

Plasma NPC

Advanced cold plasma technologies

Moscow, September 2016

Summary (1/2)

- In the recent years, cold plasma has been used in medicine, food industry and the industries of water treatment and room disinfection.
- The potential volume of the market of cold plasma devices in Russia and the EU only is $22 billion with a potential growth of 7%-8% a year.
- The list of potential customers is huge and includes medical facilities, beauty salons, food producers, cleaning companies, transport facilities, public catering businesses and consumers of drinking water.
- For each of the industries (medicine, production of food, water purification and disinfection of rooms) the cold plasma technology offers a number of considerable advantages as in most cases it is much cheaper and more efficient than traditional technologies.
- Plasma NPC is a high-technology startup engaged in developing cold plasma devices.

We have developed and obtained patents for three unique devices:

- Helios medical device for the treatment of skin diseases

- Ecoplas device for environmentally friendly and safe disinfection of interior surfaces

- Aquaplas device for water purification and oxygenation

Summary (2/2)

- While the cold plasma technology is passing from a stage of research to a commercial phase and a set of startups receive the support of funds and government grants worldwide, only three companies in the world, including ours, possess the devices ready for serial production.
- Our devices exceed foreign analogs in terms of efficiency and safety.
- We are looking for an investor to launch serial production of Helios and Ecoplas in the Russian Federation and to introduce them to the EU market.
- The Helios medical device will make a breakthrough in the treatment of bacterial and autoimmune skin diseases, while Ecoplas will help to significantly reduce costs for room disinfection in all industries.
- Even in the worst case scenario, Helios and Ecoplas will generate a cash flow of $18 million per year by 2021 and reach profitability in the first year of serial production
- If all plans are realized, namely serial production begins of the developed devices , cash flow may amount to $30 mln per year
- Within the next five years, we consider selling the company to a strategic investor (for instance, Siemens, General Electric, Covidien) with further profit taking.

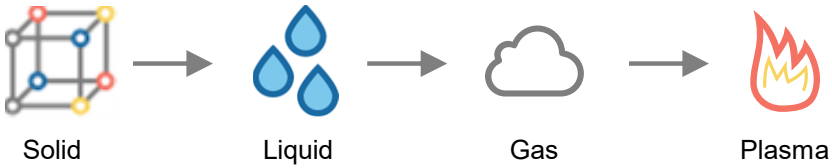
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Cold plasma is a cold ionized gas with unique properties

Short description of cold plasma technology

WHAT IS PLASMA?



- Plasma is an ionized gas, one of the four fundamental states of matter
- Atomic links break and positive ions together with electrons form a gaseous mix
- A large number of free charges and the general neutrality of plasma gives its unique properties

Types of plasma

Hot plasma

Fully ionized gas with a temperature of several thousands degrees

Examples: sun, industrial plasmatrons, etc.,

Cold plasma

Partially ionized gas with a temperature of tens degrees

Examples: Plasma TV, neon lamp

COLD PLASMA

Contents

Temperature	Tens of degrees
Contents	Ions, electrons, atoms, free radicals, UF radiation
Working substance	Inert gases: argon, xenon, neon, helium

Features

- Unique properties of plasma are caused by the mixture of active particles (radicals and ions)
- Active particles have antiseptic, coagulative effect and can selectively destroy cancer cells

Recent research shows that cold plasma is a very perspective technology for medicine

Key research on cold plasma application [1)]

RESEARCH	RESULTS
Fridman, **Drexel University**, 2006 Research of influence of cold plasma on bacteria	Cold plasma completely sterilizes the surface of skin within 5-15 seconds of treatment
Fridman, **Drexel University**, 2006 Influence of cold plasma on blood coagulation	Cold plasma stimulates natural mechanisms (not thermal) and coagulation of blood without damaging surrounding tissues
Isbary G, **Hospital Munich Schwabing**, 2006 Cold plasma treatment of chronic wounds and ulcers	Cold plasma accelerates healing of chronic ulcers and wounds
Schwabing Hospital Cold plasma treatment of chronic wounds and ulcers	Accelerates the removal of necrotic tissues and healing process by 2.5 times
Seeger W., 2006 Cold plasma treatment of pulmonary tuberculosis	8-10 therapy sessions significantly accelerated the successful treatment of tuberculous bronchitis and pleurisy
Shekhter A. B., MGMU of I. M. Sechenov, 2005 Cold plasma treatment of chronic ulcers	Cold plasma significantly reduces bacterial damage of tissues, restores blood circulation and heals wounds
Fridman, **Drexel University**, 2007 Cold plasma treatment of skin melanoma	Cold plasma treatment of melanoma started apoptosis in cancer cells
Isbary G, **Hospital Munich Schwabing**, 2014 Cold plasma treatment of shingles	Cold plasma treatment relieves pain and accelerates healing
Chesnokova M. V., Russian Academy of Medical Sciences, 2003 Cold plasma treatment of corneal burns	Cold plasma doesn't cause changes in intraocular pressure and morphological changes in eye tissues, but considerably accelerates healing of ocular wounds and corneal burns

1) More complete list of researches is given in the appendix

SOURCE: publications in reviewed scientific magazines

There are three most perspective areas for commercialization of cold plasma technology

Fields of use

Innovative medicine

Bacterial infections

- Treatment of chronic ulcers, including diabetic foot
- Therapy of resistant bacteria strains

Melanoma

- Auxiliary therapy of skin melanoma

Dermatology

- Treatment of severe forms of a psoriasis, atopic dermatitis, vitiligo, alopecia and other autoimmune skin diseases

Dentistry

- Teeth whitening
- Sterilization of carious cavities

Production of water and food

Water purification

- Water purification and removal of pathogenic microorganisms and chemicals (including iron)
- Water oxygenation

Food processing

- Effective elimination of bacteria without thermal treatment while preserving all useful properties of a product
- Significantly extends shelf life of food

Disinfection

Room disinfection

- Effective and safe elimination of pathogenic microorganisms without using UF radiation or dangerous chemicals
- The technology doesn't damage expensive electrical equipment and is environmentally friendly

Terrorism counteracting

- The recent tests have shown that cold plasma can be used to neutralize chemical and biological warfare agents

SOURCE: cold plasma research

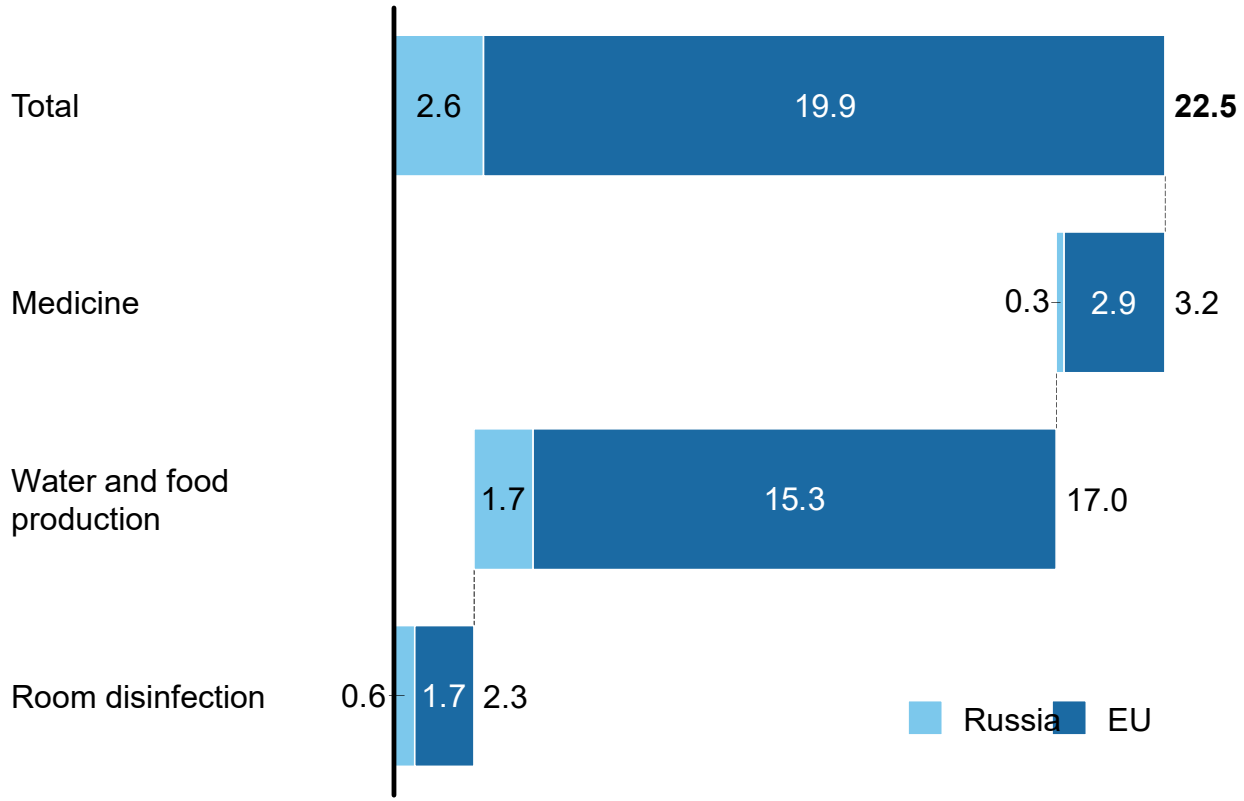
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The size of the potential market of cold plasma technology in the Russian Federation and the EU is 22.5 bln dollars …

The potential market of cold plasma equipment

The potential EU and Russian markets of cold plasma equipment for 2015
[$ bln]



Notes:

- The medicine segment includes wound, skin ulcers and melanoma treatment costs
- The disinfection segment f is estimated as the market of chemical disinfectants
- Data on market volume was taken from reports of companies specializing in marketing research
- More details can be found in the appendix

SOURCE: Market Data Forecast, Global Data, Frost & Sullivan, Freedonia, Research and Markets, BusinesStat

… with the growth of 7-8% a year – that is, every year there will be $1.5 billion additional demand in RF and the EU

Growth drivers of the potential market of cold plasma equipment

Medicine

CAGR 2015-2020

- **Bacterial infections:** Traditional antibacterial therapy is becoming less effective since bacteria develop resistant strains; the number of people suffering from diabetes is growing, which leads to a larger number of venous ulcers that require treatment
- **Melanoma:** The rates of melanoma have been rising both in Russia and developed countries

5-6%[1)]

Food industry

- **Water purification:** Demand for drinking water is expected to rise within the next decades as a result of the global warming and water sources pollution
- **Food processing:** The demand for food disinfectants will grow due to improved safety regulations in developed countries and changes in dietary habits in developing countries

7-8%

Disinfection of interior surfaces

- **Disinfection of interior surfaces:** Growing resistance of hospital-acquired infections will boost the demand for disinfectants
- **Terrorism counteracting:** There is an unprecedented growth in the number of terrorist attack victims, including the use of toxic agents and pathogenic microorganisms

7-8%

1) Average annual growth for the next 5 years

SOURCE: Market Data Forecast, Global Data, Frost & Sullivan, Freedonia, Research and Markets, BusinesStat

In each segment cold plasma technology has significant advantages

Cold plasma advantages

MEDICINE	
Antibiotic resistance	Bacteria can not develop resistance to cold plasma
Significant side effects of antibiotic therapy	Cold plasma treatment is painless and safe – no side effects were observed
Low efficiency in chronic or large wounds	Cold plasma is several times more efficient in destroying bacteria compared to antibiotics
FOOD SAFETY	
Deterioration of food properties after heat treatment	Cold plasma has temperature 30-40 ºC and doesn't heat products – product stay fresh
Low efficiency of UV radiation	The plasma jet penetrates into all irregularities and effectively kills germs on the surface, increasing the lifetime of food
WATER TREATMENT	
Limited efficiency of ozonation and filtration	Plasma preserves all nutrients unlike to filtration and effectively remove phenolic compounds compared to ozonation
High cost of ozonation technology	Cold plasma is cheaper than ozonation
ROOM STERILIZATION AND DISINFECTION	
Low efficiency of UV radiation	Cold plasma for disinfection applicable to any facility, because it does not have the "shadow effect"
High cost of manual disinfection and sterilization	Disinfection by cold plasma is much faster and cheaper than traditional manual disinfection

The technology of using cold plasma in medicine and disinfection is being commercialized, and startups are attracting money by investors and government grants

World startups on cold plasma

COMPANY		AREA	CAPITAL
neoplastools medical plasma	The startup company was founded in 2009 in close cooperation with Leibniz Institute for Plasma Science and Technology e.V. (INP Greifswald) and the University Medicine Greifswald. It is engaged in developing solutions on using cold plasma in medicine	Medicine	Unknown
AD TEC HEALTHCARE	The subsidiary company of the Japanese corporation AdTec (manufacturer of RF plasma generators) was established in 2000 and develops solutions on the use of cold plasma in medicine together with Max Planck Society	Medicine	Unknown
IonMed Plasma Tissue Welding	The company was founded by the former employee of Tower Semiconductor and the military physician who suggested to use cold plasma for seamless closure of wounds	Medicine	**$0.5 million from Chief Scientist Foundation** **$3 million from Trendlines business incubator**
DeviceFarm	The startup company engaged in developing cold plasma devices for the treatment of fungal toenail and foot infections	Medicine	**$2.8 million worth of grants and scholarships from government agencies**
TOMI ENVIRONMENTAL SOLUTIONS	The startup company bought the technology for hydrogen peroxide ionization with cold plasma from DARPA. It has been developing a network of service companies offering environmentally friendly disinfection of rooms	Room disinfection	**~ $5 million in the OTC Markets Group market**

SOURCE: Company websites, crunchbase.com, Yahoo Finance

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Plasma NPC is a hi-tech startup company developing equipment based on cold plasma technology

Company profile

COMPANY HISTORY

- The company was founded in 2015 by a group of enthusiasts; it was preceded by several years of the development of innovative technology of cold plasma
- generation
- The first prototype was built literally at home
- Less than in a year the team managed to develop a prototype of the Helios medical device and to pass all clinical tests and registration in the Russian Federal Healthcare Supervision Service (Roszdravnadzor).
- In 2016, less than for half a year, two more cold plasma devices were developed: the Ecoplas device for room disinfection and Aquaplas for water purification
- For all these years, the company has been financed by its founders and even then managed to achieve results which cost other rival startups millions of dollars

FOUNDERS



A. A. Makarov



S. N. Shcherbakov



R. A. Loleyt

PRODUCTS



Helios medical device based on cold plasma technology

Treatment of affected skin areas with cold plasma



Equipment for water purifying and oxygenation

Water purification and elimination of bacteria



Ecoplas, a device used for room disinfection

Disinfection of interior surfaces

Our key advantage is very cheap technology of cold plasma generation

Advantages of our technology

- All **existing cold plasma technologies using microwave generators**
- **Microwave generators** – very bulky, not completely safe and **extremely expensive devices**
- The cost of cold plasma equipment on the microwave generator is **hundreds of thousands of dollars** - Institute of Immunology Gamalei acquired AdTec device for 1 mln EUR
- Price – the main barrier to cold plasma development

- **Our technology is ten times cheaper than microwave**
- **Cost of our technology in the tens of thousands of rubles**, against hundreds of thousands of dollars in microwave technology
- The **technology not only patented but also it is very difficult to replicate**, as one of the key innovations - a complex mathematical algorithms stabilize the plasma jet
- This **technology allows us to quickly develop new devices**, for example "Ecoplas" was developed in six months, Aquaplas was developed in 2 months

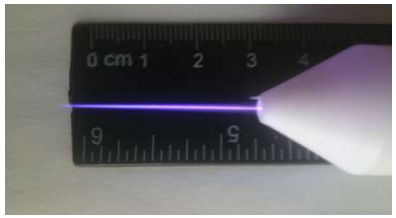
Helios has passed clinical trials and is registered in the Russian Federation as medical equipment

The Helios medical device for cold plasma treatment









HOW IT WORKS

- A jet of cold plasma is produced in the ionization chamber
- The temperature of cold plasma depends on the distance from the tool and ranges from 30 to 40 °C
- The influence of cold plasma on biological objects does not involve medicines and has no side effects

PURPOSE

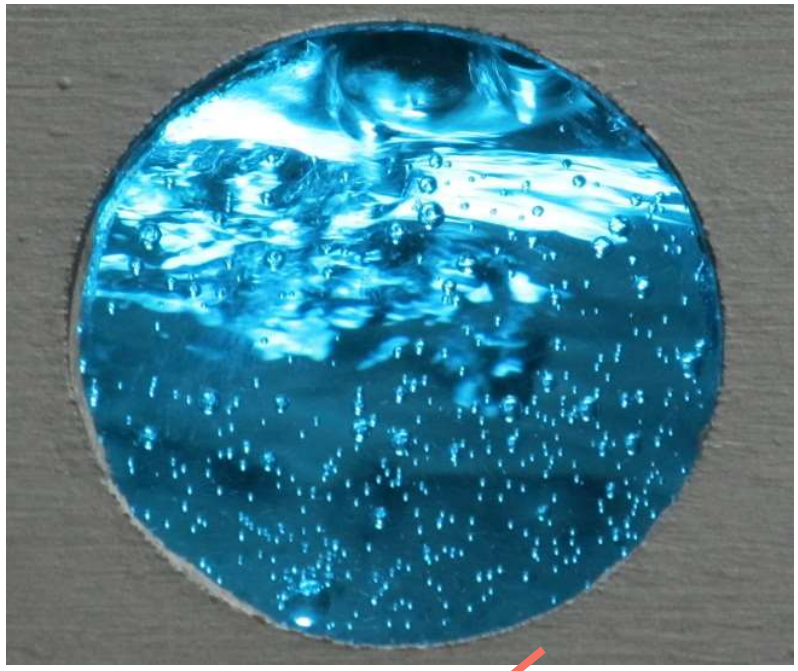
- Treatment of wounds and affected soft tissues
- Dental health treatment
- Treatment of various skin diseases
- Elimination of cosmetic skin defects

AREAS OF USE

- Surgery
- Dentistry
- Oncology
- Dermatology
- Treatment of burns
- Gynecology
- Otorhinolaryngology

Water purification device does not only clear and disinfect water, but also oxygenates it

Water purification device





HOW IT WORKS

- Water is treated with cold plasma in a gas and air mixture
- Water is cleared from contaminants through oxidation
- All chemical compounds and metals are fully oxidized into neutral salts and water is cleared from pathogenic microbes
- Water is enriched with oxygen

PURPOSE

- Water disinfection and elimination of contaminants
- Oxygenation of water while preserving essential salts
- Water softening for food production

AREAS OF USE

- Preparation of drinking water for apartments and cottages
- Preparation of drinking water for public catering
- Clearing and disinfecting of water in swimming pools
- Deferrization of mine waters
- Mobile drinking water systems
- Preparation of water for food production

Cold plasma effectively destroys pathogenic microorganisms and purifies water

Aquaplas test results

Место отбора пробы: ---
Дата и время отбора пробы: ---
Акт отбора пробы: отбор выполнен Заказчиком
Даты проведения испытаний: 15 – 20.09.2016 г.

№ п/п	Номенклатура показателей, единицы измерения	Значение показателя	ПДК (предельно допустимая концентрация), по [1]	Метод испытаний (ссылка на НД)
1.	Железо общее, мг/дм³	0,06	0,3	МВИ 01.1:1.4.2:2.18-05
2.	Нитраты, мг/дм³	5,2	45,0	ФР.1.31.2005.01774
3.	Жесткость общая, °Ж	3,9	7,0	ГОСТ Р 52407-2005
4.	Водородный показатель (pH), ед.	7,9	6,0 – 9,0	ФР.1.31.2005.01774
5.	Мутность, ЕМФ	< 1,0	2,6	ПНД Ф 14.1:2:4.213-05
6.	Цветность, град.	2	20	ГОСТ Р 52769-2007
7.	Привкус, баллы	0	2	ГОСТ 3351-74
8.	Запах, баллы	0	2	ГОСТ 3351-74
9.	Перманганатная окисляемость, мг/дм³	< 0,25	5,0	ПНД Ф 14.1:2:4.154-99
10.	Аммиак (по азоту), мг/дм³	< 0,01	2,0	МВИ 01.1:1.2.4.16-05
11.	**Фториды, мг/дм³**	**2,78**	**1,5**	ФР.1.31.2005.01774
12.	Общая минерализация, мг/дм³	360	1 000	ПНД Ф 14.1:2.114-97
	Микробиологические показатели			
13.	**Общее микробное число, число образующих колонии бактерий в 1 мл**	**225**	**50**	МУК 4.2.1018-01
14.	Общие колиформные бактерии, число бактерий в 100 мл	Не обнаружены в 100 мл	Отсутствие	МУК 4.2.1018-01
15.	Термотолерантные колиформные бактерии, число бактерий в 100 мл	Не обнаружены в 100 мл	Отсутствие	МУК 4.2.1018-01

[1] - «Питьевая вода. Гигиенические требования к качеству воды централизованных систем питьевого водоснабжения. Контроль качества. СанПиН* 2.1.4.1074–01».

* - Санитарно-эпидемиологические правила и нормативы.

Результаты анализа распространяются только на образцы, подвергнутые испытаниям.
Передача документа или его копий третьим лицам без разрешения ГИЦ ПВ и согласования с заказчиком не допускается.

Before Aquaplas treatment

Объект испытаний: Образец воды – проба № 1-№ 2
Место отбора пробы: ---
Дата и время отбора пробы: ---
Акт отбора пробы: отбор выполнен Заказчиком
Даты проведения испытаний: 15 – 20.09.2016 г.

№ п/п	Номенклатура показателей, единицы измерения	Значение показателя	ПДК (предельно допустимая концентрация), по [1]	Метод испытаний (ссылка на НД)
1.	Железо общее, мг/дм³	0,02	0,3	МВИ 01.1:1.4.2:2.18-05
2.	Нитраты, мг/дм³	4,6	45,0	ФР.1.31.2005.01774
3.	Жесткость общая, °Ж	4,1	7,0	ГОСТ Р 52407-2005
4.	Водородный показатель (pH), ед.	7,9	6,0 – 9,0	ФР.1.31.2005.01774
5.	Мутность, ЕМФ	< 1,0	2,6	ПНД Ф 14.1:2:4.213-05
6.	Цветность, град.	2	20	ГОСТ Р 52769-2007
7.	Привкус, баллы	0	2	ГОСТ 3351-74
8.	Запах, баллы	0	2	ГОСТ 3351-74
9.	Перманганатная окисляемость, мг/дм³	< 0,25	5,0	ПНД Ф 14.1:2:4.154-99
10.	Аммиак (по азоту), мг/дм³	< 0,01	2,0	МВИ 01.1:1.2.4.16-05
11.	**Фториды, мг/дм³**	2,61	1,5	ФР.1.31.2005.01774
12.	Общая минерализация, мг/дм³	361	1 000	ПНД Ф 14.1:2.114-97
	Микробиологические показатели			
13.	Общее микробное число, число образующих колонии бактерий в 1 мл	3	50	МУК 4.2.1018-01
14.	Общие колиформные бактерии, число бактерий в 100 мл	Не обнаружены в 100 мл	Отсутствие	МУК 4.2.1018-01
15.	Термотолерантные колиформные бактерии, число бактерий в 100 мл	Не обнаружены в 100 мл	Отсутствие	МУК 4.2.1018-01

[1] - «Питьевая вода. Гигиенические требования к качеству воды централизованных систем питьевого водоснабжения. Контроль качества. СанПиН* 2.1.4.1074–01».

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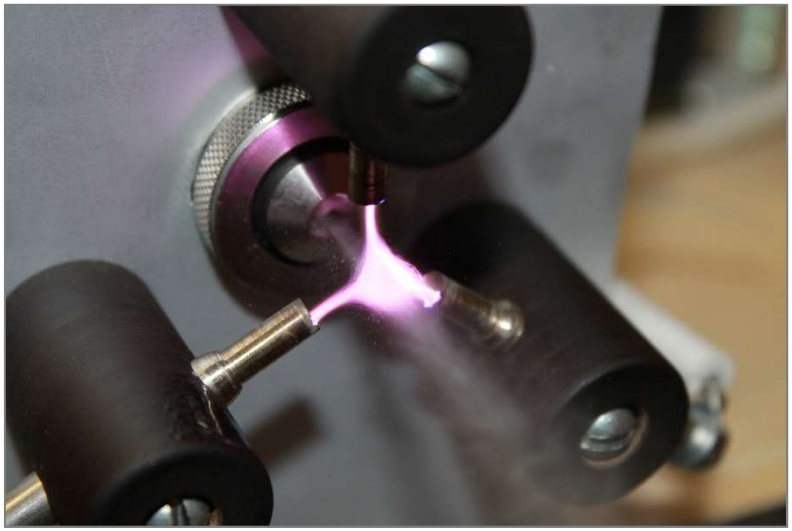
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After Aquaplas treatment

Number of bacteria reduced by 99%, iron by 66%

Ecoplas innovative device allows for quick and safe disinfection of interior surfaces

Ecoplas device for room disinfection



HOW IT WORKS

- Producing plasma-induced mist with high content of reactive oxygen species (ROS)
- ROS are capable not only to kill pathogenic microorganisms, but also to neutralize chemical warfare agents
- Mist disintegrates into oxygen and water without damaging electrical equipment and surfaces
- Disinfection takes only 15-20 minutes, the room smells fresh

PURPOSE

- Indoor surface disinfection
- Biological warfare counteracting

AREAS OF USE

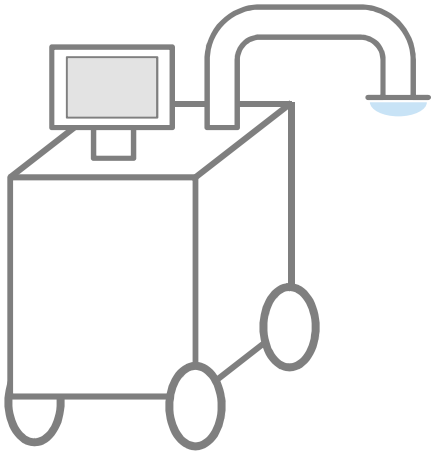


- Medical institutions
- Medical vehicles
- Schools and kindergartens
- Sports venues
- Railway stations and airports
- Shopping centers
- Visa centers
- Prisons and detention facilities
- Food processing industry
- Pharmaceuticals
- Hotels and hostels
- Nursing homes
- Public catering
- Bank offices
- State institutions

In the long term, we plan to create more devices based on cold plasma technology

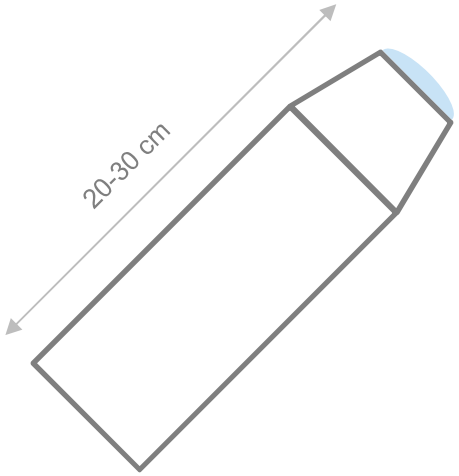
Perspective cold plasma devices in development

Inpatient stationary complex



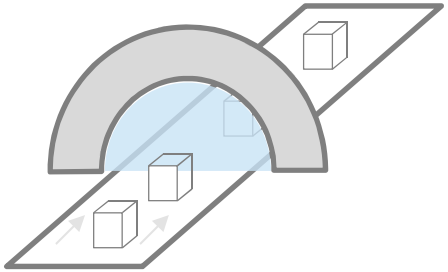
- Stationary complex with increased power similar to the AdTec device
- Reduces time of treatment and can be used for inpatients and especially in burn centers

Portable device working on air



- The portable device that uses air instead of helium
- Can be used in remote locations (disaster medicine) and at home

Equipment for the food industry



- Food disinfecting device for the food industry
- Destroys all bacteria and extends the shelf life of foods

We have done a big job with medical community and we are counting on quick start of Helios sales in Russia

Strategy in medicine segment

GENERAL STRATEGY	Promotion of Helios through the leading medical scientific research institutes and federal healthcare programs, promotion of plasma medicine through the media and medical representatives
SALES CHANNELS	**Direct sales** • KAM: Large medical centers, network clinics • State tenders and federal healthcare programs • **Distributors** • Federal distributors • Regional distributors • Niche distributors of equipment for dermatology and dentistry
PROMOTION	• Promoting of plasma medicine through medical representatives • Work with the Ministry of Healthcare on including Helios in federal programs • Launch of a training program for doctors on the use of cold plasma in medicine based on the Pirogov Russian National Medical Research University and the Research Institute of Immunology • Targeted advertising in the media to create demand for cold plasma in cosmetology and dentistry

WHAT HAS BEEN ALREADY DONE

- The Pirogov Russian National Medical Research University and the Research Institute of Immunology have started the development of techniques of treatment with Helios
- The Pirogov Russian National Medical Research University is developing a program of training for doctors

NEXT STEPS

- Meetings with representatives of large network clinics
- To form a pool of medical representatives
- To launch a system to track state tenders for medical equipment
- To coordinate sales plans with distributors (after developing treatment protocols)
- To develop an advertising campaign

Ecoplas will develop through a certified partner network and equipment leasing

Strategy in room disinfection segment

GENERAL STRATEGY	• Promotion of the Ecoplas technology through a certified network of partners • Monetization of technology through short-term and long-term equipment leasing
SALES CHANNELS	**Network of partners (equipment leasing)** • Suppliers of cleaning services for Mosgortrans, Russian Railways, and airlines • Large federal and regional cleaning companies (for example, OMC) **Direct sales (equipment leasing)** • Hospitals and outpatient clinics • Educational institutions: schools, kindergartens, universities • Food industry facilities
PROMOTION	• Participation in specialized exhibitions • Targeted promotion company in the industry media • Contacts with the Metro and Russian Railways on including Ecoplas in corporate standards

WHAT HAS BEEN ALREADY DONE

- The first meetings were held with the Pirogov Russian National Medical Research University and the Research Institute of Immunology; very good comments were received; the institutes are ready to use devices after completion of all testing and certification
- Negotiations are being held with the Moscow Department of Transport, Russian Railways, Aeroflot and the Russian Ministry of Healthcare on the use of the technology

NEXT STEPS

- To finish Ecoplas trials
- To hold meetings with representatives of cleaning companies
- To develop a training program and certifications on work with the device
- To develop an advertising campaign
- To resume talks on using Ecoplas at passenger transport after the trials are complete



Thank you for your attention!