LIQUID FUEL POWER PLANTS
BETANO, TIMOR-LESTE
Customer ....................................................... Gov. of Timor-Leste (Utility)
Type ................................................................. Wärtsilä 46 liquid fuel power plant
Operating mode ................................................ Baseload
Gensets ............................................................. 8 x Wärtsilä 18V46
Total output ...................................................... 137 MW
Fuel ................................................................................ HFO
Scope ................................................................. EEQ (Engineered Equipment Delivery)
Delivered ............................................................... 2013
Wärtsilä is one of the leading global providers of flexible power plants for utilities, IPPs, municipalities and industry. The power plants are designed for efficient, economical and environmentally sound power production coupled with uncompromising reliability. The product range comprises oil- and multi-fuelled power plants with outputs ranging from 3 to 600 MW. High efficiency, low emissions and proven long-term reliability make the plants suitable for stationary and floating baseload, for grid stability and peaking services, and for a wide variety of industrial self-generation applications.

An extensive range of customer options – simple-cycle electricity generation, industrial steam production, combined cycle, fresh water production, CHP, etc. – optimise plant economy for the lowest operational cost per output unit.

Wärtsilä power plants comply with various national and local environmental requirements as well as with the World Bank Guidelines for Thermal Power Plants.

Unrivalled experience, proven technology and local customer support worldwide ensure the performance of Wärtsilä power plants throughout their lifecycle.

LIQUID POWER PLANTS BY WÄRTSILÄ

- More than 4000 power plants
- More than 8600 gensets
- More than 42 GW in operation

Increasing demands for energy and long distances from power plant to end user affect the reliability of electricity supply and the price of energy. Wärtsilä brings the power to where it is needed and offers genuine flexibility in the scope of delivery, use of fuel and operational plant capacity.
BASELOAD POWER GENERATION
Low emissions and proven long-term reliability make Wärtsilä power plants suitable for both land-based stationary and relocatable floating baseload applications. They provide a solution even in areas considered too challenging for any other form of power generation, such as remote developing territories, islands and regions with extreme climates.

GRID STABILITY AND PEAKING
Wärtsilä power plants often operate with the transmission grid when demand for electricity, and as a result prices, are at their highest.

Grid stability and peaking applications are typically engineered for 1000-6000 operating hours a year. Due to their environmentally advanced design and high efficiency, they are typically permitted to operate more hours than the conventional peaking plant profile of 100-500 hours a year.

A lower operating cost power plant with minimal environmental impact will always be dispatched first and disengaged last, creating more revenues for its operators.

INDUSTRIAL SELF-GENERATION
Integrability, flexibility and outstanding plant efficiency are properties valued by industries that depend on reliable, decentralised power generation.

Wärtsilä engines are designed for continuous operation and they can run in island mode or connected to the grid depending on the operational demand. The plants are built up from one or more generating sets, each with an output of 3–23 MW. Typical plant sizes range from 3 to 100 MWe.

 некоторых областях. Они предлагают решение даже в областях, которые считаются слишком сложными для других видов генерации, таких как отдаленные развивающиеся территории, острова и регионы с экстремальными климатами.

СТАБИЛЬНОСТЬ СЕТИ И ПЕЙКИНГ
Платформы Wärtsilä часто обслуживают сеть во время пикового спроса на электроэнергию, и как результат, цены на них достигают своего максимума.

Стабильность и пейкинг являются обычно инженерно-изготовленными для 1000-6000 часов работы в год. Благодаря их экологически продвинутому дизайну и высокой эффективности, они могут быть разрешены к работе в течение большего количества часов по сравнению с классическим пейкинг-профилем 100-500 часов.

КОМПАКТНОЕ И СТИЛЬНОЕ РЕШЕНИЕ
Более низкое энергоемкое и устойчивое к воздействию окружающей среды решение всегда будет обрабатываться первым и отключаться последним, создавая больше доходов для операторов.

ОПЕРАЦИЯ ПРОИЗВОДСТВЕННОЙ САМОГЕНЕРАЦИИ
Интегрированность, гибкость и исключительная эффективность оборудования являются свойствами, ценимые промышленными отраслями, которые зависят от надежной, децентрализованной генерации.

Двигатели Wärtsilä спроектированы для непрерывной работы и могут работать в автономном режиме или подключены к сети в зависимости от операционного спроса. Основные узлы состоят из одного или нескольких генераторных комплектов, каждый с мощностью 3–23 МВт. Типичные размеры установок варьируются от 3 до 100 МВт.

Wärtsilä liquid fuel power plants typically serve as the main source of power for:
- oil & gas industry
- mining
- cement manufacturing
- textile industry
- food processing
- pulp & paper mills
- municipalities.

STANDBY APPLICATIONS
Wärtsilä standby applications combine high power density with quick starts, durability, excellent load pickup performance and easy maintenance.

Wärtsilä standby power plants are well suited for example for grid emergency reserve, data centres, airports and large industrial standby applications.
The Gera 89 MW baseload power plant in Manaus, Brazil was completed in nine months.

GERAMAR I AND II, BRAZIL
Customer Geradora de Energia do Norte S/A (IPP)
Type Wärtsilä 32 liquid fuel power plant
Operating mode Flexible baseload
Gensets 38 x Wärtsilä 20V32
Total output 332 MW
Fuel HFO
Scope EPC (Engineering, Procurement & Construction)
Delivered 2009 & 2010

NISHAT POWER LIMITED, JAMBAR KALAN, PAKISTAN
Customer Nishat Power Limited (IPP)
Type Wärtsilä 46 liquid fuel power plant
Operating mode Flexible baseload, heat recovery, combined cycle plant
Engines 11 x Wärtsilä 10V46
Total output 200 MW
Fuel HFO
Scope EPC (Engineering, Procurement & Construction)
Delivered 2010
The modular design of Wärtsilä power plants – together with a global sales and service network – enable fast-track delivery anywhere in the world as well as superior, lifetime plant performance.

Prefabricated, functionally pretested modules enable easy planned maintenance and guarantee consistent quality and performance. Site installation is simply a matter of assembling and connecting the modules.

Delivery scopes range from equipment supply or equipment and engineering to complete turnkey projects including engineering, procurement and construction. Wärtsilä’s Development and Financial Services unit and its service network round out a complete project implementation – from concept and financing to construction and beyond.

The range of services covers everything from rapid spare parts delivery to complete operation and maintenance solutions. By optimising all aspects of a power plant’s operation and eliminating the economic and technological risks involved, Wärtsilä enhances the plant’s profitability. The continuously growing number of O&M customers stands as proof. Wärtsilä
OILCUBE

The Wärtsilä OilCube based on the Wärtsilä 12V32, Wärtsilä 16V32, Wärtsilä 20V32 or Wärtsilä 20V32TS generating sets is a complete power plant unit designed to meet a power demand of 5 to 30 MW. The OilCube is an extremely flexible, streamlined and cost-efficient solution for power production.

- High electrical efficiency through minimised plant’s own consumption
- Easy to expand with additional modules if power need grows with time
- Quickest building and commissioning time
- Especially designed for environments where infrastructure may be challenging
- Perfect for fast-track EPC deliveries.

So you can rest assured. You will have the best possible support available as and when you need it – from training to online support and service, or modernisation and upgrading for a plant. Wärtsilä’s global services network of 11,000 service professionals worldwide will ensure that your power plant serves you at its highest efficiency and performance levels throughout its lifetime.

SUAPE II, BRAZIL
Customer: Energética Suape II S.A. (IPP)
Type: Wärtsilä 46 liquid fuel power plant
Operating mode: Peak load/stand-by & emergency
Gensets: 17 x Wärtsilä 20V46F
Total output: 380 MW
Fuel: HFO
Scope: EPC (Engineering, Procurement & Construction)
Delivered: 2011

The Petrolina 120 MW baseload power plant, up and running in only 7 months.

OILCUBE

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The combination of fuel flexibility, high efficiency and low emissions offered by Wärtsilä’s combustion technology is unequalled in the market.

**DIESEL OILS AND HEAVY FUEL OILS**
Distillate diesel oils have traditionally been the fuels for both stand-by operation and baseload power plant applications. The other very important group of liquid fuels for diesel power plants are the heavy fuel oils used in Wärtsilä power plants since the 1970s. Heavy fuel oil is still an important fuel, especially for large diesel power plants, and will continue to be so.

**LIQUID BIOFUELS**
Wärtsilä power plants can be operated using vegetable and non-vegetable oils and fats as fuel. Palm oil, soy bean oil, rapeseed oil, and jatropha oil are amongst the various vegetable oils that can be used as fuel in Wärtsilä liquid biofuel plants. Refined biodiesel can also be utilised.

**CRUDE OILS**
Crude mineral oils straight from oil wells can be used as fuels for Wärtsilä power plants. Utilising crude oils is particular beneficial for pumping stations along crude oil pipelines and for electricity production at oil fields.

**EMULSIFIED FUELS**
Emulsification with water offers means of utilising fuels with very high viscosities, e.g.
refinery residues. The fuel-in-water emulsion facilitates the handling of these fuels almost in the same manner as conventional HFOs. These fuels can be of importance because of their favourable price.

**HIGH VISCOSITY HFOs**

Among the new fuels, there are varieties of high-viscosity mineral oils that either can be found naturally, in oil-sand for example, or can be extracted from the heavy residues from oil refineries. Even fuel oils with a viscosity of up to 3000 cSt at 50 °C can be utilised in Wärtsilä power plants.

**VEGETABLE OIL UTILIZATION**

MONOPOLI, ITALY
Customer…………………………ItalGreen Energy (Industry – food)
Type…………………………Wärtsilä 46 & 32 liquid biofuel power plant
Operating mode…………………..Baseload (CHP)
Gensets…………………………6 x Wärtsilä 18V46
…………………………...+ 3 x Wärtsilä 18V32 + Steam turbine
Total output…………………………138 MWe
Fuel……………………………………Vegetable oil
Scope…………………………EEQ (Engineered Equipment Delivery)
Delivered…………………………2005 & 2007

The power plant of ItalGreen Energy in southern Italy is the world’s largest plant fuelled exclusively by straight vegetable oil.
An internal combustion engine (ICE) is the most efficient means of converting liquid or gaseous fuels into energy. The heart of the Wärtsilä genset is Wärtsilä’s reliable engine technology, which stems from long experience of building engines for demanding marine and power plant applications.

Wärtsilä ICEs with modern combustion technology have a very high efficiency. This translates into considerable savings in fuel costs compared to other technologies. Another benefit is the unique flexibility of operation enabled by the cascading multi-engine structure of the plants. Load adjustment is simple: just turn off the extra generating sets and keep running at optimum efficiency with as many as required. As your needs change you can incrementally change the plant size by adding new engine sets or removing existing ones. This also means that you can get started with a smaller initial investment, and expand later whenever it suits you.
Wärtsilä offers liquid fuel power plants in the range of 3 to 600 MW using Wärtsilä 32 and Wärtsilä 46 prime movers.

**WÄRTSILÄ 32 LIQUID POWER PLANT**

<table>
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<tr>
<th>Model</th>
<th>18V32</th>
<th>18V32TS</th>
<th>9LV32</th>
<th>12V32</th>
<th>12V32TS</th>
<th>16V32</th>
<th>16V32TS</th>
<th>20V32</th>
<th>20V32TS</th>
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<tbody>
<tr>
<td>Power, electrical (50 Hz/500 rpm) kW</td>
<td>2580</td>
<td>3890</td>
<td>5210</td>
<td>6970</td>
<td>8400</td>
<td>9340</td>
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<td>Power, electrical (60 Hz/514 rpm) kW</td>
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<td>8400</td>
<td>9340</td>
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<tr>
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<td>78</td>
<td>92</td>
<td>117</td>
<td>117</td>
<td>144</td>
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<tr>
<td>Reduced transport weight (tonne) ±5%</td>
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<td>296</td>
<td>207</td>
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**LIQUID FUEL GENSETS**

Wärtsilä 50DF liquid fuel-optimised

<table>
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<th>Model</th>
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<tbody>
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<td>Power, electrical (50 Hz/500 rpm) kW</td>
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<tr>
<td>Power, electrical (60 Hz/514 rpm) kW</td>
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</tr>
<tr>
<td>Reduced transport weight (tonne) ±5%</td>
<td>296</td>
</tr>
</tbody>
</table>

The multi-unit power plant has very high part-load efficiency over the whole load range.

Start-up and loading of a liquid fuel power plant.

*The Wärtsilä 50DF plant is optimized for liquid fuel operation, providing the same features as the Wärtsilä 46 plus the option to switch to gas when it becomes available.*
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.