

»What has ever been easy?«

Hubert Aulich, a man with 30 years of experience in the solar industry, wants to make access to safe drinking water possible all over the world using the »Autarcon« system

Hubert Aulich looks back on a long career in the PV sector. From 1974 onward, he worked for Siemens AG's research department, then from 1988 to 1991 he was the managing director of PV Electric – a joint venture between Siemens Solar GmbH and US solar pioneers Arco Solar. In 1992, he was made managing director at Siemens Solar, and in 1997, with his associate Friedrich Wilhelm Schulze, he founded PV Silicon GmbH, a manufacturer of silicon wafers for the solar industry. In 2002, the company merged with British Crystalox to become PV Crystalox AG, a wafer manufacturer that aimed to produce its main resource – silicon – independently. The latter did not work out, but the plan did show Aulich's ambitions to tackle problems head on. The scarcity of silicon was very real at the time, as was the monopoly of a few producers in the segment. After his time at PV Crystalox, Aulich took his pension – but he did not retire: he has started up a new project and is aiming to provide all people with clean drinking water. We met him at his new company, SC Sustainable Concepts GmbH, in Erfurt, Germany.

What is your motivation, Mr. Aulich?

Between 800 million and 1 billion people are estimated to have no access to drinking water. These people drink whatever they can get. And there's about the same number of people without access to the grid. Generally speaking, people without safe drinking water also lack electricity. Therefore, I'm aiming to expand PV electricity supply to help provide safe drinking water. There are enormous synergies, which have not been realized by the PV industry or water specialists as yet.

And how do you propose to implement your plans?

I worked on the topic of water treatment together with Jürgen Schmid (*Head of IWES in Kassel, died on May 6, 2013, editor's note*) many years ago.

A few young people from Kassel University, engineers, founded Autarcon and developed an outstanding system for safe drinking water that now delivers water based on WHO standards in many countries. For 2 years now, I have been supporting them in marketing and strategy development.

What technology does Autarcon use?

It is a fascinating technology. Water is not – as is most commonly seen – treated by technically sensitive reverse osmosis, but mainly by producing chlorine. Solar power is used to generate little amounts of chlorine from the water itself to kill pathogens. No chemicals have to be added. This uses very little energy, making it ideal for regions that are not connected to the grid. A small solar panel suffices to pump and disinfect 10,000 l a day. There is little, if any, need for maintenance. For reverse osmosis, on the other hand, membranes are needed. They are expensive and wear off over time.

The problem with the Autarcon system is supposedly not so much the maintenance, but the initial costs.

If you look at the cost per liter of disinfected water, it is very low. Once the money for the initial investment is procured, the water is cost-free. It is, however, correct that this is an obstacle that needs to be overcome first, and municipalities in Africa or India often can't afford it. That is why we approach a variety of NGOs that are devoted to health and drinking water and have the financial capabilities. Right now, I am evaluating cooperation options.

Which countries do you operate in?

In over 10 countries. In Egypt, for example, we work in close cooperation with the Research Institute for a Sustainable Environment at Cairo University, where our conference on solar drinking water treatment was



▲ PV veteran with great plans: Hubert Aulich (at Photon's Silicon Conference in Munich).

held in October. It is fun to work with people who really want to do something and not just talk. There are seven Autarcon systems in oases in Egypt already. Water there contains a lot of iron; it is virtually undrinkable. But if you produce chlorine in situ, iron oxidizes to iron hydroxide. That is filtered, and then it is as clean as this (*points to a bottle of tap water on the table, editor's note*). Autarcon is the first system to really work there.

Do you operate in any other countries?

I was in Indonesia 2 months ago. The country offers gigantic possibilities for PV applications. 250 million people live there; there are 6,000 inhabited islands, and 17,000 islands in total. I have seen how they produce water there; safe drinking water, that is. Usually it's boiled, which is a good idea initially. But the energy consumption is way too high, and supply from wood, coal or gas is not sustainable. I've spoken to the authorities about a pilot project. If we can show them that our system works efficiently, we will supply one village, then 10, and then hundreds.

And what's the catch?

People from government authorities often get the feeling they are supposed to follow our interests. I simply say: if you don't want it, neither do I. There's a whole range of NGOs out there, all ready to invest their sponsors' money, and for whom financing such a project is not a big deal. But these NGOs sometimes have their own agendas, deviating from ours. If possible, I want millions of people to get clean drinking water and solar power as fast as possible. I am not about a project here and one there – that is simply too slow.

But a reference project would make sense, wouldn't it?

You have to show what you can do, of course – that's only fair. But once that has happened, it needs to be multiplied. If you want to do something

in Indonesia, a model plant needs to be built there. I would be willing to support that. But seeing the kinds of discussions that the first, small project causes and what kind of fuss is made, I get the feeling it is going to take years.

But the system is very simple, and the calculations are trivial and very easily comprehensible. Logically speaking, the process should be faster?

I believe that one of the reasons things take so long is the distribution of political power. Power is not out there in the villages, it is in the capital. And that's not only the case in Indonesia. People in rural areas are often not as organized as in the cities and their lobby work doesn't have the same kind of impact.

What is the main goal of your new company?

Sustainable Concepts GmbH develops projects with solar power and safe drinking water for rural and peri-urban areas. I am trying to make sure that it is not a loose string of projects, but that one project turns into hundreds and thousands of villages, providing them with clean drinking water and solar electricity. This is also about developing a business model that is sustainable, independent in the long term and managed by the people in these areas on their own. The company I am running now is supposed to prepare the concept, but installation and operation of the systems must be handled by those onsite. Together with Autarcon, in which I'm also a shareholder, and with my numerous contacts and networking partners, I'm trying to accelerate the process.

What kind of volume of solar water treatment are we talking about?

One Autarcon system can disinfect 10,000 to 30,000 l a day. That's sufficient to supply a village of 500 to 1,000 people. For 1 billion people, a

million of these systems are needed. The systems currently cost – depending on requirements – around €12,000 to €20,000 (\$13,200 to \$22,200) a piece; that would sum up to €12 billion to €20 billion (\$13.2 billion to \$22.2 billion). With working cycles of 10 years and with cost reductions via mass production, that's roughly a billion every year. A rather modest number to tackle one of the world's most urgent problems.

What is the current status regarding access to drinking water?

The availability of fresh drinking water is getting more and more scarce. It is going to become increasingly important to treat waste water, but there are considerable obstacles that are often not due to technical issues. In some countries, there are religious reasons why people say they can't drink recycled water.

How widely spread is the Autarcon method of water treatment?

Not very. Nobody else does what we are doing. On a larger scale, chlorine or sodium hypochlorite are added to the water. This kills all pathogens, which works well in cities. In rural areas, on the other hand, precise dosing is not feasible. Here, water is boiled, but the problem is that it cannot be stored without contaminating it again. In places where groundwater is salinized or nothing but seawater is available, the only remedy is reverse osmosis. The Autarcon system cannot do that.

Because it just disinfects the water.

Exactly. There is certainly a lot of room for improvement as far as reverse osmosis is concerned, if the problem is tackled more seriously in the next few years. In Saudi Arabia, millions of liters of water are produced in gigantic facilities, and most of this is seawater. The process consumes huge amounts of energy. As long as renewable energy is used, that might be okay. But if you collect and recycle water, a lot less energy is needed. That's why such technologies are of huge importance for the future. And there are other methods, too: in some countries, for example, small clay cups are used as filters – their fine pores let hardly any bacteria through. But nobody does that; it simply hasn't caught on.

So chlorinating is better.

Yes, even if that causes problems as well. While Americans are used to water smelling of chlorine, in many other countries people take exception to the smell. Here, only information about the advantages of chlorinating can help. The WHO guidelines suggest a chlorine concentration of 0.5 mg/l.

Who's earning the big bucks in the drinking water business right now?

Currently, the segment is dominated by Nestle, Pepsi, Coca Cola and other big players. They extract gigantic amounts of water somewhere in America that do not need to be purified, and they just bottle it. The bottled water is then sold for 20 to 30 euro cents (22¢ to 33¢) – that's insane.

They extract water in regions where it's of high quality and then ship it across the world to countries with poor water quality?

Exactly. One US municipality has now sued against groundwater extraction and has won in the third instance.

What does water from Autarcon systems cost by comparison?

That costs 0.1 to 0.3 euro cents (0.11¢ to 0.33¢) per l. Bottled water, on the other hand, is only affordable for a small section of the population.

Is solar water treatment an interesting market for the PV industry? If an Autarcon system is operated at 250 to 500 W and we are looking

to add 1 million systems, we are talking about an overall power of 250 to 500 MW. There's not a lot of profit to be made there.

Yes, but this is not only about an interesting market in terms of installed power: it's primarily about using PV electricity to establish drinking water supply, which can improve the quality of life for millions of people enormously.

It would be a thousandth of the current annual production level of 50 GW. The solar industry may not be particularly interested in opening up this market.

I don't think that's the case. This is not only a market for drinking water. Every solar system that is used for water treatment could also be upscaled to provide electricity for the most important applications in a village, for lightning, communication, and other things. I also don't think that the limited capacity required for these projects is the true reason why the market has not been opened yet. The reason is that potential customers simply do not have any money and that utilities and public institutions are too weak financially.

But even at minimal sales prices, it is a highly profitable business: if the Autarcon systems enable production costs of under a cent, and water can be sold for a few cents, far below the prices for bottled water, it becomes a business, in which sales equal profits.

Yes, of course. The problem is the initial cost. We shouldn't be under any illusions there: communities usually can't cope with the investment. And for private investors, there are safer and more profitable opportunities.

But there have been investors who've built mobile networks in these kinds of countries. Investments of several billions have been involved. And why did those companies do it? Because return rates are so high.

And because, there are reliable payment systems in mobile networks reducing the risk the operator has to take.

Do you already have industrial partners apart from Autarcon?

Right now, we are developing a concept for the most important markets. But for the mass market, we need a medium-sized company that is willing to invest €50 million or €100 million (\$55 million or \$110 million). And we need financing, from KfW Development Bank for example, and the cooperation of the respective communities and governments. In many countries, you can't simply sell water. It's far easier with energy: either you have electricity or you don't. Water is another story. Do you have good water? Mediocre quality? Or really bad? And trust is involved: why should I drink your water? Is it going to make me sick? And guarantees need to be given: you have to tell the villagers that you will take responsibility for the plant and be there if something needs to be done. Those are all points that make these kinds of projects difficult. But what has ever been easy?

Is cooperating with mobile network companies a possibility? They already have infrastructure and technicians in place.

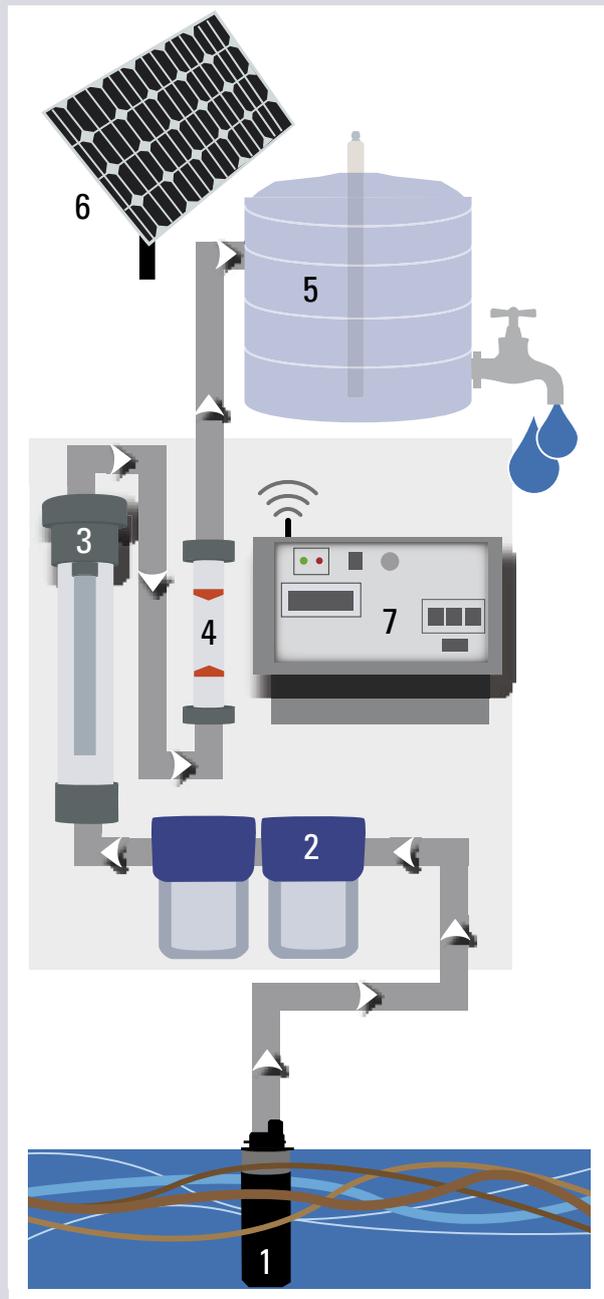
If I were a big, multinational player, it would be a good model. For small or medium-sized companies, not so much.

How many Autarcon systems are up and running now?

About 25 worldwide, right now.

Why do you think you're going to sell considerably more systems all of a sudden?

The Autarcon system for treating drinking water



Autarcon GmbH from Kassel, Germany, has precisely one product on offer: the »SuMeWa« system for decentralized water treatment, which can additionally be equipped with a filtration device. The term SuMeWa is short for »Sun Meets Water,« and the basic idea behind it is rather simple: the chlorine needed to disinfect the water is no longer added in the form of sodium or calcium hypochlorite; instead, it is produced electrolytically using mineral salts, which are dissolved in the water anyway. The use of batteries is possible, but not necessary.

The graphic depicts its functions:

- 1 Water is extracted by a submersible pump. The maximum extraction depth is 70 m and the maximum volume flow is 400 l per hour. Using batteries, the system manages 9.6 m³; without batteries, the figure is 2.8 m³.
- 2 Depending on the level of contamination of the extracted water, upstream filtration modules can remove opacities, iron and manganese. The filters do not need to be replaced.
- 3 Chlorine is produced in the electrolysis cell. It comes from mineral salts, which are dissolved in the water. As very little chlorine is needed for disinfection, the system works with very low levels of mineral salts.
- 4 A sensor controls the flow rate.
- 5 Water is stored in the tank. It can be extracted directly or directed to nearby consumers. A sensor monitors the water quality at all times.
- 6 The provided solar module has a power of 120 W. That is sufficient to treat about 10,000 l of drinking water a day.
- 7 The control unit adjusts chlorine production to the quality of the water, and is able to put current performance information online, which enables remote operating. The controls also ensure that no more chlorine than required is produced.

Autarcon has not been on the market for very long with this entirely new technology, and it will take some time until the pilot systems have created a reliable foundation of trust. But now, these efforts appear to be paying off. For 2016 alone, we already have around 20 new orders from four countries. This creates access to safe drinking water for 20,000 people. Moreover, there's growing political pressure to create better conditions in rural areas in order to stop or at least reduce dramatic rural-urban migration. Here, Autarcon has taken a solid position at the right point in time.

What's the plan for the next few years?

There is an insane amount of work to be done, and not too many players are involved so far – also not from the PV industry. The amount of solar modules is rather small, but the amount needed is not always of interest. It's the upgradable system of solar power and water and what is

going to be done with it. The situation can be compared to mobile phones: how much energy does a phone need? A tiny amount. But without this »tiny amount,« there is no communication. And it's the same with water: Without it, you die of thirst.

Thank you for the interview.

Interview Philippe Welter