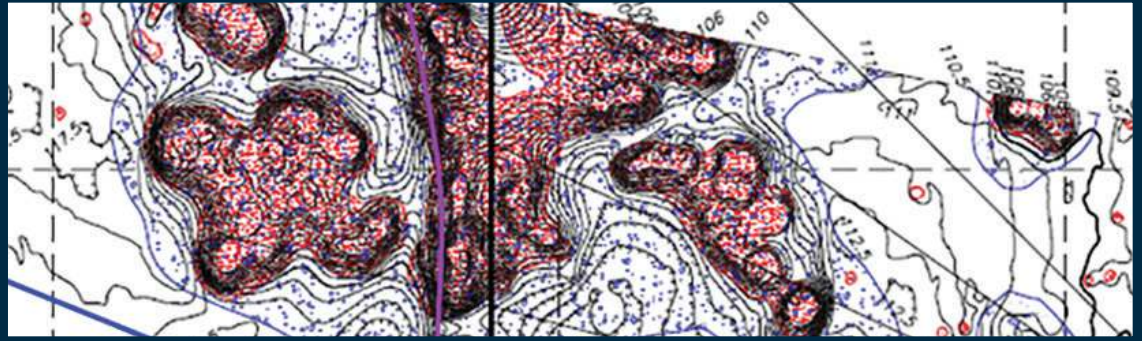


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## Project Summary

### Organization

Grupo Especializado en Obras Marinas S.A.

### Solution

Innovation in Offshore

### Location

Campeche Bay, Gulf of Mexico, Mexico

### Project Objectives

- Determine the risks of installing a submarine pipeline route along a geological fault
- Produce a safer and realistic design to reduce the risk of marine pipeline failure that would severely impact the environment

### Products Used

AutoPIPE

## Fast Facts

- GEOMSA was contracted to design and install an 8-inch to 24-inch diameter piping system that could withstand the forces of a geological shift.
- The team evaluated how the pipeline interacted with the surrounding seabed environment.
- The pipeline increased oil production in Mexico and provided job opportunities in the region.

## ROI

- AutoPIPE improved productivity and enabled GEOMSA to represent the actual conditions of the project, assessing structural behavior and pipeline safety.
- AutoPIPE reduced the time spent on flexibility analysis and displayed the results in a clear and user-friendly way, in a fully graphical environment.

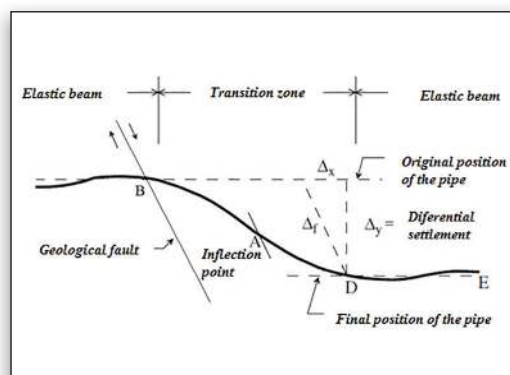
# GEOMSA's Innovative Subsea Pipeline Design Withstands Effects of a Geological Shift in the Gulf of Mexico

Bentley's AutoPIPE Determined How to Increase Structural Integrity and Prevent Failure

## Eighteen Years of Marine and Submarine Platform Design Experience

Installing new subsea pipelines in the Gulf of Mexico has its risks. The area contains active geological faults, which often test the structural integrity of an oil production pipeline system. Grupo Especializado en Obras Marinas (GEOMSA) is a major developer of pipe-soil systems in the Gulf of Mexico. With more than 18 years of experience in marine platform and submarine platform engineering projects, it designs pipeline routes and assesses the strength of subsea pipeline systems by determining the effect that expansion, lateral wear, and geological shifts have on their life expectancy. The organization specializes in terrestrial pipe and industrial installation projects for hydrocarbon collection and processing.

On this USD multi-million project, GEOMSA was contracted to design and install an 8-inch to 24-inch diameter piping system that could withstand the forces of a geological shift. The project team's principal objective was to develop a solution that would maintain the reliability and safety of the system. Using Bentley's AutoPIPE software, the team evaluated how the pipeline interacted with the surrounding seabed environment and produced a safe, realistic design to reduce the risk of marine pipeline failure, which would severely impact the local environment.



*AutoPIPE enabled the design team to assure the structural integrity of the marine pipeline.*

*“AutoPIPE reduces time spent on flexibility analysis and displays the results in a clear and user-friendly way, in a fully graphical environment.”*

— Roberto Chávez Argüelles, CEO of GEOMSA

## Innovative Technology Mitigates Stress and Assures Pipeline Integrity

The process helped to identify structural deformities in the pipelines, ground deformities resulting from changes in the pipeline configuration, load concentrations on the fault edges, and pipeline stresses that resulted from changes in its configuration. The technology also determined how the seabed that supports the pipeline would react to any geological shift. The team used AutoPIPE to model the support conditions. The application also helped analyze how those conditions interacted with the pipeline during a shift, which was based on rigidities analyzed from the mechanical properties of the seabed, the diameter of the pipe, and the unit displacement in the pipe.

The analysis began with an initial slope at a unit value of 10 centimeters to identify the pipeline's initial configuration based on the vertical deformity of the seabed. The model displayed the differences by applying a vertical gap in the pipe supports from the site of the fault. The team compared the pipe-stress analysis with what current regulations allowed, and increased the slope of the analysis cycle until it reached the top-end of these regulations. Using AutoPIPE enabled the design team to assure the structural integrity of the marine pipeline.

*“AutoPIPE reduces time spent on flexibility analysis and displays the results in a clear and user-friendly way, in a fully graphical environment,” explained Roberto Chávez Argüelles, CEO of GEOMSA. “Therefore, the models are produced quickly and efficiently.”*

*“Bentley’s software provides engineering-friendly applications that allow us to model and analyze complex problems on this project, as in this case where we had to determine the soil-pipe interaction when crossing a geological fault. AutoPIPE helped us obtain the structural behavior of the submarine pipeline to determine that we needed an intermediate expansion loop to increase the pipeline’s flexibility and ensure that it would not fail.”*

*– Roberto Chávez Argüelles,  
CEO, GEOMSA*

### **AutoPIPE Facilitates Modeling of Soil Behavior**

AutoPIPE helped GEOMSA represent the actual conditions of the project to assess the structural behavior and determine the structural safety of the pipeline system. For example, a slope along the route of the pipeline can make it difficult to model soil behavior.

AutoPIPE enabled GEOMSA to assess the risk of having the pipeline route cross the geological faults or other infrastructure, such as cables, offshore platforms, FPSO moorings, and risers. Lastly, the application helped the

project team determine and implement the required local and international regulations and codes for submarine pipelines. The project will positively impact the local economy while working to prevent environmental disasters. “AutoPIPE allowed us to design a safer and more realistic design that helped to reduce submarine pipeline failure,” said Chávez Argüelles. “Successfully completing these types of projects increases the volume of domestic oil production and, consequently, the country’s economy, which ultimately creates jobs.”

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