



SERYE SERVICIOS

Santafe de Bogota D.C., julio 14 de 2000



**EMPRESA
COLOMBIANA DE
PETROLEOS
ECOPETROL**

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**EMPRESA COLOMBIANA DE PETROLEOS – ECOPETROL
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**REPORT ON THE STEAM LINE REPAIRS USING THE
PIPE REPAIR AND REINFORCEMENT SYSTEM SYNTHO GLASS®**

The following is our final report on the repairs made using the Syntho-Glass System on the ½" diameter steam inlet and condensate outlet lines on the chimney.

The repairs were made on June 30 as a demonstration of the Syntho-Glass System for pipe repairs. Sr. Freddy Pérez and Ing. Oscar Mora, of ECOPETROL representing the management of Llanos Refinería Apiay were present. Representing Serye Servicios, Ing. Jose Bernal made the actual demonstration and repair.

OBJETIVES

The principle objective of this test was to show the versatility of the Syntho-Glass® System for repairing the more significant leaks that occur during the daily operations of the Refinery. For this reason, two steam leaks in ½" diameter line operating between 80 and 120 psi were chosen to demonstrate in real time, the advantages of reinforcing and repairing lines with a system that is easy, quick and low cost.

CALCULATING THE MATERIAL (NUMBER OF WRAPS)

For this type of repair, the factory recommends 6 – 8 wraps of Syntho-Glass® for operating pressure up to 300 psi.



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EXECUTION OF THE REPAIR

The planning for this type of repair is done in three phases:

- **Identification and Measuring of the Defect:** In this step it is required that a complete identification of the repair is made: the cause, the diameter, the location, the line pressure and product, the temperature and the pipe specification.
- **Calculating the Required Amount of Material:** This calculation is based on the above parameters in addition to the specification and wall thickness of the pipe, the remaining operating pressure, and the size of the Syntho-Glass® rolls to be used.
- **Repair:** Once it has been determined how many wraps will be required for this repair to re-establish the serviceability of the line, the repair can begin taking into account the personnel required (related to the diameter of the pipe) and the logistics of the repair (excavation, water supply, etc.).

Following is a step-by-step description of this repair:

11:00 – Arrive site. The two leaks and their location is easily visible. The line is closed off and a fire fighting hose is used to cool down the line.





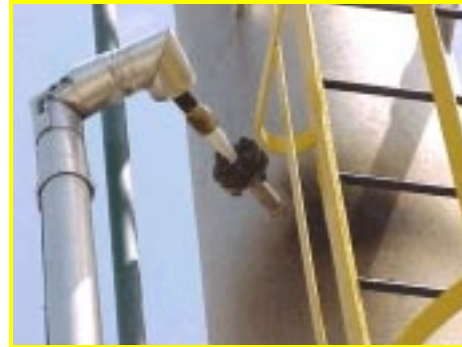
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11:10 – The cleaning of the repair area is begun using sand paper. After this cleaning, the two repair areas can be seen to be very corroded and the diameter of each hole is expanded to completely clean and remove the corrosion. After this, the upper repair is approximately 1" diameter and the lower, approximately ¾".



11:40 – The cleaning of the two defects is finished. This has taken longer than normal due to the location of and limited access to the repairs. The final area is cleaned to white metal.



11:45 –Syntho Steel Epoxy is applied to the holes to seal the leak. This procedure is accomplished rapidly due to the heat of the pipe, which causes the epoxy to cure almost immediately.

12:00 – Using a file, the excess Syntho-Steel is removed and the application of Syntho Glass® is begun, using the fire fighting hose as the water source.



For each repair, a total of 10 wraps of Syntho Glass® is applied.



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12:20 – End of the repair. In agreement with Sr. Freddy Pérez, the lines will be reopened at 14.00 hours.

14:00 – The steam line is reopened and the leaks have been repaired.



CONCLUSIONS

- The 2 repairs took one hour and 20 minutes, including the time took to clean the area and reinforce the area around the second defect.
- The time for repair of the 2 defects is very short considering the difficulty in accessing the two repairs.
- This repair was made by one person without the need for special tools, electrical connections nor draining of the lines.
- The cure time for this repair is lessened by increases in the line or ambient temperatures. Because of this, for this particular repair, the initial cure time (dry to touch) at the estimated temperature of 50 degrees C is 5 minutes.
- At these temperatures, it is possible to return the line to operation within an hour.