation and breakage-concrete structures as thermodynamically non-equilibrium heterogeneous nonuniform and anisotropic systems in order to predict their behavior due to the variation in the internal structures of discrete and continuous reinforcement. It is suggested that the methods of prediction of deformation material properties be developed as geometrical and phase characteristics of the structural elements are changed; the target is to find the optimal and reasonable reinforcement structures which would provide maximal characteristics of reinforced products from the viewpoint of strength, rigidity, and performance reliability with the maximum achievable saving of consumables.

The first stage of this cooperation project is to be over soon.

In 2013, the bid was opened for the program of SB RAS and NSC; in included such topics as the Earth Sciences, Geology and Geophysics for Civil Construction. The joint project proposed by the Geophysical Service SB RAS (PI Prof. A. Emanov) and NCREE (PI Prof. K.C. Chang) entitled as "Experimental and theoretical methods for the study of seismic stability of high-rise buildings and monitoring technologies" succeeded in this bid.

Cooperation between Siberian and Taiwan scientists already gained recognition. In November, 2013, the First International Forum on Technological Development "TECHNOPROM – 2013" took place in Novosibirsk.

As noted by the Forum chairman, Deputy Prime Minister of the Russian Federation Dmitry Rogozin: "One of the key challenges for the Russian Federation in the XXI century is to achieve a technological breakthrough. This task requires to create the effective mechanism for cooperation between the representatives of modern high-tech business, development institutions, state authorities, Russian and foreign investors.

In this respect, the International Forum on Technological Development "TECHNOPROM–2013" assumes special significance. The Forum will become an important platform for promotion of the scientific achievements and the technological developments.

Novosibirsk region is the traditional scientific and innovative center, which has the significant potential for technological breakthrough and creation of the necessary conditions for further development and prosperity of the region".

The delegation of Taiwan Chapter of International Academy of Engineering was invited to take part in TECHNOPROM-2013.

One round-table meeting was devoted to innovative materials. Mr. Raymond Wan made a presentation of spiral concrete reinforcement.

We believe that the cooperation between the Siberian Branch of Russian Academy of Sciences and Taiwan Chapter of International Academy of Engineering will give practical results which will be used in both our countries.

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