

## 3X Engineering's composite repair

An onshore transfer 24" pipeline was damaged by an excavator causing a large dent and a leak. The pipeline reinforcement was performed in April 2014 by 3X Engineering (3X) team.

The whole repair was done according to the proprietary 3X finite elements calculation programme. Twenty layers of composite were found necessary to reinforce the pipeline.

The pipe was fully flooded with water. The leak sealing was done by using arc welding. F3X8 filler (3X) was applied at the welding area. The dent and its gouges were also filled in with this filler.

As this pipeline operates between ambient and 60°C temperature, the R4D-IC kits were used. Aramide tape was impregnated with R3X5 resin (3X) and helically wrapped with 50% tape overlap. Curing time of 72 hours was done prior to hydrotest at 10 bar pressure.

On this quite special case 3X Engineering has demonstrated once again its efficiency and competency in damaged pipeline repairs and particularly in the particular case of very severe dents with gouges (onshore & offshore). Their on-site pro-active support allowed a restarting of the pipeline without removing the damaged pipe.



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Type of Defect:	dent, gouges and leak
Pipe size:	24" OD (API5L grade B, t=8.1mm)
Nominal pressure:	12.66 bar
Pipe temperature:	60 deg C
Client:	Foselev Agintis
Location:	La S.A.R.A. (Martinique)
3X Product:	Reinforcement 4D (R4D)

## Non-piggable lines - 4 case studies by Pipesurvey International

Looking back at a few decades of intelligent pigging, it is amazing what the industry has achieved. Accurate and free flowing inspection tools using high sensitivity sensors and special-design on-board electronics operate in harsh environments to collect faultless data sets. Starting from the outset on long distance and crucial transmission lines, the industry has now more and more moved its focus towards the so-called non-piggable or difficult-to-pig pipelines. This article will focus on four case studies of such pipelines, and address four extremes on the field of oil and gas transmission lines: low flow pipelines, high flow pipelines, bidirectional operation and multi-diameter pipelines.

### Low flow pipelines: the Guinness-book-of-records run

A typical example of such a line is this 20" x 84 km pipeline that brings crude oil from the North Sea to the onshore storage and processing plant. The pipeline has been in operation since the 70's and the field is exhausted. Currently, the export pipeline is operating at a velocity of 0.03 – 0.04 m/s and max. 7~8 barg operating pressure. Calculated over a distance of 84 km this results in a pigging run time of 27 days. This is a real challenge, both for the cleaning and inspection of the pipeline. A small leakage across the pig may result in loss of propulsion and the pig may get stuck. If debris accumulate in front of the cleaning pig, drive-pressure may rise and the pig might again stall in the line. And as to the inspection tool, it will

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