CASE STUDY

Carbontech Case study 012

6″ Sewer Line Repair

CARBONTECH

COMPOSITE SYSTEMS

TABLE OF CONTENT

PROJECT DETAILS

Case Study Number
CTCS:012

Design Pressure
6.2 Bar

Repair Summary
6" Sewer Line

Operating Pressure
4.9 Bar

Client
Shell & BP (Sapref)

Design Temperature
90°C

Service Type
Sewage Water

Operating Temperature
70°C

Line Size
6"

Base Material
SA-333 Gr-6

Line Class
150#

ANOMALY DESCRIPTION

Operations reported a leak on Domestic Sewage Piping discharge line ***Figure 1***. The leak is located on the Tee bottom, the through-wall damage is Ø27 mm. ***Figure 2***. The pipe spool consists of three series-connected tees. UT scan was performed to determine method of repair and it was found that minimum thickness adjacent to leak was 5.5mm while T-nom is 7.1 mm. The minimum allowable structural thickness of the piping is 3.8mm per ANSI. The possible cause of the damage is bacteriological corrosion or corrosion under deposits (internal corrosion).

Figure 1: Leak Location

Figure 2: Leak Location

INTEGRITY CONCERNS

Equipment cannot operate while leaking, and shutdown time was limited therefore replacement was not an option and a TLR was created for this repair.

THE CARBONTECH SOLUTION

This Leak required a non-standard method for Composite Wrap repair.

STEP 1: We developed a patch from pre-cured composite in the shape of the pipe where the leak was located. This ensured a stiffened patch over the leak area which assisted in a lower wrap layer count. Since the composite patch is made using the same materials as the repair, it is not considered to be the defect size, as per AMSE PCC-2.

Figures 3 and 4 show the part of the pipe that was used to mold the pre-cured composite patch. We used 2 layers of Carbon Fibre material and impregnated it with Epoxy which was the epoxy required for this repair.

Figures 5 and 6 show the composite patch after it was cured and removed from the pipe. The patch was coated on the inside with the Primer, to assist with a better adhesion once we install the patch over the leak area.

STEP 2: Surface preparation was done with bristle brushes to the profile of SSPC-3. The hole was then plugged with Revofill and cured for 2 hours with a TIOGA heater. After the Revofill cured, it was sanded down to the desired profile to ensure the pre-cured patch will fit comfortably without any sharp edges present. *Figures 7 and 8* show the surface preparation, Revofill plug and curing thereof.

STEP3: After the Revofill was cured, we installed the pre-cured composite patch with standard primer and cured the patch for an hour with Tioga heater, to prevent the patch from moving once the wrap has started. *Figure 8* shows the patch after installed and cured.

Surface Preparation achieved: SSPC-3
Product used: Revowrap 185
Engineering calculations: ASME PCC2
Layers used: 8 layers
Post cured: External using Habitat

Figure 3: Surface Prepared for patch

Figure 4: 2 x layers Revowrap 110 applied to create patch

Figure 5: Patch Removed once cured

Figure 6: Patch with Primer coating

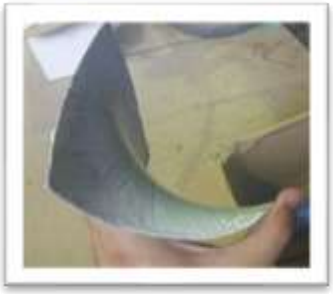

Figure 7: prepared area

Figure 8: Patch applied

Figure 9: Completed Wrap

Figure 10: Hardness test performed

CONCLUSION

A leak was found in the 6-inch sewage water line with a large through hole leak due to internal corrosion. The line could not be isolated for more than 24 hours; therefore, replacement was not possible and a temporary leak repair (TLR) was performed. To reduce the number of layers of composite wrap required, we developed a patch from the carbon material and epoxy to stiffen the total repair around the hole. The hole was filled with Revofill to form an initial plug and then the pre-cured composite patch was applied and cured. 8 layers of composite wrap was then applied and a hardness of 80 Shore D was achieved.

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PROGRESSIVE COMPOSITE ENGINEERING

CONTACT DETAILS
Office: +27 (0) 10 446 6866
Email: info@revowrap.com

PHYSICAL ADDRESS:
Unit A5 ● Growthpoint Industrial Estate ● Bell Street ● Meadowdale Germiston ● 1614 ● South Africa