



Overview

SC Johnson and Son Inc. chose WES Engineering Inc. for complete wind project services on their two turbine, 3MW, project including: turbine selection, permitting, design and construction oversight. This included; estimating site wind speeds and estimating turbine output, selecting the most suitable wind turbine for the project based on budget and siting criteria, noise and shadow flicker modeling, viewshed analysis and permitting support, assistance with writing the bid specifications, and construction oversight of the project. This is an excellent example of a distributed generation project supplying renewable energy directly to a large industrial plant, behind the meter.

WES Engineering's Solutions

WES Engineering recommended two larger wind turbines on 85m tall towers to maximize energy output at least capital cost, compared to a greater number of smaller turbines. WES worked closely with owners to site two large turbines on their own property within the existing Waxdale property, comply with Village setbacks, FAA height restrictions, minimize impact to neighbors, and maximize production.



Waxdale turbines erected December 2012

Delivered to Spinner Wind Project:

- Preliminary Site Plan and Setbacks Mapping of site and setbacks to determine permissible wind turbine locations, estimating turbine energy at these locations
- Wind Resource Assessment Report based on ten years nearby airport data, plus area met tower data.
- FAA Permits Assist with obtaining height clearances from FAA after original determination of hazard determination due to nearby Racine airport
- Preliminary Engineering work with Owner to find least cost and acceptable foundation design to accommodate high water table and lower stiffness soils
- Permitting Documentation:
 - ◆ shadow and sound studies and maps
 - ◆ site plan and setback maps
 - ◆ viewshed impact maps
 - ◆ fact book on wind turbine impacts
- Bid Specification for construction of foundations and erection of turbine
- Project Engineer, to provide oversight during construction and during final commissioning



Foundation South turbine- included geopiers and larger mass to address poor soils

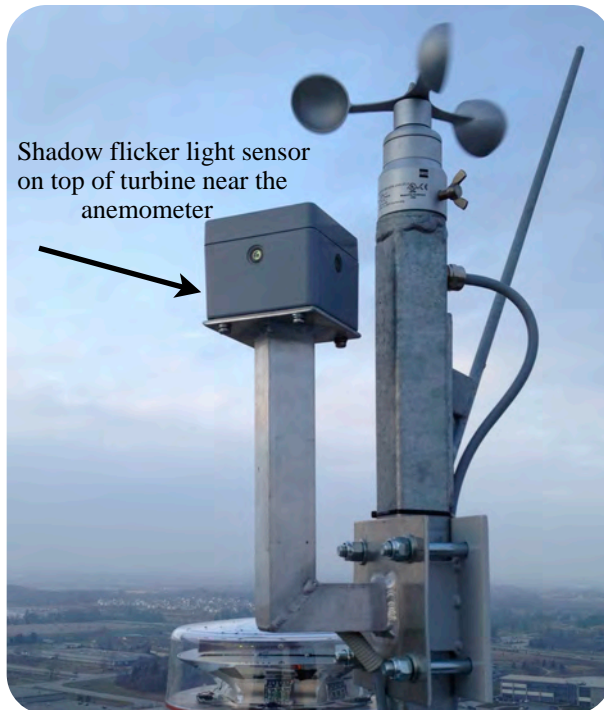
Value Engineering

WES Engineering worked with owner to find a turbine that had least cost operations over turbine life, not just lowest purchase price. A direct drive Vensys 1.5MW turbine with 82m rotor and 85m tower was chosen. This turbine has direct drive permanent magnet generator, with less downtime for service work, and lower operating costs since there is not a gearbox needing repairs in the future. In addition this turbine features full power converter that can supply unity power factor, and reduce plant power factor financial penalties/charges from the local utility.

Community Friendly Turbine

Quiet Turbines- The turbine chosen is one of the quietest in its class, with ability to not exceed 45dBA at a distance of 1000 feet from a single turbine. Nearest residences are more than 1600 feet away and sound levels from turbines would be well below the 45dBA night time limit set in Wisconsin as a reasonable limit. Residents interviewed after turbine is operational say they cannot hear the turbines at all most of the time. Community response to project is positive.

Shadow Flicker Control- The project added an additional control module to allow curtailment of turbines during periods of actual shadow flicker over identified residences that could be affected by more than 30 hours per year of flicker. The module has a light sensor so that curtailment only occurs when its bright enough for shadows, and after the maximum allowed hours of flicker have already occurred that year.



Continued Project Support-

Even after the turbine is operating WES Engineering staff continue to provide support to assure that the turbines continue to operate safely and cost effectively. The turbines did average 99% availability in their first 5 months of operation, demonstrating a quality product and proper installation. WES staff have addressed issues with the mechanical lifts, access to turbines via the SCADA connection provided by the manufacturer, yaw brake noises, and communication with turbine supplier on an as needed basis.



View of North Turbine from South turbine, main crane boom has been lowered