



Fiber Reinforced Polymer Composite Wicket Gates

Problem

Traditional wicket gate design utilizes a main body made of wood, typically white oak. A service life of 10-20 years is typical in the river environment. Gate failure creates difficulties in maintaining upstream pool and the repair or replacement of wicket gates is a costly and dangerous process. A commercially available **polymer composite** manufacturing technique will allow for the design and creation of a wicket gate that will eliminate the use of wood. This process enables the design and fabrication of a composite wicket gate with equal or greater mechanical properties to a wooden gate and use of current hardware for ease of retrofit.



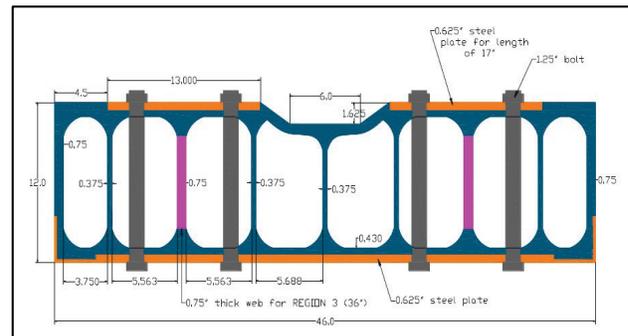
Wooden Wicket Gates

Approach

This research is focused on the use of glass fiber reinforced **polymer (GFRP) composite material** to replace wood in wicket gates. By utilizing a vacuum assisted resin transfer molding (VARTM) process, it is possible to build a gate made mostly of GFRP material. The composite wicket gate will be of the same general dimensions and equal or greater stiffness as a standard wooden wicket gate. Additionally, the composite design will allow for the use of the original hardware to aid in ease of replacement and operation of the gate. The proposed gate design has inner “channels” that will be filled with various materials with different densities to allow designers to tune the overall weight and center of gravity of the gate. This will ensure that the gate will operate and perform just as a wooden wicket gate, but without the use of wood which degrades in the elements. Engineers at ERDC-CERL, the Inland Navigation Design Center (INDC), Rock Island District, and West Virginia University have contributed to this **polymer composite** wicket gate design which has a projected installation date of September 2015.

Products

The primary product of this work will be engineering guidance for the design and manufacture of **polymer composite** wicket gates to maintain navigable pool levels. The overall investigation and field demonstration will also be described in a series of technical transfer products, including conference proceedings, technical reports, articles in publications such as Navigation e-News, and webinars.



Proposed Polymer Composite Wicket gate design showing “channels” that can be filled with varying density materials

Benefits

Polymer composite wicket gates will provide a longer-lasting gate which will result in cost savings from a reduction in maintenance costs and limiting out-of-service times. This will benefit both the Corps and private industry. Successful use of composite wicket gates will be a stepping stone for the design and use of **polymer composites** for larger, more demanding gates on hydraulic structures.

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