MAXIMIZED PREFABRICATION FOR MINIMIZED BUSINESS RISK

The Cubes are complete, fully functional power plants with all the auxiliaries and components that a power production unit requires.

The scope of supply is a cubical construction with radiators on the roof and an exhaust gas stack either situated close to the cube or integrated within it. Each cube is delivered complete with all the components and structures located above ground. Only the concrete foundation on which the assembly rests is built locally, thus significantly reducing the customer's responsibility.

FAST, FUNCTIONAL AND FLEXIBLE

For industrial self-generation, small utilities and IPP customers who do not have major construction and project-handling resources, a complete power production unit requiring minimum work on site is the answer. The installation of a Power Cube is rapid and easy. Plant start-up is fast thanks to pre-configured software and interface solutions. Operation and maintenance require a minimum of staff on site and remote monitoring is possible. Trouble-shooting is quick and spare part availability is good. All this due to advanced standardization.

The standardized design of the Power Cubes also lifts the concept of "step-wise" investment to new heights. Starting with just a single Cube, you can easily expand the installation by adding new, interconnected Cubes. As the demand for power grows so will your plant.

ADVANTAGES OF CUBE DESIGN:

- Validated and reliable technical solutions
- High electrical efficiency through minimization of the plant's own consumption
- Compact design and a minimized annex system
- Fluent and cost-efficient project execution from planning to start-up
- Optimized lifetime support and reduced warranty costs
- Future expansion flexibility.

Are you looking for a great package deal for power generation in the 5-30 MW range?

With our OilCube and GasCube power generation solutions for smaller power plants, you enjoy the same big benefits as our customers for large turnkey power plants: proven technical and logistical solutions and reliable delivery schedules guaranteed by a single supplier.

The Wärtsilä Power Cubes are modular, pre-engineered single-engine power plants produced within a cost framework that justifies turnkey deliveries for small plants while still complying with the needs of different clients and applications.
The Wärtsilä OilCube is a complete single-unit power plant. The 20V32 engine version is designed to meet a power demand of 5 to 30 MW. 12 and 16 cylinder engine versions are also available as options.

The design of the Wärtsilä OilCube is compact. Nevertheless, it includes a modular heavy fuel oil (HFO) treatment system consisting of two separators and a tank with separated fuel.

Electrically heated and without a steam system, the electricity consumption in a Wärtsilä OilCube plant is minimized by utilizing heat taken from the engine cooling water and lubrication oil systems. A closed-circuit cooling water system keeps the need for water down to a minimum. And radiators placed on the roof ensure the most efficient cooling in all circumstances.

Power Cubes have a low-voltage electrical system inside the cube that includes a plant programmable logic control (PLC) and a panel mounted WOIST™ (Wärtsilä Operator’s Interface System). Thus, the plants can be monitored and operated remotely or by using WOIST™ workstations.
1. Wärtsilä 20V32 engine
2. OilCube Auxiliary module
3. OilCube Treatment module
4. Maintenance water tank
5. Air compressor, 7 bar
6. Starting air compressor
7. Ventilation intake louvre
8. Intake air filter
9. Starting air vessel
10. Charge air silencer
11. Exhaust gas silencer
12. Cooling radiators
13. Exhaust stack
14. Expansion vessel
15. Oil mist separator
16. Overhead crane
17. Generator ventilation duct
18. Generator
19. Ventilation outlet fan

**OilCube power outputs**

<table>
<thead>
<tr>
<th>Technical data</th>
<th>50 Hz/750 rpm</th>
<th>12V32</th>
<th>16V32</th>
<th>20V32</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power, electrical kW</td>
<td>5327</td>
<td>7124</td>
<td>8924</td>
<td></td>
</tr>
<tr>
<td>Heat rate, kJ/kWh</td>
<td>7840</td>
<td>7815</td>
<td>7799</td>
<td></td>
</tr>
<tr>
<td>Electrical efficiency, %</td>
<td>45.9</td>
<td>46.1</td>
<td>46.2</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Technical data</th>
<th>60 Hz/720rpm</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Power, electrical kW</td>
<td>5211</td>
<td>6970</td>
<td>8730</td>
</tr>
<tr>
<td>Heat rate, kJ/kWh</td>
<td>7840</td>
<td>7815</td>
<td>7799</td>
</tr>
<tr>
<td>Electrical efficiency, %</td>
<td>45.9</td>
<td>46.1</td>
<td>46.2</td>
</tr>
</tbody>
</table>

**Dimensions and weight (generating set with liquids and 150 mm high spring elements)**

<table>
<thead>
<tr>
<th>Dimensions and weight</th>
<th>Length (mm)</th>
<th>Width (mm)</th>
<th>Height (mm)</th>
<th>Weight (tonne)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length mm</td>
<td>10030</td>
<td>11240</td>
<td>12200</td>
<td>92</td>
</tr>
<tr>
<td>Width mm</td>
<td>3050</td>
<td>3300</td>
<td>3300</td>
<td>119</td>
</tr>
<tr>
<td>Height mm</td>
<td>4420</td>
<td>4340</td>
<td>4420</td>
<td>130</td>
</tr>
</tbody>
</table>

Heat rate and electrical efficiency at generator terminals, including engine-driven pumps. ISO 3046 conditions and LHV. Tolerance 5%. Power factor 0.8.

**MAIN TECHNICAL DATA**

- **Engines**: Wärtsilä 12V32, 16V32, 20V32
- **Ambient temperature**: 0…+40 °C
- **Noise level**: 70 dB(A) 100 m
- **OilCube auxiliary module**: Fuel booster with massflow
  - Prelubrication oil pump
  - HT preheater
  - Thermostatic valves
  - Sludge collection
- **OilCube treatment module**: 2 x HFO separators
  - Heater HFO/HT water
  - Separated fuel tank
  - LO separator
- **Control system local**: Control panel with remote monitoring as option
- **Cooling radiator**: Single circuit, low noise on the roof
- **Ventilation**: Free in, forced out
- **Max temperature inside power house**: +50 °C

**Oil Cube – Wärtsilä 32**

- **37 x 14 m**
- **Area**: 518 m²
WÄRTSILÄ GASCUDE

The Wärtsilä GasCube is a complete one-engine power plant, based on the Wärtsilä 20V34SG, with all the auxiliaries and components needed to make up a working power production unit, providing up to 10 MWe per unit.

The Wärtsilä GasCube consists of a cubical enclosure that has the engine and the alternator located on a common baseframe. The inlet air module, charge air silencers, exhaust gas system and an auxiliary module are all connected to the genset.

The auxiliary module includes a gas-regulating unit, the cooling system, an instrument air system, and an engine pre-heater. All auxiliaries are located in the modules.

The radiators for engine cooling are installed on the roof of the enclosure. The starting air vessel and the maintenance water tank are installed next to the auxiliary module. The only major component not located on the auxiliary module is the starting air compressor next to it.

The closed-circuit cooling systems used in the GasCube make it the perfect choice for remote locations or any location in which water is scarce.

All Wärtsilä gas power plants are also designed to give full output and high performance in hot and dry conditions, as well as at high altitudes.

New possibilities for Cube placement are opened up by the Cube’s simple interface and small footprint. A typical storage yard of an industrial company, for example, would be more than adequate as a location for this compact solution offering excellent power density.
1. Maintenance water tank 3.2 m³
2. Starting air vessel 3.0 m³
3. Exhaust gas module
4. Cube auxiliary module
5. Wärtsilä 20V34SG gas engine
6. Generator
7. Cooling radiators
8. Expansion vessel
9. Ventilation roof fan unit
10. Stack
11. Exhaust gas silencer
12. Generator ventilation outlet air duct
13. Ventilation inlet air louvre
14. Neutral point cubicle
15. Explosion relief valve

MAIN TECHNICAL DATA

Engines ........................................................................................... Wärtsilä 16V34SG, 20V34SG
Ambient temperature ........................................................................... -5…+40 °C (+45 special arrangements)
Noise level ........................................................................................................... 70 dB(A) 100 m
Gas regulating unit .............................................................................................. Wärtsilä design
Control ...................................................................................................... Power house / remote
Cooling .................................................................................................................... Single circuit
Radiator ...................................................................................................................... On the roof
Ventilation ........................................................................................................ Free in, forced out
Max temperature inside power house ..................................................................... +50 °C

GasCube power outputs

<table>
<thead>
<tr>
<th>Technical data 50 Hz/750 rpm</th>
<th>Unit</th>
<th>16V34SG</th>
<th>20V34SG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power, electrical kW</td>
<td></td>
<td>7744</td>
<td>9730</td>
</tr>
<tr>
<td>Heat rate kJ/kWh</td>
<td></td>
<td>7819</td>
<td>7779</td>
</tr>
<tr>
<td>Electrical efficiency %</td>
<td></td>
<td>46.0</td>
<td>46.3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Technical data 60 Hz/720 rpm</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Power, electrical kW</td>
<td></td>
<td>7434</td>
</tr>
<tr>
<td>Heat rate kJ/kWh</td>
<td></td>
<td>7819</td>
</tr>
<tr>
<td>Electrical efficiency %</td>
<td></td>
<td>46.0</td>
</tr>
</tbody>
</table>

Dimensions and weight (generating set with liquids and 150 mm high spring elements)

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Length mm</td>
<td>11300</td>
<td>12890</td>
</tr>
<tr>
<td>Width mm</td>
<td>3300</td>
<td>3300</td>
</tr>
<tr>
<td>Height mm</td>
<td>4240</td>
<td>4440</td>
</tr>
<tr>
<td>Weight tonne</td>
<td>120</td>
<td>130</td>
</tr>
</tbody>
</table>

Heat rate and electrical efficiency at generator terminals, including engine-driven pumps, ISO 3046 conditions and LHV.
Tolerance ±5%. Power factor 0.8. Gas Methane Number >80.
Wärtsilä Containerized Power Plants are a fast alternative for distributed power production needs running on heavy fuel oil.

Comprising two standard size 40’ HC sea containers, the one engine plant is easy to transport and erect. These containers are tailor made for this purpose so there are no weak points. They are CSC-certified with full stacking capacity.

Since the containers are compact it is easy to multiply the amount of gensets when needed. Wärtsilä can offer containerised MV-switchgear solutions combined with Wärtsilä 20 Containerized Power Plants.

Thanks to precommissioned auxiliaries and tested functionality the start-up time at site is short.

Everything needed is packed neatly in two containers. The generating set, starting air compressor and bottle, air and fuel filters, pumps, separators, radiators, even the exhaust silencer and stack are carried in the two containers. Yet, it makes for a fully equipped heavy fuel oil power plant.

For the plant a simple concrete foundation is needed. Lift the containers into place, connect the piping between the two containers and the tank yard, lift up the radiator air guide vanes, erect the exhaust stack and connect the cables. Your HFO power plant is ready for starting.

The heaters and trace heating are electric so no boiler or steam generator is needed.

The cooling system is closed minimizing water consumption. Wärtsilä 20 engines are fuel efficient and economical to operate.

The control is handled by one PLC in the auxiliary container, which controls all functions of the plant.

Engine start and stop, speed control, synchronization, loading, separators, pumps and heaters are controlled with one operator interface panel.

As an option the running data can be monitored on a computer screen in a separate
control room by the Wärtsilä Operator Interface System (WOIS). All operation data and alarms can be recorded.

If one day the plant is to be relocated it is simple and fast to pick up and move. No buildings to be demolished just prepare the containers for transportation and drive to the next location.

Depending upon the local environment and customers needs there are different configurations to choose from.

- Wärtsilä 9L20 for heavy fuel oil 1539 kW
- Wärtsilä 9L20 for liquid biofuel 1539 kW
- Wärtsilä 6L20 for liquid biofuel 998 kW

### MAIN TECHNICAL DATA

- **Engine**: Wärtsilä 9L20 1000 rpm
- **Generator**: Standard 50 Hz/11 kV, 50 Hz/400 V and 60 Hz versions are available on request
- **Electrical power**: 1539 kW
- **Heat rate**: 8527 kJ/kWh
- **Electrical efficiency**: 41.9%
- **Fuel**: HFO, 380 cSt at 50°C, 980 kg/m³
- **HFO separators and full fuel treatment included**
- **Ambient temperature**: 0–40°C
- **Noise level**: 65 dB(A) at 40 m
- **Containers**: 40 ft high cube, CSC certified
- **Length**: 12.2 m
- **Width**: 2.5 m
- **Height**: 3.0 m
- **Weight**: Genset container 40 tons, auxiliary container 25 tons
With more than 10 900 MW under service agreements, Wärtsilä is recognized as the preferred service supplier to its customers in ensuring the availability and cost-efficient operation of their installations. Customers benefit from having their entire power system fully serviced by one global supplier.

Wärtsilä Services provides full service throughout the product lifecycle for both marine and power plant customers, and is constantly developing its worldwide network. Our organization currently features more than 11 000 dedicated service professionals in 70 countries.

For power plant applications, our service solutions cover everything from basic support with parts, field service and technical support to complete service agreements; from installation and commissioning, performance optimization, including upgrades and conversions, to environmental solutions, training, technical information and online support.

The choice available extends from parts and maintenance services to a variety of comprehensive, customized long-term service agreements, including performance guarantees, and operations & management agreements.

On the basis of our experience in operating and maintaining close to 330 installations located in more than 45 countries, and through the know how and support of Wärtsilä’s worldwide organization, we undoubtedly provide the best available agreement services in the industry.

Wärtsilä adds value to your business at every stage in the lifecycle of your installations. With us as your service partner, you receive many measurable and guaranteed benefits such as availability and performance, productivity gains and cost benefits. Above all, you get peace of mind knowing that your installation is being serviced by the most experienced partner you could have – Wärtsilä.
THINKING INSIDE THE BOX PROVED WORTHWHILE IN BONTANG, BORNEO

The challenges were many for the very first Wärtsilä GasCube plants delivered to Bontang on the island of Borneo, Indonesia. Still, the Cubes succeeded in taking the customer by surprise as they were finished ahead of a tight schedule in May 2009.

As the demand for electricity is on the rise, the Indonesian government has initiated programmes for increased generating capacity. In Bontang the existing power plant needed to be backed up by an easy-maintenance and highly reliable solution. A smart assembly kit plant for a limited space, but with high net power output, was just what was needed.

The Wärtsilä GasCube, with a footprint of only 113 square metres, made it a perfect fit. The two units have one Wärtsilä 16V34SG engine each. They run on locally supplied natural gas and have a total output of 14 MW. The variable frequency drives reduce auxiliary power consumption, resulting in a higher net power output.

One of the innovative design features of the Cube is that the radiators are mounted on the roof, which makes separate supports and foundations unnecessary and also improves the cooling performance which is a significant benefit in hot climates. With its closed-circuit cooling system even the water consumption is reduced to a minimum.

The GasCubes were assembled on-site from prefabricated modules and the contract covered engineering, delivery, construction and commissioning of the power plants including the gensets, auxiliary equipment and building structures.

Type.......................... Baseload, 2 x GasCubes
Engines......................... 2 x Wärtsilä 16V34SG
Total output .......................... 13.9 MW
Fuel ............................................. Natural gas
Delivered........................................ 2009
Wärtsilä is a global leader in complete lifecycle power solutions for the marine and energy markets. By emphasising technological innovation and total efficiency, Wärtsilä maximises the environmental and economic performance of the vessels and power plants of its customers. Wärtsilä is listed on the NASDAQ OMX Helsinki, Finland.