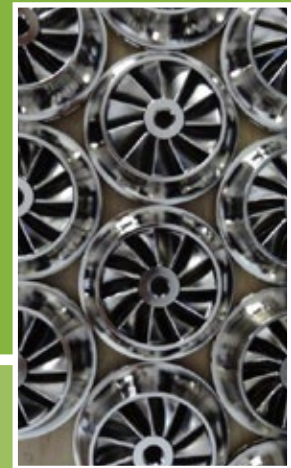
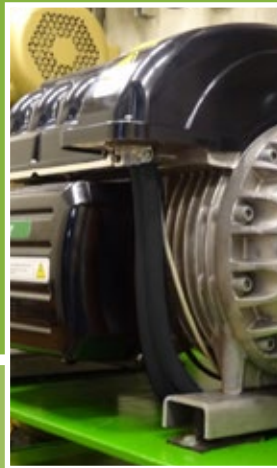


ORGANIC RANKINE CYCLE TECHNOLOGY

Turning waste heat into power!



Verdic**corp**
ENVIRONMENTAL TECHNOLOGIES
By  **MULTISTACK**



VERDICORP ORC / *BUILT ON PROVEN TECHNOLOGY*

Multistack International, is a manufacturer of an innovative range of chillers, heat pumps, and oil-free, air-cooled and water-cooled Organic Rankine Cycle Systems. These ORC systems harness energy that would typically be vented to the atmosphere as waste heat, and convert it into useful electrical energy.

Heat sources can be harnessed from renewable resources such as biomass, geothermal, solar, waste heat, in addition to industrial processes and engine exhaust from reciprocating and turbine engines.

The technology behind these ORC systems was originally developed by Verdicorp in 2009, by the same award winning individual who founded both Multistack and Turbocor, as a further application of the proven, successful and revolutionary Turbocor Compressor technology.

Multistack is focused on generating electrical power from sources of low grade heat with their Verdicorp ORC range, achieving this through two primary approaches to the market.

The first approach is to assist clients in harvesting their own waste heat and converting it into usable electrical energy. The second is to partner with clients to jointly harvest waste heat, and help the clients reduce their electricity bill.



Organic Rankine Cycle System - Turning waste heat into useful energy

AIR & WATER COOLED SYSTEMS



DELIVERING PROVEN TECHNOLOGY

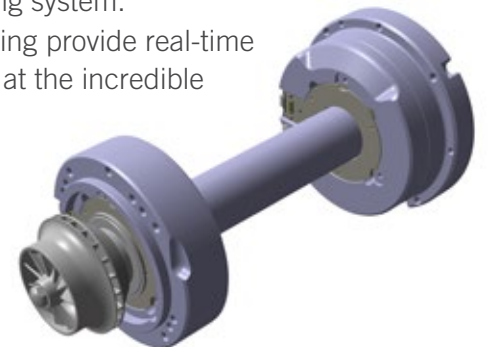


OIL-FREE TECHNOLOGY

All Multistack's ORC's, are designed to optimize the performance of their oil-free Verdicorp Turbo Expander which has been based on the Danfoss Turbocor compressor. The expanders use oil-free magnetic bearings and variable-speed generators to deliver superior efficiencies than conventional oil-lubricated radial inflow turbines or screw technology. The Verdicorp Turbo Expander delivers variable high speed turbine performance - up to 45,000 rpm, whilst remaining extremely compact, quiet, rugged and reliable.

MAGNETIC BEARINGS

Proprietary magnetic bearings replace conventional oil-lubricated bearings, eliminating high friction losses, mechanical wear and high-maintenance oil management systems. This contributes to the delivery of superior turbo expander efficiencies. The expander's one main moving part (rotor shaft and turbine) is levitated during rotation by a digitally-controlled magnetic bearing system. Position sensors at each magnetic bearing provide real-time feedback to the bearing control system at the incredible rate of 100,000 times every second, ensuring constantly centered rotation.



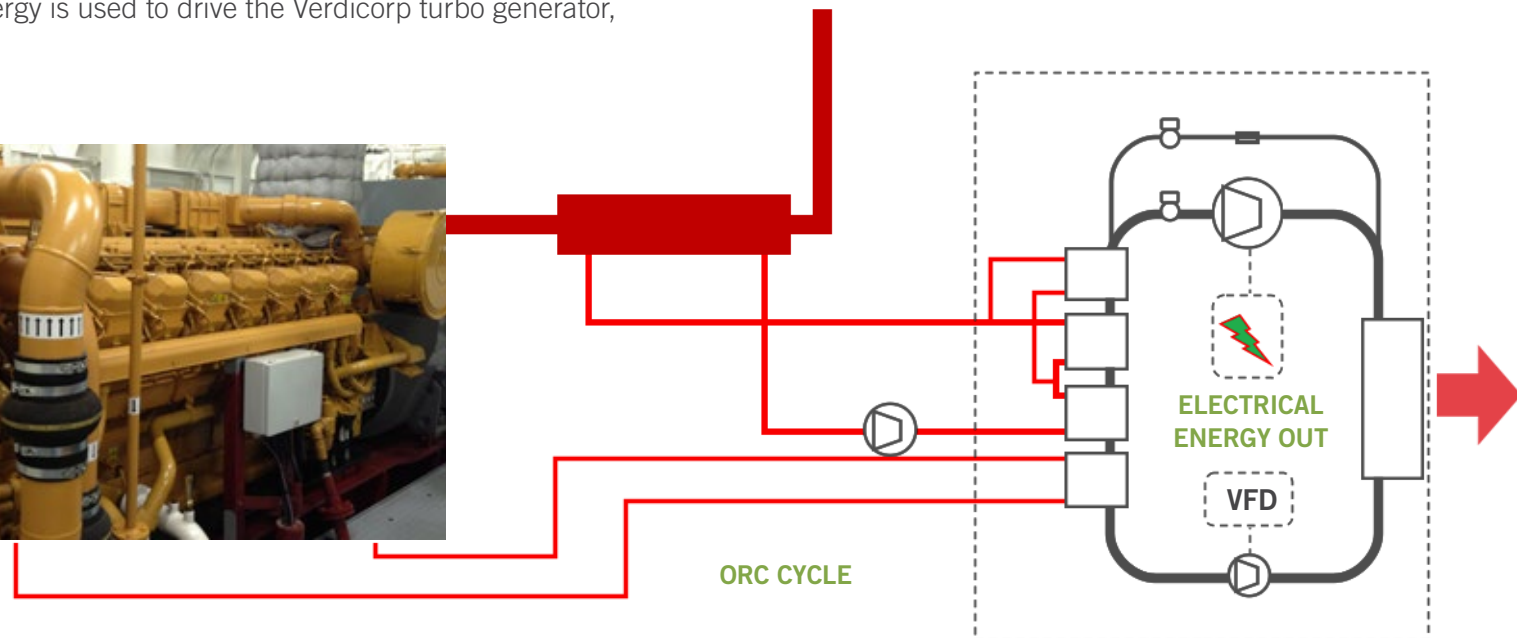
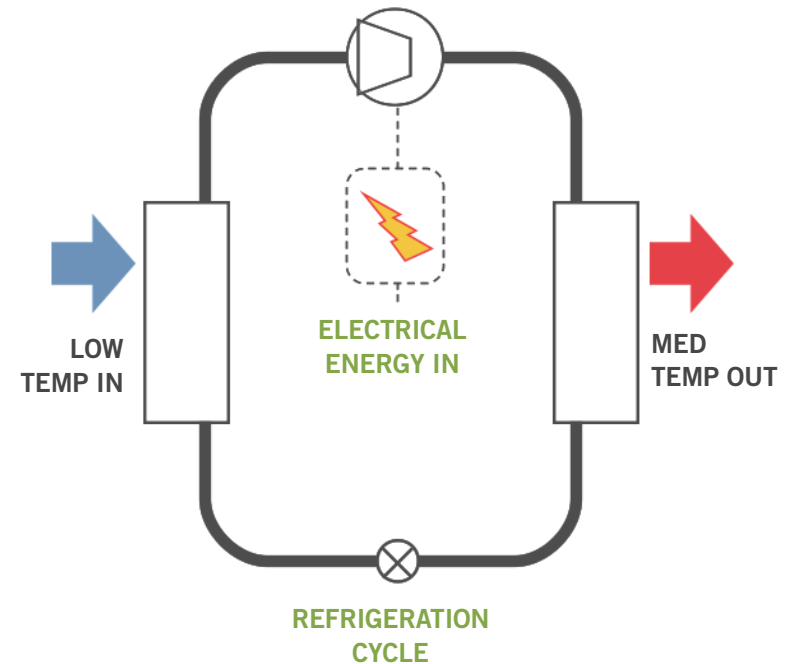


HOW AN ORC WORKS

In simple terms, an ORC can best be described as a refrigeration system running backwards. Unlike a refrigeration system that uses power to create cooling, an ORC uses heat to generate electricity.

In a refrigeration system, the heat energy is absorbed into an evaporator and by using electrical power to compress the refrigerant gas, the pressure and temperature is elevated in the condenser, allowing the heat and waste electrical energy to be transferred into the atmosphere.

The ORC operates in a similar manner, however, instead of removing heat through electrical energy, heat is injected into the evaporator it causing it to operate at much higher temperatures than the condenser. The resultant difference in pressure due to this heat energy is used to drive the Verdicorp turbo generator, providing electrical power.





THE ORC PRODUCTS

A MODULAR APPROACH - Multistack's ORC's come in a variety of models and configuration which can be selected based on specific project requirements. Currently Multistack produces both air-cooled and water-cooled models ranging from 60kW to 1260kWe Net. Their modular design allows the models to be configured into very large capacity plants.

Each unit has been designed with a modular approach, so there is flexibility to match an installation to your own particular site requirements, allowing for lower installation and site preparation costs, reducing the overall cost per kilowatt. The configuration of the modules and the maximum electrical net output achievable with a Multistack ORC system is limited only by your imagination.



A VARIETY OF HEAT SOURCES - A Verdicorp ORC by Multistack, can convert waste heat into electrical energy from a significant number of sources. Some typical examples are solar concentrators, bio-mass, waste engine heat, manufacturing processes, geothermal or waste steam.

Although the ORC does not create thermal energy directly, it is used to convert heat from other sources into electrical power. Multistack prides itself in offering this extremely advanced technology at competitive prices, and is able to adapt its design to suite the various available heat sources.

ENERGY REDUCTIONS FROM WASTE - The need for renewable energy is universal, as is the ever increasing sources of waste heat, and Multistack is committed to creating competitive solutions to meet this growing demand. Manufacturing both the expander and the ORC, Multistack fully understands how to maximize their potential in solving the renewable energy puzzle. Multistack is therefore uniquely qualified to provide sustainable energy efficiency solutions to anyone with waste heat. With this innovative technology offered by Multistack, every customer should reassess the cost of their current processes and should investigate just how much could they reduce their energy through simply capturing some of their waste with a Verdicorp ORC by Multistack.





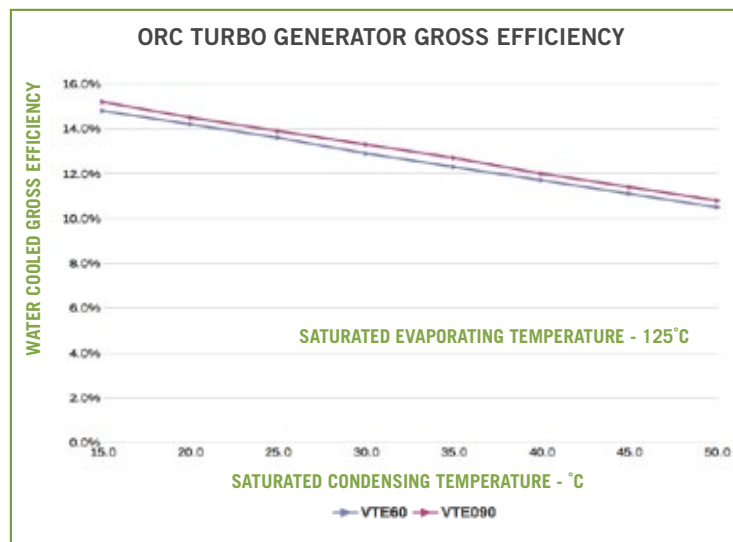
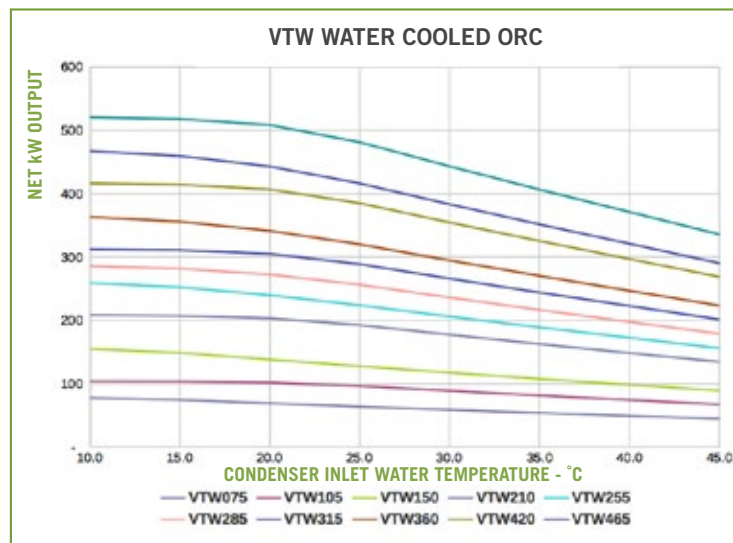
SUSTAINABLE ENERGY EFFICIENCY



SUSTAINABLE ENERGY EFFICIENCY

Installing and operating energy efficient equipment is very important but retaining that efficiency in a sustainable way is often difficult. Conventional ORC systems rely heavily on oil for lubrication, and this reliance on oil results in efficiency losses due to the contamination of the heat transfer surfaces over time.

Verdicorp's oil-free technology redefines sustainability as there is no oil present to cause this drop in efficiency and the system continues to maintain its high efficiency year after year throughout the life of the equipment.



VERDICORP'S TURBO EXPANDER

The range of Verdicorp ORC systems by Multistack is based on the long-established and proven Turbocor oil-free compressor technology which has over 80,000 machines operating world-wide.

Multistack produce oil-free ORC's ranging from a gross individual output of 60kW up to 1260kW. Larger systems output can be easily achieved due to the expanders unique oil-free design which allows them to be safely coupled together to achieve the customers desired capacity.

HIGH PERFORMANCE

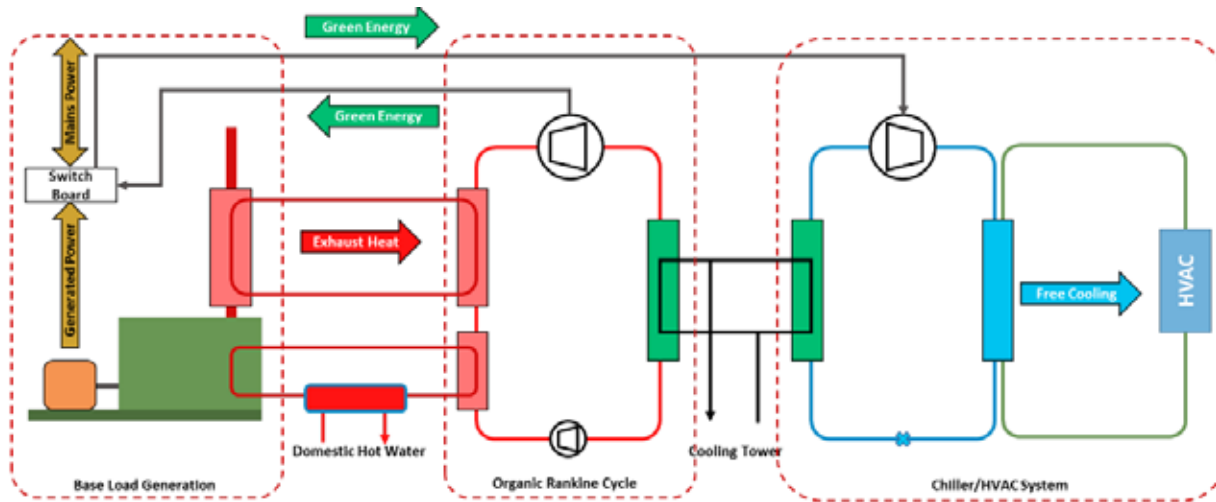
The Multistack range of Verdicorp expanders, operating from what would normally be considered waste heat, have very high efficiency, and can deliver efficiency gains of up to 15% when coupled to engines.

The performance of the Verdicorp ORC by Multistack will vary with the seasons, with lower ambient temperatures in cooler months providing an increase in the overall electrical output.

Multistack enables you to take advantage of this renewable energy technology by turning your waste heat into useful energy, reducing operating overheads, and allowing your system to operate at extremely high performances.



ADVANCED TRI-GENERATION

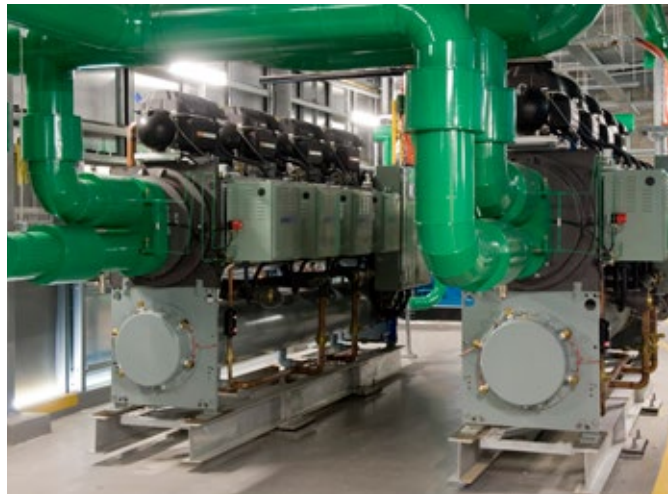


Tri-Generation is the concept of creating electrical energy, and producing heat and cooling as a by-product of the wasted energy created by the inefficiencies of the power generating process.

As energy usage and costs continually rise, an ever increasing number of building owners are generating their own Base Load power with stationary Gen-sets. The Verdicorp ORC technology can increase engine efficiencies by up to 15% by converting the engine exhaust and water jacket heat into environmentally friendly, renewable energy, whilst still providing sufficient residual heat for domestic hot water.

Verdicorp ORCs have been designed to operate with Multistack's Turbocor driven chillers to create the world's most energy efficient tri-generation solution. By coupling these two systems the customer is provided with an optimal electrical, cooling and heating solution, as the waste heat is turned in additional green power, cooling and heating through the most advanced combination of energy efficient technologies.

Both Multistack's Turbocor chillers and Verdicorp ORCs operate using the same high speed, oil-free technology, so servicing and maintenance are simplified as a single provider can work on both systems. Turbocor compressors are now driving tens of thousands of chillers in operation throughout the world, and Turbocor driven chillers have become dominant as the world leading producer of energy efficient chilled water in HVAC, ensuring technical support is readily available.





VERDICORP / *RENEWABLE AND SUSTAINABLE POWER*

The Multistack range of Verdicorp ORC systems are ideally suited for recovering heat and generating power from a wide variety of sources, such as engine, furnace and boiler exhausts, industrial waste, foundries, glass, cement, and steel manufacturing, chemical plants, oil and gas production. In addition to generating useful electricity from these many sources of waste energy, the Verdicorp ORC systems are also ideally suited to generating power from other sources, such as bio-mass, concentrated solar, and Geothermal energy.

Geothermal energy has long been recognised as a sustainable and environmentally friendly source of power. Although it has been in use as a generating power source for over 100 years, the global utilisation of Geothermal power has been quite limited, as geography, technology and efficiency limitations have historically prevented it from being widely adopted or viable. The unique technology found within the Verdicorp ORC systems however has removed many of these perceived limitations through dramatic efficiency improvements over conventional technologies, and the ability of Verdicorp ORC systems to run sustainably at significantly lower temperatures than have been traditionally utilised. The Verdicorp ORC system can therefore be configured to provide a commercially viable and scaleable solution to the users power requirements utilising the available geothermal energy.

The same innovations and capabilities of a Verdicorp ORC have also made the use concentrated solar systems combined with a Verdicorp ORC a viable power generating source. The ability to operate at much lower temperatures than conventional equipment has allowed the Verdicorp systems to operate for a greater period of time using the solar energy and heat available.

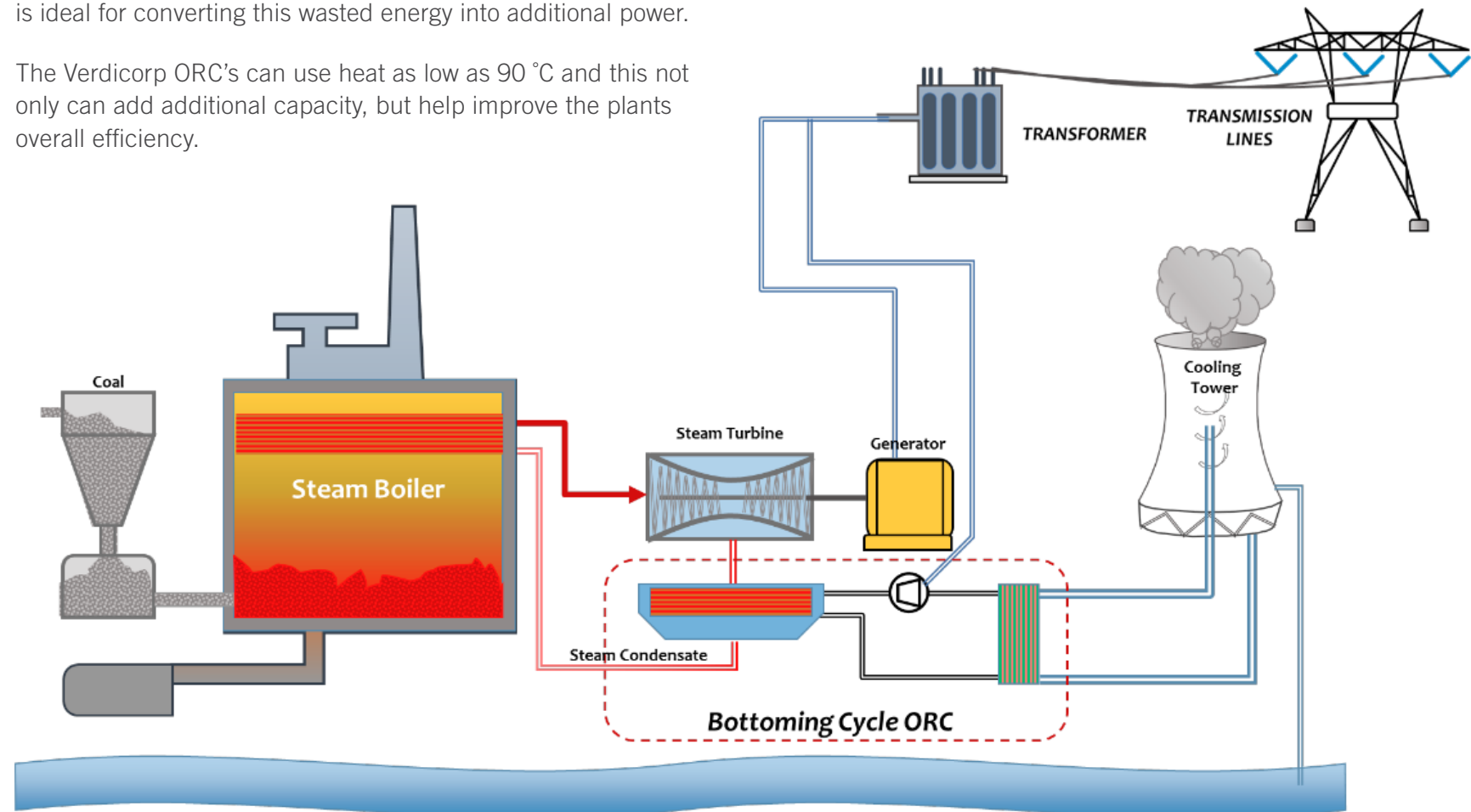




VERDICORP / *BOTTOMING CYCLE*

Modern coal and gas fired power plants have been designed to maximize their cycle efficiency, however in many older power plants, this is not the case. Many of these plants reject useful energy, and the Verdicorp ORC is ideal for converting this wasted energy into additional power.

The Verdicorp ORC's can use heat as low as 90 °C and this not only can add additional capacity, but help improve the plants overall efficiency.





AIR COOLED ORC

ORC model number	VTA065	VTA085	VTA120	VTA175	VTA205	VTA235	VTA265	VTA290	VTA350	VTA380
Nominal Input - kWt - total	575	815	1,150	1,630	1,965	2,205	2,445	2,780	3,260	3,595
Gross electrical power - kWe	71	108	142	216	250	287	324	358	432	466
Gross electrical efficiency	12.90%	13.20%	12.9%	13.2%	13.0%	13.1%	13.2%	13.1%	13.2%	13.1%
Net electrical power - kWe	58	88	116	176	204	234	264	292	352	380
Net electrical efficiency	10.50%	10.80%	10.5%	10.8%	10.6%	10.7%	10.8%	10.7%	10.8%	10.7%
Unit dim.s - Height - (m)	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6
- Width - (m)	2.2	2.2	4.4	4.4	6.6	6.6	6.6	8.8	8.8	11.0
- Length - (m)	5.8	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2
ORC model number	VTA440	VTA470	VTA530	VTA555	VTA615	VTA645	VTA705	VTA790	VTA880	VTA1050
Nominal Input - kWt - total	4,075	4,410	4,890	5,225	5,705	6,040	6,520	7,335	8,150	9,780
Gross electrical power - kWe	540	574	648	682	756	790	864	972	1,080	1,296
Gross electrical efficiency	13.2%	13.1%	13.2%	13.1%	13.2%	13.1%	13.2%	13.2%	13.2%	13.2%
Net electrical power - kWe	440	468	528	556	616	644	704	792	880	1,056
Net electrical efficiency	10.8%	10.7%	10.8%	10.7%	10.8%	10.7%	10.8%	10.8%	10.8%	10.8%
Unit dim.s - Height - (m)	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6
- Width - (m)	11.0	6.6	6.6	8.8	8.8	8.8	8.8	11.0	11.0	13.2
- Length - (m)	8.2	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4
Standard Design Parameters	Nominal temperature - deg.C HT Loop (In/Out)				150/120		Electrical generation 50Hz		380/400/415	
	Nominal temperature - deg.C LT Loop (In/Out)				90/80		Electrical generation 60Hz		400/460/480	

NOTES

- Nominal Conditions - Air Cooled • Saturated Evaporating Temperature - 125 °C
- Saturated Condensing Temperature - 30 °C • Ambient Temperature 15 °C
- Net Electrical Power - including refrigerant pump, it does not include thermal fluid pump losses
- Data presented is for a generic application at “Nominal Conditions”, actual performance will depend on detailed specifications of each application
- Published data subject to change from time to time, consistent with Verdicorp’s product enhancement program



WATER COOLED ORC

ORC model number	VTW075	VTW105	VTW150	VTW210	VTW255	VTW285	VTW315	VTW360	VTW420	VTW465
Nominal Input - kWt - total	521	724	1,042	1,448	1,766	1,969	2,172	2,490	2,896	3,214
Gross Electrical Power - kWe	88	123	176	246	299	334	369	422	492	545
Gross electrical efficiency	14.40%	14.50%	14.4%	14.5%	14.4%	14.5%	14.5%	14.5%	14.5%	14.5%
Net electrical power - kWe	75	105	150	210	255	285	315	360	420	465
Net electrical efficiency	13.20%	13.50%	13.2%	13.5%	13.3%	13.4%	13.5%	13.4%	13.5%	13.4%
Unit dim.s - Height - (m)	2.85	2.85	2.85	2.85	2.85	2.85	2.85	2.85	2.85	2.85
- Width - (m)	1.45	1.45	2.9	2.9	4.35	4.35	4.35	5.8	5.8	7.3
- Length - (m)	2.65	2.65	2.65	2.65	2.65	2.65	2.65	2.65	2.65	2.65
ORC model number	VTW525	VTW570	VTW630	VTW675	VTW735	VTW780	VTW840	VTW945	VTW1050	VTW1260
Nominal Input - kWt - total	3,620	3,938	4,344	4,662	5,068	5,386	5,792	6,516	7,240	8,688
Gross electrical power - kWe	615	668	738	791	861	914	984	1,107	1,230	1,476
Gross electrical efficiency	14.5%	14.5%	14.5%	14.5%	14.5%	14.5%	14.5%	14.5%	14.5%	14.5%
Net electrical power - kWe	525	570	630	675	735	780	840	945	1,050	1,260
Net electrical efficiency	13.5%	13.4%	13.5%	13.4%	13.5%	13.4%	13.5%	13.5%	13.5%	13.5%
Unit dim.s - Height - (m)	2.85	2.85	2.85	2.85	2.85	2.85	2.85	2.85	2.85	2.85
- Width - (m)	7.3	4.4	4.4	5.8	5.8	5.8	5.8	7.3	7.3	8.8
- Length - (m)	2.65	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9
Standard Design Parameters	Nominal temperature - deg.C HT Loop (In/Out)				150/120		Electrical generation 50Hz		380/400/415	
	Nominal temperature - deg.C LT Loop (In/Out)				90/80		Electrical generation 60Hz		400/460/480	

NOTES

- Nominal Conditions - Water Cooled • Saturated Evaporating Temperature - 125 °C
- Saturated Condensing Temperature - 20 °C • Condenser Water Pumps of “13/18.5 °C”
- Net Electrical Power - including refrigerant pump, it does not include thermal fluid pump or condenser pumps and fan power losses
- Data presented is for a generic application at “Nominal Conditions”, actual performance will depend on detailed specifications of each application
- Published data subject to change from time to time, consistent with Verdicorp’s product enhancement program

**MANUFACTURING**

Florida, USA
Guangzhou, China

ASSEMBLY

Melbourne, Australia
Tallahassee, Florida
Guangzhou, China

SALES

Florida, USA
Melbourne, Australia
Guangzhou, China
Bangkok, Thailand
Jakarta, Indonesia

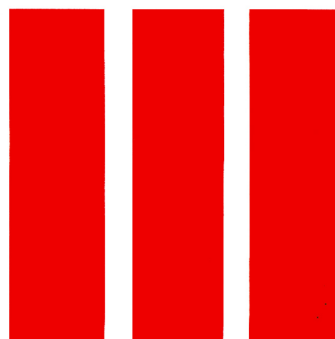


www.multistack.com.au

Australia

17 Friars Road,
Moorabbin, Victoria,
Australia, 3189

+61 3 8586 8200
sales@multistack.com

**MULTISTACK****I N T E R N A T I O N A L L I M I T E D**