The Amal Petro Company (AMAPETCO) planned to optimize its network flow to overcome a number of issues that were preventing it from producing its reservoirs to full potential. Its existing capacity was challenged by varied reservoir pressures, while flow assurance was often compromised by hydrate, slug, erosion, and bottleneck problems. AMAPETCO wanted to define an ideal network and facility design, and isolate associated flow assurance issues.

AMAPETCO discussed the creation of a new network model with Schlumberger to help in this process. It needed to include all wells, risers, subsea pipelines, and elbows, as well as reflect the subsea environment—accounting for temperature gradients and water velocities.

Building the model
The first task was to gather data from all areas of the network, including flowlines and riser properties, PVT data, and observed and wells data. This information was then used to create a comprehensive network model in the PIPESIM steady state multiphase simulator. History matching was then undertaken, and applicable horizontal and vertical flow correlations were evaluated. The best combinations were then selected to show the smallest difference between simulated and actual pressure measurements at the surface. The model was then fine tuned by adjusting holdup and friction factors to improve match accuracy. Flow correlation was validated at different time steps.

To test various flow situations, simulation scenarios were then run. Just-gas, just-oil, and gas-and-oil flow scenarios were simulated with a number of different flow assurance simulation variations, including hydrates, slugs, erosion, and bottlenecks.

“The new PIPESIM network model has helped us mitigate flow assurance issues, while increasing our production system capacity. Improved engineering and planning is now possible, and we have already made financial savings through optimal design.”

Abdel Fattah Fayad
Reservoir Department Head
AMAPETCO
CASE STUDY: Multiphase flow simulations drive new network design and increased capacity

**Optimized flow—optimal production**

The new history-matched PIPESIM network model allows AMAPETCO to run multiple flow assurance scenarios to select an optimal pipeline design, as well as increase its network capacity to better realize the production potential of its multiple reservoirs. In addition, efficient engineering and design enabled by the new system saves capital and operating expenditure through a reduction in pipe costs and ideal coating type, thickness, and application selections.

Scenario results showing phase envelope with main flowline conditions.

Erosion scenario results in a 16 km pipeline, in which the maximum erosional velocity ratio is 0.75.