

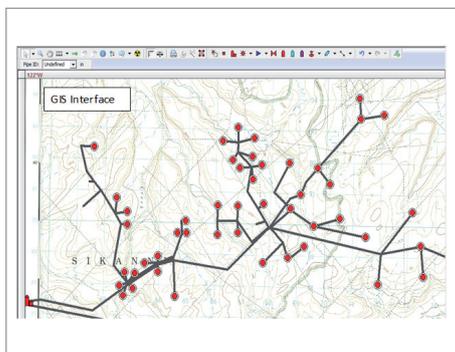


Piper®



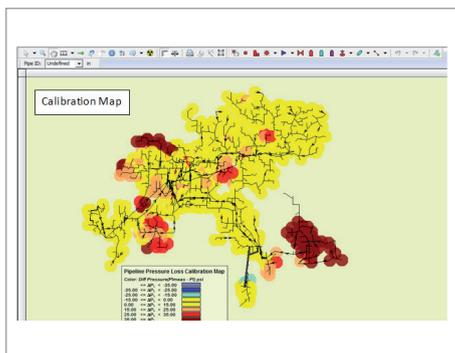
Integrated Asset Management

Flow Modeling from the Reservoir to the Delivery Point



Field Development Planning from Reservoir to Delivery Point Using:

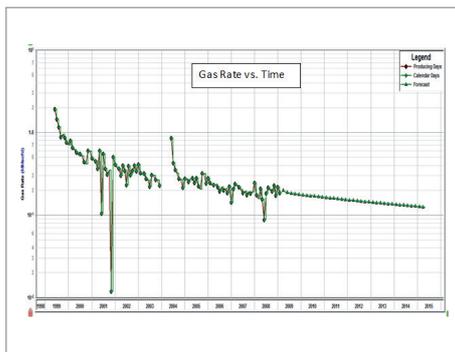
- Geographical referencing.
- On-screen editing.
- Shape files.
- Image files.
- Analytical reservoir models.
- Compression modeling.
- Proposed development forecasting.
- Economic forecasting.



Production Optimization:

Diagnostics for easy identification of:

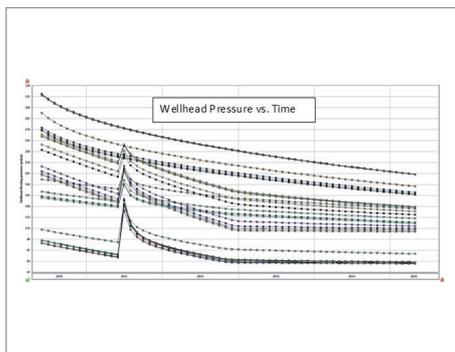
- Additional system losses.
- Liquid loading.
- Data errors.
- Bottlenecks.
- Uplift potential.



Production Forecasting and Development Justification:

Use Piper to determine:

- Pipeline, compression and wellbore requirements.
- Impact of proposed development (i.e. infill wells, compression, pipeline expansion).
- If proposed development is economic.



Import IHS Markit's Harmony Reservoir Models:

- Quantify flush production on a daily or monthly basis.
- Identify production back-out.
- Identify potential problems due to liquid loading.
- Evaluate impact of re-completion.

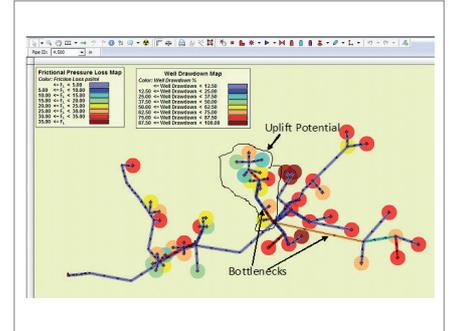
Evaluate Upside Potential in Debottlenecking

Objectives:

Determine if there is potential for system optimization and quantify the potential revenue

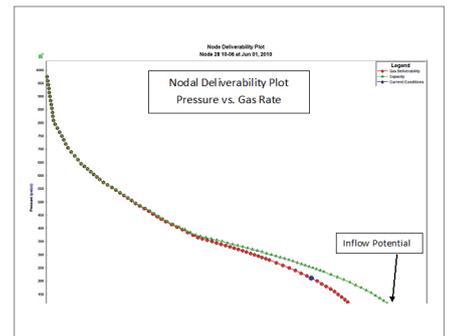
Background:

- 44 wells.
- Average operating pressure of 230 psia.
- Total gas rate of 39 MMscfd.
- Compression is currently utilized.
- Bottlenecks upstream of compressors.
- Uplift curve reveals potential by lowering suction pressure and reducing frictional pressure losses.



Analysis:

- Add two miles of 6" pipe.
- Account for additional gas volumes through compressors; increase compressor capacity curves to reflect full load conditions.
- Input economic parameters.

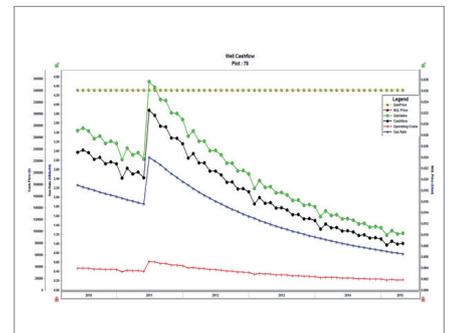


Results:

- Reduced wellhead pressure by 50 – 100 psi.
- 1.9 MMscfd incremental rates.
- Cumulative incremental production of 1 Bcf over five years.
- NPV = \$2,114,300 over 5 years.

Other Studies:

- Piper is currently being used to model:
- 7,000 wells over 30 years.
- Shale gas developments in the Barnett, Marcellous, Montney and Woodford.
- Gathering systems in tight gas basins such as Piceance, Washakie.



For more information [ihsmarkit.com/energyengineering](https://www.ihsmarkit.com/energyengineering)

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