



Conversations  
That  
Matter



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Imagine if you will a world in which wastewater, yes, the stuff you drain out of your sink, shower, dishwasher, and toilet, could provide you with the energy you need to power your home. Sounds like a line from the Twilight Zone, except for the fact that it's real.

Enter SHARC, a Coquitlam-based company that is changing the way buildings around the world are

utilizing what was until now considered wastewater.

Reusing grey water, which is water from everything but the toilet, is one thing. Repurposing all wastewater is another.

Now consider this: in North America, 400 billion kilowatts – hours of energy a day goes down the drain. That works out to about \$1,000 a year per household, just in hot water.

The average temperature of the collective house water is somewhere around 23 degrees Celsius. The impediment to using all of the wastewater is solid waste.

If only you could clean the water and it would be usable as an energy source.

Well, now you can.

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And once clean, the water can be used in a series of heat exchangers, concentrated, and then used to supply energy to heat houses. Once the cycle starts, the laws of thermodynamics kick in and the same energy gets reused without have to draw on an external source.

We invited Lynn Mueller of SHARC Energy Systems to join us for a conversation that matters about how wastewater helps reduce our carbon footprint, reduces the massive volume of warm water that spills back into the oceans, and saves consumers money.

- Welcome, thanks for joining me.

- Well, thank you, sir. It's a pleasure.

- When I first heard about your company, I thought, nah, come on, how do you do that? And then also to learn that you're made in BC technology, which excites me, and I have tried to describe what it is that you do. But in essence you're taking warm water, making it cold, and creating electricity. Do I have that right?

- No.

- Or is that too simple?

- Yeah, no, you don't, actually. That's one of the things that makes our system really efficient, is we don't convert energy into anything but what it is, and what we do is recover heat. We can heat and cool a building, and what makes it very efficient is we're not trying to convert it into electricity or anything. We're just using it as heat. And it's 500% more efficient to recycle heat than it is to produce new heat.

- Okay, so let's talk about how you do that. Where does your source material come from?

- Well, every day in the world, most people, thank God, get up and have a shower, do their laundry, wash the dishes, and that takes hot water. All that hot water goes down the drain, and in North America for instance, that's 400 billion kilowatts-hours a year of energy that goes down the drain.

- So help me understand how much that is.

- Well, it's about, probably about \$1 a day per person.

- Of energy.

- Of energy that--

- Washed down the drain.

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- And the funny thing was, when I was home in my brief retirement, was that I noticed my hot water bill in my home was about \$1,000 a year. And I thought, if everybody in the world throws away \$1,000 a year, why can't we get that back?

- Okay, so?

- So I did the world sewage tour, and, you know, not as glamorous as it sounds, but I got to examine sewer systems around the world, found out everybody had a common temperature of about 23 degrees C. So the impediment to using that warm water as a heat source was taking the solids out of it. So what we invented at SHARC is an extremely efficient, very reliable sewage filter. So once the water's warm, you can put that through a series of heat pumps or chillers or various number of ways to recover the heat. We take that small temperature difference out of the water in the sewer line and we concentrate that into high-temperature heat that you can use to heat houses, hot water, huge buildings, hospitals, prisons. We take something that people were throwing away and very, very happy to get rid of it, and we recover the heat and reuse it. Once the cycle starts you use the same energy every day. It's the same energy recycled every day.

- Not the same water, but it's the same energy system.

- Yeah, just the same energy. We use the first laws of thermodynamics, the first two laws of thermodynamics, that energy cannot be created or destroyed, and heat moves from warmer to colder. So it is one of the simplest principles in the world to make our equipment work. We don't have to have any quantum shift on how the world operates to make our system work. We know it's gonna operate every day. You need heat, you move it. You try to get rid of heat from air conditioning, you can put that into the sewer system. It's really an infinite supply.

- For somebody like me, I don't work in the HVAC world, which in essence is what we're talking about, right? Heating and air conditioning. For me to visualize how this works, it's difficult for me to wrap my mind around it and say, okay, you're taking water, okay, I get it, goes down the drain, and then you clean it up and not really doing anything too mechanical, you're taking that heat and then reusing it. How do you do that?

- Because I've been a working guy my whole life, I like to use the analogy that every night on my way home I pick up a six-pack of warm beer and put it in the fridge for a couple of hours. The beer is cold and the back of the fridge is warm. That's a heat pump. You've taken the heat out of that warm beer and you've moved it to the back of the fridge. We just move it now into a different water source so we can circulate it around buildings and communities. If you look at False Creek, for instance, with the city of Vancouver--

- Which is using one of your systems, correct?

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- Which has got our system operating in there. It heats five million square feet of property with heat people have thrown away.

- And so you're drawing that water down into the sewer system, you're putting it through a plant, and then pumping it back out.

- Well, we just temporarily clean the water, take the heat out of it, put it right back in the sewer system. Some of our competitors have systems where they actually take the solids out of the flow, you have to truck 'em away. You can imagine the smell around those places in the summer, so we have a completely hermetically sealed system. If you were to walk into one of the 20 mechanical rooms we've done, you would not smell sewage. You wouldn't know that the system was operating in there with your sewage leaving the building.

- This is a closed system that you operate in.

- Yep.

- So how on Earth do you install it in existing infrastructure, or buildings that are already standing? Are you able to do that?

- Well, it can be a bit of a challenge, because in older buildings you never know what kind of mechanical systems you might have. But all buildings only have one sewer line going out of the building, so quite often you can tap into the sewer line quite easily. But interfacing with the building system may not be as easy. So it's probably 50/50 whether an existing building could retrofit. New buildings, it's a slam dunk. I was over at the new Wall Centre Central Park building at Kingsway and Boundary this morning. We're just commissioning the two new Piranhas in there. So if you can imagine--

- Piranha being the name of one of your units.

- Yeah, the Piranha is a smaller version of the SHARC. And if you can imagine, you have 1,000 apartments in there that are now recycling all the heat they use into that building. So that saves approximately 500 tons of carbon being produced a year by recycling that heat.

- 500 tons, just for that one facility.

- Yep, and that would basically offset most of the cars that are being used by those people in the buildings. So the effect of pollution from burning gasoline to drive your cars has been negated because you're recycling all your heat for the hot water. And the thing that most people, most people think when you are doing something green you have to make a sacrifice. You still have warm showers, you have warm bath, you have warm water for doing your laundry and dishes. No sacrifice, super efficient, and green.

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- What about money? Everybody goes, okay, well, I can go green, but it's gonna cost me more money. With your system, what's the financial equation?

- Well, that's what makes me the most proud about our system, is it's also financially viable for most buildings. You can expect the larger the building, the faster the payback. So on Wall Centre, for instance, they're probably paying off the entire investment in three to four years. A smaller building, you may go out as far as five or six years. But there's always a payback.

- And so what does that mean to the individual in each unit when they now start to get their monthly bill?

- Yep. Well, once the system's paid for it means that everybody saves about \$300 or \$400 a year.

- On their electricity.

- Per person, yeah. That's by recycling that waste heat.

- Wow, okay.

- And you don't have to change your lifestyle.

- Is the world beating a path to your door?

-I wish. But I think what--

- But they are, aren't they?

- Yeah, we're certainly busy. We have never seen the kind of volume of inquiries now. And over the last couple years we've opened offices around the world. We have an office in San Jose, California, Melbourne, Australia, Nottingham, England, Glasgow, Scotland, and absolutely unprecedented interest.

- California must be a bit of a tricky market, though. How on Earth do you introduce something like this into such a highly regulated environment? Because we think we've got a lot of regulation here. It's nothing compared to what they have.

- Yeah, and we learned a lesson the hard way, because we went through all the regulatory hoops here and got all the CSA and all that stuff, and then we were ready to launch in California and they go, well, hold on for a moment, you need your California rating. So we've gone through the last year now where we've had to get all our certified Title 24 and everything required there. Now we're ready to go to market. I think I told you before that the California Energy Commissioner called me and he said, "Lynn, why would I call you?" I said,

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"Well, probably about our super-efficient units." We are now working with the blessing of the California Energy Commission and the major utilities in California support us. We have a very robust plan to install units in California because one of the next innovations we're gonna introduce is we're not only gonna get the energy back, but we're gonna get a large portion of the water back. So we wanna have a system that gets all the energy back and 5,000 gallons a day of water from an apartment building. And water is actually more expensive in California than energy.

- Oh my gosh, so if you can do that in California, does that not really sort of establish the gold standard? Because their regulatory environment is far more stringent, as we just pointed out, than almost anywhere else. That must make... Make your effort in exporting this made-in-Canada technology a little easier.

- Well, you know, I'm a farmer from Alberta, so I'm absolutely in awe of how the world works and how energy works. I guess maybe from riding around the tractor long days, had a lot of time to think, because I think in very simple terms. We have a very simple technology that's applicable all over the world. Eight years ago when I decided to start down the path of sewage heat recovery, virtually nobody had heard about it. Now every city in the world has us on their list of things they wanna investigate doing. We're up there with wind, solar, biomass, cold fusion, sewage heat recovery.

- Yeah, but you don't sound as sexy as wind and solar.

- Thank God for that. No, but I think--

- But nobody's been paying attention to this, and this is what I find so interesting and fascinating that you would have that kind of perspective.

- Yep, everybody understands it, so when I tell you or anybody that I get heat from the sewer system, they don't ask how you do it as much as they go, I always thought there was a lot of heat in there. 'Cause everybody knows that hot water goes down the drain.

- Yeah, but somebody had to think their way through on how am I gonna turn that around and use that waste as a usable product.

- You know, it's what I've done my entire life, is refrigeration, and that's all about heat movement. So cold beer, cold sewage. It's all about moving instead of creating, and it's just, you know. One of the highlights of my career actually now is that there's a museum in Scotland called the Kelvingrove Museum. It's named after the fellow that invented the Kelvin temperature scale and heat pumps. So the building is 1,200 years old and we're putting one of our systems in there to heat the Kelvingrove Museum. So learning about that as a young person in refrigeration school, to now heat this museum is a very cool thing.

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- That's the highest possible compliment there is, isn't it?

- That's it, now I gotta go somewhere and die. But it's an amazing opportunity. In the world every year there's 938 trillion liters a year of sewage that goes down the drain. And it makes it way to the oceans and rivers of the world.

- I can't fathom what the scale of that is.

- It's a lot, and if you think of just the United States, for instance, the hot water that goes down the drain in the United States is enough heat to melt 12 trillion tons of ice. If you think of global warming and you're dumping enough heat into the ocean to melt 12 trillion tons of ice, that's significant.

- Wow.

- And you can recover it.

- And so you're keeping that heat out of the oceans.

- Absolutely. And we just continue

- Which we all recognize

- to reuse it.

- that warming temperatures in the ocean is something that is a real challenge.

- Absolutely. And all the carbon you saved in the meantime, you've recycled the heat and you've saved the carbon production that would have gone into heating it in the first place. I have now two granddaughters that are absolutely the light of my life, and I'm entering my golden years and I'm not worried about this planet for myself, but I'm gonna do everything I can to make sure they have a better chance of having a long and happy life.

- Hmm. What I also like about this is yes, it's a great environmental contributor, but you're also creating jobs here. You've been in business in British Columbia for how long now?

- About eight years now.

- And your staff has grown to what?

- Well, we have about 30 right now.

- And I imagine you're growing, because when I came out to see your facility, which is this Conversations That Matter is an Oh Boy Productions program.

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pristine, small little facility, and when I think about the scale that you're supplying to now, I don't know how you're gonna be able to stay there.

- Well, we're looking all the time for talent and bigger spaces. We wanna be an absolute first class manufacturer. And one of the things that we build into the product is a 30- to 40-year life cycle, 'cause quite often--

- For the product.

- For the product, because quite often, we own, operate, and maintain the systems. So we wanna take every impediment from people buying the systems away, so we'll take all the risk, because we know how simple it is. We know it has to work. We built a very robust system and we've built in predictive analytics and artificial intelligence. You have the simplest machine in the world controlled by the most intelligent data collection system available. Every system reports every second of operation back to the mainframe. We control every part of it, so you as a homeowner really don't care what time your hot water's heated as long as when you wanna have a shower you got hot water. So we're able to work with utilities in places like California that have tremendous peak power problems. We just take the hot water heating off of their peak. And all we have to do is learn the building so we know when to have it ready. It's a tremendously intelligent piece of equipment. I had the vision. I don't know how to do it, but I had the vision that I wanted to create a living machine that knows what we're doing.

- Wow, okay, so you're taking hot water out of the sewer system that's being driven down into the ocean, you're reducing carbon, and you're reducing the load on the electrical grid as well.

- Yeah, it's a pretty enticing package. We're doing the headquarters of the DC Water corporation in Washington, DC, just down the street from the White House. We will have the most efficient building in North America that is heated and cooled completely with the SHARC system. Saves 35% on cooling, 85% on heating, and three to four million gallons a year of water that would have been used in their cooling towers.

- Wow. How does this fit into a model of passive housing?

- It should fit very well, because it's all about recovery.

- Because this is where our construction is going as well. They're wanting to achieve many of those same goals through all different aspects of construction. The lead and passive housing and so on, I would imagine that this would be a natural fit.

- Absolutely, because now building envelopes of most buildings, they're so well-insulated, they're so well-sealed, it's hard to squeeze more savings out of the building envelope. So you

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have to look internally to save all the energy from the hot water. Very important, so that's why I invented the next unit, which is called a MAKO that runs on the solar grid with a solar battery. Because I believe the home of the future has a solar grid with solar capability to store energy. So when you take the hot water heating off your power grid and you do it with solar, when you have more solar than you need to charge up your battery and stuff, it just fits into the grid and becomes part of the future home.

- Wow. So how does an individual find out more about this if they say, I want that? Because you've talked about buildings and so on, but the individual homeowner, is this gonna work for them?

- Absolutely. My key when we build everything is to have a financial payback. So on a single family home, if you put in a high efficient water tank now, you're going to spend \$2,000 or \$3,000 if high efficient gas. Ours are gonna spend \$2,000 or \$3,000, but you don't have any more utility bills. So the payback is in three to four years and you've recovered all your money for this system and you get 20 years of free operation.

- And are those units available? I'm thinking because you're still early days and you're going after a larger, more commercialized market to date. Can an individual, because I foresee a day when somebody will say, I want that. Where do I go get it? Do I go down to my Home Depot the same way I do for my hot water tank?

- The MAKO's in prototype stage, so we have it working in half a dozen homes around Vancouver. My goal is to have that tank available within the next year, but I don't wanna just build a tank like everybody else builds. My tank is gonna also incorporate heat storage so that your normal hot water tank will actually have three to five times the storage capability of a normal hot water tank.

- Wow, and you're going to keep the company here in British Columbia, right?

- Absolutely.

- Alright.

- Fiercely Canadian and very proud of what our guys are doing. We have an amazing team and always looking for individuals with an engineering background and a desire to make a difference.

- Well, I'm in awe of what you've done 'cause I know others have tried and they have not succeeded to do the same thing that you have.

-I'm just too stupid to quit.

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- Well, thankfully so. Thank you very much for coming in and doing this.

- Thank you, sir.

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