Earth, Water, Air (EWA)

The Rural Concept for Water Supply

September 2008

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Content

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1. Introduction

Water is essential for the survival of all known forms of life, including humans, animals and plants. Tragically, shortage in available water might annihilate entire populations and turn wide regions to endless deserts.

Human settlements, agriculture, animals and water are interwoven together in a non-separatable way. Unfortunately, the relations between these groups are not mutual – the water consuming populations of humans, animal and plants, almost do not contribute to the water balance as serving only as consumers of water.

'Traditional water' resources such as lakes, rivers, runoff, underground water, rains and snow are not always available and in many – too many – regions on the planet they are limited or absent.

EWA Tech's methods for the Extraction of Water from Air involve air desiccants.
Cost effective adsorption of the air humidity and low dependency on ambient relative humidity and temperature are the breakthrough characteristics of EWA Tech's effective methods and technologies which allow the use the enormous water resource of air humidity.

There is only one natural endless source for fresh water – the air humidity.

Water from air humidity, an unlimited renewable natural resource, is available to all mankind, except in certain extreme climatic conditions (where the temperatures are bellow 4°C and extreme arid zones). One cubic kilometer (1km^3) of air routinely contains 10 to 40 tones of water. Nature continually recharges the atmosphere with moisture by evaporation from the world's oceans, seas and fresh water bodies.

Hitherto, air humidity was considered as a squandered water resource that could not be utilized efficiently; i.e., that this potential life-giving huge water reservoir is useless.

Several attempts were invested in order to try and pull out some of the water latent in the air humidity. However, these attempts resulted in small amounts of expensive water demanding high energy consumption. Naturally, such solutions could not serve large populations, livestock and agriculture.

A novel break-through cost effective process, based on adsorption of atmospheric humidity and the use of heat to extract large amounts of potable water from the air, even in arid zones, is the backbone of EWA Tech Ltd.

EWA Tech virtually provides the humanity with an additional water source to those available by Mother Nature that could be easily utilized for all necessities.

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From obvious reasons, agriculture is the first being injured from water shortage. But, agriculture is not only food. Agriculture is a major player in all essential life cycles; the oxygen cycle, the carbon cycle, the phosphorus cycle, the nitrogen cycle and other nutrient cycles. Thus, giving up agriculture lead to disastrous results.

EWA Tech provides a solution to break the destructive process of diminution of agricultural areas and emigration from agricultural regions to the big cities and urbanization.

2. The Surrounding Air

The globe hovers in a diluted ocean of aerial moisture with real 'sky rivers' full of fresh water[1], from which we could draw.

In 1993, MIT Professor Reginald E. Newell of Arlington[2] found 10 huge filamentary structures that are the preferable pathways of water vapor movement in the troposphere (the lower 10-20km section of the atmosphere) with flow rates of about 165 million kilograms of water per second. These 'sky rivers' band from 320 to 770km wide and up to 7,700km long, 1 to 2km above the earth. These 'sky rivers' transport about 70% of the fresh water from the equator to the mid latitudes.

Water from air humidity – an unlimited renewable natural resource – is available for all mankind, except in very extreme climatic conditions.
One cubic kilometer of air routinely contains 10 to 40 tones of water.
Nature continuously recharges the atmosphere with moisture by evaporation from oceans, seas and fresh water bodies.

According to Newell, a typical flow in the South American tropospheric river is very close to that in the Amazon (about 165 x 106 kg/sec).

Approximately 13,000km^3 of water is in the atmosphere at any given time: 98% in the form of vapors and only 2% as clouds.

The world's reserves of fresh water are estimated to be approximately 35 million km^3, including glaciers, ground water, wells, rivers, lakes, and precipitations as rain and snow. Yet it is inadequate for the ever-increasing, largely unrestrained demands of human civilization; therefore - alternative sources are desperately needed.

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[1] Nelson 2003, www.rexresearch.com/airwells/airwells.htm
[2] Newell, Reginald, *et al.*: *Geophysical Research Letters* 19: 2401 (1992); *ibid.*, 21(2):113-116 (Jan 15, 1994).

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While desalination of seawater is an obvious option, as yet the total annual quantity produced by desalination is about 10km3, a very small percentage (0.3%) of the 3000km3 of water consumed annually.

It MUST be possible to draw water from 'Sky Rivers'! The humanity can not afford itself to give up this huge resource of fresh water.

Water produced by extraction from the air humidity as an alternative water source, has been known and reported since bible times. Various methods for extraction of atmospheric humidity and air drying are known. The older methods are based on cold; condensation on cold objects or condensation by reducing the air temperature below the dew point, with/without pressure. In comparison to all previous methods, EWA Tech's technology is superior in terms of cost, efficiency and yield, as providing large-scale quantities.

3. EWA Tech Ltd.

EWA Tech. Ltd., a private Israeli company, was established in 2006 following nine years of fundamental R&D activities. EWA Tech is being lead by the entrepreneur, Dr. Etan Bar. The company was established in order to execute the business potential of the innovative concepts and technologies for plants, devices, systems and large-scale water production apparatuses to supply high quality water from air humidity. EWA Tech is the sole owner of all intellectual properties. Besides water technologies, EWA Tech deals with additional environmental related technologies, mainly in the field of renewable energy.

More than 80% of EWA Tech's shares are being held by the reputable investment & development company Bar P.M. Project Management Ltd., who founded EWA Tech. The remaining shares are being held by Stratum Wealth Management LLC, Florida, USA and its clients.

Bar P.M. Project Management Ltd. (www.bar-pm.com) is a private holding-managing company active since 1995, concentrating on novel technologies at their early stages. Bar P.M. Project Management Ltd. provides the EWA Tech group with management services and basic and complementary R&D activities.

Dr. Etan Bar, associate and manager in Bar P.M. Project Management Ltd. is the inventor of EWA Tech's technologies and serves as the CEO of the company.

EWA Tech targets its products mainly to the Developing World, and more specific to Africa and Asia. The unique portfolio and intellectual properties of EWA Tech enable the company to provide a package of solutions to contribute the efforts to protect the environment and to provide hope to those populations suffering from water shortage.

EWA Tech is acting in West Africa since 2006, aiming to establish technical and production facilities to meet the global demands for renewable energy and reduce carbon dioxide emissions. EWA Tech's water technologies and and water systems are capable to provide water for drinking, as well as for agriculture, independent of available infrastructure. These independent water supply systems enable to develop agriculture in regions suffering from lack in water.

EWA Tech operates R&D site and a small production site in Beer-Sheva, Israel, distributing it's products mainly through licensees. In addition, EWA Tech is acting in various territories:

- India: A J&V in R&D, production and sales was established with Energreen Power Limited.
- Europe: EWA Tech has established a partnership with Proplan Ltd. (Cyprus) <www.proplan-cyprus.com> as a channel to Arab countries and Europe. The company is operating, together with Proplan Ltd., a R&D and demonstration site in Nicosia, managed by Proplan.
- Australia: Distribution is performed through Aly Tech Pty/Ltd. <www.alytech.com.au>
- Africa: EWA Tech Africa, a subsidiary company located in Ivory Coast, is responsible to implement the Rural Concept in West Africa

4. Intellectual Proprieties

EWA Tech Ltd. owns six patent applications:

1. US 60/836,282 patent application entitled “Method and apparatus for extracting water from atmospheric air”.
2. US 60/849,678 patent application entitled: “Method and system combining extracting water from atmospheric air humidity unit with air conditioning to be integrated into constructions”.
3. PCT/IL2008/000397 patent application entitled "Method and apparatus for extracting water from atmospheric air".
4. IL 183073-07 patent application entitled "Method, Technology and Apparatus for Solar Dripper".
5. IL 182120-07 patent application entitled "Method, Technology and Apparatus for Solar Cooling and Air Conditioning".
6. PCT/IL2008/000397 patent application entitled "Apparatus and method for cooling and air conditioning".

5. EWA's Water Technology

EWA Tech's patented technology for the extraction of humidity from atmospheric air basically combines adsorption of the water particles on solid granular desiccants and pressure-condensation. This is the sole technology for the extraction of the air moisture with positive energy balance, allowing to recover more than 85% of the latent heat.

> *Water extraction from air moisture as an alternative source for water is known and reported since ancient times. Condensation of the air moisture to water is possible by three main processes: cooling below the dew point, adsorption using desiccants and pressure. Due to the high latent heat of steams, condensation is an exothermic process. Only two of the condensing processes, desiccation and pressure, could be performed without massive investment of energy, while the latent heat is of about 540kcal per one liter of water (the same amount of energy that needs to be invested by cooling condensation technologies) is being recovered and used.*

By using EWA's water technology the energy is mainly required to blow the air through the desiccants, while the condensation process utilizes the latent heat released upon adsorption, and the heat forms by applying pressure is recovered and returned to the process. Moreover, the use of dry granular desiccants enables effective extraction of the air humidity almost at all levels of relative humidity. Due to its effectiveness at extremely wide ranges of environmental conditions and due to its low energy consumption, huge water systems could be built and operated using the novel EWA's water technology. EWA's water technology, therefore, answers the world's desires for available, clean and safe water without the necessity for polluting energy and expensive infrastructures.

EWA's technology for capturing air humidity and release liquid water in three main Stages is presented in Fig. 1.

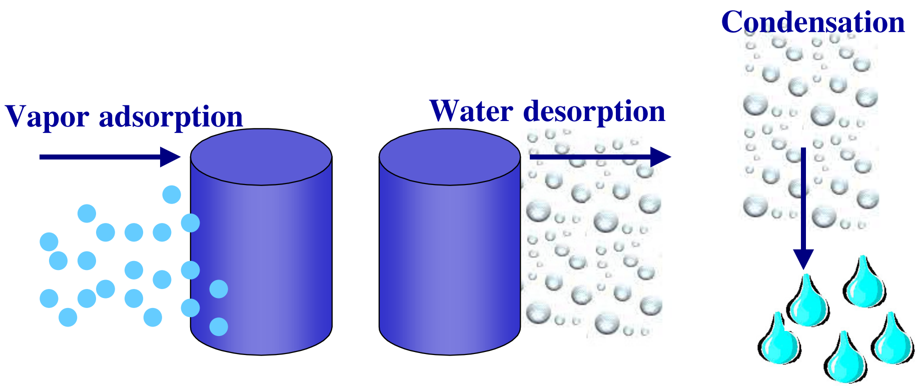

Fig. 1. EWA Techs' technology – the fundamentals process

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I. Absorption of the air humidity;
II. Desorption of the absorbed water; and
III. Condensation

The three Stages as described above and in Fig. 2 and 3, are combined with a sophisticated airflow system, pressure control and coupling between the heat and cool processes, allowing recovery of most of the heat energy that being used for the process and, accordingly, involve minimal energy consumption.

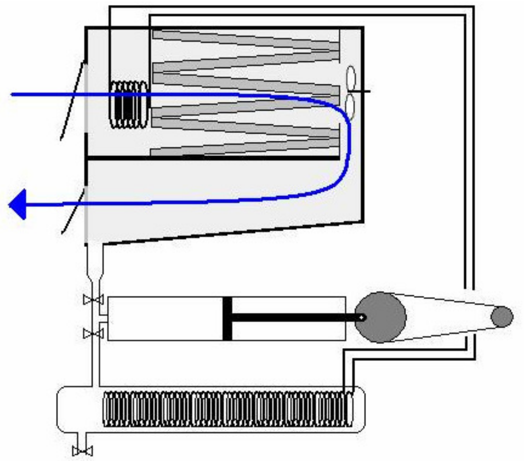

Fig. 2. Stage I - Adsorption

In Stage I (Fig. 2), the humidity is removed from the air by using chemical desiccation. Since the absorption of the humidity is an exogenic process (involving heat release), the absorption of the humidity occurs spontaneously, demanding minor energy consumption (electricity) to cause the air to flow through the absorption unit. Only the air humidity remains adsorbed on the desiccants, while the dry air flows out to the atmosphere. The absorption (Stage I) is a key element of the technology, allowing to utilize ambient air, even with very low relative humidity (RH) of less than 20% or absolute humidity of 5g/1m3 of air. The unique tailored desiccants selected to be used in EWA Tech's apparatuses enable efficient operation at a wide temperature range between 4°C to 45°C.

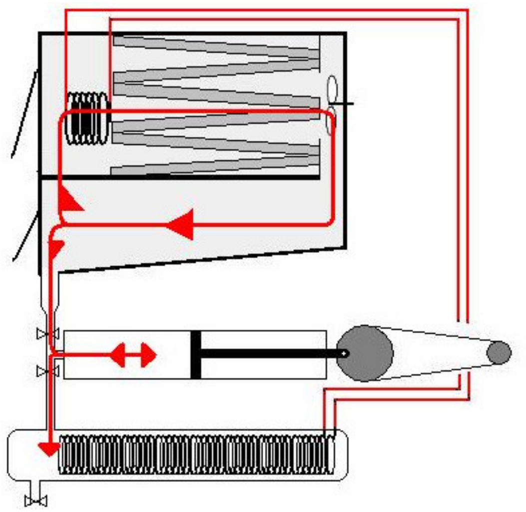

Fig. 3. Stages II and III - Desorption and condesation.

In Stage II (Fig. 3), minimal energy is required to flow the air in circulation and to create moderate heating (~85°C) under negative pressure, enabling the release of the water from the desiccants.

In Stage III (Fig. 3), that being operated simultaneously with Stage II, The air in EWA's apparatus is sucked into a unique hydraulic condenser while heat is recovered and returned to continue the extraction of the water from the desiccants. This process allows condensation of the steams with minimal heat losses and allows to preserve more than 85% of the energy invested.

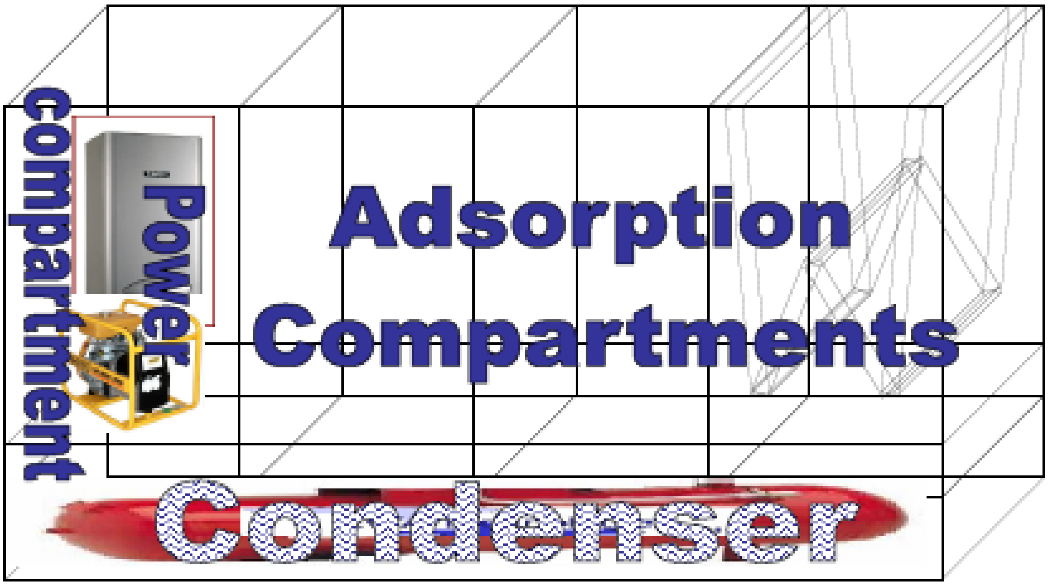

Fig 4. Scheme of a multi-stages EWA plant

Multi-stages EWA plant (Fig. 4), combine 3 individual adsorption/desorption units, each located in a separate compartment, connected to single condenser that enables continuous water production, while heat is totally conserved and transported from one unit to another. At every given moment one unit is on Stage I, one on Stage II and the third is on Stage III. The heat released from Stage III is being used to heat the unit on Stage II.

EWA's water apparatus could be produced at various scales, from very small apparatus with a daily capacity of few tens of liters and up to water apparatuses having daily capacity of hundreds thousands of liters. The bigger the apparatus, the energy consumption per liter of water is lower. Some of EWA's water apparatuses are equipped with air conditioning capability, providing air condition with very low electricity consumption.

6. EWA Tech's Rural Concept for Water Supply

EWA Rural Concept is based on EWA Tech's novel water technology for the extraction of water from air. Conventional sources for water supply to agriculture suffer from two main difficulties: 1) shortage in water sources; and 2) lack of appropriate and available infrastructures.

EWA's water technology overcomes these limitations by extracting air humidity that available in every place where needed, where no long distance water supply systems are required. However, energy still remains a major problem.

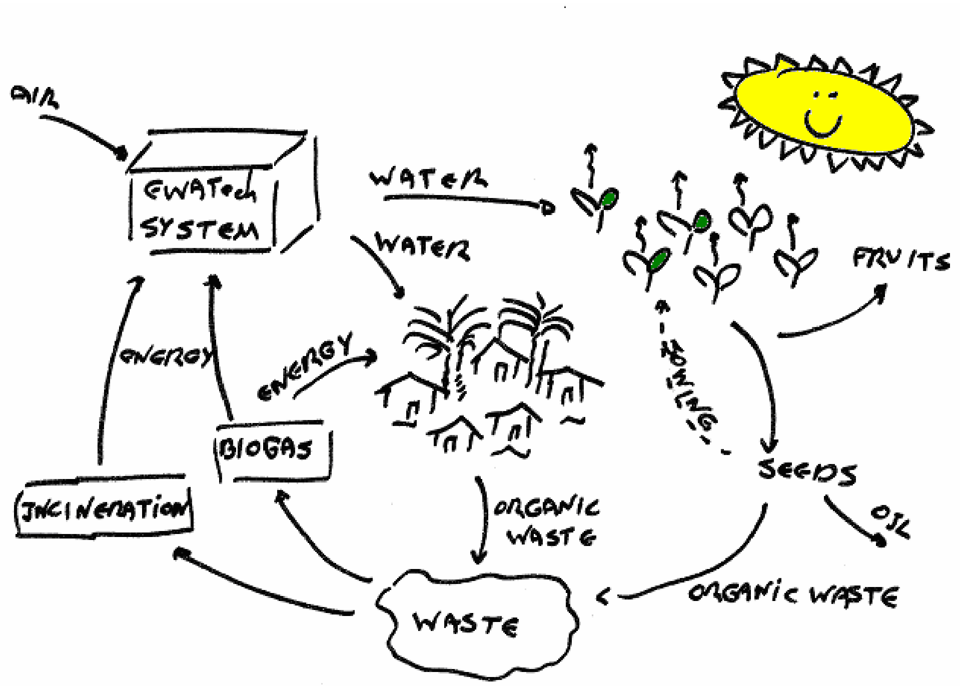

Fig 5. EWA's Agri Cycle: the Rural Concept for Water Supply for agriculture

EWA Tech's novel concept for rural and agricultural purposes is illustrated in Fig. 5. EWA's Rural Concept is based on three main components:

I. Incineration;

II. Biogas production plant; and

III. EWA's water apparatus.

EWA Tech's Rural Concept makes use of agricultural wastes as an energy source for the EWA's water apparatus. EWA's water apparatus is capable to utilize all types of energy, but mainly demands heat. Agricultural wastes are

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composed of organic matter that enables to produce heat without causing air pollution. Therefore, EWA's water apparatus allows to utilize the energy emitted from incineration of organic wastes and biogas system (both are detailed below) to produce water from the air humidity, targeted for irrigation and municipal uses.

Multi-stages EWA's water plants utilize electricity to blow air through the apparatuses. For every cubic meter of water (1,000 liters), at least 50,000 cubic meters of air are requested to pass via the EWA's water apparatus. To blow such an amount of air, about 5KW electricity needs to be invested, i.e., 5W/liter. In addition, 600,000kcal of heat should be invested, while 85% of this energy is recovered using the sophisticate condenser of the EWA's water apparatus. Considering the heat recovery, 51,000kcal should be invested to produce one cubic meter of water, 51kcal/liter.

To produce 51kcal of heat only 5kg of dry organic matter are needed to be incinerated. The electricity required to blow the air is produced by using biogas, as detailed below. The biogas produced is more than enough to operate the blowers, as detailed below.

The bottom-line is that by using agriculture wastes it is possible to supply water for agricultural and municipal purposes at extremely low price. EWA's water apparatuses are the sole solution to supply water for agricultural and municipal purposes in an independently of underground water or long distance pipes. Moreover, EWA's water technology is the sole technology that enables supply of water for agriculture based on the extraction of air humidity at reasonable price. The combination of EWA's water apparatus with biogas and agriculture waste incineration makes the supply of water, almost free of charge, for agriculture and domestic purposes possible.

6.1. Biogas

The Biogas in EWA Tech's Rural Concept:

Biogas will be used as a low-cost fuel to run EWA Tech's water apparatuses, where the excess energy will be directed to the village. Biogas production plant is an integral part of EWA Tech's Rural Concept as the biogas produced in this plant is being used to operate electric generator.

Biogas:

Biogas is the gas produced by biological breakdown of biogenic material in the absence of oxygen (anaerobic). The biogas comprises primarily methane (50%-75%, CH_4), carbon dioxide (25%-50%, CO_2), Nitrogen (0-10%, N_2), hydrogen (0-1%, H_2), hydrogen sulfide (0-3%, H_2S) and oxygen (0-2%, O_2). The composition varies depending upon the origin of the anaerobic digestion process.

The production process is based on anaerobic 'digester' that biogenic material, fed with energy crops or any other biodegradable wastes. In order to get a clean and fast process and due to the variety and seasonal nature of the biogenic material, no landfill techniques are being used.

When the tank is opened, old slurry is removed for use as fertilizer and the new charge is added. The tank is then resealed and ready for operation. Dependent on the waste material and operating temperature, the digester will start producing biogas after two to four weeks, slowly increase in production then drop off after three or four months..

Most vegetable matter has high carbon:nitrogen ratio, and weight for weight, vegetable matter produces about eight times as much biogas as manure, so the quantity required is much smaller for the same biogas production.

Biogas around the world:

In India biogas produced from the anaerobic digestion of cows' manure in small-scale digestion facilities (Gober gas) is directly connected to the kitchen fire place in more than 2 million household facilities. Biogas is used extensively throughout rural China and where wastewater treatment and industry coincide. The Biogas Support Program in Nepal has installed over 100,000 biogas plants in rural areas. Vietnam's Biogas Programme for Animal Husbandry Sector has led to the installation of over 20,000 plants throughout that country. Biogas is also in use in rural Costa Rica. In Colombia experiments with diesel engines-generator sets partially fuelled by biogas demonstrated that biogas could be used for power generation, reducing electricity costs by 40% compared with purchase from the regional utility.

In all these places two reasons limit the use of the biogas: 1) inefficient production; and 2) the use of the biogas, as mainly being done by each household separately, could not serve much more than the elementary need for cooking, hot water, etc. These limitations overcame in large scale biogas systems.

Europe is home to more than 5,000 biogas plants, which provide clean, renewable electricity, heat and natural gas to communities from energy-rich organic by-products.

http://www.completebiogas.com/

Legislation:

The legislation mainly concentrates on biogas produced by landfill; i.e., burial of the waste in open spaces.

In order to remove the entrained non-methane organic compounds (NMOCs) and due to the remoteness nature of landfill sites, the European Union Landfill Directive and the United States Clean Air Act and Title 40 of the Code of Federal

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Regulations (CFR), which, generally saying, are against landfill gas as it contains volatile organic compounds (VOCs), require landfill owners to estimate the quantity of NMOCs emitted.

The biogas system, as will serve in EWA Tech's Rural Concept for Water Supply does not suffer from any of the disadvantages associated with landfill systems as being fully controlled in closed tanks for maximal efficacy and safety.

Biogas adjustment to EWA Tech's Rural Concept for Water Supply & Costs:

Generally saying, the operating efficiency of biogas systems – if only heat is produced – is 90%, 85% if both electricity and heat are produced and 35% if only electricity is produced.

Few samples of many for similar biogas sites are:

a) In Bischhausen, Germany, biogas plant utilizing chicken manure, pig manure and turkey dung was established as an energy source. As a fermenter served a concrete tank of 450 m³, results with a gas engine with an output of 45 kW. The system, established in 2000, cost €200,000.

b) In Bad Hersfeld, Germany, biogas plant utilizing manure and other organic waste was established as an energy source. As a fermenter served a concrete tank of 600 m³, results with a dual fuel co-generator (co-generation is the production of heat and electricity by the same energy plant), 30 kW and gas engine, 15 kW. The system, established in 2001, cost €350,000.

c) In Ochsenhausen (Hofgut Holland), Germany, biogas plant utilizing pig dung, turkey dung, grass and corn silage was established as an energy source. As a fermenter served a concrete tank of 350 m³, results with a gas engine with an output of 60 kW. The system, established in 2004, cost €285,000.

d) In Dentingen (Frey Farm), Germany biogas plant utilizing corn silage, grass silage and wheat silage (no manure) was established as an energy source. As a fermenter served a concrete tank of 1.530 m³, results with a gas engine with an output of 330 kW. The system, established in 2005, cost €900,000.

It should be noted that biogas plants established in northern countries in Europe and North America could not resemble plants in equatorial countries and hot regions. In biogas plants located in relatively cold regions extensive investment of heat is required, while this heat is saved in hot regions. Accordingly, the efficacy of the plant would be higher in hot regions as saving the necessity for energy investment.

EWA's water apparatuses utilize electricity to operate an air blower for the transference of the air through the apparatus. For each cubic meter of water (1,000 liters), at least 50,000 cubic meters of air are required to be blown through the apparatus.

For an apparatus with a daily capacity of 10,000 liter of water, the electricity consumed is estimated as 0.00045kWh/l. The following is based on 0.5kWh/1 cubic meter of water. Accordingly, a very small biogas plant is required.

The bottom-line of the aforementioned data is that by using agriculture waste it is possible to supply water for agricultural and municipal purposed at extremely low cost.

EWA's water apparatuses are the sole solution for supply of water for agriculture, independently of underground water or long distance pipes. Moreover, EWA Tech's Rural Concept for Water Supply is the only system that can supply water for agriculture based on extraction of air humidity at reasonable price. The combination of EWA's water apparatus with biogas and agricultural wastes' incineration makes it possible to supply water almost free of charge, for agriculture, as well as for domestic purposes.

6.2. Incineration

All agricultural wastes and ~70% of household wastes (in developed countries) can be burnt. Incineration means of eliminating a large part of the waste volume, but also means of producing energy from waste.

Incineration is the thermal oxidation of waste at temperatures in excess of 850°C. An incineration plant consists of an oven and a post-combustion chamber. In the oven, the waste undergoes decomposition by heat (pyrolisis), producing combustible gases. These gases are burnt at 800°C to 900°C in the post-combustion chamber. 5 to 7 tons of wastes are required to produce the equivalent of 1 ton of fuel oil.

If the target is only to produce heat, water is sufficient, since heat exchangers yield is very good: 70% to 80% of the heat of combustion is recovered, about 1500 kW per ton of waste.

The fumes from waste incineration might be toxic, especially when dealing with household wastes which contain paper, cardboard, decomposable organic matter, textiles and plastics. They must be filtered and neutralised before being discharged into the atmosphere. The atmospheric pollution norms applicable to incineration plants are particularly strict.

The main disadvantage of straw – its big volume that should be transported and stored – becomes negligible when the fields are close to the incineration plant.

In Senegal, almost 10% of the country's electricity production results from the use of cane sugar and groundnut waste. In Southeast Asia, the shells of coconuts and palm nuts, from which oil has been extracted, are burnt.

The range in size of incineration plants vary from units rated to burn waste from 25kg/hr to over 3000kg/hr and can be oil, gas or liquefied petroleum gas(LPG) fuelled. They can be manually or semi automatically fed via auto feeder.

It should be emphasized that the incineration plant, as a part of EWA Tech's Rural Concept for Water Supply will deal only with agricultural wastes, eliminating all wastes associated with toxins and/or damages to animals, humans and the environments.

7. Market & Business Environment

More than 1,500,000,000 people worldwide suffer from water and food shortages, many of them are leaving in rural regions. Both, starvation and thirst are the direct results of the lack in water!

Water shortage limits agricultural production, drive away wildlife and limit the ability to nurture livestock – water is the key for life. Further, in some cases water is available, but the distances between the water reservoir and the water consumption point demand expensive piping and infrastructures, which are unaffordable for the local authorities.

Accordingly, rural regions are the initial target market for EWA Tech's Rural Concept products.

More than one billion people currently suffer from lack in adequate and/or insufficient drinking water. According to Population Action International, by the year 2025 more than 2.8 billion people in 48 countries will face water deficiency ranging from serious water shortages to major life-threatening crises, unless dramatic solutions are introduced. The sum of people without access to piped fresh water accounts for more than 25% of the global population, most of them located in Africa, Asia and South America.

Besides EWA Tech there are no entities that offer large scale water ***production*** based on extraction of water from air in sufficient quantities and affordable prices for agriculture and rural settlements.

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8. Competing Technologies

In cases where fresh water is unavailable, the following alternatives are the most common:

- ⊗ Wastewater treatment and reclamation
- ⊗ Water decontamination and purification
- ⊗ Water desalination

Desalination has long been considered as a promising solution for the world's current and future water problems. Water desalting, or desalination, has long been utilized by water-short nations worldwide to produce or augment drinking water supplies. However, desalination has been found to be costly and unaffordable in places where it is most needed, and the demand for water continues to exceed the available supply. There are more than 10,000 large commercial desalination plants in operation worldwide in ~120 countries.

According to the UNEP International Environmental Technology Centre, Newsletter and Technical Publications and according to the American Desalting Association (ADA), more than 50% of the desalination plants are located in the oil-rich countries of the Gulf countries: 27% in Saudi Arabia, 11% in the United Arab Emirate and 8% in Kuwait. Following the Gulf Countries, advanced countries with water shortage problems, such as the United States, operate 15% of these plants.

Generally speaking, it costs US$0.5-1.5 to get 1m^3 of freshwater from a desalination plant with a capacity of 4,000m^3 per day and more. In the Gulf Countries, where oil is inexpensive and is used to generate electricity rather cheaply, the distillation process is most frequently used since it can utilize low-pressure steam from steam-power stations. The reverse osmosis process is more popular in the rest of the world.

In the United States, water is relatively inexpensive compared to many other parts of the world. However, the vagaries of weather, skyrocketing population growth, and subsequent increases in demand for water in arid or semi-arid areas, are contributing to a heightened interest in water desalting as a means to augment existing supplies. In addition, many communities are turning to desalting as a cost-effective method of meeting increasingly stringent water quality regulations.

Water desalination meets several severe disadvantages: extremely high volumes of concentrates (brain), much more than the desalinated water, which causes many difficulties including the demand for expensive getting ride of it, especially when the desalination plant is far of the sea shore; and, the need for long distance water supply systems to transporting the water inland. In contrast, EWA's water apparatuses produce the water in the place where the water is needed and there are no discharges of any kind.

Wastewater treatment, reclamation, decontamination and purification are used in many countries not only as a source of water but as an efficient way to get rid of the polluted and/or contaminated water. However, in most places the resulting water is not acceptable for drinking, since the final purification steps are the most expensive. Further, water supply based on these processes is dependent on existing sources of water, efficient transportation systems of the polluted/contaminated water that will not leak and thereby contaminate and pollute the whole environment and a separate water transportation system specifically targeted to the 'renewed' water.

Despite the expanding use of desalted, purified and treated water, all processes do not provide solutions to the following essential problems:

- ⊗ Expensive transportation systems (pipes or trucks) are required. In the case where the resulting water is not acceptable as drinking water, a separate piping system is required for the treated water;
- ⊗ Water is subject to contamination during delivery;
- ⊗ The overall cost of tap potable water is high;
- ⊗ No 'new' water is available – the quantity produced is never higher than the quantity entering the treatment-plant! In many cases, this total amount is still insufficient;
- ⊗ Many processes, including desalting, cannot provide sufficient and safe solution for heavy metals, radioactive and many organic and inorganic contaminations in the water.
- ⊗ In case of desalination, the resulting brine should be stored or returned to the sea far from the seashore by using expensive piping.

The aforementioned problems become acute in arid zones and poor and isolated areas or in the case of special necessities (fast growing population and industry, expeditions).

EWA Tech's Rural Concept does not suffer from any of the aforementioned disadvantages as it does not require any infrastructure or expensive piping systems, being operated with minimal energy consumption, does not involve toxic or contaminating byproducts, and can create 'new' water!

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9. EWA Tech's Rural Concept: Business Models & Costs

EWA Tech's water apparatuses are applicable to produce every water quantity; from few tens of liters up to hundreds of cubic meters daily.

An average person in developed countries consumes 100-150 liters of water per day, 80% of which is used for hygienic purposes. Water consumption in developing countries and arid zones is estimated to be only 20% of this consumption.

The products of other companies claiming to extract water from air possess low water capacity and, thus, are unable to supply high quality water in large scales and low cost. Accordingly, all these are unable to replace conventional water supply systems or to reinforce significant amount of it.

EWA Tech's water apparatuses are combined of modular components, which allow simple engineering and construction for tailored engineering and designing. The two basic EWA Tech's models are detailed in Table 1.

Table 1. EWA Tech's main models.

Model	**Daily water capacity (liters)**	**Retail Price ($)**
Type III 20	10,000	85,000
Type III 40	25,000	125,000

These apparatuses are supplied on 20/40 feet sea container platforms, suitable for delivery by truck and able to combine up to 40 Type III40 units per single water apparatus.

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The physical characteristics of EWA Tech's Type III models are detailed in Table 2.

Table 2. Physical characteristics of Type III models.

Characteristic	**Type III 20**	**Type III 40**
Daily water production	10 m^2	20-25 m^2
Size (m)	6.0 x 2.5 x 2.5	12.0 x 2.5 x 2.5
Weight (ton)	15	26
Control	Fully automatic	
Maintenance	○ Air filters – weekly ○ Minerals cartridge – according to water consumption (about weekly) ○ Cassettes replacement/recovery – annually	
Guarantee	One year (including training)	
Extra equipments	Electric generator Diesel/gas heater Water container	
Operations range	Minimum RH - 20% Ambient temperature 4°C to 45°C	

*1kg diesel = 11 kW, 1m^3 natural gas = 10 kW

Maintenance includes mainly weekly cleaning/replacing of the dust-filter, annual service (including replacement or regeneration of the absorbent, overall cleaning and check-up) and filling the mineral solution. The annual maintenance cost is calculated to be 5% of the apparatus price.

The energy consumed by the apparatus is detailed in Table 3.

Table 3. Energy consumption of EWA Tech's Rural Concept models.

Energy source: Bio-waste plus agricultural waste		
Daily capacity (l/day)	Bio-waste (kg/l) Heat consumption	Electricity consumption (kWh/l)
10,000	0.026	0.00045
25,000	0.022	0.0003
Energy source: Natural Gas [2]		
Daily capacity (l/day)	gas (m^3/l) Heat consumption	Electricity consumption (kWh/l)
10,000	0.03	0.00045
25,000	0.024	0.0003
Energy source: Diesel [1]		
Daily capacity (l/day)	Diesel (kg/l) Heat consumption	Electricity consumption (kWh/l)
10000	0.065	0.00045
100000	0.055	0.0003

[1] 1kg diesel = 10,200 kcal or 11 kW

[2] 1m^3 natural gas = 8,600 kcal or 10 kW

The entire structure of 'standard' EWA's Rural Concept includes:

- ⊗ EWA's water plant of 100m^{3}of water per day.
- ⊗ Biogas plant
- ⊗ Incinerator

The total cost of such structure, including construction, is estimated to be around US$250,000. This price includes a small incinerator with capacity of 25kg/h (600kg/day) of organic waste providing 900kW/day (37.5kW/h) and a small biogas plant with a capacity of 25kWh.

To produce 100m^3 of water 500kg/day of organic matter should be incinerated. Biogas plant, including an electric generator, with a capacity of 5kW/h is needed. Nevertheless, EWA's Rural Concept includes a 25kW/h biogas plant, while the extra amount of electricity will be sold for domestic or industrial consumers.

The business structure of the EWA Rural Concept takes into consideration two options:

- Sale of water and electricity; or
- Provide free-of-charge water to the farmers and buying the crops from the farmers at predetermined price.

Naturally, only the first option fits EWA Tech's business concept. Due to the high investments needed to set up the EWA Rural Concept, the company might benefit from the Carbon Credit System and, in such case, the second option will be considered as well, on a case-by-case basis.

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