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Wausaukee Composites, Inc. – CASE STUDY

Wind Turbine Generator (WTG) Nacelle and Nosecone New Product Introduction (NPI) and Manufacturing Plant Launch



Challenge: A major European Original Equipment Manufacturer (OEM) of wind turbine generators engaged Wausaukee Composites as its first US-based supplier. Wausaukee Composites will provide large-scale composite wind turbine components – nacelles (turbine housings), spinner hubs and nosecones – for its commercial utility grade (Class V) wind turbines to be manufactured and assembled in the United States.

Project Highlights

Design: Wausaukee Composites assigned a dedicated project manager to this NPI project responsible to work closely with the customer's US-based procurement and operations teams, along with its Europe-based design and engineering staff. The scope of work included the entire assembled nacelle housing, spinner hub, nosecone, and ancillary hardware such as insulation, fans, lighting, catwalks, ladders, safety rails, window hatches and access doors. Some component re-design and engineering changes were also necessary prior to launch of the US-model.

Product Development: The project team utilized Wausaukee Composites' disciplined New Product Introduction planning process, and a comprehensive timeline with identified critical milestones was developed in Gantt chart format and shared with all of the team members utilizing a secure FTP site. Periodic milestone reviews ensured that the team, prior to moving forward, approved each critical step. In parallel with that effort, Wausaukee Composites' sourcing team launched a comprehensive Request-for-Quote (RFQ) solicitation to establish a qualified Tier-2 vendor base that would provide various secondary hardware and sub-assembled components for the nacelle housings.

Tooling: Wausaukee Composites' expert tooling technicians fabricated production molds in-house off of master patterns supplied by the customer and modified for customer-approved engineering improvements. Our high-temperature tooling gel-coats, and low shrink tooling resins were utilized, and the large production molds were reinforced with welded tubular steel frames. Custom tipping frames and fixtures with hydraulic controls were developed to facilitate the lamination and de-molding process, and to improve production labor ergonomics. Secondary hardware placement fixtures were designed and fabricated to ensure the accurate placement of flanges, mating components and attachment hardware.

Manufacturing Process: Open Molding and Resin Infusion Molding – Following a thorough review of the product technical specifications, laminate schedule, field performance requirements, critical-to-quality (CTQ) specifications, and related attributes, we mutually determined with our customer that Open Molding would be the preferred manufacturing process for the majority of components to be manufactured in this program. As production volumes increase, mold design will allow for transition of many of the components to Light Resin Transfer Molding (LRTM) or Vacuum Bag Infusion Molding.



Nacelle Base Mold on Tipping Frame

Production Environment and Capacity Plan:

The dimensions of this new program launch were substantial in every way. A fully assembled nacelle is equivalent in size to a large semi-tractor trailer, and the spinner and nosecone assembly are two-thirds that size again. The planned production work cell capacity requirements, along with customer forecast demand indicated additional manufacturing capacity would be required within one-year of the program launch. Wausaukee Composites management determined that a new manufacturing facility would be required, in order to accomplish the most economically efficient and successful program launch. A new site selection team was assembled in parallel with the commencement of the NPI engineering and production planning effort. Due to the short leadtime to first production requirements, the new site selection team focused its search on brownfield manufacturing plants with adequate headroom and freespan, in close proximity to the customer's assembly plant in the Midwest USA. Approximately twenty plant sites were evaluated before Wausaukee Composites selected its new location, a 42,000 s.f. facility with an adjoining three acres located in Cuba City, Wisconsin.



Wausaukee Composites' dedicated wind turbine component plant in Cuba City, Wisconsin



Nacelle components in queue for trim and assembly



Fully assembled nacelle under inspection

Lean manufacturing principles were employed in the facility re-design, construction improvements, and production floor layout for the Cuba City plant, which was purposely retrofitted as a dedicated facility to wind turbine component manufacture. Expansive work cell bays and overhead cranes were installed to facilitate large component handling and lean production flow. Plant ingress and egress was modified to accommodate the large materials handling, shipping and logistics needs of this facility.



Assembled spinner hubs staged for the next wind farm



Fully assembled nacelles awaiting transport

Results: The wind turbine generator nacelle and nosecone program was successfully launched at the new Cuba City manufacturing facility, on time and on budget. Wausaukee Composites' Cuba City facility has the capacity to manufacture up to 800 nacelles and nosecone assemblies per year. The facility is purpose-designed and equipped for the manufacture of wind turbine nacelle housings, spinner hubs, nosecones, small & mid-size wind blades, and ancillary composite components, along with secondary hardware and electronics installation, and nacelle value-added sub-assembly. The centrally located USA facility has excellent access to highway, rail, and river transport.