CES

Complete Energy Saving

Cool Heat Power Save

PT. BETA SARANA ENERJI

WARU TEKNIKATAMA
HEAT TRANSFER TECHNOLOGY

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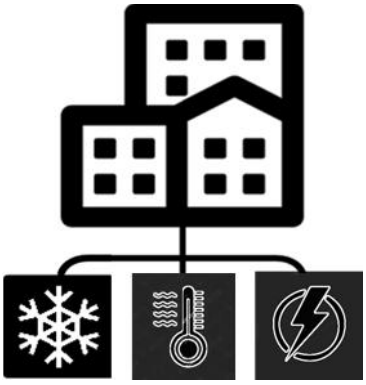
Complete Energy Saving

Higher efficiency than furnaces, boilers, air-conditioners and the electric grid means lower utility bills for you.



The world economic growth results us to consume more energy. However many installed energy systems show inefficiency therefore the consumers experience high energy cost.
We provide comprehensive energy efficiency and renewable energy solutions for facilities in industries, commercial buildings and homes.
Heating, cooling, mechanical and electrical power system are the basic needs in any industry.
We have energy efficiency systems customized for client conditions.

- **GEG (Gas Engine Generator) 5 – 8 MW**
  GEG produces electricity eco friendly and less costly by using natural gas fuel. The waste heat can be used for water heater, oil heater and steam generator for production process.
  The generated steam can be used in absorption chiller to produce chilled water for air condition or production process.

- **GPAC (Gas Powered Air Conditioning / Chiller)**
  Electrical/Mechanical Refrigeration Chiller produces chilled water for air condition and production purposes in industries.
  The chiller can be powered by electricity grid (PLN) and Gas Engine Generator (GEG).
  In case of using GEG, the waste heat can be used for water heater, oil heater and steam generator for production process.

- **GPWH (Gas Powered Water Heater) up to 200 KW**
  GPWH generates electricity from its Gas Engine Generator (GEG) and the waste heat is used for residential needs (hotel, apartment, etc).
  The waste heat can be used for oil heater or steam generator for production purposes in industries.

- **GTIAC (Gas Turbine Inlet Air Cooling)**
  A Gas Turbine generates electricity. Its waste heat can be used in steam generator for production process and absorption chiller to produce chilled water.
  To gain excess power the gas turbine inlet air is cooled by absorption chiller (in gas power generation) and mechanical refrigeration chiller (in steam and gas power generation).
  Generated excess power is about 6 – 10 % of gas turbine performance.

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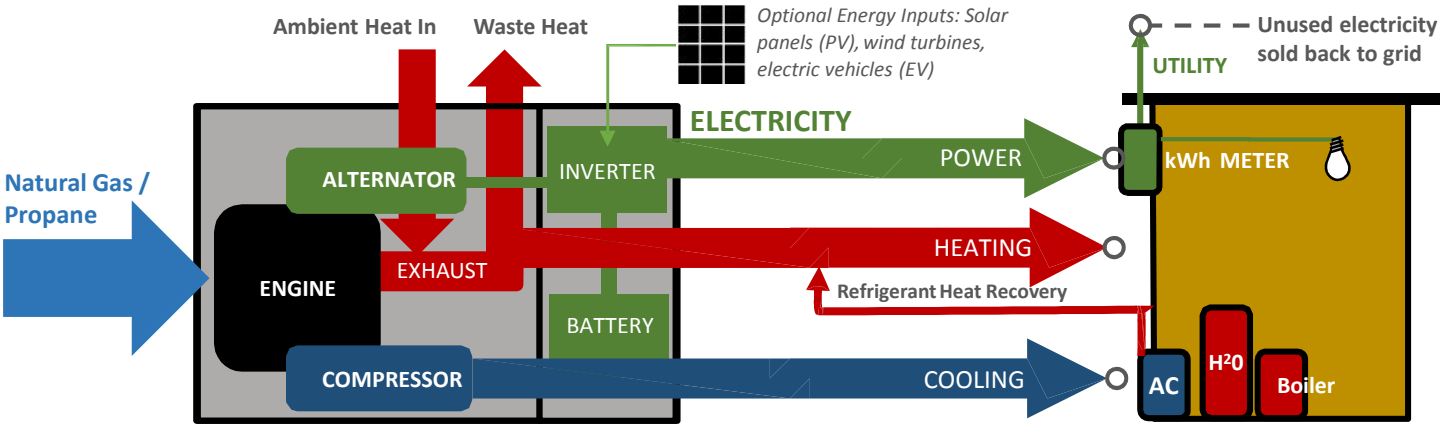
Complete Energy Saving

It's the high-efficiency, renewable, adaptable, adjustable, all-in-one Cooling Heating and Power machine.

HOW IT WORKS

Complete Energy Saving makes the most efficient use of fuel by producing cooling, heat and power at the point of use allowing medium to large industries to benefit from distributed power and maximum efficiency in energy generation. This process is typically two to three times more efficient as a centralized electrical utility grid. The result is lower energy bills.



POWER

- Functions as a continuous power source – producing electricity to use or sell back to the grid
- Provides uninterruptable power when the grid goes down

COOLING

- The natural gas engine drives a compressor which cools just like an electric air conditioner but more efficiently using variable refrigerant flow (VRF)

HEATING

- The natural gas (or propane) engine creates heat, which is recovered for water and space heating
- With the Air Source heat pump, additional heat is captured from outside air. Combined with the engine heat, the operating range of the heat pump can be extended to low ambient temperatures

EFFICIENCY

- Offers the lowest operating cost of any heating / cooling systems
- Fully programmable inverter allows for time-of-day and peak shaving, interfaces with solar or wind power, sells back to the grid and integration with multiple units

CUSTOMERS

- Medium to large Industrial
- Small to medium businesses

ADVANTAGES

By applying our energy efficiency system, our clients don't need to act capital in fact that we would be paid from the savings itself

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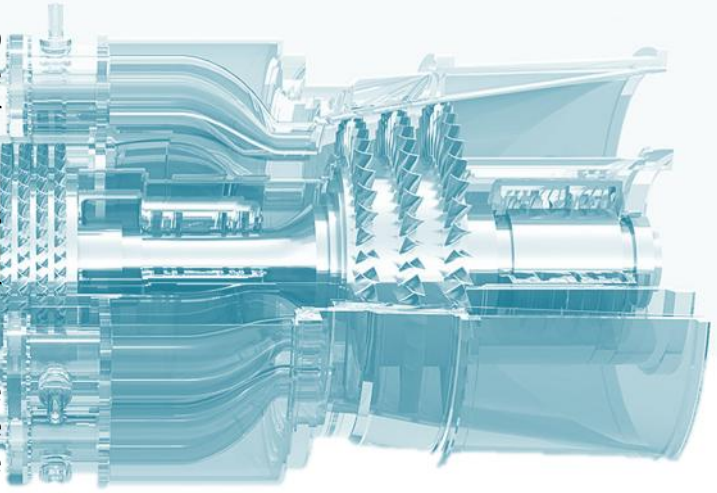
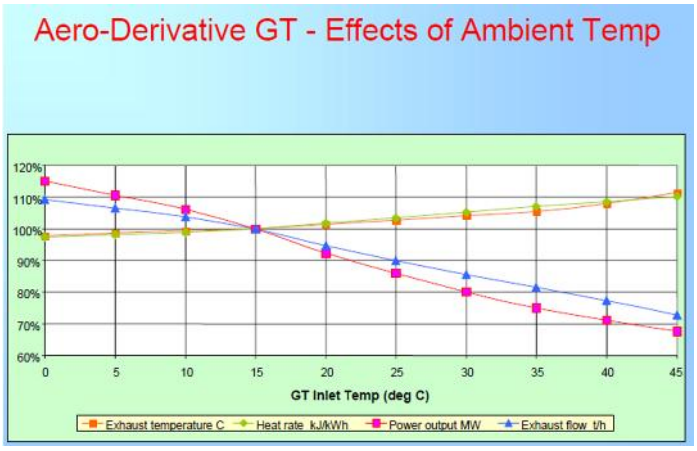
Why do we cool gas turbine inlet air by applying GTIC technology

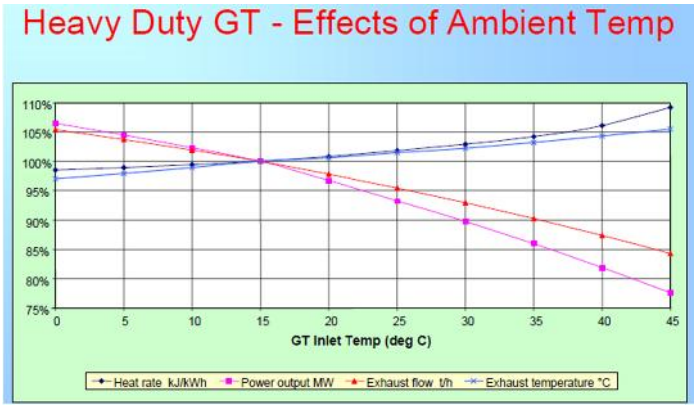


The standard gas turbine performance is based on ISO conditions (ambient temperature 15°C, relative humidity 60%, pressure 1 bar @ sea level). The power output decreases as the air inlet temperature increases. The heat rate (fuel required per unit of electric energy) increases as the air inlet temperature increases. Gas turbine installations in tropical countries like Indonesia (ambient temperature about 32°C) experience power output and fuel efficiency decrease.

GTIAC technology cools the air before it enters to the compressor that supplies high pressure air to the combustion chamber from which hot air at high pressure enters the combustion turbine. Power output of a gas turbine is directly proportional to and limited by the mass flow rate of compressed air available to it from the air compressor that provides high-pressure air to the combustion chamber of the gas turbine system. An air compressor has a fixed capacity for handling a volumetric flow rate of air. Even though the volumetric capacity of a compressor is fixed, the mass flow rate of air it delivers to the gas turbine changes with changes in ambient temperature because the air density decreases when air temperature increases. Therefore, the power output of a combustion turbine decreases below its rated capacity at the ISO conditions (15°C, 1 bar @ sea level) with increases in ambient temperature above 15°C. GTIAC allows increase in air density by lowering the temperature and thus, helps increase mass flow rate of air to the gas turbine and results in increased output of the gas turbine.

Some reasons to apply GTIAC are to increase power output and fuel efficiency in gas turbine power system, reduce capital cost for the enhance power capacity, increase steam production in co-generation plants, increase power output in steam turbine in combined cycle plants.





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