WGE Start-Up
May 10, 2018

Dr. Alp KARABAS

Overview

Water Generation in anywhere!

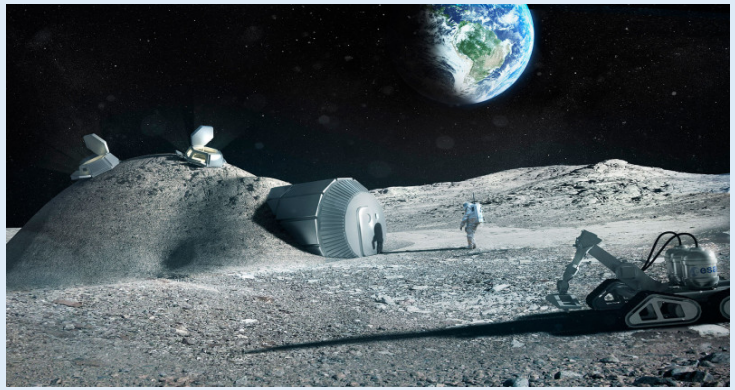
- Water Generation Equipment (WGE) generates drinkable water at any place at any time
- WGE uses air or crystal water and solar energy for continous water supply in isolated areas at zero energetic cost and with no negative effect on the environment, preserving the natural resources
- The best solution for water stressed regions in the world and the space missions

Water Stressed Regions

Space Station

Mission to Mars

Space Mining



Team

Dr. Alp Karabas
Managing Director-EMEA, Kerry International
Founder, Kerry WGEs Start-Up

Background
PhD in International Business
MSc in Global Marketing
MBA, specialized in Services
BSc in Mechanical Engineering, specialized in HVAC & Energy

Experience
Energy (2007-2018) (Gen-Sets, Fossil Fuel, Geothermal, Solar PV, Biomass),
Automotive (2005-2007) (Truck, Bus),
Machinery (1999-2004) (Construction, Earth-Moving Machinery, Tools & Equipment)

Partners :

Muhterem Karabas
Managing Director
YILDIZ MAKINA
Partner-Kerry International

Background
BSc in Mechanical Engineering, specialized in HVAC

Experience
HVAC (1979-) (Boilers, Heat Exchangers, Water Treatment)

Osman Arslan
Managing Director
Junis Machinery

Background
BSc in Electrical Engineering

Experience
Automation (1978-)

Ahmet Yucekaya
Managing Director
DETAY PATENT & CONSULTANCY
Partner-Kerry International

Background
BSc in Business Administration

Experience
Accounting (2002-) (Trademarks, Patents, Business Consultancy)

Ozlem Arslan
Senior Designer
Reddish Bath Design Service

Background
MSc in Graphics

Experience
Industrial Design (1998-)

Milestones

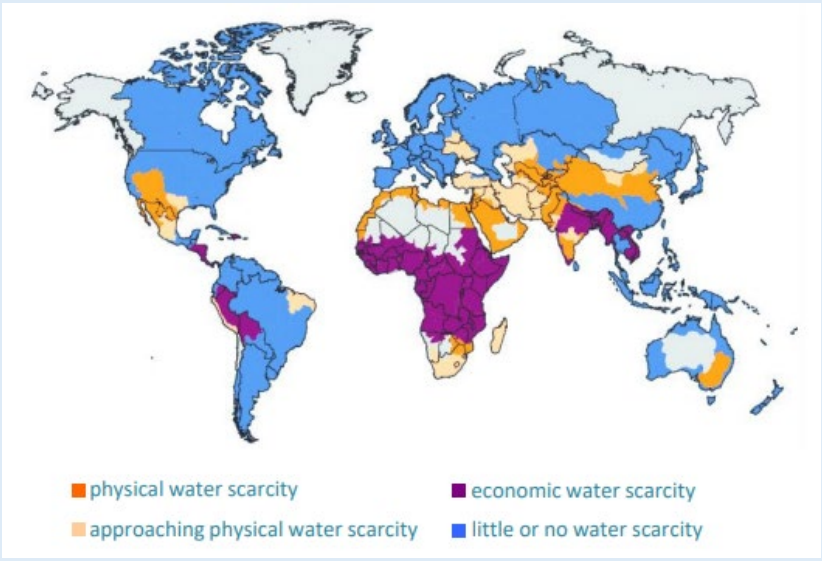
1983-Establishment of YILDIZ MAKINA and OZTERMAL® Brand
1984-Production of First Boilers & Heat Exchangers , Fuel Tanks
1985-Production of First Steam Boiler & First Central Heating System
1986-First production of Water Softeners, Water Filters and Sand Separators
1988-Production of First CNG Boiler, First Design & Engineering Services
1990-First turnkey centralized heating plant for a production facility complex
1994-First Exports to Middle East and First production of Pressure Vessels
2004-First Country distributorship of Waterite, SWT, Scalewatcher and Aquasan
2005-First Production of Water Treatment & Waste Water Treatment Systems
2008-Certification for ISO 9001 awarded and First Exports to EU
2009-First Engineering-Design-Production Services for PV and Solar Thermo Unit
2010-First Exports to CIS Countries
2011-First production of Plated Heat Exchanger under Heat Plate® brand
2012-CE Marking for OZTERMAL® brand Boilers & Heat Exchangers
2014-First R&D and Engineering Works for Heat Recovery Plants
2015-Certification for ISO 14001 and OHSAS 18001 awarded
2016-Launch of KERRY Engineering
2018-Launch of KERRY International Affiliate Network
2018-Establishment of Kerry WGE Start-up, Preliminary Designs, Cooperation with technology partners for design, first products

Problem-Space Missions

- Gold, silver, cobalt, molybdenum, nickel, osmium, palladium, platinum, rhenium,rhodium, ruthenium and tungsten are waiting in the asteroids to be mined!
- Mars and many planets are waiting to be explored!
- Transporting anything to the space station is extremely expensive-launching a SpaceX rocket costs more than $1800 per pound. And you know what's really heavy? Water.
- Tanks of H20 can't be constantly shipped up to any other space mission. Then, what will we do?
- However, moon, comets, asteroids and many other planets have water and thin atmosphere waiting to be processed.

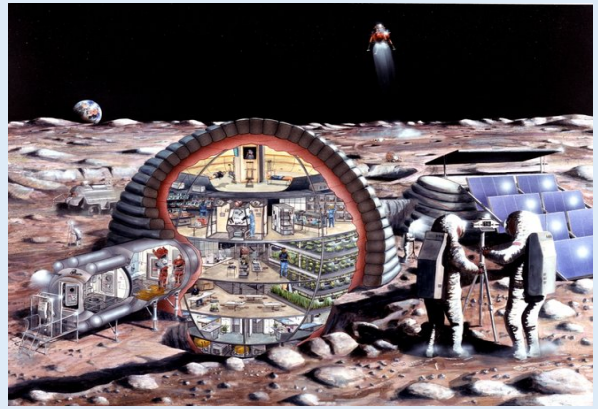
Problem-Water Stressed Regions

- Worldwide relative humidity (“RH”) is rapidly increasing. For every 1° celsius increase in global warming results about 7% increase in RH. In recent history Worldwide RH has increased about 10%.
- Even though relative humidity is increasing, billions of people suffer the water challenge: Scarcity, droughts, pollution, diseases,...
- Many emerging countries could not develop their commercial and industrial targets due to lack of water.
- We aim to provide a solution by generating safe drinking water by using relative humidity with no negative effect in the environment



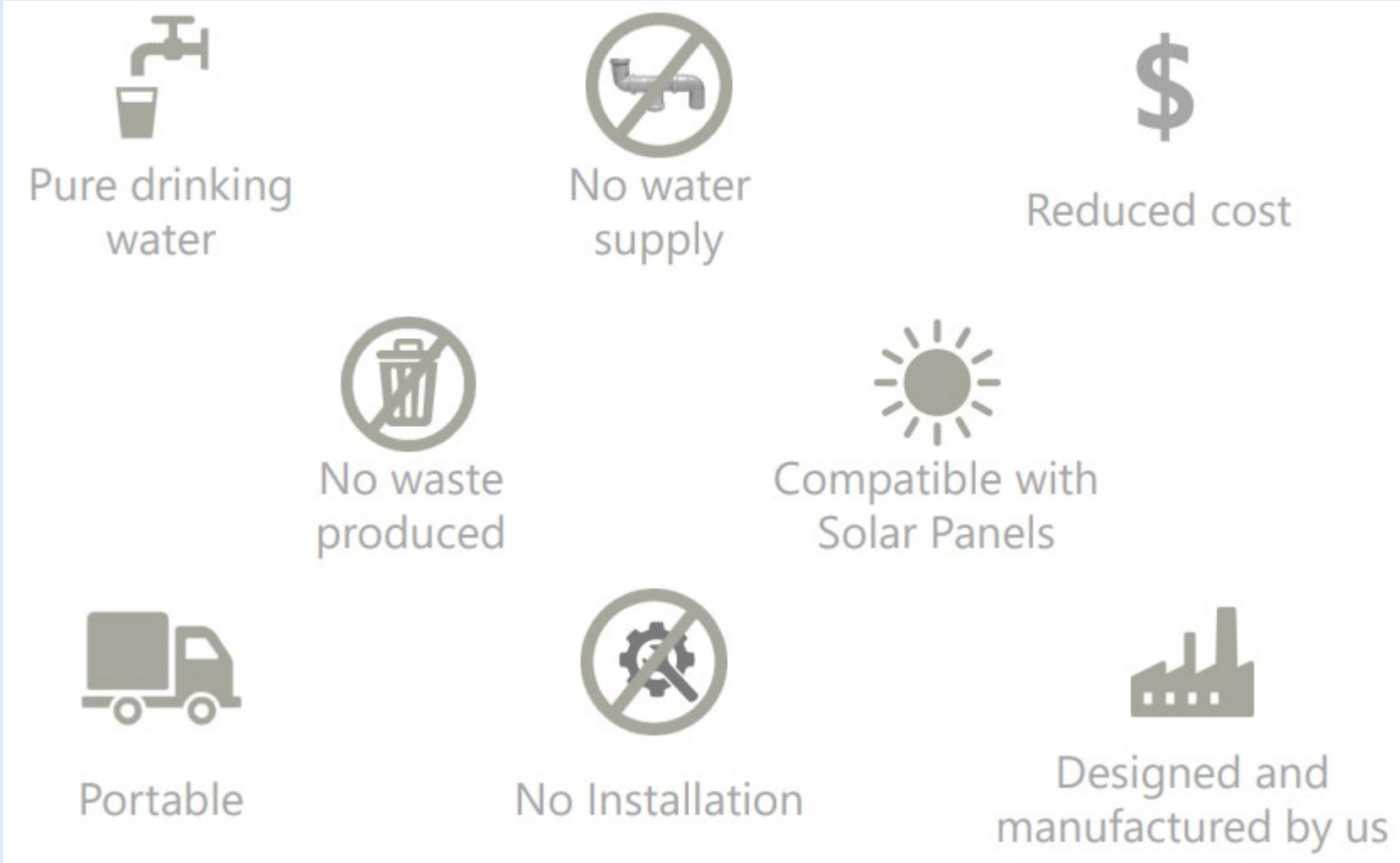
Advantages-Space Missions

- Modular design allows the WGE to be assembled and maintained at anywhere in space missions
- Only a 45 kilogram WGE could generate 50 liters of water per day which will bring an excellent advantage for long space missions with crews.
- Crystal water in asteroids or other planets, any water vapor, the air-con system, process or even urine can be used as water source to be processed.
- Process water for cooling purposes of excavating machines could be also achieved.
- Only solar energy could be used which is free at space with high-efficiency solar panels. The more efficient solar panels, the more compact WGE!



Advantages-Water Stressed Regions

- WGE uses air or crystal water and solar energy for continous water supply in isolated areas at zero energetic cost and with no negative effect on the environment, preserving the natural resources.
- The generated water is pure and free from contaminants, certified by the European Health Authorities & complies with World Health Organization (WHO) standards.
- The generated water could be also used in process water for factories, HVAC applications or any other application that demands water!



Solution

WGEs generate clean water from the humidity of the air in any where, just air and an source of energy is required!

How?

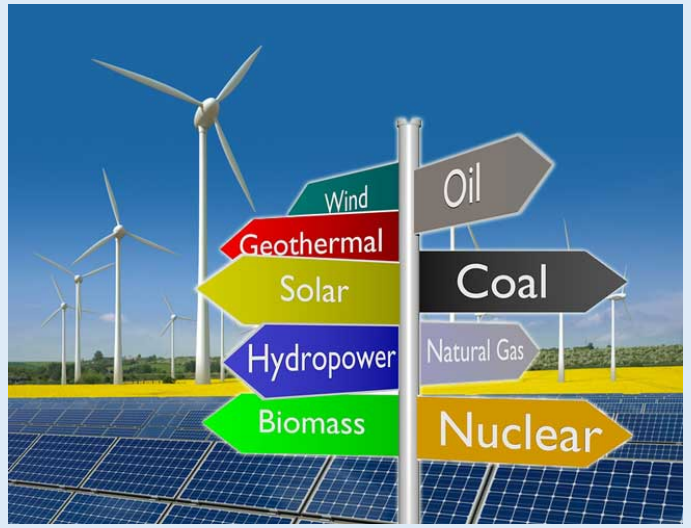
-Air holds up to 30g of water/kg
-WGEs will extract of this available water contained in the air and exhaust much dryer air back into environment.
-WGEs draw in large volumes of air that are then filtered, then pre-conditioned for saturation, then compressed and then cooled below the dew-point to the optimum point to collect H2O in the form of condensation.
-WGEs also clean the air by filtration.

Limitations

-Even arid climates with temperature over 50ºC (122F) and relative humidity lower than 20%.

Benefits

-Free from biologic contamination, and with excellent physical and chemical properties.



-WGEs are portable and autonomous so water is produced wherever it is needed.
-WGEs could be used even in industrial or polluted areas
-WGEs can be powered by utility power, gen-sets, geothermal, wind, biomass, hydropower or solar energy.
-WGEs can be combined with existing air-con system or ventilation system at indoor applications in which humidity needs to be removed.
-WGEs can use water vapor in the production processes or HVAC applications.

Applications-Options-Potential Customers

WGEs generate clean water or process water from 5 liters to 10.500 liters a day.

Applications
-Space Missions (5 to 100 liters/day)
-Domestic, Offices, Residents and other Residential (from 5 to 200 liters/day)
-Remote residences, hotels, labor camps (from 500 to 5000 liters/day)
-Business complex, schools, universities, hospitals (from 50 to 5000 liters/day)
-Emergency, military, civilian response units (from 50 to 5000 liters/day)
-Warehouses, commercial facilities, industrial complex and utilities (10.500 liters/day)
-Marine applications

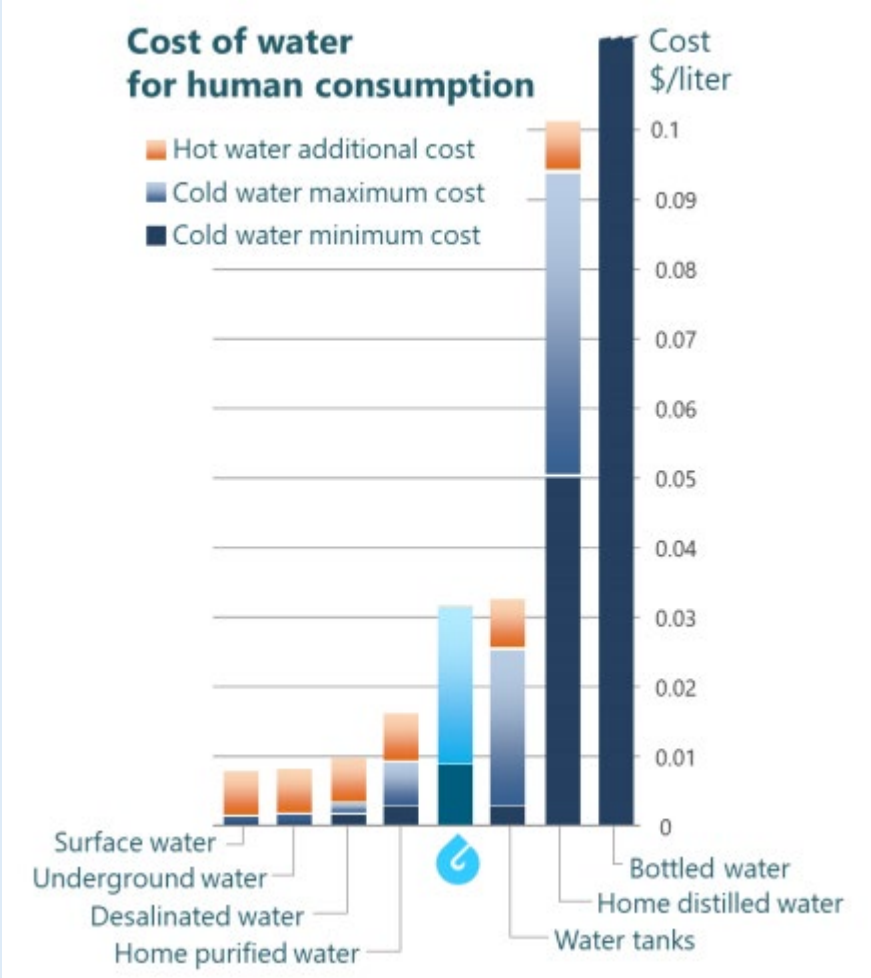
Options
-Integration to Buildings and Utility, Generation and Storage up to 100.000 liters/day
-Internet of Things, Automation, Remote Control and Modularly Expansion
-Containerized solution package for commercial and industrial applications
-Compact WGEs are compatible with PV Solar and Wind energy.
-Special IP Protection and ultrafiltration levels

Industries
Aerospace & Defense, Construction, Agriculture, Mining, Chemicals, Oil & Gas, Manufacturing, Food Processing, Ships & Yachts, Petrochemical, Utilities, Education, Healthcare, Development Programs and anywhere demands water!

Why WGEs?

Why WGEs in water stressed regions?
-Lower cost than bottled water
-Lower cost than supplying water in tanks
-Lower investment than desalination
-Hot water is produced at zero cost
-Final cost is from 0.01 to 0.03 $/liter and even 0 $/liter energetic cost by using renewable energy sources

Why WGEs could be preferred?
-No pollution to environment
-Sustainable water generation night & day
-Pure drinking water or process water generation is available at the same unit
-Moisture elimination, air cleaning, safe water production by one unit
-Adaptation to any kind of energy



Why WGEs in space missions?
-Unique water generating source
-Compact and portable
-Various sources could be used for water generation including ice, moisture, vapor, grey water, etc.
-Very light structure which decrease the cost of transportation
-It could enable irrigation at space in greenhouses and also use vapor by the plants.
-Pure water supports health & life.

Market
The market size is unknown due to the possibility of the realization in the space missions.

Competition

Segment	Residential	Commercial-Industrial	Aerospace	Kerry in Competition
Competitors	Around 20 firms mostly from Far East	3-5 firms mostly from EU and USA	1 firm	Active in EMEA
Products	Range: 5-25 liters/day	Range: 200-500 liters/day	Electrolyzer	Range: 5-10.500 l/day
Technology	Modified Dehumidifier	Complex Dehumidifier + Air-Con	Electrolysis	Vapor + Ice HVAC Conden.
Investment	Investment cost is cheap; however, maintenance is costly and complex	Investment cost is expensive; maintenance is costly & complex	unknown	Economical investment with easy maintenance
Energy	Utility, not stable in target markets	Utility, not stable in target market	Solar	Any energy source
Pros	Cheap investment	High amount of water generation	Water Cycle	Water generation
Cons	Challenging to operate in remote areas, high maintenance costs and thirsty to electricity, fixed installation	Challenging to operate due to its complex structure, high operating and maintenance costs, fixed inst.	Expensive and low water generation	Compact structure, easy maintenance, portable, low energy consumption
Options	No option for storage or integration	Containerized solution	No	Many (see options page)
Renewables	No	Limited with solar	Integrated	Solar, wind, geo, biomass
Vapor-Ice-Grey Water	No	No	Grey Water	Vapor, Ice, Grey Water and Industrial Condense

Market and Key Players

The water generation industry started in 2013. It is expected to grow at a CAGR of 30% from 2018 to 2024. The
global market is expected to reach USD 4.74 billion by 2022, according to a new report by Grand View Research, Inc.

Higher water output & less complicated mechanism and rising shortage of water supply with uncertain rainfalls are expected to be the key factor driving demand market share growth from 2016 to 2024.

The market size is expected 8-9 billion USD by 2024 according to a new research report by Global Market Insights, Inc.
-USA: 0.5 billion USD
-MENA: 2 billion USD
-China: 2 billion USD
-Asia & Africa: 1 Billion USD each
-Rest of the World: 1.5 billion USD

Residential is the largest application segment for the product volume in 2015 and accounted for over 50% of the overall volume share in 2018. Growing urbanization in the country coupled with changing consumer lifestyle is expected to increase the need for pure water. Rising occurrence of water drought across various parts of the country are expected to drive demand for suitable water generation options over the projected period, which is likely to have a positive impact on the market growth. For instance, he demand in India was valued at just under USD 25 million in 2015, it is USD 200 million in 2018. The market demand from residential is expected to install over 100 thousand units by 2024.
However, a significant rise in the number of installations at industrial workplaces are expected to result in higher growth rates in this application as compared to its counterparts. Rapid economic and industrial development in emerging economies such as India, China, Brazil, and UAE are anticipated to drive growth. Growing demand for large scale installations will favor the industry growth. High investment in construction sector mainly from Nigeria, Qatar, UAE and Ghana will positively influence the market share growth in future.

Key Players

The key players in the industry are WaterMicronWorld, Dew Point Manufacturing, Watair Inc., Ambient Water, Dew Point Manufacturing, Saisons Technocom Pvt. Ltd., Water Maker India Pvt. Ltd., Planets Water, Water Technologies International, Inc., Island Sky Corporation, Fujian Yuxin Electronic Co., Ltd., Eurosport Active World Corporation Technologies, Atlantis Solar, Air2Water LLC, Konia and Ecoloblue, Inc.