Project Overview

FRP REHABILITATION OF LOW PRESSURE PIPELINE AT HYDROPOWER GENERATING PLANT IN COSTA RICA

Name: "El Encanto" Pipeline, Costa Rica
Type: Low Pressure Pipeline Hydropower Generating Plant
Location: Sardinal, Costa Rica
Completed: July 2009

PROBLEM

The 7 ft diameter and 5,742 ft long low pressure pipeline at the "El Encanto" power plant is made of cast in place reinforced concrete, exhibited significant longitudinal cracking during a pressurized test run and as a result, as much as 20% of the flow was lost due to leaks. The pipeline was drained out and all visible cracks were sealed. Given the rigidity of most crack sealing materials however, full deformation compatibility between the material and the concrete could not be achieved, breaking the seal and allow leaking to occur again.

SOLUTION

The pipeline was pressure washed with 7,000 psi machines to remove any scour, sediment, curing compounds or any other substance that could hinder the bond between the FRP and the pipe surface. An FRP liner based on one layer of bidirectional glass fabric was designed to provide a humidity barrier, to provide an effective crack control mechanism and to provide additional hoop strength to account for a significant loss of hoop steel due to corrosion. Finally, an epoxy top coat was considered to cover all the installed FRP. This coat will provide abrasion resistance due to sediment carried by the river water and additional leak proofing by covering remaining pin holes left in the FRP liner. The coating has a concrete gray color which facilitates quality control to ensure that the entire light green-colored FRP liner is properly covered and any missed spots could be easily detected.

Technical Highlights

- 5,742 ft long and 7 ft interior diameter cast in place concrete pipeline strengthened with Glass FRP.
- The average rate of production of each installation station was 2500 ft^2 of FRP liner installed in an average 8 hour work day.
- Crews worked seven days a week which allowed completion of 150,000 ft^2 of FRP liner installation in 15 days.

Credits

Engineering and Materials: QuakeWrap, Inc., Tucson, AZ
FRP Installation: FRP Construction in cooperation with Ghella S.p.A.
General Contractor: Ghella S.p.A., San Jose, Costa Rica

This project included the installation of about 150,000 ft^2 of FRP liner and is the largest reported FRP pipeline retrofit job to date.

"The FRP Retrofit Experts"