



# SKOLKOVO ENERGY STARTUPS

2020



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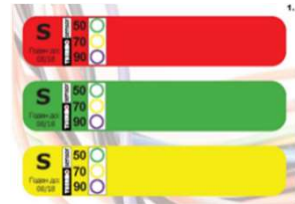
Hyper-Smart Office Buildings

Other projects

# ThermoSensor – predictive contacts and wires monitoring system

## PRODUCT

- Gas-emitting stickers and remote sensors for online high-voltage contact connections and load carrying wires monitoring
- Preliminary to overheating and combustion of insulation ThermoSensor sticker emits portion of harmless signal gas which is detected by wireless ThermoSensor
- Risk of failure or fire is indicated by remote and audio-visual alarm system
- Unique monitoring solution for 220 volts up to 220 kilovolts switchboards for institutions and households, grids and industry



## COMPETITIVE ADVANTAGES

- The cheapest meanwhile uniquely reliable solution on the market - compared to periodical thermal imaging ThermoSensor solution provides 24/7 reliable protection
- The capital cost to protect switchboards with stickers is €5 to €15 with zero OPEX
- Significantly reduces cost of maintenance of grids and electrical facilities



## ACHIEVEMENTS

- ✓ Scalable mass production facility setup
- ✓ Industrial end-user solutions developed with ABB, Schneider Electric, etc.
- ✓ ThermoSensor is widely used in schools, medical, electric grids, industry in Russia
- ✓ Patented unique solution to signal with gas specific combination



<http://thermoelectrika.com/en/>

# Metsbyt - conductor cable with double capacity

## PRODUCTS

- High-temperature and high-tension conductor cables for overhead power lines
- Current load 2-times higher to double operated powerline capacity
- Widely implemented in Russian grids, tested for Europe by SAG (Germany)

## COMPETITIVE ADVANTAGES

- 30% higher breaking tension for 13% less powerline construction CAPEX
- Costs 3-5 times lower compared to analogous Aero-Z®, J-POWER®
- Metsbyt solution perfectly fits Ten-year network development plan (TYNDP) for development of all-European power grids (20 000 km of new lines, 4 600 km to upgrade)
- Metsbyt offers modernization of high-voltage power lines to increase power transmission up to 100% more power transmitted with 20% increase in CAPEX
- Long distance high-voltage power lines construction with 30% lower OPEX
- Modernization of power lines to increase lightning resistance for operation life increased to 50 years

## ACHIEVEMENTS

- ✓ Innovative technology is based on unique technology of plasticly deformation of steel strands to increase strength and adhesion of the core
- ✓ Mass production launched in Russia (Severstal) and Italy (Redaelli) up to 10 000 km per year





# RF Sens – ultra-stable wireless temperature & current sensors

## PRODUCTS

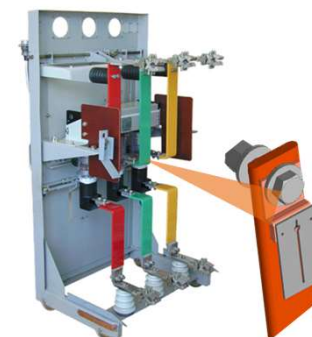
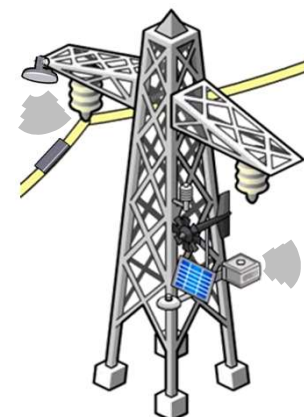
- Temperature and current measurement gages for HVAC equipment 10-750kV: contact connections, conductors, transformers
- Measurements for technical diagnostics and prediction, power and load switching
- Online grid monitoring systems leads to an increase in the service life and capacity

## COMPETITIVE ADVANTAGES

- Unique operating principle through passive radio frequency vibration, which allows placing sensors on current-carrying elements and on rotating parts
- Temperature up to +400C, mechanical, magnetic and electric fields do not influence measurement results
- Passive design allows for no batteries, reading range up to 15 meters, online accuracy up to 1 degree

## STAGE OF PRODUCT AND IMPLEMENTATION EXPERIENCE

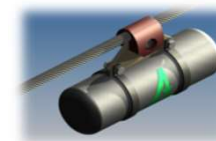
- ✓ Pilot operation at various power and industrial plants, high-voltage grids
- ✓ Commercial applications in power grids to control and manage grid capacity
- ✓ Produced in Russia, protected by patents and certified



# Trinity – distribution grid fault monitoring system

## PRODUCT

- Software analytical system for calculating the load of the power system with automatic recalculation of the optimal switching bypassing the damaged section
- Combined with autonomous wireless compact measurement units: wires mechanical characteristics, tension, deflection, 3D-tilt, vibration, weather conditions



## COMPETITIVE ADVANTAGES

- Increases transmitting capacitance of an overhead power lines and manages peak loads
- Clear and simple management using on-line analysis of data derived from diagnostic
- Online decision making, including control of power flow switching
- Using probabilistic and artificial intelligence algorithms allows to guarantee fault protection
- Predictive functions enabled to detect evolving faults in advance and reduce outages



## ACHIEVEMENTS

- ✓ Smart sensor hardware modules in serial production and under pilots in Russian grids
- ✓ Constant software and hardware design development for new functionality
- ✓ Co-development activities set up in Switzerland



<http://trinity-sk.ru>  
<https://a3.energy/solutions>

# Profotech - all-digital measuring transformers for digital substations

## PRODUCT

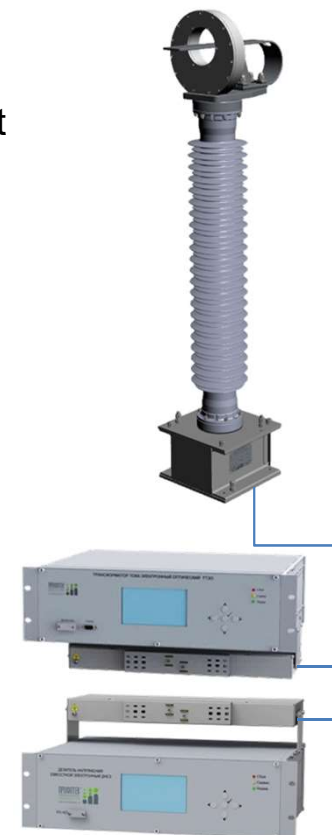
- All-digital instrument measuring transformers based on photonics technology
- Designed for high-accuracy current and voltage digital measurements with digital output signal generation for Digital Substation according to IEC 6850-9-2 LE standard (for using by secondary equipment such as energy meters, relay protection, etc.).

## COMPETITIVE ADVANTAGES

- Optical principles of current measurement, no residual magnetism effect
- Digital output interfaces (correspondence to latest IEC 61850 standards)
- Complete galvanic isolation, correspondence to modern EMC requirements with high fire and explosion safety
- Measures in a wide dynamic range (incl. short-circuit) with high accuracy for both AC and DC grids

## ACHIEVEMENTS

- ✓ Co-development with Maxwell (European market leader) and pilot implementations in Switzerland since 2018
- ✓ Numerous commercial supplies in Russia since 2015
- ✓ Production and R&D facilities set up in 2015



<http://en.profotech.ru>



# DCVT - digital current and voltage measuring transformers

## PRODUCT

- DCVT 6 (10) - 220 kV is a solution for measurement of currents and voltages data for relay protection and automation devices according to advanced IEC 61850-9.2 protocol
- Innovative sensor system converts currents and voltages, measured values are digitized directly at the high potential and transmitted to the low-voltage side

## COMPETITIVE ADVANTAGES

- The unique sensor system allows to exclude saturation, magnetization, ferro-resonance
- The usage of a solid dielectric makes DCVT explosion- and fireproof
- Advanced digital protocol IEC 61850-9.2 to apply in "Digital substations"
- The usage of DCVT allows to significantly reduce the number of secondary cable circuits, and at the same time transmit information to large number of subsystems
- Self-diagnostics systems integrated into the DCVT

## ACHIEVEMENTS

- ✓ DCVT have been successfully tested in certified test laboratories
- ✓ DCVT trial performance is held on several digital substation projects in Russian grids



<https://digitrans.ru>



# i-Tor – digital smart metering tool for high-voltage grids

## PRODUCT

- Unique on the market compact and autonomous all-digital smart metering units for high-voltage 6-220 kilovolts power grids and overhead power lines
- Electronic sensor for current and voltage measurement
- Measured data collected by optical fiber and transferred wirelessly (3G/radio)

## COMPETITIVE ADVANTAGES

- All-digital aggregate electric power and energy smart metering for 6-220 kV grids
- Compact and lightweight (40 kg) unit to organise 110 kV metering exactly at the point of supply with low CAPEX
- Reliable measuring instrument with 0.2S - 0.2 accuracy and Smart Grids standards

## VALUE PROPOSITION

- Autonomous smart metering unit at any point of 110 kV grid provide accurate instrumental revenue metering for lower losses and better profit
- Arranging of 110 kV grid data monitoring in real-time with lower costs and no need to build on the ground power substation for metering



# Mobin – control of the technical condition of the equipment

## PRODUCT

- Mobile inspections solution for field service personnel to implement risk-oriented service system aimed at preventing accidents
- Software for inspections and monitoring of the condition of equipment to reduce the accident rate and improve the productivity of staff
- SmartBox measurement and transmitting data on-line

## COMPETITIVE ADVANTAGES

- Unique SmartBox with built-in temperature measurements ( $-70...+380^{\circ}\text{C}$ ), vibration speed monitoring, RFID tags scanner and thermal imaging
- Cost-effective solution with user-friendly interface
- Integration with corporate technology and ERP information systems

## ACHIEVEMENTS

- ✓ Developed and patented software and a unique multi-functional SmartBox
- ✓ Implementations in Russia: smart grid infrastructure and power plants
- ✓ Integrated solution implemented in Lukoil Ecopower corporation



Cloud storage  
and processing  
of big data



<https://mobin.pro>



# «Optimum Energy» – Multistage Automatic Voltage Regulators which Monitor the Quality Parameters of the Power Supply Network

## PRODUCT

- Energy Optimum develops, manufactures and implements equipment that ensures the effect of energy saving and regulates the quality of electrical energy in the given parameters
- Practical solutions are presented by the energy efficiency optimiser for the voltage supply in a given range, reversible Optimum booster, which maintains the voltage on the load in the range specified by the operator, and home appliances for home or small businesses.

## COMPETITIVE ADVANTAGES

- Energy efficiency optimisers can be implemented both in new networks under construction and in old ones that have been functioning for a long time.
- With the normalisation of high voltage, by reducing the power consumption on loads with relatively constant active resistance, a saving of 5 to 15% is achieved
- High efficiency of the equipment during its operation in nominal modes
- Small size and weight

## ACHIEVEMENTS

- ✓ Implemented mass production of equipment
- ✓ Implemented multiple projects in Russia at facilities of Lukoil, Tatneft, Mosenergo, Pyaterochka, Magnit, Mosvodokanal and PepsiCo

<http://optimizator-energy.ru/>



# «ECOLIGHT» – Sparking Protection Device

## PRODUCT

- Innovative automated specialized equipment to prevent fires from sparking in electrical networks
- Ecolight detects high-frequency interference that the arcing process creates in the protected circuit and automatically disconnects it from the mains

## COMPETITIVE ADVANTAGES

- Uninterrupted work in real time
- High probability of correct detection of all types of potential sparking at the initial stage of its occurrence, as well as low probability of false alarm
- Ability to connect to standard boards, switching and network devices, circuits of mobile objects and devices having power supply from external power supply devices
- Reliability of operation and shutdown of the electric circuit in case of arcing

## ACHIEVEMENTS

- ✓ Product was successfully piloted at multiple sites under real conditions
- ✓ Successfully tested and recommended for use, as evidenced by the following expert opinion: No. 137/15 dated November 20, 2015, issued by FSBEU VPO MGSU
- ✓ 4 patents for invention and use model (No. 2528137, No. 124451, No. 2572371, No. 2580011)
- ✓ <http://ecolight.ru/>

 ecolight



Sparking Protection Device



The device is equipped with a means of control of the device, designed to test the functioning in the field of operation.



# ENREPORT - energy management system

## PRODUCT

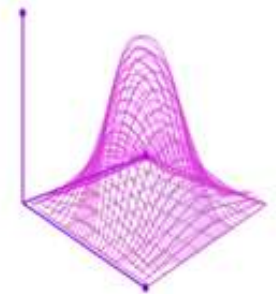
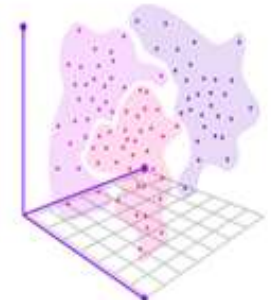
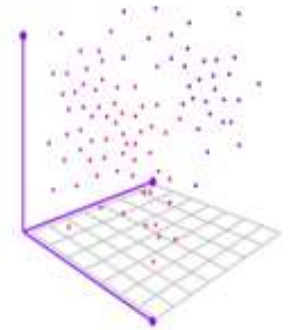
- Electricity price forecasting with hourly updates;
- Energy consumption model of manufacturing process;
- Pay-off validation with supplier, optimal price pattern selection

## TARGET INDUSTRIES

- Continuous (flow-line) and discrete manufacturing with and without energy resources management (metallurgy complexes, mining and concentration complexes, breweries, compressors and pumping equipment manufacturers, telco).
- Distributed and technologically interconnected facilities like heat or water suppliers

## TRACK RECORD

- ✓ **Brewery:** price forecasting, peak load shifting, pay-off validation with supplier, energy-output ratio calculation of manufacturing. Cost improvement by 23%.
- ✓ **Papermill:** energy consumption departmentalization; feasibility study of new generating equipment introduction; pay-off validation with supplier; energy consumption mode control from power grid and from generating equipment. Cost improvement by 17%.
- ✓ <https://enreport.ru/>



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## VDM tech - small scale wind turbine with high efficiency

### PRODUCT

- Wind power plants with an electronically controlled direct drive generator effectively generate electrical energy at a low average wind speed of 4-6.5 m/s

### COMPETITIVE ADVANTAGES

- Most efficient energy production with low-speed wind flows
- Perfectly meet needs of households, meteorologists and autonomous objects
- Vector control of the generator in the extended range of rotation speeds
- The synchronous electric generator with a slotless designed stator allowing to lower starting torque at about 10 times
- Electronic power converter allowing the vector control of the shaft to increase the efficiency of generator
- Wind rotor adapted to the low potential wind flow

### ECONOMICS

- ✓ The cost of wind turbines for 1 kW of installed capacity – USD2500-3500
- ✓ Annual energy production per 1 kW of installed capacity 2826 kWh at rated wind speed 6,5 m/s
- ✓ Rated power wind turbine capacity factor 0,32
- ✓ LCOE 0,15 USD/kWh



<http://www.vdmtech.ru/en>

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## «Alphaopen» – Universal Platform for Digitalisation of Infrastructure

### PRODUCT

- Alphaopen allows you to create a unified management and control environment, as well as intersystem interaction of a variety of engineering, technical and information systems for manufacturing purposes
- It provides a single platform to monitor, collect data, visualize it, as well as analytics and management

### COMPETITIVE ADVANTAGES

- Built-in hardware support from over 120 manufacturers
- Integration with ERP, EAM, GIS, BMS and other information systems
- Support for over 50 industrial data exchange protocols
- Equipment control and analysis of information in real time with a processing speed of over 5 million transactions per second
- 3D visualisation and navigation
- Built-in data analytics, BPM support, flexible interface configuration

### ACHIEVEMENTS

- ✓ Over 4000 objects equipped with AlphaOpen solutions
- ✓ Implemented full solution, including a situational center of security systems
- ✓ Pilots implemented at Hilton Garden Inn (Riga) and Moscow Medical Center
- ✓ Included in the list of innovative high-tech products and technologies of the Moscow Innovation Agency

<http://alphaopen.com/>

ALPHAOPEN



# «IQnergy» – Automation of Engineering Systems

## PRODUCT

- Innovative energy monitoring and control system for commercial and municipal buildings reducing energy costs due by prompting personnel to take (uses machine learning algorithms, and subsequent monitoring of their implementation)

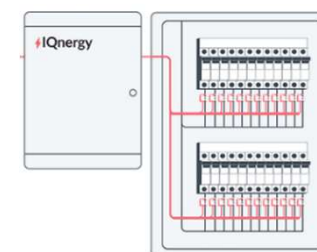
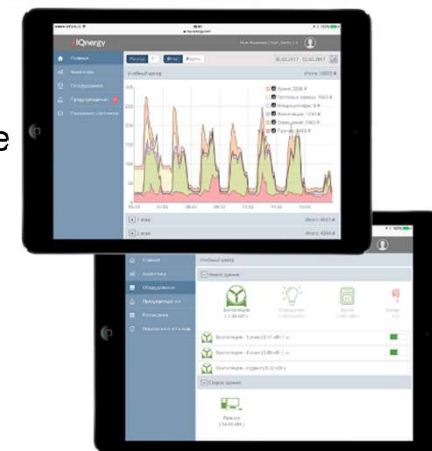
## COMPETITIVE ADVANTAGES

- Reducing energy costs: savings on already implemented projects are up to 30%
- Convenient interface: access to data on energy consumption and equipment management from anywhere with Internet access, a simple interface does not require special training
- Billing control and tariff optimisation: automatic analysis and proposal of the optimal electricity tariff
- Optimisation of repair: identification of emergency and pre-emergency situations on the analysis of energy consumption
- Installation of the system is possible without breaking the electrical and thermal networks

## ACHIEVEMENTS

- ✓ Successfully implemented projects from one of the largest retail chains in Russia
- ✓ The project was implemented in a Moscow school (20% energy savings were achieved)
- ✓ The system is installed in an office center (30% energy savings achieved)

<http://iqnergy.com/>



# MicoTech – High durability & anti-friction mineral coating technologies

## PRODUCT

- A new class of mineral coating to improve wear and reduce friction on metal surfaces

## COMPETITIVE ADVANTAGES

- Wear Resistance: Increasing the wear resistance of parts 4-5 times (500-600%), increasing the lifetime and reducing repair costs
- Anti-friction: Mineral-coated parts show no scoring and no signs of seizure, smoothing occurs, and the roughness decreases to Ra 0.1 (mirror-smooth surface).
- Increased corrosion resistance, allowing applications in vicinity of hydrogen sulfide, abrasive dust, ammonia, salt fog and in the mode of dry friction
- Application does not change the geometric shape of the parts.
- Can be applied to any geometric surface

## ACHIEVEMENTS

- ✓ Successful implementation at multiple energy facilities: Mosenergo, Kaluga Turbine Plant, Penzatyazhpromarmatura, Livgidromash, etc.
- ✓ Mico-Tech coating efficiency has been accepted and vouched in German Federal Institute for Materials Research and Testing (BAM).
- ✓ 8 years of successful experience abroad. Used in more than 10 industries
- ✓ <http://mico-tech.com/>





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## PRODUCT

- An open ecosystem for the mass market of the Internet of things, qualitatively superior to modern competitors
- It consists of a powerful central device that works on the basis of 4 technologies (Z-Wave, Wireless RF, Wi-Fi and Bluetooth) and its own mobile application, cloud service and a line of wireless smart devices

- Energy efficiency
- Compatibility with devices from other manufacturers
- Scripting between devices
- Intuitive phone control
- Instant event notifications
- Easy installation without assembling
- No subscription fee

- ✓ Conclusion of exclusive distribution contract with Leroy Merlin network for the territory of Russia
- ✓ Created a comprehensive solution that is constantly updated and supplemented

rubetek



Удаленное  
управление



Экономия  
электричества



## Сценарии



# MY SMART FLAT – Digital Infrastructure of Residential Complexes

## PRODUCT

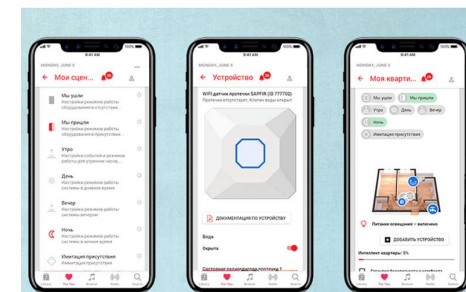
- Complete solution for the creation of a smart flat
- Single handy application for solving a set of issues related to the acquisition of housing, its arrangement, operation and housekeeping

## COMPETITIVE ADVANTAGES

- Each device and can be used regardless of other hardware components
- Ease of use - WPS mode, minimum settings
- Easy to connect - 220V power for most devices
- Data security, encryption and backup
- Switch to local control using a smartphone or when there is no connection to the cloud server

## ACHIEVEMENTS

- ✓ Contracts have been concluded for the installation of basic packages of the Smart Home system and connection to the MySmartFlat platform for 4-objects of Kortros Group of Companies (14 blocks)
- ✓ Pilots projects with PJSC Sberbank and PJSC Rostelecom.
- ✓ Part of the Moscow Institute of Technology and Information effort to build a “Smart Neighborhood”
- ✓ Developed a single cloud integration platform MySmartFlat and a line of IoT devices for the “Smart Home”





# SMART HOUSE SENSEHOME – design and Implementation of Smart Home Systems

## PRODUCT

- Full cycle technology from design to smart home system implementation
- Own development of controllers, user and internal software

## COMPETITIVE ADVANTAGES

- Automatic creation of project documentation
- Automatic creation of software configuration of the system based on project source data
- Specialised technology for the assembly of automation panels
- Software and hardware automation testing system
- Intuitive Connection Diagrams

## ACHIEVEMENTS

- ✓ Installed more than 100 smart home systems in new developments
- ✓ More than 300 organizations interested in partnership in Russia, the CIS, Europe and Asia
- ✓ Received certificate of state registration for own software

умный дом  
**SenseHome**



## «Tion» – Smart Microclimate Systems

### PRODUCT

- Energy-efficient ventilation and air-conditioning system with the ability to automatically control the parameters of the air environment and air monitoring using unique control mechanisms
- Creating a comfortable and healthy microclimate in the apartment with the windows closed - without noise and pollution from the street

### COMPETITIVE ADVANTAGES

- Compact and affordable system
- Quickly customizable and easy to manage
- The highest filtration class among household appliances
- Smart algorithms for air heating and climate control
- Minimal power consumption with maximum comfort

### ACHIEVEMENTS

- ✓ Tion already mass-produces multiple products:
  - MagicAir Base Station: Central Control Unit
  - Breezer: Ventilation equipment for homes and offices (Two models: Tion O2 & Tion 3S (silent & with recycling function))
  - CO2 + Sensors: Monitoring Peripherals
  - <https://pro.tion.ru/en/>



# Watts – modular energy storage solution

## PRODUCT

- WATTS solution provides households to set up personal power plant utilizing any available green power source, battery and grid socket
- As easy as using TV, just connect the socket and push the On button
- Adjust the capacity and power by adding number of modules

## COMPETITIVE ADVANTAGES

- Each WATTS module includes all power supply components: batteries, invertors, power electronics and does not require assembly or installation
- The modular system is maintenance-free, extremely easy to use and works on the principle of plug-and-play
- Cloud base IoT solution with Smart Home compatibility and mobile app
- Each 10 kg module stored energy 1.2 kWh (scalable up to 24 kWh), 1.5 kW output power (scalable up to 30-60 kW)
- Grid, solar, wind, generator AC220/DC24 input, AC220/DC12 output

## ACHIEVEMENTS

- ✓ Low-scale production set up, numerous CE tests passed
- ✓ Pilot projects in Switzerland, Finland, Russia negotiated and launched



<https://wattsbattery.com/de/hauptseite/>



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# «TION CityAir» – Air Quality Monitoring System

## PRODUCT

- Quality monitoring system + interactive air pollution map operating on the basis of compact micro monitoring stations with particle sensors PM2.5, PM10, atmospheric pressure, temperature and humidity
- Useful to the city as a tool for monitoring and designing the urban environment and citizens to choose homes or places to walk

## COMPETITIVE ADVANTAGES

- High detection standard
- Monitoring stations automatically send sensor data to the server every 5 minutes
- Analytics allow prediction of future air quality
- Can be integrated with stations from other manufacturers
- Affordable and intuitive interface
- Own API that allows to upload data to third-party software

## ACHIEVEMENTS

- ✓ Provides a wide range of air quality parameters (including toxic substances, small particles etc.)
- ✓ Winner of the contest MosGorTech 2017

<https://cityair.io/about-project/>



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# Thin films R&D center – cutting edge solar technologies development

## PRODUCT

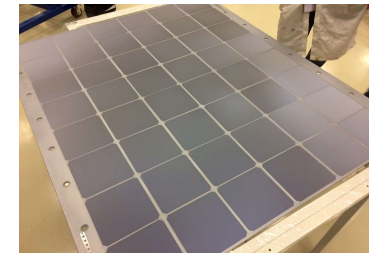
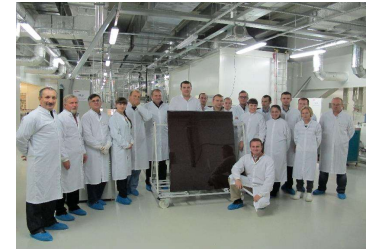
- Silicone-based high-performance thin-film solar cells' production technology developed
- New nanostructured materials and coatings in solar energy and microelectronics
- Shared used lab & center of certification in solar energy launched

## COMPETITIVE ADVANTAGES

- Full-scale production technology of solar cells with 22+% efficiency (top-3 global)
- HIT technology is adapted on HEVEL solar factory production line
- Techniques have been developed and field tests cells and modules by heterostructure a-Si/c-Si technology
- Formed production based on research results
- Provision of services for fast prototyping by customer's process maps

## RESULTS ACHIEVED

- ✓ Factory upgrade resulted doubling production up to 160 MW per year
- ✓ State-of-the-art laboratory and analytical techniques with 35 world-known solar scientists and technicians to solve promising scientific and engineering tasks
- ✓ Partnership with Ioffe PTI, SPbSU, SPU, MSU, NEXT Energy, Fraunhofer ISE



## EVOGRESS – micro CHP power systems using local fuel sources

### PRODUCT

- Individual micro thermal power plants based on a free-stirring Stirling engine for constant power supply (electric, thermal energy, hot water supply) of residential and commercial buildings
- Possibility of building a cascaded mini-CHP, as well as virtual power plant when supplying geographically distributed objects.

### COMPETITIVE ADVANTAGES

- High engine life that does not require maintenance during the entire life cycle (up to 100,000 hours);
- High efficiency in cogeneration mode - up to 98%;
- Low operating costs and optimum power rating of the power plant for a specific consumer.

### ACHIEVEMENTS

- ✓ The equipment is entered in the register of power equipment of PJSC Gazprom and has a certificate of industrial safety
- ✓ Pilot samples of products for power supply of remote objects located on main gas pipelines have been developed and delivered to the customer
- ✓ A line of 1, 4, 7 kW units has been developed, factory and pilot tests have been carried out



<http://evogress.com/en/>

# Brosk – Heat Pumps for Heating and Air Conditioning Buildings

## PRODUCT

- Heat pump that converts low-grade heat of soil, waste water or ventilation emissions into high-grade heat for heating and conditioning buildings with savings of up to 85%
- To ensure maximum energy efficiency, the technology of pulsed heat extraction using a corrugated stainless steel tube as a probe is used.

## COMPETITIVE ADVANTAGES

- Combining heating and air conditioning in one device
- Production of 4 kW of heat at a cost of 1 kW of electricity
- The average payback period of heat pumps “BROS K” is 3 years, competitors - from 6 years or more
- Reducing the cost of heating up to 4 times compared with classical sources of heating

## ACHIEVEMENTS

- ✓ Established mass production
- ✓ The product is marketed and ready for use.
- ✓ It is being introduced in Moscow at the facilities of JSC Mosvodokanal, as well as at residential facilities in Tver





# ALTECHNOLOGIES – environmentally friendly energy sources with high capacity based on the aluminum fuel

## PRODUCT

- Autonomous power sources of different capacity (pre-serial prototypes)
- Portable USB power source
- Aluminum-air power generator for off-grid e-scooter/bike charging stations



## COMPETITIVE ADVANTAGES

- Full autonomy from the power grid
- Mechanical fuel recharging
- Environmentally friendly and safe to use (no fire or explosion danger)
- No toxic materials and precious catalysts
- High energy density: up to 400 W·h/kg
- Source of electrical and thermal energy: works at a wide range of temperatures
- Low cost of power source in material: \$300-550/kW and less than \$150/kWh
- Long-term storage without: maintenance, losses of energy, characteristic deterioration and special storage conditions: about 20 years and more



## LOOKINF FOR

- ✓ Customers for the future products
- ✓ New actual needs for off grid power supplying
- ✓ Partnership for developing new products based on the aluminum air technology
- ✓ Partnership for developing new energy solutions and technologies

<https://al-technologies.com>

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## «Vacuum Designs» – Baseboard Heaters

### PRODUCT

- Two-phase heat generator with low energy consumption due to “heater - enclosing structure”, which allows increased heat-transfer and reduce heat loss of the heated air volume
- Intelligent microcontroller achieves highest comfort at high efficiency

### COMPETITIVE ADVANTAGES

- Low power consumption with high heat dissipation
- High coefficient of useful heat, having a temperature distribution in the room in height, close to ideal
- High reliability, low cost
- Allows you to save the heated surface from condensation, excessive moisture / moisture and even mold / mildew
- Compact design allows to place heaters also near full height windows, without visual obstruction

### ACHIEVEMENTS

- ✓ Installation of products on hundreds of objects, incl. Petrovsky Stadium (St. Petersburg), HONKA houses, Pyaterochka chain stores, at gas stations
- ✓ The batch production technology has been developed
- ✓ Sales through federal electronics networks





# «Photoplast» – Electrically Heated Glass

## PRODUCT

- Heated glass panels that emit infrared rays increasing the temperature of surfaces and objects on which they fall, creating an even heat distribution within the room without a draft effect
- Can be installed in vertical and horizontal glass panes (e.g. as part of rooflights)
- Maximum dimensions: 2000x3000 mm
- Additional products for other surfaces: ThermoUp Floor, ThermoUp Wall, ThermoUp Top



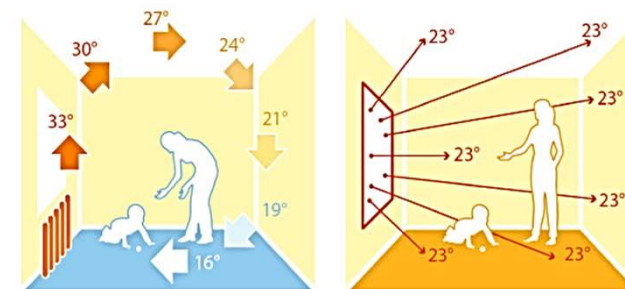
## COMPETITIVE ADVANTAGES

- Automatic climate control
- Energy saving (the amount of energy consumed per 1 m<sup>2</sup> is ~ 1.5 kW per day)
- Increased fire and electrical safety
- Uses regular AC 220 V supply without the use of transformers
- The possibility of manufacturing with a heating temperature up to 300 °C



## ACHIEVEMENTS

- ✓ Cooperation with construction companies
- ✓ Currently actively used at customer sites
- ✓ The product is ready for use
- ✓ Own design office and research center



# «ThermoGlass» – Heating Glass

## PRODUCT

- Double- and triple-glazed windows and with electric heating
- The function of the heating element is performed by a continuous conductive coating of metal oxides, which is applied to the glass surface using a proprietary technology.
- Supply comes from a standard network of 220 V, heating temperature is regulated from 5 to 60 °C

## COMPETITIVE ADVANTAGES

- There is no "cold window effect"
- Efficiency: displays heat back into the room even when it is off, and in the summer does not allow hot air to get inside
- Double-glazed windows eliminate condensation and window fogging

## ACHIEVEMENTS

- ✓ More than 55 completed projects using this technology



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# IrbisTech LLC – dry ice leaning machine

## PRODUCT

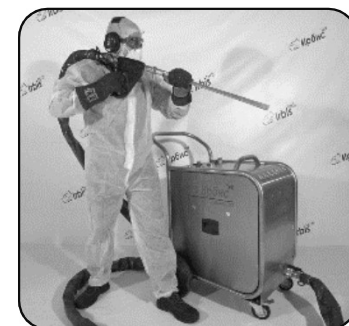
- Dry ice blasting machine that can be used for cleaning of transformers, heat exchange equipment, turbogenerators and hydrogenerators

## • COMPETITIVE ADVANTAGES

- Reduced downtime for equipment and production (up to 50% reduction)
- Increased labor productivity (reduced cleaning time)
- Effective removal of bacteria (mold, listeria, salmonella).
- Surface degreasing
- Increasing the level of labor safety at the workplace (reducing additional payments for harmfulness and increasing the duration of the working week)
- Improving the safety of storage and transportation of cleaning products
- Environmentally friendly
- Reduced production losses due to an accident
- Decrease in economic losses due to staff turnover

## • ACHIEVEMENTS

- ✓ Sales of dry ice cleaning machines in Russia from 2019.
- ✓ Preparation for manufacturing of dry ice pelletizers and for integration on some Russian dry ice plants.
- ✓ <https://new.irbistech.com/ru/>



# «EnergyTechnica» – Highly efficient and lower maintenance SpinCell Heat Exchangers

## PRODUCT

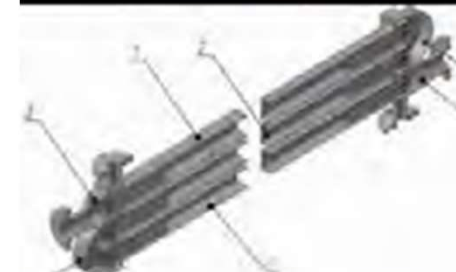
- Energy efficient heat exchangers, based on the swirling flow, with low scaling and low operating costs, surpassing the world's existing shell-and-tube and lamellar designs
- The basis of the heat exchange matrix of SpinCell heat exchangers are multiple spiral-shaped tubes
- Swirling flow interacts with the wall, actively mixing the layers turbulently, thus reducing the thickness of the viscous wall layer (self-cleaning effect)

## COMPETITIVE ADVANTAGES

- Heat transfer coefficient is 1.5-2.0 times higher than that of competitors
- Scale reduction and scaling (self-cleaning effect)
- Compact design is lighter than lamellar by 2-3 times and shell-and-tube by 5-10 times
- Resistance to hydraulic shocks, work at high pressures

## ACHIEVEMENTS

- ✓ Designed a modern robotic plant for 1500 units / year
- ✓ Successful pilot projects at “T Plus” facilities (large energy company)
- ✓ Received the approval of the Technical Council for implementation of SpinCell heat exchangers at enterprises of "T Plus"



# Avtostankoprom – Coating to reduce deposits in Heat Exchangers

## PROBLEM

- Deposits lead to poor performance of heat exchangers, as well as to downtime and premature wear
- Corrodes about 10% of used heat exchangers
- The cost of one repair of a medium-sized heat exchanger is on average €20k, the loss of profits from idle time is much higher

## PRODUCT

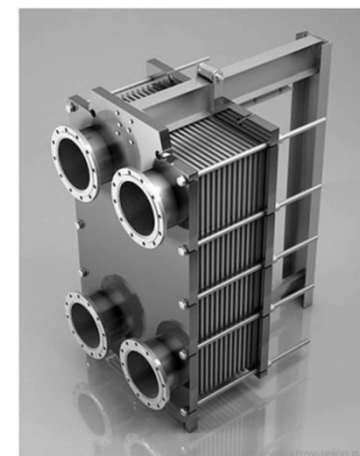
- The cleaner of heat exchangers "EPILAM-05flora-a" is liquid polymer composition for cleaning the inside pipe and outdoor space of heat exchangers
- Antiadhesive "EPILAM-05 flora-b" is a liquid polymer composition for protective-antiadhesive coating for heat exchangers

## COMPETITIVE ADVANTAGES

- Eco Biosafety coating
- Proven technology
- Easy spray application
- Long duration of antiadhesive action

## ACHIEVEMENTS

- ✓ Serial production of liquid compositions started
- ✓ Successful implementations at Gazprom, Lukoil, Sibur, GAZ





# BONAKA – Biologically active cleaning of Heat Networks

## PRODUCT

- Bioorganic fluid (BIZ-1) to clean thermal equipment from scale and deposits
- The mechanism of operation of the BIZ-1 bacterial strains is the direct effect of modified lactic acid bacteria cells, enzymes and decomposition products of microorganisms on deposits of any origin, littering pipes and equipment.

## COMPETITIVE ADVANTAGES

- Safety: does not damage equipment, passive to metals, gaskets, fittings, plastic and other materials, forms a protective film
- High efficiency: Reduces needs for maintenance and increased efficiency
- Environmentally friendly: Product is fully biodegradable

## ACHIEVEMENTS

- ✓ The product is marketed. More than 1500 objects.
  - Residential & public buildings in 19 regions of Russia, incl. Ministry of Education, Ministry of Interior
  - Central heating networks in 10 regions of the Russian Federation
  - Industrial enterprises Bashneft, Rosneft Refinery, Russian Railways, etc .;
- ✓ Nationwide dealer network in Russia
- ✓ Production site in Krasnodar



# ANGARA – Cleaning of deposits in heating systems

## PRODUCT

- AlfaPEROX active selective composition removes all types of deposits, does not damage equipment, acts quickly
- The cleaning potential is due to the catalytic decomposition of AlfaPEROX in the pores of the sediments, resulting in micro-level local zones of high and low pressure with the destructive action (“microexplosions”), leading to mechanical rupture and crushing of sediments to a sandy state

## COMPETITIVE ADVANTAGES

- Does not violate the operating conditions of the equipment
- Does not damage metals and seals materials.
- Works at low temperatures
- Removes non-reactive deposits

## ACHIEVEMENTS

- ✓ Successfully completed pilots for cleaning heat exchangers in Taneko (Nizhnekamsk), RNPk (Ryazan), NLMK (Lipetsk), MUP “Teploset” (Domodedovo)
- ✓ A pilot series of cleaning units has been manufactured
- ✓ Selected line of compositions for different types of deposits have been developed





# AEROTRUCK – the only proven aerodynamic skirt in Europe

## PRODUCT

- Aerodynamic skirt for semi-trailers and trucks that cuts fuel consumption and emissions by 4-5% (confirmed by multiple independent 3rd party tests)
- Saves €3000-5000 per vehicle per year! 5-7 months payback

## COMPETITIVE ADVANTAGES

- The only aerodynamic skirt in Europe that uses design and materials proven in America over 7+ years of service
- co-developed with the biggest skirt producer in the world, American RidgeCorp (exclusive supplier of skirts to DHL, FedEx, JB Hunt, Schneider, etc.)
- At \$1500 3-4X cheaper than competition
- Simple modular structure: no complicated moving parts to break, no maintenance necessary

## ACHIEVEMENTS

- ✓ Ran pilots w big European fleets (X5 Retail, Globaltruck, Delovie Linii, Iteco) all confirming 4-5% fuel savings. Launching pilots w EU Co's (Gefco & Girtka)
- ✓ After successfully testing the product, X5 Retail (biggest grocery chain in Russia, \$25B revenue) & Delovie Linii (biggest transportation Co in Russia) started buying our skirts on their fleets





# «Intellect-Auto LLC» – Intelligent Vehicle Management System (IVMS)

## PRODUCT

- Hardware and software solution for online monitoring and predictive analysis of current parameters of internal combustion engine operation
- Automatic notification and issuance of recommendations to prevent possible emergency condition

## COMPETITIVE ADVANTAGES

- 26 high-precision sensors allow full engine control. Each sensor is capable of up to 1000 measurements per second, giving the most accurate result
- Instant notification about the engine state through SMS, e-mail, messengers
- Dozens of different engine operation scripts allow the system to prevent 90% of all faults
- Industrial components design allows to operate in extreme temperatures from -40 C to +85 C
- The control unit has 22 universal ports, which allows to connect additional sensors and expansion modules

## ACHIEVEMENTS

- ✓ IVMS was tested and installed on more than 70 BelAZ mine dump trucks
- ✓ Prototype of predictive analysis system is in experimental operation Siberian Anthracite JSC, Taldinsky west open cut LLC, Novoangarsky dressing plant LLC

