



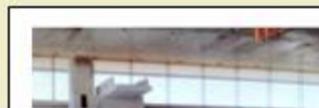
# Science Park “Kyivska Polytechnika” as an integral innovative component of Kyiv Polytechnic Institute

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zgurovsm@hotmail.com



# National Technical University of Ukraine “Kyiv Polytechnic Institute”

***KPI is one of the biggest technical universities in Ukraine. It was founded in 1898.***





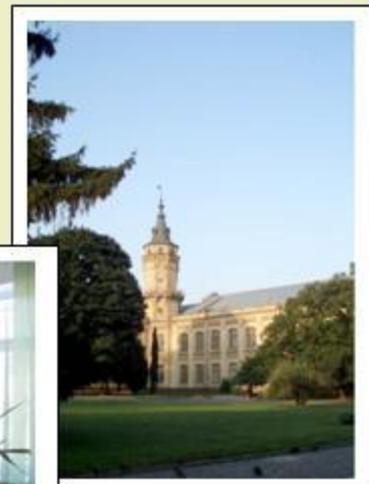
# OVERVIEW

**39 bachelor's, 92 master's, 82 Ph.D. programs**

**About 40 000 students**

**The largest producer of engineers in Ukraine**

**25 % students of technical universities of Ukraine are students of NTUU "KPI"**



# HISTORY



***Prof. D.I. MENDELEYEV –  
Chairman of the first  
examining board in KPI,  
1903***



***The student I. SIKORSKY in the  
plane of his own design***



***S. KOROLEV –  
the student of  
KPI, the  
member of  
university air -  
club***

# HISTORY

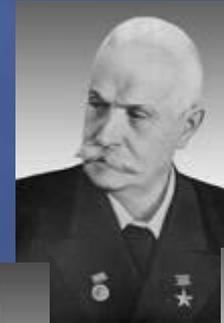
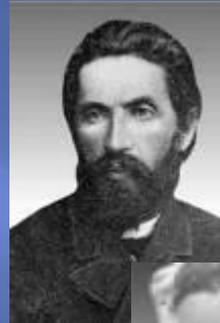
*Outstanding scientists, the founders of scientific-pedagogical schools*

**V.M. Kyrpychov**  
**Ye.O. Paton**  
**V.O. Plotnikov**

**S.P. Tymoshenko**  
**A.M. Lyulka**

**G.S. Pisarenko**  
**M.P. Kravchuk**  
**V.M. Chelomey**

**O.O. Mikulin**  
**I.P. Bardin**



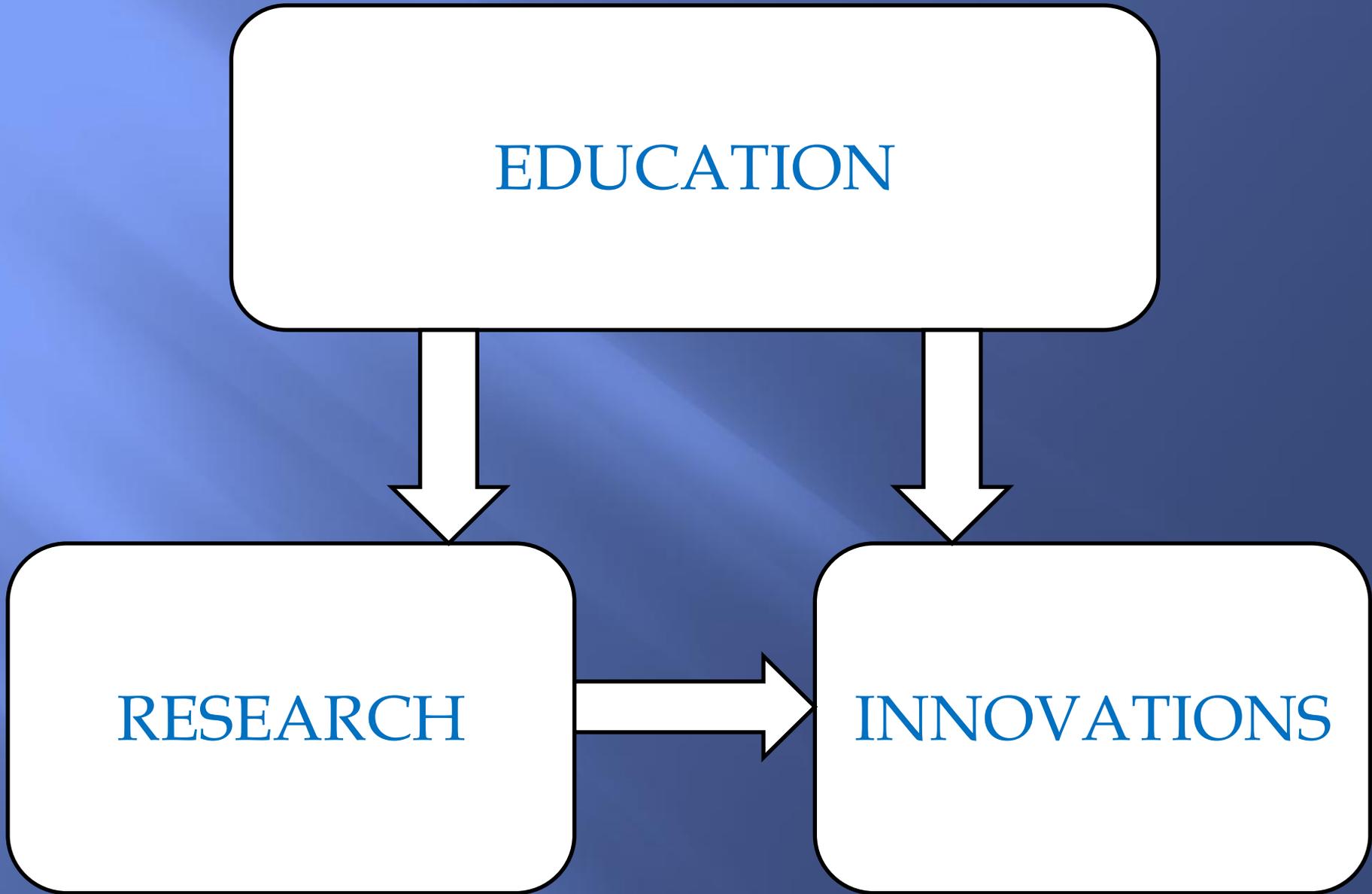
EDUCATION



RESEARCH



INNOVATIONS





**Kiev Polytechnic Institute  
carries out the 3-years**

**“TEMPUS” project:**

**“Bridging the gap between  
University and businesses”  
2004-2006**

**Participants:**

- Royal Institute of Technology, Stockholm, Sweden
- Polytechnico di Torino, Torino, Italy,
- Polytechnic University of Catalonia, Barcelona, Spain,
- Delft University of Technology, Delft, the Netherlands

Science Park “Kyivska Polytekhnika” was stipulated by the law of Ukraine December 22, 2006, № 523

Order of the Cabinet of Ministers of Ukraine July 18, 2007, № 546 “On approval of the action plan for the implementation of the Law of Ukraine “On Science Park “Kyivska Polytechnika”

ORDER of the Cabinet of Ministers of Ukraine September, 19, 2007 № 760 “On approval of the innovation programs for the Science Park “Kyivska Polytechnika” for 2007-2011 “

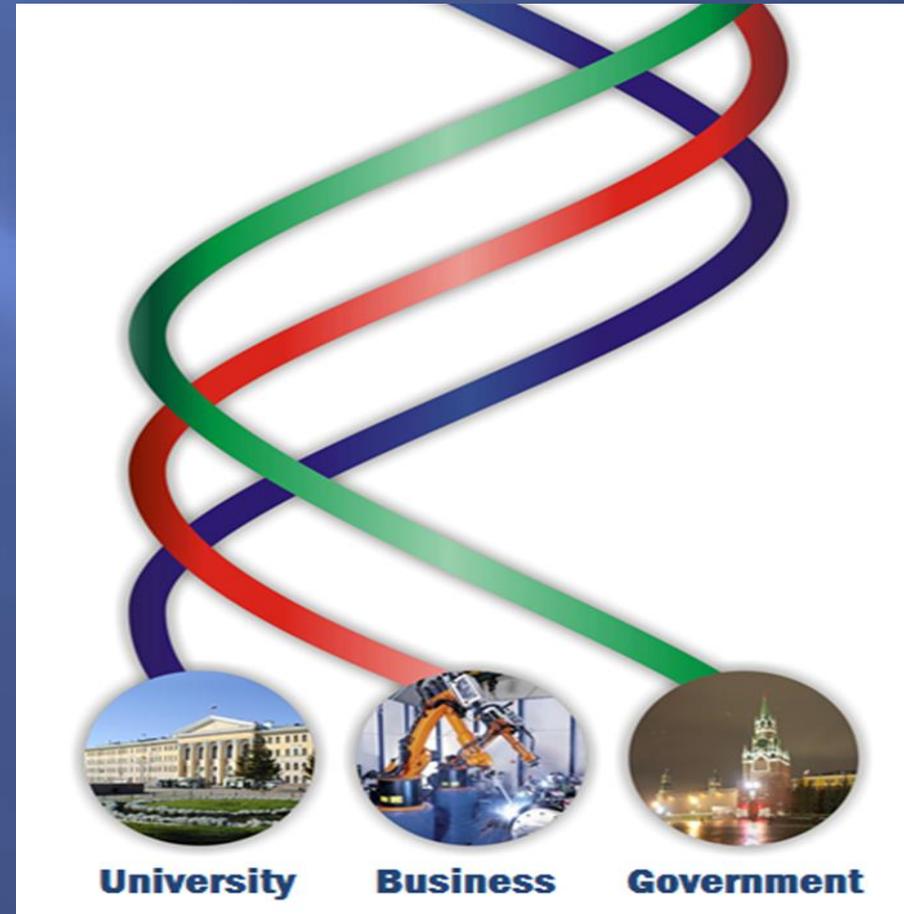


# MISSION

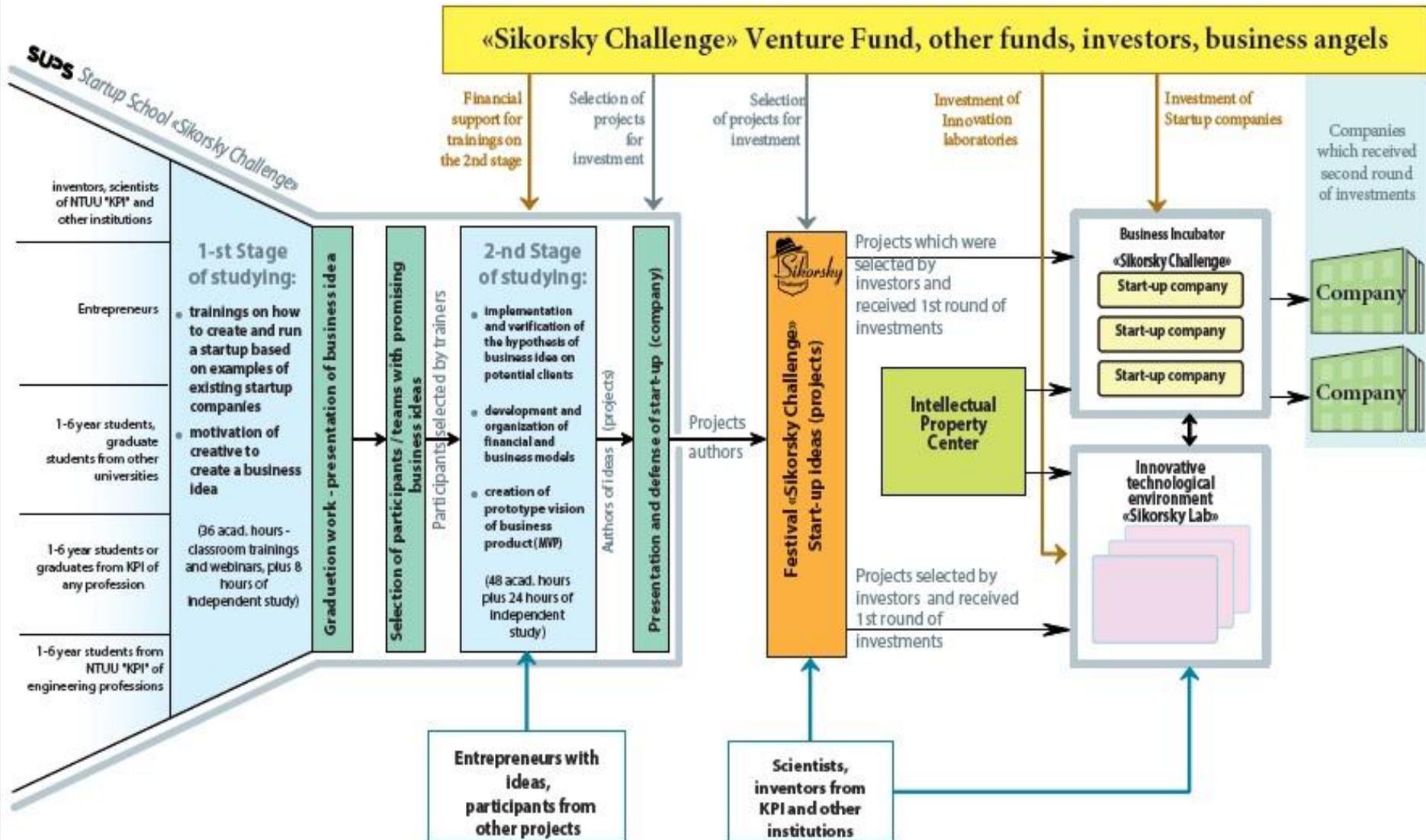
The objective of the Science Park is to promote innovative activity in Ukraine, to stimulate young scholars, scientific and business community to participate in technology transfer, to develop cooperation between researchers, business community and authorities in order to ensure innovative development of the national economy and society and to enhance its integration into European and World high-tech space.



# Science Park “Kyivska Polytechnika” – the example of implementation of Triple Helix by Henry Etzkowitz



# Structure of Innovation ecosystem (platform) of «Sikorsky Challenge» NTU "KPI" and the Science Park "Kyivska Polytechnika"



# The basic results for 7 years of work

**60 HI-TECH COMPANIES HAS ENTERED INTO THE PARK, MORE THAN 20 FROM THE USA AND EUROPE, OTHER FROM UKRAINE;**

**MORE THAN 150 HI-TECHNOLOGICAL PRODUCTS AND TECHNOLOGIES ARE TRANSFERRED TO THE MARKETS WITH CONSIDERABLE ECONOMIC AND SOCIAL EFFECT**

# SOME EXAMPLES





# 1. Cyber Security

1. Intrusion Detection Systems (IDS) and fraud prevention (For example in banking systems)
2. Active protection of software and IT systems
3. Automatic detection, assessment and analysis of software vulnerabilities
4. Analysis and synthesis software for legal interception
5. Software for detection of information operations in media
6. Software for detection of information operations in social networks



# 1.1. IDS AND FRAUD PREVENTION IN BANKING SYSTEMS

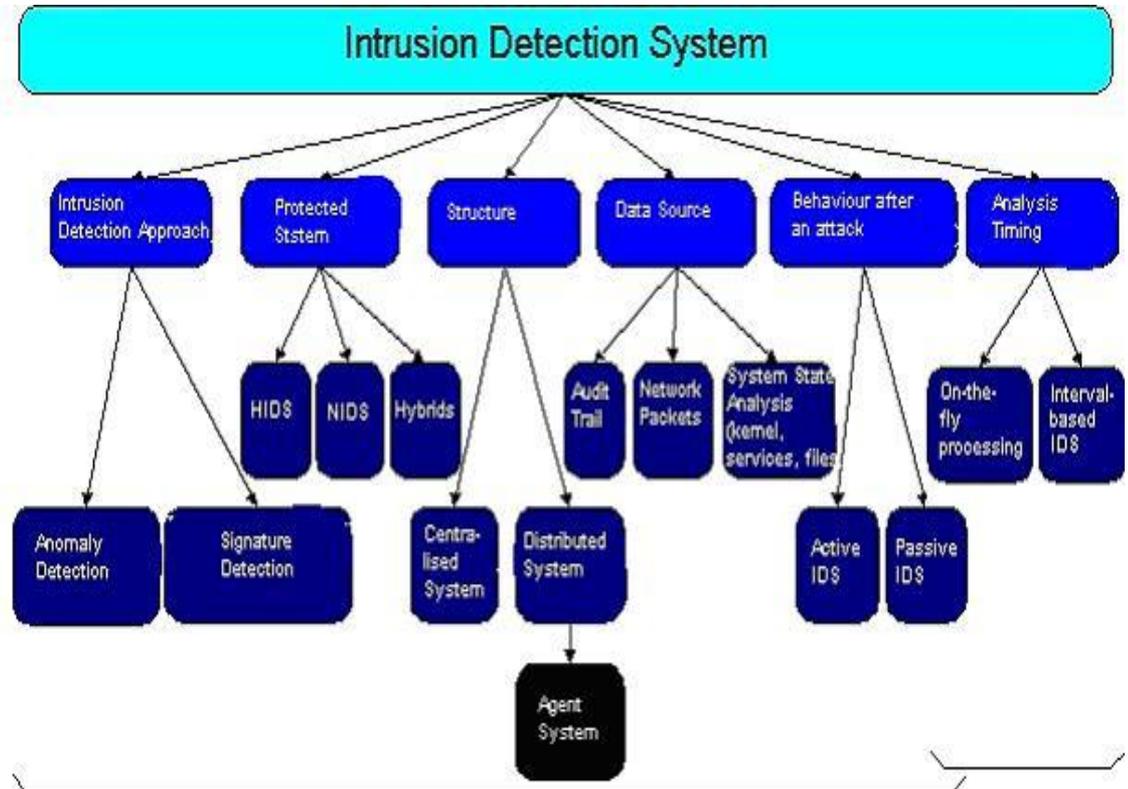
## Purpose

Designed to detect attacks on the software infrastructure of banks, as well as identifying abnormal behavior of bank customers in carrying out banking transactions.

## Characteristics

The system is based on advanced mathematical methods of decision-making for intrusion detection and artificial intelligence methods for modeling the behavior of the bank's clients.

The system issues an alarm in the case of abnormal behavior.





# IDS AND FRAUD PREVENTION IN BANKING SYSTEMS

## Characteristics

- Intrusion Detection
- Fraud prevention
- Full transactions fixation
- Full infrastructure activities fixation
- Popular hardware and software support

## Specifications

- DB: MS SQL, Oracle, IBM DB2
- CrossPlatform (Java)
- Local + Global networking

## Advantages



- New mathematical approaches for decision making
- Neuron networks
- Scalability
- Flexibility

## Economy

Decreases Fraud Loses by 20%



## 1.2. ACTIVE PROTECTION OF BANKING SOFTWARE AND SYSTEMS

### Purpose

The system is designed to perform complex and active protection properties of confidentiality, integrity and availability of information in the banking sphere.

### Characteristics

The system is a set of software modules (antivirus system, intrusion detection system (IDS), a fraud prevention system), which are integrated into the existing e-banking system.

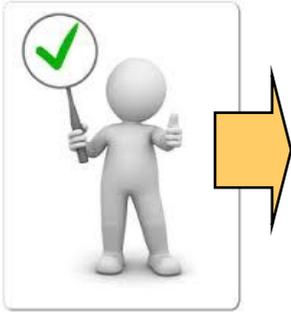
System uses modern technologies to secure bank infrastructure, enhanced antivirus protection, additional counterattack function.





# ACTIVE PROTECTION OF BANKING SOFTWARE AND SYSTEMS

## Advantages



- Framework for e-banking clients
- Adds antivirus protection
- Adds counter-attack functionality
- State of the art Artificial Intelligence technologies for infrastructure security

## *Specifications*



- Combination of Open Source software types
- Integrated decision support system

## *Economy*



20% Decrease of Fraud Losses



## 1.3. AUTOMATIC DETECTION, ASSESSMENT AND ANALYSIS OF SOFTWARE VULNERABILITIES

### Purpose

The software package is designed for automated dynamic and static automatic detection, assessment and analysis of software vulnerabilities, software without source code (black box testing).



### Characteristics

- Platform for file format and browser fuzzing, fuzzing cluster orchestration
- New samples acquisition from online search engines
- Core includes open-source solutions (peach, crossfuzz) and custom intelligent fuzzers
- Dynamic crash analysis engine using taint propagation
- Coverage extension via samples synthesis after taint analysis



# AUTOMATIC DETECTION, ASSESSMENT AND ANALYSIS OF SOFTWARE VULNERABILITIES

## Application area

- Securing of critical objects of civil infrastructure
- Protection of industrial facilities (SCADA security for city water supply chain & electricity power supply)

## Advantages

- State of the art automated chains of fuzzing-exploitability assessment-coverage extension

## Specifications

Support x86\_32 and  
x86\_64 Windows XP-7  
Linux kernel 2.6+  
x86/x86\_64/ARM





## 1.4. ANALYSIS AND SYNTHESIS OF LEGAL INTERCEPTION SOFTWARE

### **Purpose**

The basic idea is to emulate the computer network of an organization that is a honeypot for the attacker (false target). The project is designed to protect governmental, scientific and industrial enterprises from targeted malware attacks.

### **Characteristics**

- Honeynet emulating technology of target enterprise department
- Used for analysis of the attacker activity after successful exploitation/perimeter penetration
- Fast deployment via series of VPN tunnels, while physically located in our data center, it looks like a part of the target enterprise for the attacker





# ANALYSIS AND SYNTHESIS OF LEGAL INTERCEPTION SOFTWARE

## Application area



- Protection from cyber-attacks and APT
- Protection from cyber terrorism



## Advantages

- State of the art dynamic and behavioral malware analysis

## Specifications



- Client system fully compatible with common enterprise solutions
- Windows 95-8.1 honeynet nodes



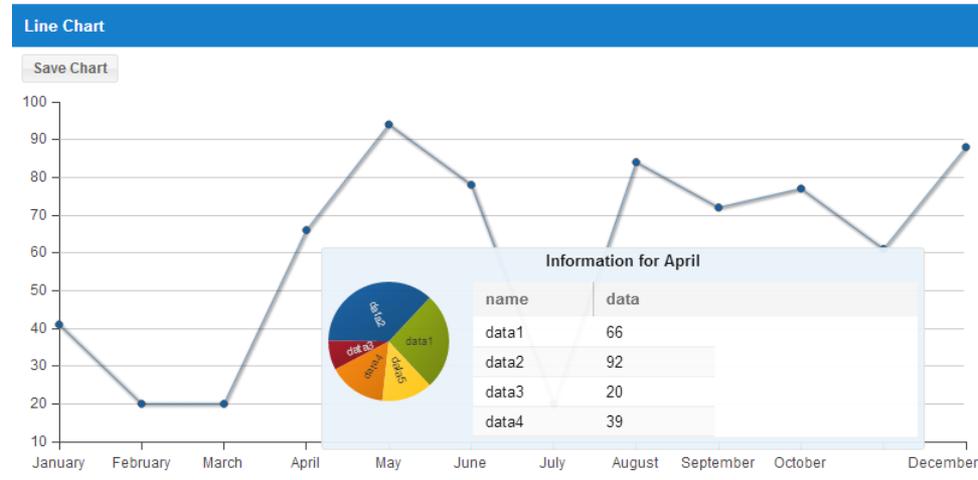
# 1.5. SOFTWARE FOR DETECTION OF INFORMATION OPERATIONS IN MEDIA

## Purpose

Designed to monitor and analyze the information environment of electronic media.

## Characteristics

- Efficiency fixing posts (frequency 5 minutes);
- Possibility of retrospective analysis;
- Intelligent search of related concepts;
- Mathematical models for detection and analysis of unsecured information flows;
- Content-monitoring;
- Data-mining;
- Unsecure flows detection;
- Flow monitoring and analysis of dynamic.





# SOFTWARE FOR INFORMATION OPERATIONS IN MEDIA DETECTION

## Advantages



Advanced mathematical approaches:

- Non linear dynamics
- Chaos theory
- Online analytics

## Specifications



- DB: MS SQL, Oracle, IBM DB2
- Java
- Web 2.0

# 1.6. SOFTWARE FOR DETECTION OF INFORMATION OPERATIONS IN SOCIAL NETWORKS

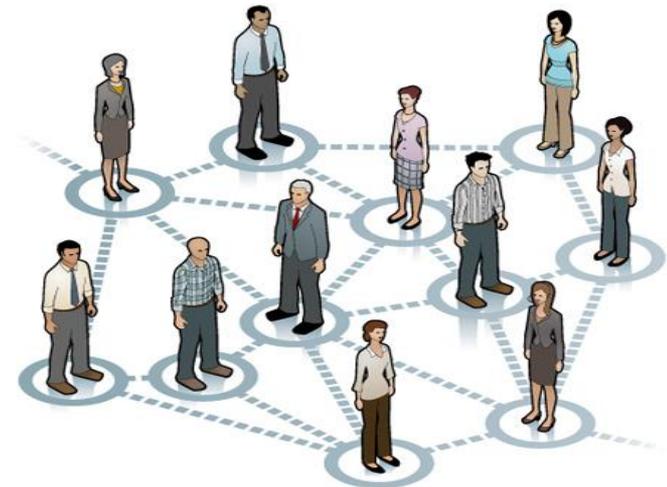


## Purpose

The software is designed to monitor and analyze the information environment of social networks to detect insecure information flows. In contrast to the previous project, this software system flexibly classifies users' groups and sets the hidden connections between them, continuously monitors the events in the selected area, uses mathematical models to determine the sources of targeted messages.

## Characteristics

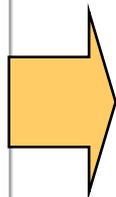
- Efficiency of events fixation (5 minutes);
- Retrospective analysis
- Flexible classification of user groups
- User activity geo-location tracking
- Restoration of hidden connections between users
- Agents detection
- Mathematical models to identify sources of targeted messages





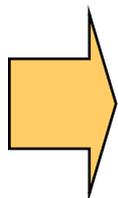
# SOFTWARE FOR DETECTION OF INFORMATION OPERATIONS IN SOCIAL NETWORKS

## Advantages



- State of art mathematical approaches
- Online analytics
- Targeted messages detection and preventing

## Specifications



- DB: MS SQL, Oracle, IBM DB2
- Java
- Web 2.0

This software analyzes behavior of malware attacks in enterprise environment.

## KEY FEATURES:

- ✓ Full target and task identification
- ✓ Attacker capability identification
- ✓ Compromise reaction time reduction
- ✓ Investigation capabilities
- ✓ Target markets analytics
- ✓ Early detection of controlled information leakage



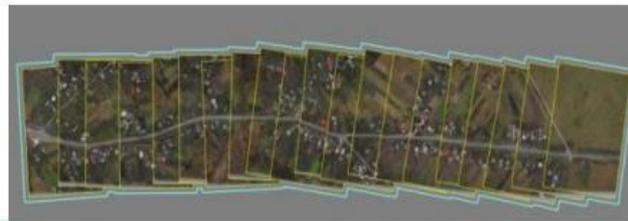
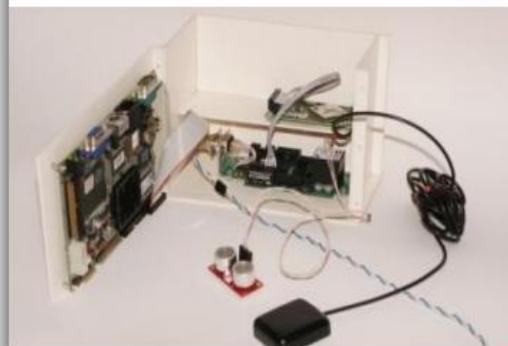
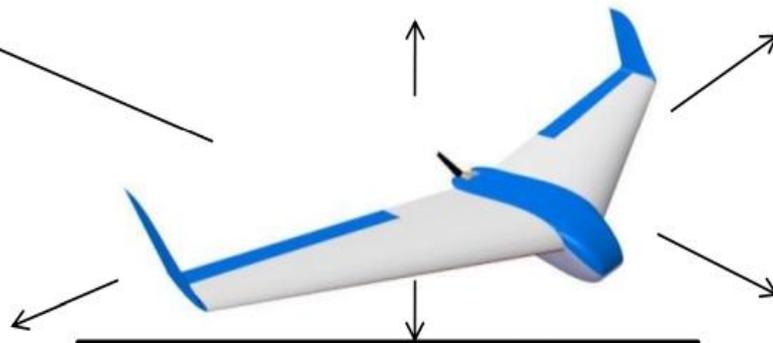
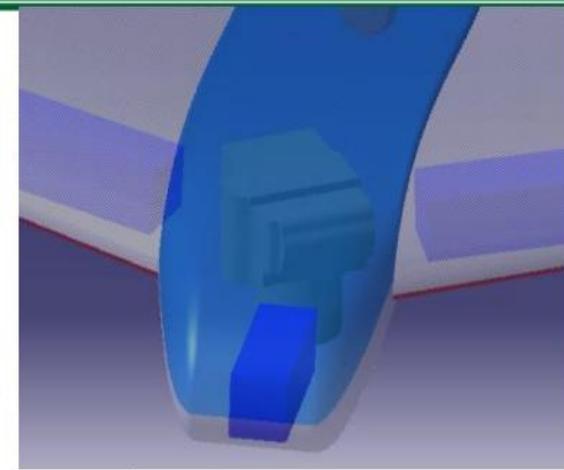
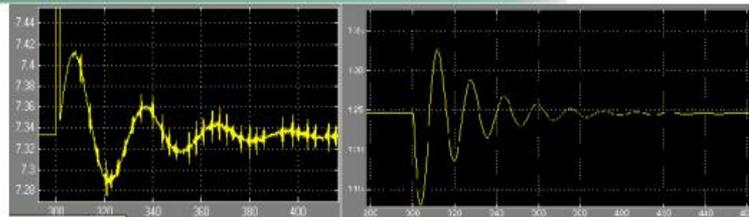
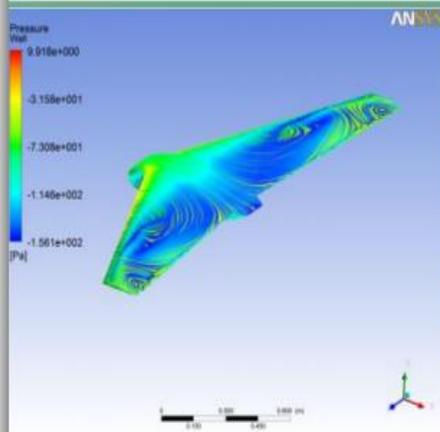
This software helps businesses to better analyze the continuously changing media dynamics related to specific company or products.

## KEY FEATURES:

- ✓ Brand assessment
- ✓ Analyzes content, not keywords
- ✓ Analyzes customer feedback and comments
- ✓ “Positive and negative” content assessment
- ✓ Analyzing post, repost dynamics, influential accounts
- ✓ Target markets analytics



# 2. DRONES



# DRONES

Ваш Бат. Дрон. Настройка. Опции

Объекты 0/0

- BTM-A1
- BTM-A2
- Наземный роут

Слой 0/0

Bot

- Динамический канал
- Наземный пункт для сравнения

Бат 0/0

Масштаб: 100%

Трекер: 0

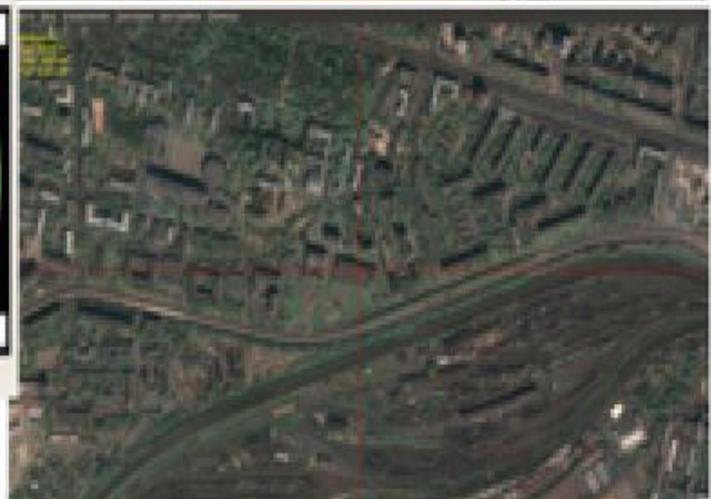
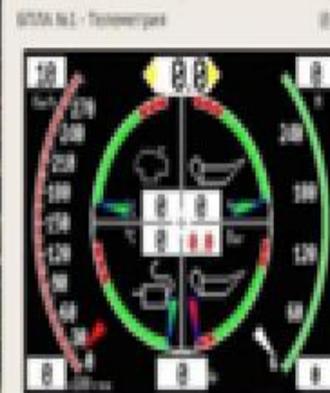
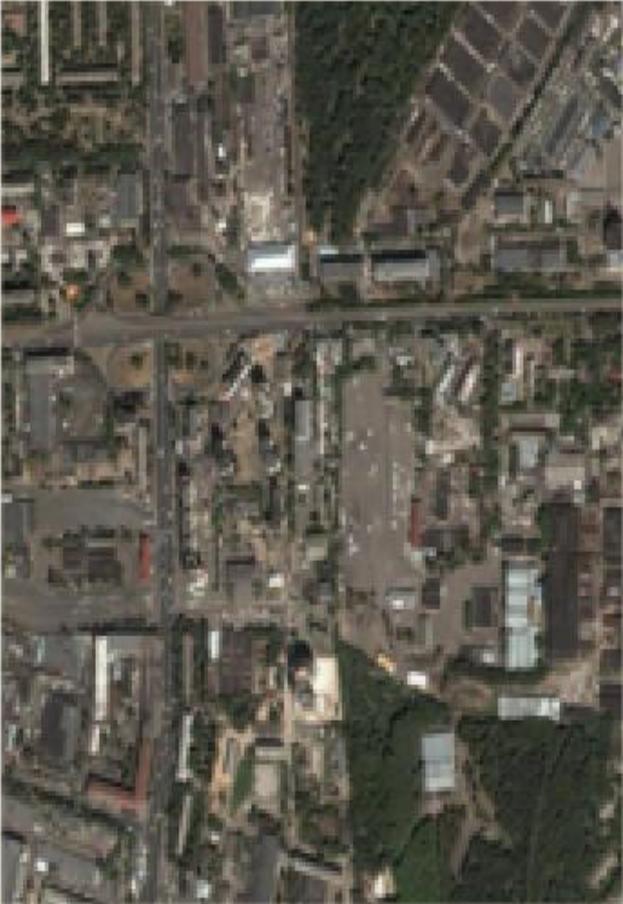
- Телеметрия
- Рывочек камеры

Настройка 0/0

Широта: 50.4924 N

Долгота: 38.4512 E

Горизонт



## 3. 1. SPACE TECHNOLOGIES

- Recently launched nano-satellite PolyItan-1, first of a kind in Ukraine
- Further research under way



## 3.2. InterOrbital Transfer Services

- **Transportation of space vehicle (SV) will be required while:**
  1. **Transfer payloads from GTO to GEO**
  2. **Transfer SV from operational orbit to the graveyard orbit or de-orbiting in case of failure or in the end operational life**
  3. **SV removal alongside operational orbit**
  4. **SV keeping in an operational orbital slot (staging point)**
  5. **Transfer to an operational slot in case of incorrect initial orbit placement**
  6. **Carry loads to ISS**



# 4. Development of Water Treatment Technologies

**DRINKING WATER  
(FRESH WATER)  
PREPARATION**



**TECHNICAL WATER  
PREPARATION**



**INDUSTRIAL WATER  
PREPARATION**



# Spaceship drinking water regeneration system



## DESCRIPTION

This in-space regeneration system turns liquids of any nature into the drinking water. Current system allows to attain up to 95% of drinking water from liquid waste and is set to operate in the no gravity conditions. It uses 1.6 less energy consumption that other known systems of such kind.

## KEY FIGURES

Distillator productivity – **5 liters /hour.**

Weight – **19.6 kg;**

System cost - **\$500,000;**

Marginal energy consumption – **up to 100 watt/hour per liter;**

Power of electric engine - **200 watt;**

Payback period – **1 space launch.**

# Low waste sewage water purification technology



## DESCRIPTION

Membrane-based water purification technology. This technology purifies water into a high quality drinking water from natural salt water and industrial sewage water. The technology treats liquid wastes, that are created during water purification.

## KEY NUMBERS

Productivity – **1000 - 20000 m<sup>3</sup>/day.**

12000 m<sup>3</sup>/day treatment facility approximate initial cost – **\$6.5 million;**

Cost of 1m<sup>3</sup> of purified water – **\$0.7 - \$1.2;**

Facility set up period – **1.5 - 2 years;**

Payback period – **5 years.**

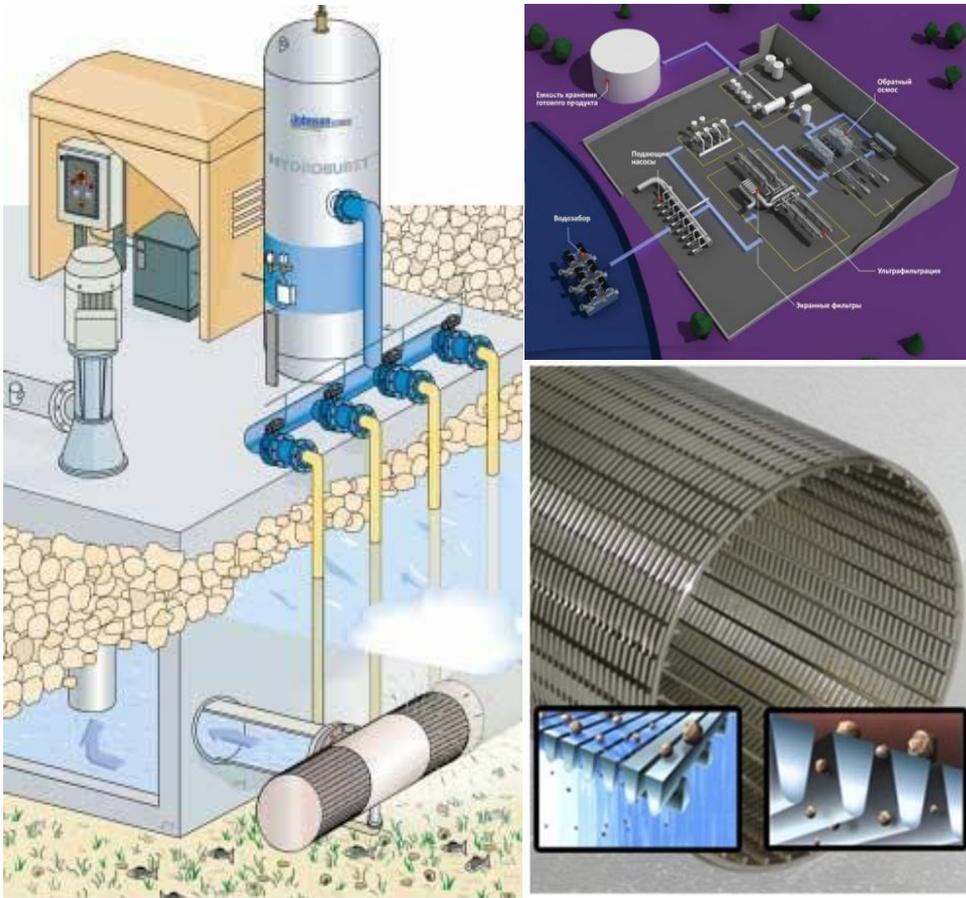
# Sea water desalination into a fresh drinking water

## DESCRIPTION

Membrane-based technology that desalinates sea water into a high quality drinking water. This technology is perfect for coastline cities or other town close to salt water reservoirs.

## KEY FIGURES

Payback period	<b>12 - 18 months</b>
Productivity m <sup>3</sup> /hour	<b>700</b>
Treatment facility approximate cost (millions)	<b>\$20.5</b>
Cost of 1m <sup>3</sup> of purified water	<b>\$0.8-1</b>



# Mobile container water purification system



## DESCRIPTION

Membrane-based technology that desalinates sea water into a high quality drinking water. This technology is perfect for coastline cities or other town close to salt water reservoirs.

## KEY FIGURES

Productivity – **360-6400 m<sup>3</sup>/day;**

3200 m<sup>3</sup>/day treatment facility approximate initial cost – **\$1.5 million;**

Cost of 1m<sup>3</sup> of purified water – **\$0.4 - \$1;**

Maximum single energy consumption - **600 kilowatt/hour;**

Payback period – **5 months.**

# Drinking and technical water disinfection (with harmless organic chemicals)



## KEY NUMBERS

Productivity – **from 10,000 m<sup>3</sup>/day;**

20,000 m<sup>3</sup>/day treatment facility approximate initial cost – **\$2 million;**

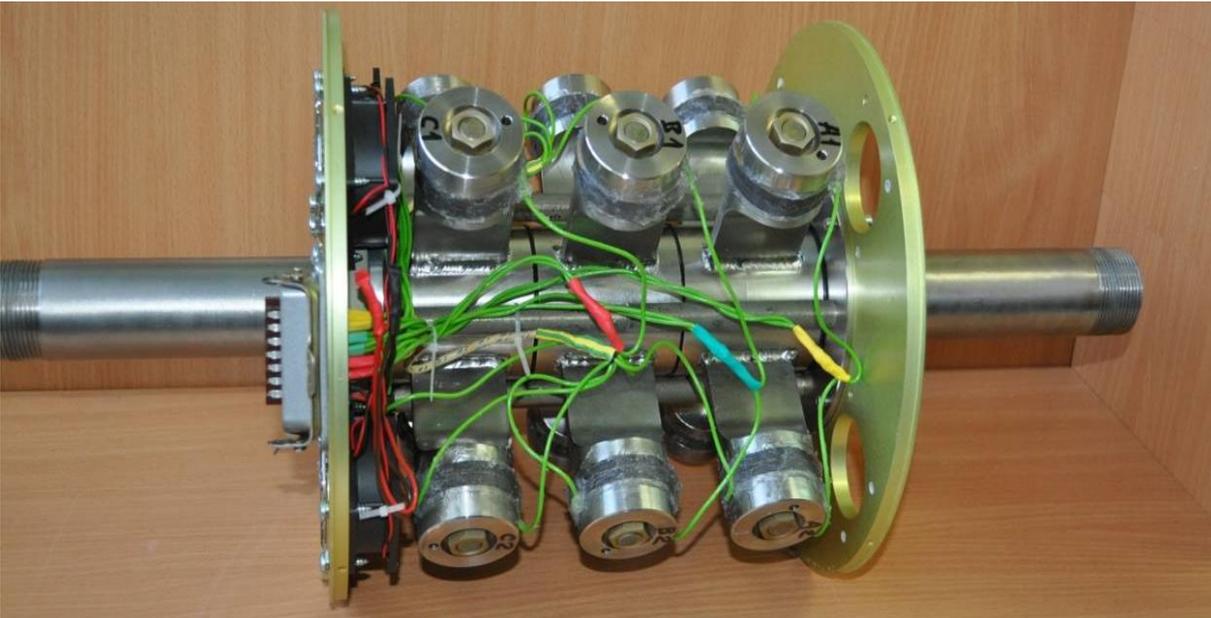
Cost of 1m<sup>3</sup> of purified water – **\$0.05 - \$0.3;**

Payback period – **1 year.**

## DESCRIPTION

- This water disinfection technology uses special non-toxic chemicals to decontaminate the water as well as preserve it. The chemical used is harmless to the health of humans and animals. Meanwhile, the applied chemicals produce no additional harmful substances.
- Given technology is currently installed at various municipal water treatment facilities in Ukraine and Ghana.

# Ultrasound cavitation water disinfection equipment (no chemicals)



## DESCRIPTION

This water purifying equipment is capable of treating water of any level of contamination using the efficient technology of ultrasound. Within the application of this technology there is no need for any additional chemicals. Upon decontamination no additional harmful substances are produced.

## KEY NUMBERS

Productivity – **100 liters /minute;**

Equipment cost – **\$20,000;**

Cost of 1m<sup>3</sup> of decontaminated water – **\$0.13;**

Energy consumption - **1200 watt;**

Payback period – **5 months.**

# Water treatment system for pharmaceutical purposes



## DESCRIPTION

This system allows to attain purified distilled water of high quality with marginal energy consumption 3 - 4.5 times lower than other systems of such kind.

## KEY FIGURES

Productivity – **500 liters /hour;**

Approximate installation cost – **\$100,000;**

Cost of 1m<sup>3</sup> of purified water – **\$1.5 - \$2;**

Energy consumption – **2.5 kilowatt;**

Payback period – **2 years.**

# Physical method water post treatment from impurities



## DESCRIPTION

This water treatment system uses magnetic fields and ultrasound to treat water. Processed purified water is of high quality and does not leave residuals of the pipe surface or heat-exchange equipment.

## KEY NUMBERS

Productivity – **2500 m<sup>3</sup>/day;**

2500 m<sup>3</sup>/day treatment facility approximate initial cost – **\$130,000;**

Cost of 1m<sup>3</sup> of purified water – **\$0.2 - \$0.3;**

Energy consumption – **1.5 kilowatt;**

Payback period – **1 year.**

# A high efficiency ultrasound and magnetic field pipe cleaning system



## DESCRIPTION

This system efficiently cleans and treats pipes from residuals of any nature using a cutting-edge ultrasound and magnetic field technology. Current technology is generally used to clean pipes that force water into the oil measures.

## KEY FIGURES

Productivity – **800 m<sup>3</sup>/day.**

Pipe cleaning facility system cost – **\$80,000;**

Energy consumption – **up to 0.5 kilowatt;**

Ultrasound generator power – **300 Watt/cm<sup>2</sup>**

Payback period – **1 year.**

# Crude oil residual water purification technology



## DESCRIPTION

This water purification technology uses magnetic field to detach crude oil elements and other organic residuals from the water. As a result this highly efficient process turns contaminated water with into a clean technical water.

## KEY FIGURES

Productivity – **1000 m<sup>3</sup>/day.**

Treatment facility approximate initial cost – **\$ 1.5 million;**

Cost of 1m<sup>3</sup> of purified water – **\$0.5 - \$0.7;**

Facility set up period – **1 - 2 years;**

Payback period – **4 years.**

# Modular wave energy converter

## DESCRIPTION

This industrial stage-based technology is an engineering solution of energy conversion from sea and ocean waves.

At the same time this technology can also desalinate water into drinking water with use of pump and membrane filter in the open sea or coastal areas without any traditional sources of energy. All needed is waves. Almost complete absence of operating costs.

## KEY FIGURES

Productivity – **1 liter / minute;**

Necessary start-up investments – **\$1 – 1.2 million;**

Energy costs - **\$2,000 / kilowatt;**

Cost of 1m<sup>3</sup> of desalinated water – **\$0.5 - \$0.7;**

Facility set up period – **1 year;**

Payback period – **less than 1 year.**





THANK YOU