

MODULAR HYDRO-POWER FARM

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ABSTRACT

This article is devoted to the new types of the energy installations - Modular hydro-power farms (MHPF), their designs and work. MHPF function on the basis of the ecologically clean renewable energy sources, i.e. the kinetic energy of low head ocean, sea or river flows.

High level of MHPF quality indexes is conditioned by use in these electric power stations new perfect basic energy components, namely turbines and generators converting the kinetic energy of the water flows into the A.C. electric power of industrial frequency with high values of efficiency, reliability and maintainability. Expediency of MHPF creation and use is conditioned by a number their merits in power, economic, ecological and social aspects. The most significant merits are the following:

- Lack of necessity of the dam, power plant building and reservoir erection too which are the most expensive components of Hydro-electric power station determining besides total time its erection;
- Exclusion of dandification to environment (change of climate and natural landscape, alienation of lands suitable for the economic activity: flood of forests, settlements, partial destruction of fisheries, etc.);
- MHPF creation is, in essence, industrial process of the basic equipment production; it is more adaptable to manufacture and, therefore, more qualitative and cheap in comparison with the HPS technology of erection.

**FROM SEISMIC INVERSION TO APPLIED OPTICS: A NOVEL APPROACH
TO DESIGN OF COMPLEX SYSTEMS**

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ABSTRACT

Propagation of seismic waves studied in geophysical prospecting and propagation of optic waves through defined media are based on the same physical-mathematical principals. It makes possible transferring modern procedures developed in the first field to the second one and back. In this paper we suggest to transfer novel procedures developed in seismic prospecting, to applied optics. For such a conversion we selected two developed approaches:

1. Homeomorphic Imaging, and
2. Novel description of boundary conditions.

The first approach is based on the employment of revealed local theoretical relationship between the geometrical characteristics of two fundamental beams and geometrical properties of geological layers (bodies) of the studied media. Geometrical characteristics of the fundamental beams are spreading functions and curvatures of the special wave fronts. The second approach – new description of boundary conditions permits to determine a perfect seismic (optical) system having necessary focusing and imaging properties, which is free from any aberrations. An optimal optical system is determined as an arrangement corresponding to some perfect system with the admissible accuracy. Application of the developed procedures in the optic design will permit to apply a description of optical surface using :

- a. Parametric functions,
- b. Differential equations, and
- c. Mixed (parametric-differential).

On this base the optical systems consisting of minimal number of optical elements with complicated shape might be promptly computed. Other important application field of the suggested methods is design of optical systems with diffractive elements

**OPTIMIZATION OF INTEGRATION PARAMETERS
OF SUSPENSION SHELL STRUCTURES**

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ABSTRACT

The problem of the optimum physical and geometrical constructive parameters of suspended structure are considered. The problem is formulated as one-criterion, multi-parametric, non-linear, of non-evident aspect. A local search is based on concept of the Hook-Jeevs method. A global search is executed using the method of test points. An example of parametric optimization of one-bay suspended combined structure witch vertical suspensions is presented.

**USING OF THE KANTOROVICH METHOD FOR MODELING
OF BENDING VIBRATION OF THE FLOATING BRIDGE SYSTEMS**

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ABSTRACT

Within the framework of the general fluctuation problem of the floating bridge systems under the action of rolling load, bending fluctuation of the bridge construction in vertical plane are considered. The full decision of the problem by Kantorovich method is given taken into account effect of the fluctuation damped by means of the Rayleigh functions. The comparative analysis of the Fourier method and Kantorovich method is undertaken.

ECOLOGICAL INFLUENCE OF FIRES ON ENVIRONMENT

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ABSTRACT

Factors influencing on value of ecological influence of fires are defined. It is established that rate of fire service provided by fire divisions is of great value. This rate of service of burning objects, cities and settlements provided by fire divisions depends on quantity of fire teams, fire trucks, and also on distance which team must cover therefore on time of arrival at object.

**DYNAMICS OF FORMATION OF AIR STREAMS
AND TEMPERATURES FIELDS IN PREMISE**

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ABSTRACT

Results of mathematical modelling of aerodynamic heat processes of interaction of ventilating streams with convection streams from sources of heat in premises are submitted. For the description thermo- and aerodynamic processes Equations of non-stationary two-dimensional non-isothermal movement of air and k- ϵ models of turbulence are used for description of thermo- and aerodynamic processes. Detailed numerical research of formation of air streams and temperature fields is executed.

**REVEALING FLAWS BY QUANTITATIVE ACOUSTIC EMISSION
NON-DESTRUCTIVE AND PHOTO-ELASTIC METHODS**

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ABSTRACT

Research performed by Quantitative Acoustic Emission Non-Destructive Inspection (QAE NDI) and by photo-elastic methods reveal and determine quantitative statistical Acoustic Emission (AE) indications that would enable the recognition of individual and interacting flaw development and assess flaw danger levels according to fracture mechanics criteria. Elaborated techniques allow:

- Revealing and determining quantitative statistical AE indications that would enable the recognition of individual and interacting flaw development (pitting and cracking) and assess flaw danger level in accordance with fracture mechanics criteria.
- Establishing acceptable and critical danger levels of flaws in industrial equipment.
- Guarantee of reliable diagnosis of the integrity of the entire structure, and evaluating of kinetics of flaw development within specified time intervals.
- Estimating of remaining lifetime of equipment with interacting flaws using theoretical calculations, based on results of QAE NDI.

**URBAN SYSTEMS OF LOW GAS PRESSURE:
MODELS OF OPERATIONAL CONTROL**

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ABSTRACT

A new scheme of extraction and control of gas streams for individual consumers or consumer groups is offered. Mathematical model of the functioning control based on the formation of a feedback between the gas consumption rate and the executive organs of control system for this scheme is considered.

**SIMULATING OF A HEAT TRANSFER PROCESS IN ROAD STRUCTURE,
EQUIPPED WITH A SNOW MELTING SYSTEM**

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ABSTRACT

A non-stationary mathematical model of a heat transfer in the road structure equipped with the embedded hydraulic system preventing the formation of snow and ice coating of the road surface is numerically investigated and formulated. The mathematical model allows designing the energy saving modes of operating for snow melting systems taking into account various mechanical and meteorological factors.

**RISK OF BEGINNING OF LIMIT STATES
IN FERRO-CONCRETE ROAD BRIDGES AT EARTHQUAKES**

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ABSTRACT

Probability calculation of limit states origin in ferro-concrete main beams of road bridge at earthquake based on the risk theory is described. Suggested procedure orients on using of modern finite elemental complexes and programs of probability analysis. Example of calculation of standard bridge structure is given.

**PHYSICOSTATISTICAL FORECAST
OF SHORT-TERM ROAD ICE FORMATION**

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ABSTRACT

The necessity of perfection of operative road winter maintenance control is proved. Decisions of a problem on the basis of perfection of the road weather system are offered. The technique of construction of statistical models for the short-term forecast of ice formation on road surfaces is considered. The project of a “virtual” road meteorological station for realization of received results in practice of the road winter maintenance is offered.

**ORGANIZATION OF ENERGY SAVING IN HOUSING
AND COMMUNAL COMPLEX OF MUNICIPALITY**

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ABSTRACT

Analysis of energy effectiveness in Russian Federation and abroad is undertaken. Methodological bases of organization of energy saving in housing and communal services of municipalities are suggested.

**DEFORMATION NON-LINEAR CALCULATION
OF REINFORCED CONCRETE T-SECTION BEAMS**

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ABSTRACT

Algorithm of deformation non-linear calculation of a bending reinforced T-beam with common reinforcement is considered. Flat sections hypotheses, a three-linear diagram of concrete compression and unimpeded deformation at tension are taking into consideration. An example of the calculation of a ribbed bridge superstructure is given.

PNEUMATIC SHUTTERING SYSTEMS: RESEARCHES AND USE

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ABSTRACT

Technological aspects of pneumowireframe shuttering use at construction of span and enclosing structures are proved. Results of experimentally-theoretical researches on studying of pneumatic shuttering under operational loadings are described. Technological parameters of the pneumowireframe shuttering at various stages of its use are established.



**MODERN PROBLEMS OF THE COMPUTER-AIDED DESIGN
OF BUILDING STRUCTURES**

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ABSTRACT

The paper presents the basic modules of the new computer complex of calculation and design of building structures (MCAD) integrated into AutoCAD media. MCAD allows to define the stress-strain state of a structure at static and dynamic loading and to realize a number of the main designing functions