



Inspection and Replacement of Meteorological Tower Anchors at Callaway Plant.

Presented by Kip Barbour,
System Engineer, Callaway Plant

Anchors: A Cause for Concern

- To my knowledge, Callaway Plant had never inspected its meteorological tower anchors.
- 2001 NUMUG listserver messages:
 - >Bob Pickwood described the degradation and repair of the anchor rods at Palo Verde.
 - >Paul Fransioli provided information regarding the failure of a meteorological tower at the Sandia National Laboratory (SNL) Solar Test Facility due to degraded anchor rods.
- A NUMUG 2002 Presentation, “Examining Tower Guy Wire Anchor Rods” by Matt Parker illustrated other tower failures.

Photo from Matt's Presentation



Anchors: A Legal Concern

- “The Legal Landscape When a Tower Collapses” by Vincent F. O’Flaherty found at www.mobar.org describing the legal ramifications of a tower collapse.
- Tower accidents are “a high profile event that will obtain maximum media scrutiny.” Just what we need...
- “The legal fallout from a collapse can continue for many years.”

Plant Health Risk for Anchor Rods

- Created a Plant Health Risk for the Anchor Rods due to the unknown condition of Callaway's anchors.
- Callaway's Plant Health Committee approved a modification and budget to upgrade the meteorological system, including replacing the primary tower with a new 60 meter tower at the site of our existing back-up tower.

Decision to Retrofit Existing Tower

- The decision to relocate our primary tower was dropped last year due to the potential impact on our environmental monitoring program.
- We decided to retrofit the existing tower with redundant instruments at 10 and 60 meters using elevators, and to reduce the tower height.
- System Engineering insisted that this include a complete inspection of the primary tower and its anchors to verify long-term **reliability**.

December 2005 Inspection

- The Primary Tower at Callaway is a 305 foot Rohn 80 erected in 1973.
- Tower Systems, Inc. was contracted to perform the tower and anchor inspections in December 2005.
- Tower Systems sub-contracted a backhoe operator to dig down to the anchors.
- The anchors were then exposed by hand using shovels and wire brushes.

Inspection Results



Inspection Results



Inspection Results



Inspection Results



Inspection Results

- The anchors consisted of two 1.25” rods welded to a divider plate.
- Rods were in exceptional condition, except for the last few inches before they entered the concrete slab.
- Substantial degradation was found on several of the rods near the slab, with some rods corroded to 7/8” of material.
- Tower Systems would not climb tower...

Decision to Replace Anchors

- Callaway had to make a decision about how to handle the degradation.
- Even if the remaining material could be evaluated as safe, the degradation extended into the concrete.
- We chose to replace the anchors as soon as possible, and to not allow any climbing until the new anchors were installed.

Anchor Replacement

- We could not install the new anchors at the same location as the old anchors.
- Tower Systems provided a civil engineering evaluation of the tower loading in order to move the anchors ~ 50' closer to the tower.
- In March, the protective fence was removed, holes were dug, and new single-rod 1.5" anchors were embedded in concrete slabs.
- The guy wires were then systematically transferred to the new anchor rods.

Anchor Replacements



Anchor Replacements



Transfer of Guy Wires



Guy Wire Ends



Transfer of Guy Wires



Weather was a factor in March.



4-Wheeling in a JLG



Lessons Learned

- There was probably no point in inspecting anchor rods from 1973. The cost of the replacement was roughly twice the cost of the inspection.
- Replacing the anchor rods was not as big a deal as we expected it to be.
- Tower Systems did an outstanding job performing this work for us.
- There are better times to do this work than in the middle of March.