

## Waste not, Want not

By Kate Kunkel

If there is one thing Western nations can do, it is fill up landfills despite all the efforts being undertaken to reduce the amount of trash that ends up there. But still, the trash arrives and eventually, as it decomposes, produces methane.

That is where Bo Linton and Ralf Horn come in. They are installing the GDT Tek Phoenix system, which turns waste heat into additional power, at the closed, 80 acre American Canyon landfill north of Oakland, California.

Bo explained the project. "An existing power plant on the site currently uses captured methane from decomposing garbage, but our



Ralf Horn, Chief Technical Officer and Director of GDT Tek

project will harness heat normally lost during the power generation process to generate up to an additional 1.5 MW of electricity. The project is part of a \$23 million endeavor that should increase electricity produced at six greater Bay Area landfills by up to 9 MW."

Ralf Horn is the inventor of the patented technology which, he explained, works like an air-conditioner in reverse. A nonpolluting mixture of refrigerants in a heat exchanger surrounding the 800 to 1200F exhaust of the methane generators captures heat that would otherwise just raise the temperature of the air. The technology is based on the Organic Rankin Cycle

principle that involves the harnessing of waste heat having electrical generation and/or mechanical drive capabilities.

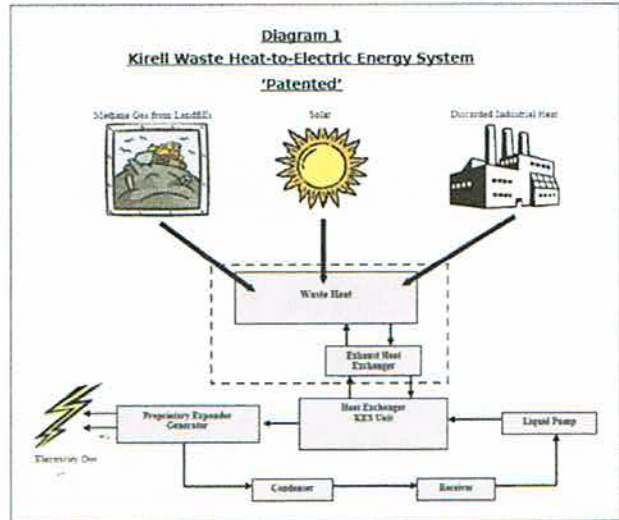
Ralf elaborated. "The system is very similar to a steam turbine system. Heat water to the boiling point to create steam to run the steam turbine which runs the generator. The difference is that our system is a closed loop. There is no discharge like in a steam turbine where the condensate goes to the atmosphere. Here, the refrigerant is condensed using a cooling circuit allowing the refrigerant to return to an ambient state prior to recirculation. Our circuit is a refrigeration cycle that turns heat into electricity, instead of discharging the heat to the atmosphere.

"In landfills, they have methane flares that operate at 1800F, and exhaust temperatures of 800F on engines, so the feed water to the exhaust gas heat exchange carries heat from the exhaust to the refrigerant heat exchanger and elevates the temperature of the fluid. That in turn converts the liquid into a pressurized, gaseous form. The refrigerant gas is then expanded into the chamber of a mechanical apparatus, producing a rotating force that then has the ability to drive mechanical devic-

with modifications. The way we pick up heat from the engine: one is exhaust heat, the other is the water heat. On a 1 MW engine, there is a 16 inch exhaust pipe that has a 3 way diverter valve on it. The actuator is in the neighborhood of 600 foot pounds of operational torque – that's one place we have valves."

We wondered if stainless steel was being used because corrosion was a problem in this system.

"Corrosion is not the issue here," replied Ralf. "But refrigerant is very viscous, so we have very tight tolerances on the valves. The system is also evacuated of air, so there are



He continued. "Then in the system itself, there are several, half a dozen, 6 inch stainless steel valves that manage the water flow from the engine back to our system, back to the engine. Water flowing from the from the engine's water source and they all have air actuators. It's all about pressure in this system, not corrosion. We also have a safety valve that bypasses that pressure circuit and sends it back to the condensing circuit.

no contaminants. The fluid itself always stays clean."

A big issue for many utilities of course, is the economics of building and maintaining this system. It is basically financed by buying the power from GDT Tek. Also, the operating cost itself is negligible. It is comparative, but much less than a steam turbine and it has basically no maintenance issues."

"Most of the valves are for managing the waste heat source external to our machine. Our machine only has two active valves – one to bring the water in, and the other for safety. In our system, the valves have to be able to withstand the rigors of the hot refrigerant, so we took manufactured valves and modified them for the refrigerant material used in the closed loop of the Organic Rankin Cycle circuit.

"The valves are all stainless steel because the surface material has a good polish on it, and suits the seats of the valve well. We took manufactured valves and modified them for the refrigerant material. The seal is a special material, glass filled UHMW, and it's custom made for the specific refrigerant we use. R 123 is the refrigerant, and operates at 220F."



When asked about other potential uses of this technology and its limitations, Bo pointed out that it could be used basically anywhere heat is being generated. It can be used with thermal solar panels, methane flares, anywhere there is waste heat because that can then generate electrical or mechanical power. He elaborated. "The limitations have more to do with size. We're targeting systems from 1.5 to 100 MW; they are most complimentary to our distributed generation business model. But there is no limit to the maximum size system we can build, it's just a matter of how much waste heat that is available to consume. In most landfill power facilities, there is enough waste heat to offset the parasitic electrical consumption of the power generation itself. By offsetting this parasitic, you are able to send the complete amount of methane-generated power to the grid."

For more information on the waste heat to power system, visit [www.gdttek.com](http://www.gdttek.com)



Bo Linton, President, GDT Tek

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Add: 506, 820 Xialhe Road, Xiamen, 361004 China  
 Tel: +86 592 229 4111 Fax: +86 592 229 4999  
 Email: [kenda@kendavalve.com](mailto:kenda@kendavalve.com) [hhj@kendavalve.com](mailto:hhj@kendavalve.com) Web: [www.kendavalve.com](http://www.kendavalve.com)