

Press Release

ESA has extended Danish Aerospace Company A/S & Aquaporin Space Alliance ApS water recovery development activities.

Odense, December 2019

The two Danish companies; Danish Aerospace Company A/S (DAC) and Aquaporin Space Alliance ApS (ASA) are working for ESA to develop a breadboard model of a semi-closed loop water recycling unit for space applications. ESA has now extended these activities.

ESA (European Space Agency) had previously tasked DAC & ASA with developing a breadboard for a new type WRU (Water Recycling System) for spaceflight. These activities have now been extended. If successful, this could lead to a new type of semi-closed water recycling system for future testing on the International Space Station and eventually be used on human voyages further out into the Solar System.

“We are very happy ESA has extended this activity, as we see a great potential for such a semi-closed water recovery system. It has huge potential in space applications and other extreme environments. The technology can among others be used for generating drinking water from urine in landing vehicles for manned Moon missions, the coming Lunar Gateway space station around the Moon and other manned spacecraft systems.”
- says Thomas A. E. Andersen, CEO of DAC & ASA.

The new semi-closed loop WRU breadboard model under development is a dual loop system consisting of a primary loop with Aquaporin’s patented Aquaporin Inside[®] technology. DAC and ASA are using technology from the startup Memsift Innovations Pte Ltd for the secondary loop of the WRU-system that will separate the product water from the intermittent draw solution.

The DAC & ASA will spend the next six months updating the design and enhance the WRU breadboard model.

The core of the WRU breadboard model is the primary loop, based on the biomimetic water filtration membranes from Aquaporin. The patented Aquaporin Inside[®] technology uses aquaporin proteins to enhance the transport of water across the membrane. Spanning the protective membrane of every living cell, aquaporins are Nature’s own water filters and facilitate rapidly a highly selective water transport. The newly developed Aquaporin Inside[®] membranes were initially tested in space by the Danish ESA astronaut Andreas Mogensen during his 10 days stay on the International Space Station (ISS) in September 2015.

“By utilizing the unique features of the aquaporin proteins, we are able to achieve a higher selectivity. This will enable us to have direct water recovery from the contaminated sources (e.g. urine & condensate) that astronauts have at their disposal. Developing and testing a technology for spaceflight is challenging but will prove its versatility

and robustness. When we succeed in making a small WRU for space many more earth-bound applications will benefit and open up.”, says, Aquaporins VP of Technology Development, Jörg Vogel.

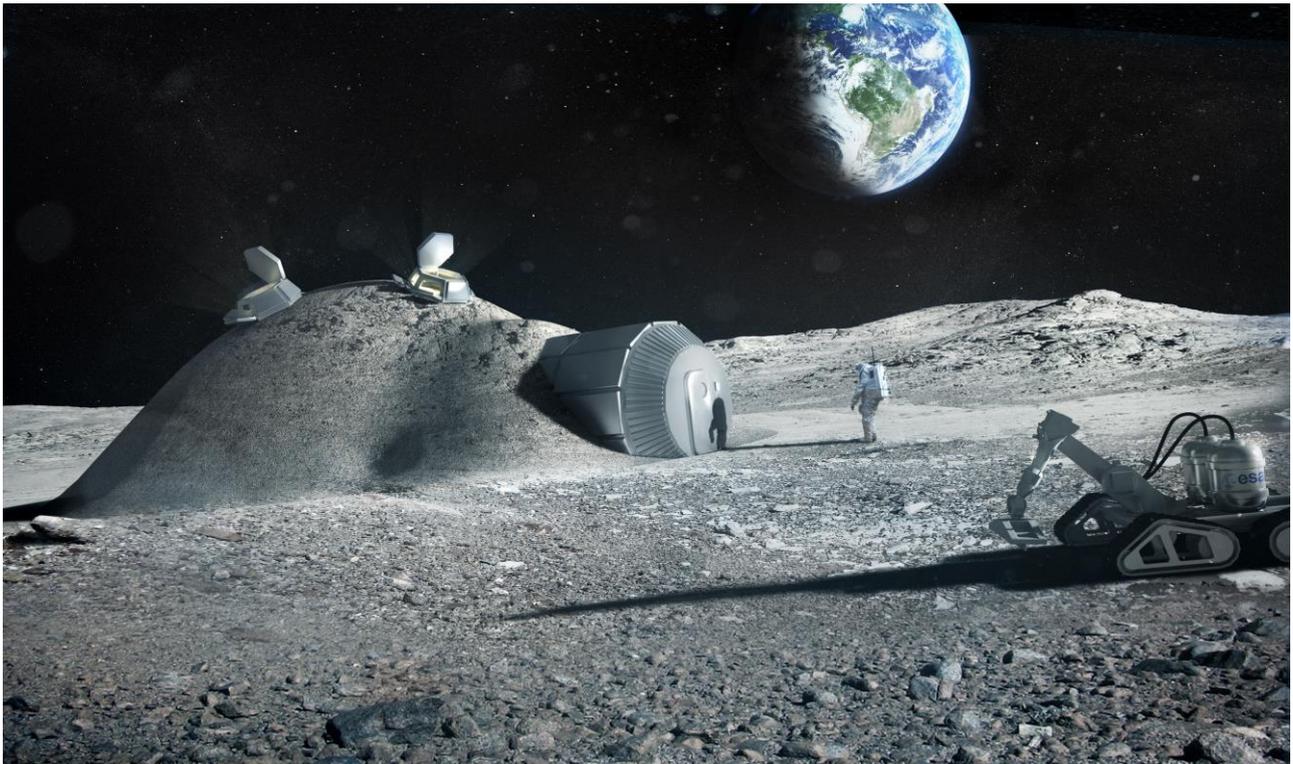
The secondary loop of the WRU breadboard model will utilize the patented TS-30™ Improved Membrane Distillation process from Memsift that utilize the proprietary STOMATE® membranes. The system operates in the principle of simple thermodynamic (heat and mass transfer) and the driving force is the partial vapor pressure gradient across the membrane. The TS-30™ system operates at relatively low temperature and pressure when compared to the conventional thermal and pressure driven membrane process and handle high salinity wastewater.

“The TS-30™ technology has been well proved for liquid-waste volume reduction and brine treatment for pharmaceutical and metal finishing industries. Space application is very new to us and challenging especially, when the system needs to be operated at the microgravity. We see this as a very big opportunity for us to make the unknown become known by working with the great experienced team from ASA and DAC. This will expand the applications of our products in the space sector.” says, Dr J Antony Prince, Founder and CEO of Memsift Innovations Pte Ltd.

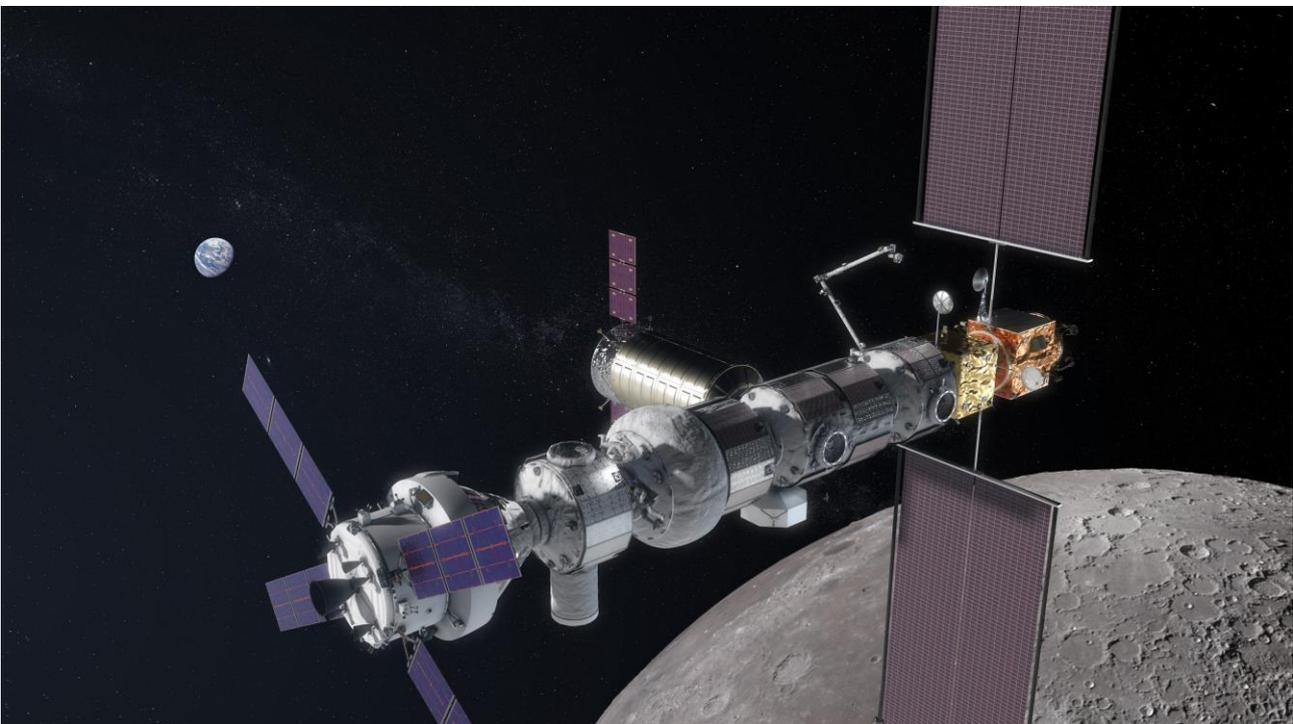
Water is an extremely important commodity in space despite the fact that on the space station, astronauts will wash with much less than one-tenth the water that people typically use on Earth. Usually an astronaut in space uses around 6 liters of water per day for drinking, hygiene, cleaning etc.

In space several types of water such as condensate from the humidity in the cabin, urine from astronauts, wastewater from toilet and cleaning processes can be recycled and reused. Launch of supplies from ground to Earth orbit is usually valued around 50.000 \$ per kilo, so any considerable amount of water which can be reused with a simplified and reliable system, will provide a direct significant cost saving in human exploration.

The work for ESA on developing the breadboard model based on the Aquaporin Inside®, TS-30™ IMD process and the STOMATE® membrane technologies will help pave the way for future use of these technologies for ESA in space.



Water recycling systems is essential once humans returns to the Moon. (Photo: ESA)



New water recycling systems can be used on a Lunar Gateway station around the Moon. (Photo: NASA)

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Aquaporin Space Alliance ApS is a joint venture between Aquaporin A/S and Danish Aerospace Company A/S.



Aquaporin A/S is a global cleantech company located in Copenhagen, Denmark. Aquaporin is dedicated to revolutionizing water purification by means of industrial biotech techniques and knowhow. The main strategy is to develop the Aquaporin Inside™ technology capable of separating and purifying water from all other compounds. (www.aquaporin.dk)



Danish Aerospace Company A/S is a space technology company operating in the area of advanced medical instrumentation, exercise equipment and other engineering fields primarily for space applications. The company is located in Odense, Denmark, and is listed on the Nasdaq First North Growth Market in Copenhagen. (www.DanishAerospace.com)



Memsift Innovations Pte Ltd is a technology-based company. Memsift is the developer and manufacturer of the novel vapor transfer membrane STOMATE® and the thermal membrane system TS-30™. Memsift is providing solutions for high strength industrial effluent treatment, liquid-waste volume reduction, resource recovery, brine treatment, zero liquid discharge and aqueous/organic separations for various industries using their proprietary technologies. (www.memsift.com)