

Makuhari

CASE STUDY



Trigeneration – **ALL-IN-ONE** for 24/7 comfort

The growing demand for natural gas as fuel and the increasing importance of environmental values in Japan have encouraged investments in gas-fired power generation systems. The green point of view has also contributed to the rise of interest towards trigeneration energy sources. This shift in mindset and energy policy has created an opportunity for Wärtsilä to offer its trigeneration solutions to Energy Advance (ENAC) in the form of the Makuhari District Heating and Cooling (DHC) Centre power plant.

“Since the Wärtsilä gas engines were taken into operation in 2007, they have run well in daily start and stop mode. Each engine reaches about 30,000 running hours with reliable operation.”

Mr. Atsuya Ono, Chief Manager,
Makuhari District Heating &
Cooling, Operation Center,
Energy Advance Co.,Ltd.

KEY DATA

CUSTOMER

Energy Advance Co. (utility)

TYPE

Wärtsilä 34SG gas
trigeneration power plant

OPERATING MODE

Flexible baseload

GENSETS

1 x Wärtsilä 20V34SG +
1 x Wärtsilä 16V34SG

TOTAL OUTPUT

15.7 MW_e + 10.85 MW_{th}

FUEL

Natural gas

SCOPE

EEQ (engineered equipment delivery)

DELIVERY

2007

ENAC is an energy services provider and a subsidiary of Tokyo Gas, Japan's largest gas company. For Tokyo Gas ENAC is a way of promoting cogeneration services to its customers nationwide. The trend in the market shows a growing need for trigeneration as well as combined heat & power (CHP) technologies located close to end-users, near the point of consumption.

The Makuhari DHC incorporates two Wärtsilä 34SG gas-fuelled gensets producing not only electricity but also heating and cooling for the Makuhari area. The plant allows optimal air conditioning for buildings both during winter and summer, on weekdays and at weekends avoiding separate electrically-driven air conditioning units in each apartment.

The construction of the Makuhari DHC plant extension began in 2006 and commercial operation started in April 2007. The extension consists of two Wärtsilä 34SG gensets, two exhaust gas boilers rated at 4.5 tonnes/h and 5.6 tonnes/h of steam, and two chillers; one electrical turbo-chiller and one absorption chiller, out of which Wärtsilä supplied the gas engine generators, auxiliaries and control systems. Wärtsilä also made a 10-year maintenance agreement with ENAC in order to ensure reliability of plant operations, minimise risks and keep the plant productive and profitable. The agreement transfers the responsibility of maintenance to Wärtsilä and increases the customer's financial predictability by covering maintenance intervals and service with fixed prices.

The Makuhari DHC Centre, located between the city of Tokyo and Narita International Airport, is situated in the Makuhari Business Centre, an area of more than 500 hectares consisting of apartments, hotels, schools, shopping centres and office buildings. The plant provides round-the-clock electricity, heating and cooling for nine customers ensuring year-round comfort for guests of the Makuhari Messe convention centre, five hotels, office buildings and a shopping

centre. Not a single watt produced is wasted since the energy surplus not used by these nine customers is sold to the grid.

Wärtsilä 34SG engines were chosen for this power plant for mainly two reasons: because of the high efficiency they achieve and because they are pure gas engines which do not require any liquid ignition. Using CHP technology in electricity production allows overall efficiency up to 77% in this case. Besides high efficiency rates, gas engines of this size can be run flexibly according to demand. As the city of Makuhari is progressing into becoming a more environmentally friendly community, using natural gas as fuel works perfectly as a stepping stone towards a more sustainable future.

The Wärtsilä 34SG engines combined with cooling and heating properties allow ENAC to focus on its core competence of providing energy services to its nine main customers. The solution provided by Wärtsilä is in line with the environmental values of ENAC as well as the energy and heat demand of the Makuhari New City.

| CHALLENGE | WÄRTSILÄ'S SOLUTION | BENEFIT |
|--|---|--|
| Progression into becoming a more environmentally friendly city | Wärtsilä 34SG engines and natural gas as fuel | Cutting CO ₂ emissions by 24,000 tonnes per year compared to conventional DHC systems |
| Providing continuous and reliable electricity, heat and cooling to Makuhari New City | Wärtsilä 34SG engines as a suitable power generation source | High electrical & thermal efficiencies, no liquid fuel needed for ignition |
| Location in the middle of densely populated Makuhari City | Clean and quiet operation of the trigeneration plant | Capability to provide energy to the whole city, minimal heat and electricity transmission losses |



wartsila.com

WÄRTSILÄ® is a registered trademark. Copyright © 2017 Wärtsilä Corporation. Specifications are subject to change without prior notice.



WÄRTSILÄ