Lock 53 Wicket Lifter Winch Failure

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Background

- Lock 52 and 53 are the last two remaining wicket dams on the Ohio River
- Both dam's use Maneuver boats or wicket lifters to raise and lower the dams
- Wicket lifters were developed to phase out the maneuver boats as they are labor intensive and do not meet current standards

Background

- Olmsted's floating schedule has promoted minimal investments into Lock 52/53 over the last 20-30 years.
- Wicket lifters were constructed of many re-used components to conserve funds.

Maneuver Boat in Action

Existing Steam Maneuver Boat

Existing Steam Maneuver Boat

Background

- Wicket Lifter was developed as a replacement to the original steam powered maneuver boat to raise and lower the dam
- Both have refitted or modified hulls with an excavator to raise and lower wickets.

Wicket Lifter in Action

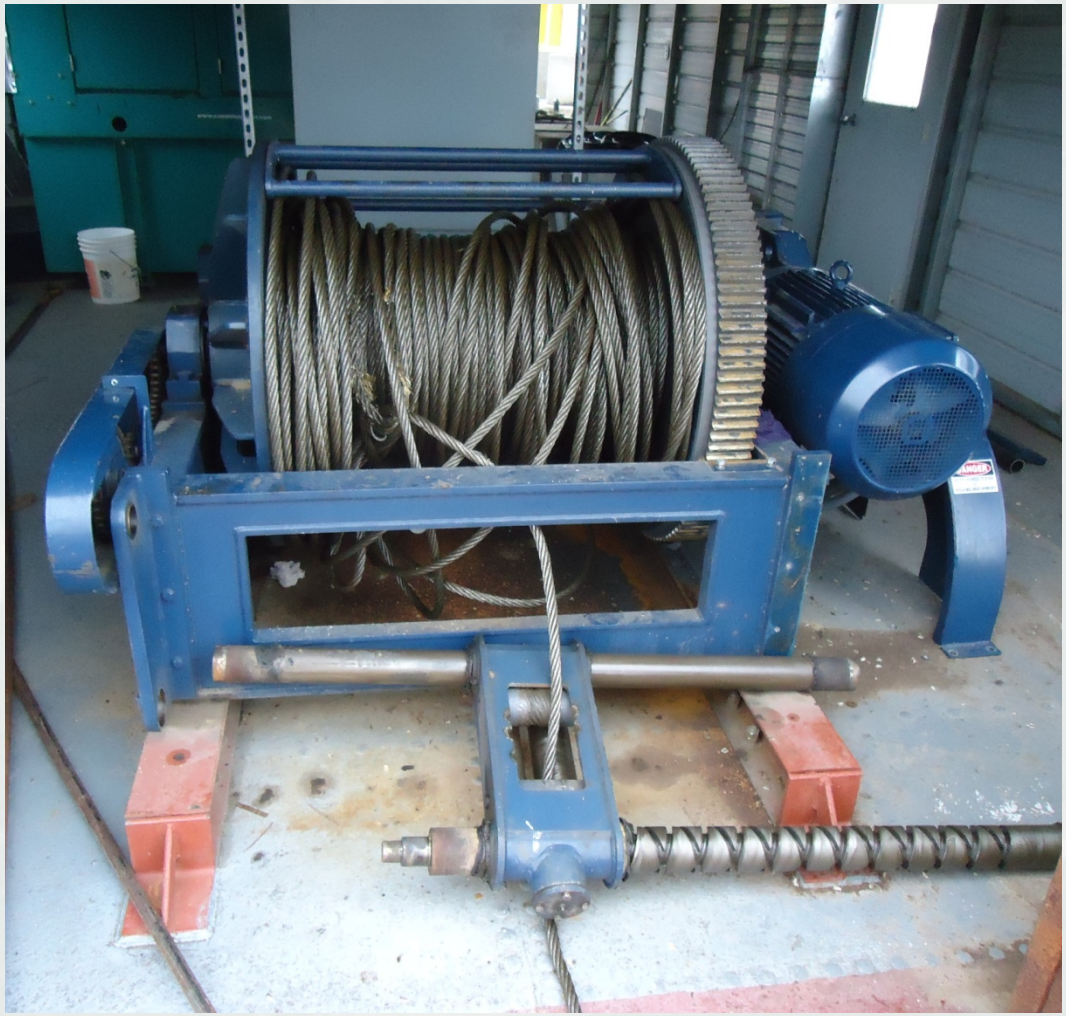
53 Wicket Lifter

52 Wicket Lifter

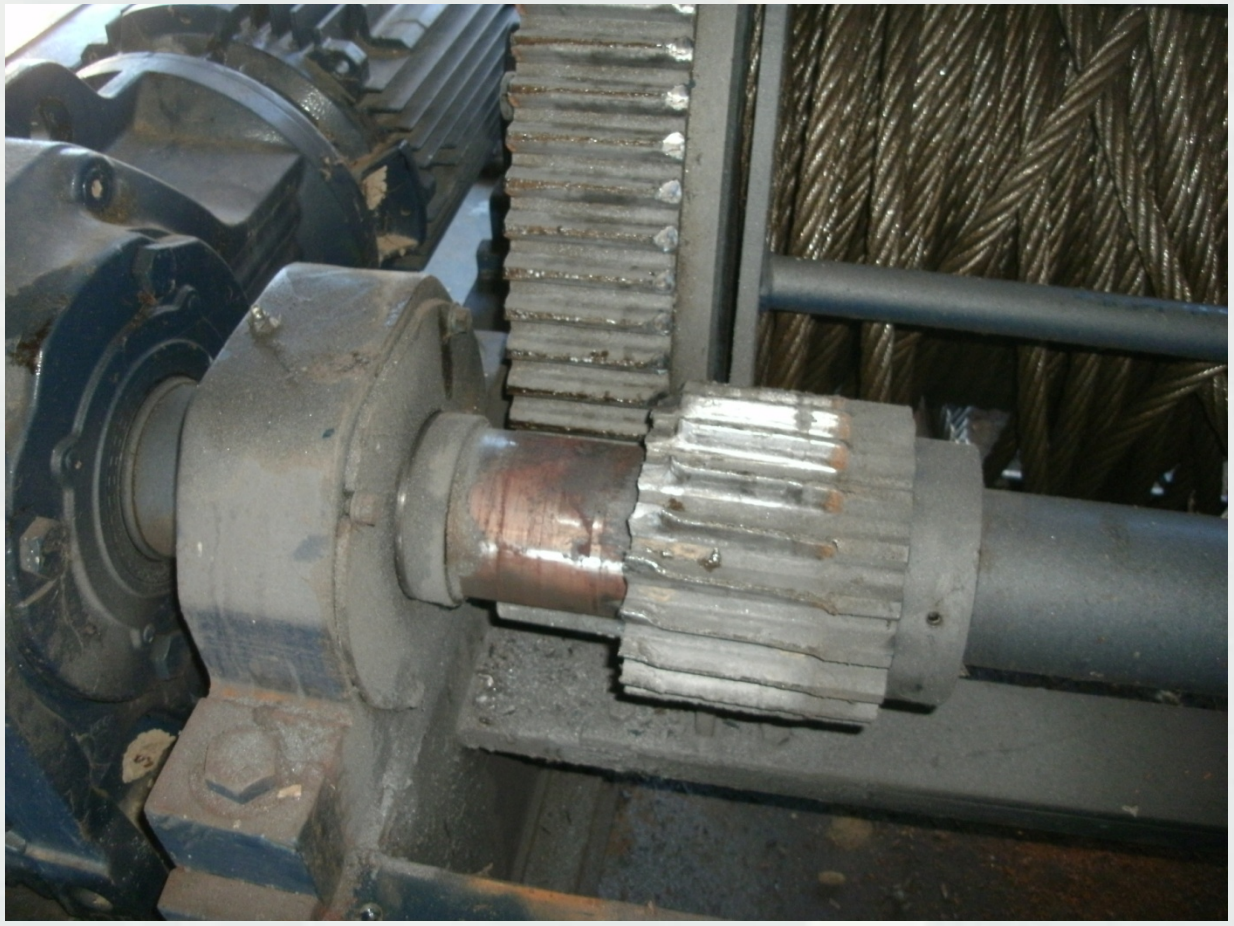
53 Wicket Lifter stuck on dam

Recovery

What Happened



What was found



Lessons Learned

- Performing scheduled maintenance and inspections would have caught this well before failure.
- Inspections should be performed to ASME B30.7 (Winches)
- Winch provided lacked some important safety features, and would nuisance trip under load.
- Auxiliary drum mounted brake and E-stop system would have saved from going over the dam.

Way Forward

- Winch in this situation is unique as there are no ASME standards directly addressing the situation.
- Asked MDC to research and design the replacement given the unique situation and experience with the Illinois River wicket lifters.

Load Verification

- Took a series of readings with a load cell fastened in line with the wire, and found the current winch sizing to be marginal.
- MDC further analyzed the barge overhanging the end of the dam according the to UFC on moorings to determine winch loadings in “Accident occurring state”

Applicable Standards

- Depending on interpretation winch could be considered anything from a standard mooring winch with a SF of 3 to a personnel hoist with a SF of 10.
- Using personnel hoist criteria results in equipment that would most likely sink the barge.
- A compromise was necessary

Applicable Standards

- The original setup has given 80 years of nearly trouble free service.
- Current thought is to go from a 7/8” wire rope sized winch to a 1 ¼” wire rope on an ASME B30.7 type winch.
- This increases FS to 6 for observed loading
- FS of 3 for “accident occurring” loading
- Equipment remains in proportion to the barge.

Specs

- Safety equipment to be added:
  - Line speed sensors and limiters
  - Drum and motor mounted brakes
  - E-stop system to apply the brakes
  - Warning system for when the E-stop is applied.

Questions?