Don't waste your energy

Soren Qvist Vestesen discusses how a Vestesen A/S Danvest Wind Diesel System can slash operational and maintenance costs, maximise output potential and cut down on waste energy, with an easily managed automatic back-up system

Based in Denmark, Vestesen A/S is one of the world's leading technology specialists for wind-diesel systems with high wind penetration. Previous and in-hand projects range from 100 to 10,000 kW. With contacts worldwide, the company has full access to the global market, working in remote areas on every continent.

In remote areas, electricity is commonly not connected to a grid, meaning power supply can unreliable and very expensive. This is where Vestesen can step in to deliver individually adapted wind-diesel systems to produce inexpensive, high-quality electricity 100% of the time. Under normal circumstances, wind turbines will reduce diesel consumption in such areas by 50-90%.

Wind energy facts

Wind energy is one of the cleanest and most cost-efficient sources of energy available today, so, in areas of high wind potential, it makes absolute sense to generate energy through wind turbines. A wind year will typically feature around 1,000 hours of calm wind speeds of 0- 5 m/sec, 6,500 hours of moderate 5-10 m/sec wind speeds, around 1,000 hours of 11-14 m/sec wind, 200 hours of 15-25 m/sec, and around 60 hours of inoperably high winds speeds, when turbines have to be stopped.

Optimal utilisation

Average yearly wind energy output must match average yearly consumer consumption. High wind periods, when surplace energy is likely to be produced, account for only around 2,260 hours. The rest of the time, turbines will achieve optimal wind penetration without the need for energy dumping, and promise an annual fuel saving of up to 90%, depending on wind condition and consumer patterns.

Any surplus energy can be retained in a common cooling system used for desalination or central heating, meaning the entire plant is highly cost efficient.

Danvest Wind/Diesel Systems (WD), with high wind penetration for off-grid operations, are based on normal diesel generator sets, and fitted with Danvest WD equipment for backing up wind turbines, securing continuous operation regardless of the level of wind supply.

At times when wind energy supply is sufficient to meet all power consumption, the engine is stopped and the dumpload control kicks in, with a frequency quality at +/- 0.1 - 0,3 HZ that balances between fluctuating wind energy and consumer load. When wind is decreasing and demand is increasing, the engine is automatically started again.

Plant Configuration with optimal design

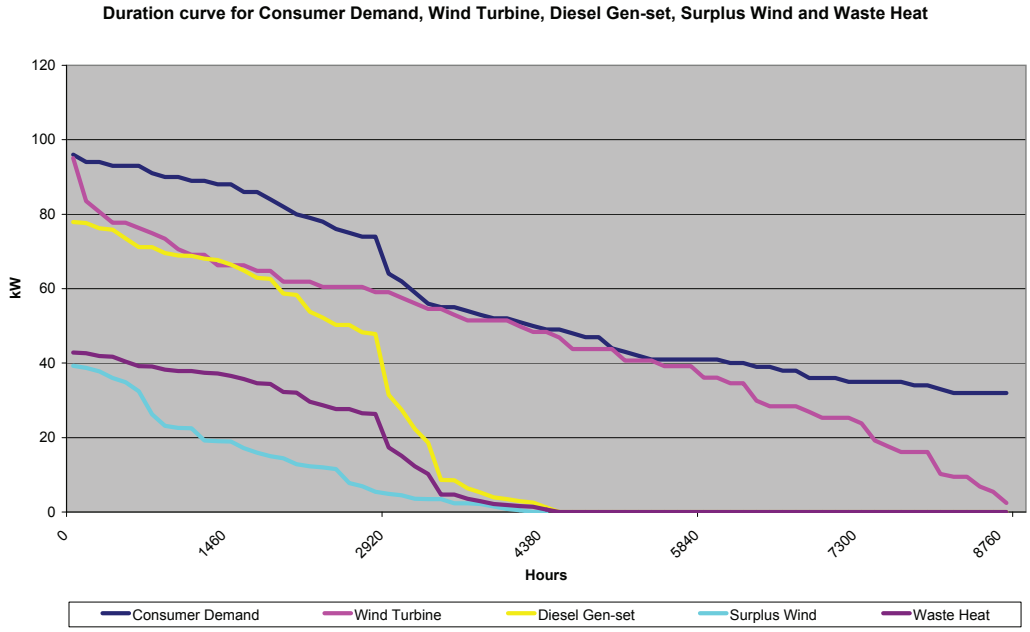
With experience in WD installation and designing programmes based on specific local data, Vestesen A/S can provide optimal system design and component combination for wind and engine power capacity to obtain the lowest kWh price.

To achieve this optimal configuration, the following parameters must be taken into consideration:

- Future consumer growth
- Stand-by capacity for optimum performance
- Engine operation load and load sharing – 40-80% of engine capacity
- Average maximum load of 80%
- Pick loads and large consumer loads
- Wind turbine production capacity
- Grid condition and power factors – sufficient active power supply from WD Gen.sets
- Wind penetration and dumpload capacities
- Utilisation of surplus wind and waste energy

Existing wind power installations can be converted to WD systems to achieve grid stabilisation and back-up for continuous, high-quality power supply. Installations can be extended with water-purification, desalination and central-heating production facilities. In terms of module capacity, the Danvest concept can offer 100-1,500 kWe of electric power and 10-2,000 m3/day of sea-water desalination.

In the past, WD technology has faced critisicm over the production of waste energy, especially via high-wind off-grid systems. However, through market campaigning, we have convinced our critics that dumped surplus wind energy is only produced over a few hours per year. Additionally, since the World Bank will now finance WD projects to combat surging fuel prices, we are receiving more and more inquiries for WD projects, with several quotations now at contract stage. Potential projects, as well as those in hand, range from 120 to 12,000 kw, with some including desalination modules.



Vestesen A/S – previously Danvest Energy – has extensive know-how and experience in design, engineering (particularly diesel engines), production, installation, operation and implementation of WD systems, and has long been at the forefront of innovative development and design of commercially viable WD concepts.

The following key features for the Danvest WD system are now attracting the attention of (often sceptical) major power suppliers, and are in a constant stage of development to achieve optimum results and keep up with consumer, environmental and technological trends:

The basis diesel generator sets operate independently, but in parallel with the W/D system, this means that if a break-down occurs with the W/D equipment, it is cut out and the basis, diesel-based, generator sets continue to operate.

The WD system is simple and robust – making it possible for staff to operate and maintain it following just a short introduction and training session.

The W/D wind turbines are based on internationally recognised and proven technology, securing high reliability of operation and low maintenance costs.

The W/D system operates automatically and continuously, cutting the majority of manual operational duties and periodic routine checks, and guarenteeing a steady flow of high-quality power.

The service system ensures optimal operation conditions through the remote worldwide communication system, parallel with similar systems for wind turbines.

Danvest dynamic dumpload controlling ensures a total rotator system, by which heavy masses from the wind turbines and diesel generator flow into a frequency system, which: minimises inertia gust; minimises the wear of bearings, couplings and gear wheels; minimises transients in the electric system; and stabilises the effects of fluctuations in wind levels and consumer demand.

Optimal Design

With unique experience in the field of wind diesel installation for given locations, a calculation programme has been developed which enables Vestesen A/S to provide optimal system design and establish the most efficient component combination for wind and engine power generation capacity for the local installation to obtain the lowest kWh price.

Regular feasibility studies calculate the annual wind penetration and fuel saving, as well as the amount of waste heat and surplus wind energy. Results are vital in the research and development stages of our design and production process.

Low-load operation

With yearly wind penetration at 50-90%, the WD gen.set typically operates at a 0-30% load. To ensure optimal operation with normal standard service intervals, the WD engine is preheated, prepressured and conditioned so the engine can be "parked" at 0+/- 5% load in the main controlling system ready for taking up load picks and stops when wind energy is sufficient for power supply from wind alone. In this case, up to a 100% fuel saving is achievable, without using power recovery systems.

High-wind penetration

With our optimal design and engineering, the lowest yearly kWh cost is obtained, where wind turbine output will often be 120-150% of the maximum consumer demand during the day. Surplus wind energy will only occur at high wind periods, for just a few hours per year, for the rest of the year, average power output will remain stable.

Power quality at any operation mode is within predefined limits, as follows:

Frequency	50/60 HZ +/- 01-0.3 HZ
Voltage	400/480v +/- 3-6%
Power factor	0.8-0.98

A PC-based remote monitoring system also means that a power generating facility can be controlled by skilled engineers from a central service centre, cutting down the need for on-site maintenance.

Life cycle

Main componants have an expected life cyle of up to 20 years, including diesel engines, due to reduced operational pressures with high wind penetration.

Please visit www.danvest.com for more information.