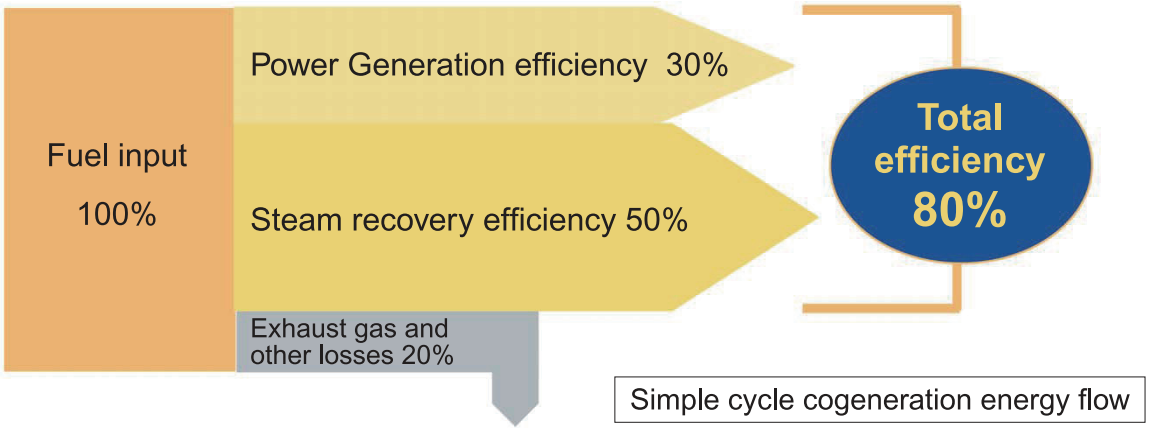
						S4	FEMS
E-09	Keywords	Y3	equipment or facility	Z2/3	oil/natural gas	E25	general-purpose machinery

Kanadevia Corporation

Gas Turbine Cogeneration Systems

Features

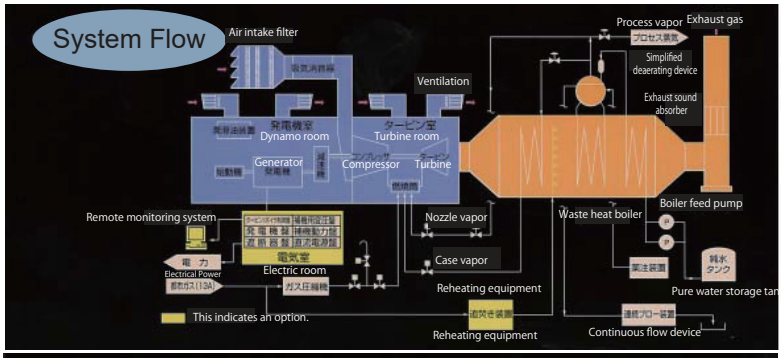
- Energy system with a total efficiency exceeding 80% achieved by natural gas or other fuels fired power generation system with heat recovery from exhaust gas
- Power can be supplied from the cogeneration system even in the grid power black-out situation (emergency power generating facilities)
- Environmental-friendly system by reducing CO2 emissions
- Energy saving system by recovering waste heat from exhaust gas with generating power
- Peak-cut operation can contributes to load leveling
- Cost saving by avoiding the use of special high-voltage power supply systems from the grid

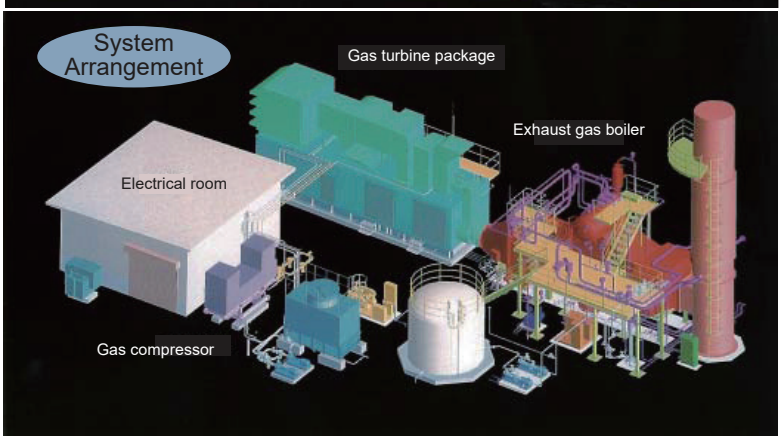


Simple cycle cogeneration energy flow

Basic Concept or Summary

- The system drives a gas turbine or gas engine using natural gas, etc. as a fuel, thereby turning the generator, and recovers the exhaust heat to be used for plants and/or for air conditioning in buildings.
- The system is called a cogeneration system, because two products (electricity and steam) are obtained from single fuel source.
- When surplus steam is generated, it is possible to put back the surplus steam into the gas turbine and mix it with the combustion gas to increase the generating power and efficiency by around 30%. This is called Variable Heat and Power system (VHP system).





Effects or Remarks

◆ System installation can achieve energy savings of 5~10%, although the actual level depends on the user's operating conditions.

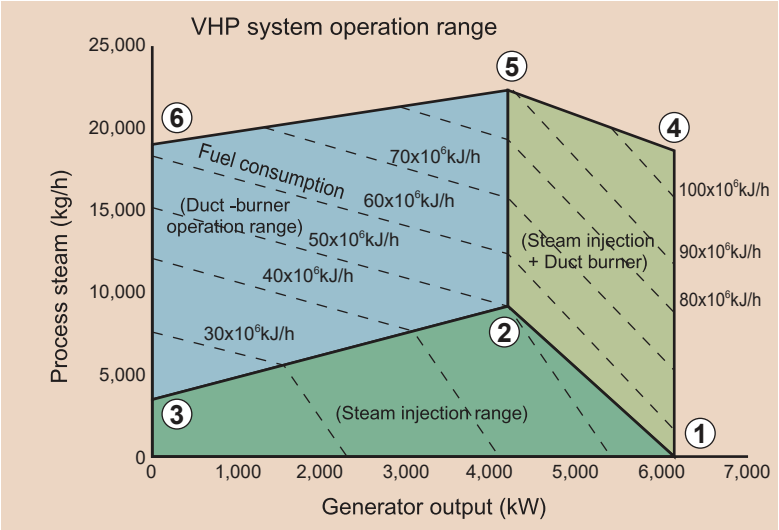
The performances of the Mark I (Electrical efficiency-oriented type) and Mark II (total efficiency-oriented type) are compared below.

Maximum power output operation
(Operation point: (1))

Model			Mark I	Mark II
Ambient air temperature		ºC	15	15
Generator output		kW	6,100	6,120
Steam	Injection steam volume	kg/h	9,792	9,792
	Process steam volume	kg/h	400	3,500
Fuel	Fuel consumption rate	kcal/kW	2,207	2,370
Efficiency	Electrical efficiency	%	39.0	36.3
	Total efficiency	%	40.9	51.9

Maximum process steam operation
(Operation point: (2))

Model			Mark I	Mark II
Ambient air temperature		ºC	15	15
Generator output		kW	4,200	4,220
Steam	Injection steam volume	kg/h	2,052	2,054
	Process steam volume	kg/h	8,678	9,408
Fuel	Fuel consumption rate	kcal/kW	2,878	2,881
Efficiency	Electrical efficiency	%	29.9	29.9
	Total efficiency	%	76.5	81.4



(Steam injection + additional burning)
Area surrounded by (1), (4), (5) and (2) is for a (Steam injection + Additional burning)
The increase of power generation in the right side of (2) and (5) area is by Steam injection to Gas turbine.
The increase of steam generation in the above (1) and (2) area is by additional burning to Heat recovery boiler

(Steam injection)
The area surrounded by (1), (2) and (3) is for a (Steam injection), which is subject to partial load of and steam injection to Gas turbine.

(Additional burning)
The area surrounded by (2), (5), (6) and (3) is for a (Additional burning), which is subject to partial load of Gas turbine and additional burning to Heat recovery boiler.

Installation in Practice or Schedule

Domestic 48 plants in Japan/66 units/Total output: 627,080 kW

Overseas 8 plants in overseas countries/21 units/Total output: 108,100 kW

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