**Right, first things first…I’ve got a new background. The thing is, it was getting a bit cramped in the cabin at the back of my house where I’ve been doing all the filming AND all the editing for five years, so I’ve decided to keep the cabin just for editing, and I’ve moved the filming kit inside my house, where it’s also a bit warmer!**

**Some of you will like the change and some of you will probably hate it. But I suspect the vast majority of you will not be all that bothered either way. And to be honest, any one of those 3 reactions is absolutely fine with me.**

**So, let’s get straight into today’s topic, which is a look at what is, in my view, one of the most innovative and genuinely useful pieces of real-world sustainable technology I’ve come across for some time.**

**Hello and welcome to Just Have a Think**

**So, what’s this amazing piece of tech I’m referring to?**

**Well, to paraphrase a well-known sixties Sci-Fi TV series, “it’s desalination Jim, but not as we know it.”**

**Now, desalination has obviously been around for a long time. Almost six decades in fact, ever since Alexander Zarchin patented a seawater vacuum freezing device back in nineteen sixty-four. But desalination technologies have been getting a pretty bad rap in recent years, for reasons that we’ll have a look at in a moment.**

**So, it was unusually uplifting to discover a completely new approach to desalination that pretty much does away with all the problems of current technologies, and also manages to recycle hundreds of thousands of single use plastic bottles that would otherwise have gone to landfill or been tossed into the sea. I’ll explain all that later in the video, but first of all, let’s look at why the existing tech is apparently so problematic.**

**Large scale desalination is generally achieved in one of two ways. The so-called thermal method sucks in seawater and then heats it up to produce a pure water vapour, leaving behind a very concentrated briny sludge that then gets pumped back into the sea.**

**The more modern, and now much more widely used, method involves something called a Reverse Osmosis Membrane, which is the one that I guess most of us have probably heard of. Essentially, sea water is forced through one of these membranes at very high pressure so that all the salt and other contaminants are filtered out, leaving pure fresh water at the end. You still get some brine that needs to be discharged somewhere, but reverse osmosis tends to produce less brine than the thermal method. Plus, it’s cheaper and more efficient overall, so reverse osmosis now accounts for about seventy percent of all desalination around the world.**

**Arguably the biggest criticism of these huge, centralised desalination plants though, is that they use an enormous amount of energy to process large volumes of seawater, which in turn results in high greenhouse gas emissions from the generation of electricity. Those greenhouse gas emissions warm the climate, which makes water scarcity a bigger and bigger problem, which means the world needs more and more desalination plants, and… well, you get the idea. It’s a similar feedback loop to the one causing an exponential rise in air conditioners around the world, which is something we’ve talked about in a previous video. There are some small, medium and even large desalination plants powered by on-grid renewables like wind and solar, but even if renewable energy was diverted on a mass scale to run all desalination plants, they would still be using a huge amount of energy that arguably could and should be used elsewhere to displace fossil fuels.**

**So that’s problem number one.**

**Problem number two is the accidental intake of fish, larvae and plankton, and any other kind of small marine life that’s unlucky enough to be swimming next to an intake pipe when the system gets switched on.** **Even with grilles on the front of the pipes, millions of tiny marine creatures are still inadvertently sucked into desalination systems this way each year.**

**The third problem is the brine itself. If it’s released from a single outflow at a large plant or from a cluster of plants in a small area, which is what happens in the Persian Gulf region for example, then it represents an extremely sudden and disruptive concentration of very warm, very salty water that does all sorts of nasty things to the local marine ecosystems.**

**A recent analysis by the United Nations found that brine discharge from the sixteen thousand or so desalination plants in operation around the globe today is fifty percent higher than previous estimates. In actual numbers that equates to about a hundred and forty-two million cubic metres of concentrated brine being sent back into localised coastal regions every single day. That’s enough to cover the entire state of Florida in thirty centimetres, or twelve inches, of liquid.**

**Last but by no means least is the fact that these enormous desalination plants are extremely expensive to build and run. Those costs have to be amortised over the lifetime of the project, and if a large part of that amortisation is based on the dollar value of fresh water delivered, then of course as energy costs rise then inevitably so does the cost of fresh water to the consumer.**

**Water scarcity is a growing problem all over the world, even in affluent western regions like California and Nevada. In twenty-twenty roughly one percent of the human population relied solely on desalination for their daily water supply. By twenty-fifty that number is expected to increase to ten percent. That’ll equate to about a billion people who will have no access to fresh water without some kind of desalination technology. If the world continues to desalinate water using existing methods, then by mid-century the process will account for about five percent of total global greenhouse gas emissions, which will contribute heavily to the feedback loop I mentioned earlier. So, anyone coming along with a better idea probably needs to be listened to.**

**And that’s where a Canadian start-up called Oneka Technologies comes in. The company was founded in twenty-fifteen by a mechanical engineer and entrepreneur called Dragan Tutic, specifically to address to issues we’ve just looked at.**

**I caught up with the company’s Commercial Manager, Camille St-Pierre, via Zoom recently to get a better idea of how their innovation works and why they believe it could transform an entire sector.**

**Not all desalination takes place in coastal regions, but the vast majority of it does. And that begs the question of whether it might be possible to harness some of the energy in the ocean itself to provide power for the desalination process. Now, when people like me talk about wave and tidal energy technologies we’re almost always talking about devices that can convert that energy into electricity, either for local use or for transmission back into an electricity grid system.**

**That’s not how Oneka have tackled the challenge though. They’ve developed a system that harnesses the motion of ocean waves in an entirely mechanical way with no electricity generated or used in any part of their desalination process. It works like this -**

**A floating platform is anchored to the seabed and just like any other ocean-going vessel it bobs up and down with the motion of the water. As it moves downwards it draws in seawater via a strainer on the underside, which has a very fine mesh across its opening to vastly reduce the chances of sucking in any tiny marine creatures that may be passing by. The seawater then goes through filters to remove the worst of any other rough stuff.**

**As the platform rises with the waves, the sea water passes through a mechanical pump followed by a pressure and flow optimisation system that provides enough pressure to force the water through a reverse osmosis membrane very similar to the technology I described earlier. All of this is wave driven, don’t forget. There’s no electricity anywhere in the system.**

**Now here’s where a second key difference comes into play. The system desalinates twenty-five percent of the water that passes through the membrane, leaving seventy five percent of the water as a relatively low salinity brine which then gets sent back through the pressure and flow optimisation system before going back into the water below the platform. That means the discharge brine is only about thirty percent more saline than the seawater that its being released into, compared to conventional desalination plant discharge which can have between a hundred and a hundred and fifty percent higher salinity than the surrounding water. As well as that, a typical Oneka installation will be comprised of multiple relatively small platforms distributed over a very wide area, as opposed to one huge, centralised desalination plant spewing out brine at a single location. That creates what Oneka describe as multiple outfalls which combine with the natural sea currents and waves to very quickly diffuse the brine back to nominal levels.**

**In fact, Oneka’s own testing has demonstrated that within a distance of only about two to three metres from each platform, no change in salinity can be detected. Those findings are now being formally validated by University researchers and environmental engineering companies in Chile and California.**

**The freshwater is then sent to shore under pressure via a single submerged pipeline, again driven by the mechanical action of the waves, with no additional electrical power. The only electrical components you’ll find on one of these platforms are the solar panels that are there purely to drive the sensors that monitor performance and send data to the cloud where they’re available online in real time.**

**Oneka have developed three distinct categories of platform to cater for more or less any size of application.**

**The smallest of the three is the Ice cube class. This is a unit that can be disassembled and packed inside a standard sized shipping crate, which makes it extremely easy to send out to remote coastal bases, or as an emergency, fast response solution in disaster relief situations. The platform is about 1.5 metres in diameter and produces about one cubic metre of freshwater per day. And for those of us who work in more basic units, that equates to a thousand litres or two hundred and twenty gallons.**

**Having carried out extensive lab testing and computer simulations, the Oneka team then produced a slightly larger prototype for real world testing. This one was capable of producing ten cubic metres of fresh water a day, and it was taken straight out into the extreme ocean conditions off the coast of Canada where it endured, and survived, waves of up to seven metres in height.**

**Next up is the Iceberg Class, with about a six-metre diameter equivalent, and the capacity to churn out up to fifty cubic metres of freshwater per day, which is fifty thousand litres or eleven thousand gallons. The floating platform is made from recycled polyethylene terephthalate or PET, so it’s perhaps the most environmentally friendly way of chucking discarded soda bottles into the sea that anyone has ever devised! This size of installation is ideal for small off grid communities, or perhaps for tourism in remote resorts, and even for smaller industrial applications. A working example of the Iceberg class is currently deployed as part of the first phase of a commercial project in Florida that will eventually have a total generating capacity of three hundred cubic metres of water per day.**

**Full production of the Iceberg class is scheduled to commence in twenty-twenty-three.**

**Oneka are now working flat out to develop the largest of the three platforms, which they call the ‘Glacier Class’. This one will have a diameter of between twelve and fifteen metres, and a typical installation comprising forty of these platforms will be capable of producing more than twenty million litres or almost four and a half million gallons of fresh water a day. An installation this size would be useable by municipal authorities, or in large industrial or agricultural applications.**

**So, what about cost?**

**Well, the numbers can vary quite significantly depending on things like the size of the plant, the local cost of electricity, the length of the water supply agreement, cost of capital, the regulatory environment, and even the quality of the water. Huge, centralised desalination plants in the Middle East, typically powered by cheap electricity from fossil fuels can produce between three hundred and nine hundred thousand cubic metres of freshwater per day for around fifty cents to a dollar per cubic metre.**

**Smaller facilities that are closer in size to an Oneka installation typically sell fresh water for between two and five dollars per cubic metre. But electricity costs represent roughly half the operating cost of a conventional desalination plant, and that’s an overhead that Oneka’s system simply doesn’t have, so on a like for like size basis, the Oneka team reckon their technology can already produce water at a lower cost. And as they scale up production and start operating larger arrays, they expect to be producing water at only a quarter of the current market price.**

**So, what’s your view? Do you think this kind of desalination technology can make a genuine difference, or do you see issues that we haven’t covered in this video? Maybe you’re working in the industry, and you have some insights that you can share with us all. If you do, then as always, leave your thoughts in the comments section below and I’ll be interested to see what you think.**

**That’s it for this week though. If you’ve enjoyed this video, then please do give us a like and hit that subscribe button if you haven’t already done so.**

**And if you want to get actively involved in guiding the content of the channel, and get exclusive monthly content from me, then why not come and join our amazing channel supporters over at Patreon. And talking of Patreon, I must just say a massive thank you to some long-term supporters of the channel whose names are scrolling up the screen there, all of whom reached an anniversary of Patreon membership during November. This channel would simply not possible without them, so they all have my undying gratitude.**

**And, if you’re keen to learn more about other sustainable technologies like the one we’ve talked about today, then I reckon you’ll enjoy this video too.**

**As always, thanks very much for watching, have a great week, and remember to Just Have a Think.**

**See you next week**