

Investigating Windmills Safety and Reliability

Principal Investigator: Michael Riley,
Industrial and Management Systems Engineering
<http://engineering.unl.edu/academicunits/imse/faculty-staff/riley.shtml>



Abstract

The country is investigating wind energy as a means to become less dependent on fossil fuels and focus on renewable energy. In light of recent events such as turbine fires and power grid failures (feedback into existing power lines) the need to investigate wind energy safety and reliability has become important. Though catastrophic events such as fires have been described in recent news, the number one hazard related to wind energy are slips and falls. This research investigates best safety practices that support effective operating procedures in windmill powered energy environments. Best practices will be investigated through extensive interviews from industry experts, visits to local windmill facilities, and literature review. This research seeks to further develop a decision modeling tool for selecting the most effective safety practices for windmill power operations. The Analytic Hierarchy Process is utilized to demonstrate the proper selection between several safety alternatives including additional fall protection, fire protection for power grid overload, and safe distances for generator breakage. The proposed results will be best practices for safety based upon ratings identified by user or researcher's preferences.

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Large scale wind driven electrical generators (over 300 feet tall towers, blades over 100 feet long and an 80 ton generator) present potential hazards to workers performing such tasks as maintenance, inspection and repair. Hazards include falls, fires, confined spaces, hit by an object and biological sources.

We seek to identify potential hazards that are associated with windmills and (1) determine if the conditions are unreasonable dangers, (2) if conditions are unreasonably dangerous, determine if the condition can be eliminated and if conditions cannot be eliminated identify appropriate engineering or administrative controls to minimize exposure to the conditions. For example, if a worker must be more than four feet above the ground what is the appropriate fall protection (guard rail, fall restraint, fall arrest, or other)? When the windmill is in operations, is a worker exposed to any forms of energy that must be prevented or minimized to prevent (1) electrical shock, (2) mechanical force of being stuck by or pinched by moving parts, (3) airborne or contact exposure to contaminants or toxic materials, (4) encountering harmful levels of electromagnetic radiation, or (5) injury from fire or explosion due to malfunctions? During operations or non-operations, are proper systems in place for work and rescue in confined spaces? Are procedures and policies in place to prevent worker exposure to biological sources of injury such as insects, reptiles and rodents? A systematic approach to analyzing the windmill work zone potential hazards, plus developing and selecting appropriate engineering solution strategies through input from safety and operating personnel will result in a safer work environment and documentation (best practices) that could be used in training workers.