Natural Gas Well Feasibility Analysis Report

Well: PEGASUS (DEVONIAN) Well No.: 70279125
Data Source: Texas Railroad Commission
https://webapps.rrc.texas.gov/PDQ/changePageViewAction.do?pagesize=500

Executive Summary

This report summarizes the reservoir engineering analysis conducted to assess the viability and performance of the PEGASUS (DEVONIAN) Well No.: 70279125 natural gas well. Production data was extracted from the **Texas Railroad Commission** website, combining decline curve analysis (DCA), economic evaluation, and nodal analysis to provide a comprehensive overview of the asset.
The decline analysis, based on 84 months of historical data, resulted in a total **EUR of 3,706,677.99 MCF**. However, the economic evaluation indicated a **negative Net Present Value (NPV) of -$5,404,187.80**, suggesting that the project is not economically viable under current assumptions. Additionally, the nodal analysis identified a liquid loading risk that could result in a **25% reduction in production**, a critical factor to consider for optimizing well operation.

Methodology

The well viability analysis followed a multifaceted approach, integrating standard reservoir and production engineering techniques:

Data Acquisition and Preparation

Historical production data was obtained directly from the **Texas Railroad Commission** website. Initial preparation was performed to ensure data consistency and integrity, including time series automation and the unification of historical and future production columns.

Decline Curve Analysis (DCA)

- **Model Applied:** The exponential decline method was selected to forecast future gas production, using 84 months of historical data.
- **Curve Fitting:** The decline curve was fitted to historical data to determine the parameters qi (initial production) and D (decline rate), resulting in an R2 of 0.7551, indicating a good fit of the model.
- **Projection and EUR:** Production was projected up to month 444 (equivalent to an additional 30 years of projection), and the Estimated Ultimate Recovery (EUR) was calculated by summing historical and projected production.

Economic Evaluation

- **Economic Parameters:** Parameters such as gas price (/MCF),monthlyoperatingcosts(/month), and an annual discount rate (converted to monthly) were defined.
- **Cash Flow Calculation:** Monthly cash flow was calculated based on total projected production, subtracting operating costs from gas sales revenue.
- **NPV (Net Present Value):** The NPV was calculated using Excel's NPV function, applying the monthly discount rate to the projected monthly cash flows to determine the project's economic viability.

Nodal Analysis

- **IPR and VLP Modeling:** Inflow Performance Relationship (IPR) and Vertical Lift Performance (VLP) curves were modeled to represent the performance of the reservoir and the lift system.
- **Optimal Operating Point Determination:** The optimal production rate was determined by the intersection of the IPR and VLP curves under ideal conditions, using Excel's Goal Seek tool to find the point where the pressure difference between the curves is zero.
- **Liquid Loading Simulation:** To simulate the impact of liquid loading (liquid accumulation in the wellbore), the VLP equation was modified with an adjusted coefficient. Goal Seek was again used to determine the new operating rate under these conditions.
- **Quantification of Reduction:** The percentage reduction in production due to liquid

loading was calculated by comparing the optimal rate with the rate obtained in the liquid loading scenario.

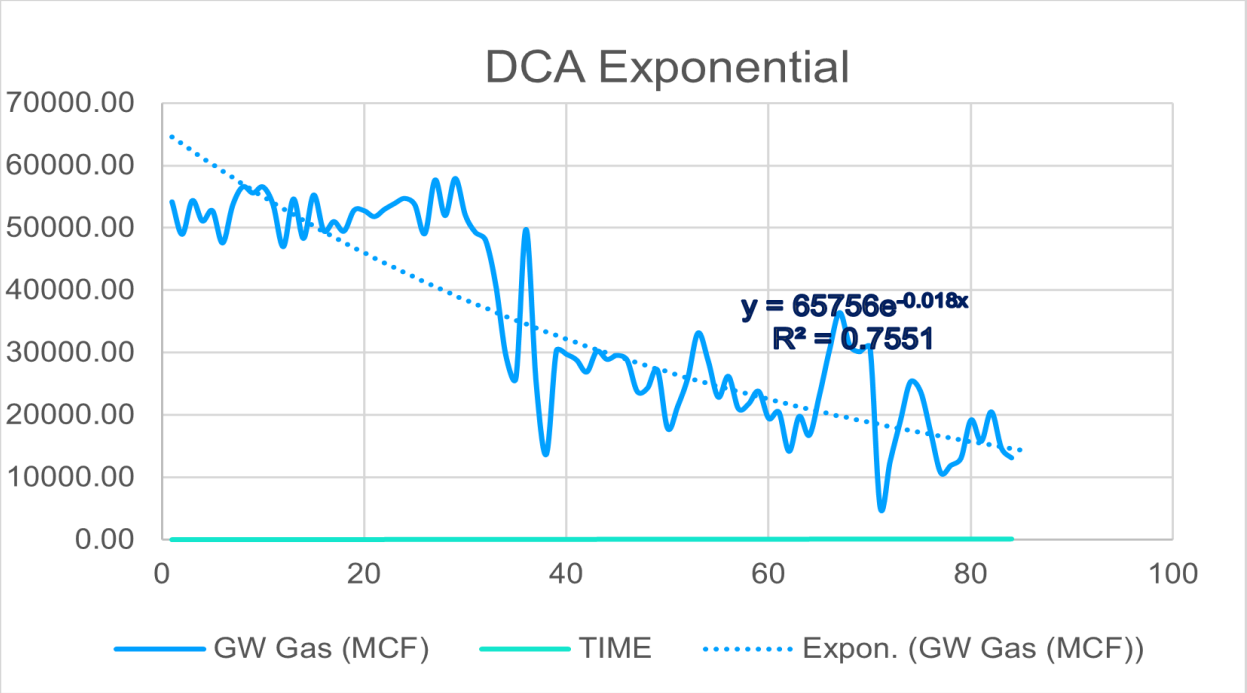
1. Decline Curve Analysis (DCA) and Reserve Estimation

The initial analysis of 84 months of well production data revealed a decline trend that best aligns with an **exponential model**. After cleaning volatile initial data, applying the model resulted in a **high** R2 **value of 0.7551**, indicating a good fit with the decline curve.

DCA Results:

Parameter	**Value**	**Unit**
Historical Gas Production	2,909,755.00	MCF
Projected Future Production	796,922.99	MCF
Total EUR	**3,706,677.99**	**MCF**

Fig.1 Decline Curve Analysis



Gas Production over Time with Fitted Exponential Decline Curve.

2. Economic Evaluation

With the decline curve and projected future production established, an economic evaluation was performed to determine the project's profitability. This analysis, based on defined gas prices and operating costs, calculated the well's cash flow.

Economic Results:

Indicator	Value	Unit
NPV (Net Present Value)	**-5,404,187.80**	**$**

The negative NPV indicates that, under the economic parameters used, the project is **not economically viable** and does not generate sufficient financial return to justify the investment.

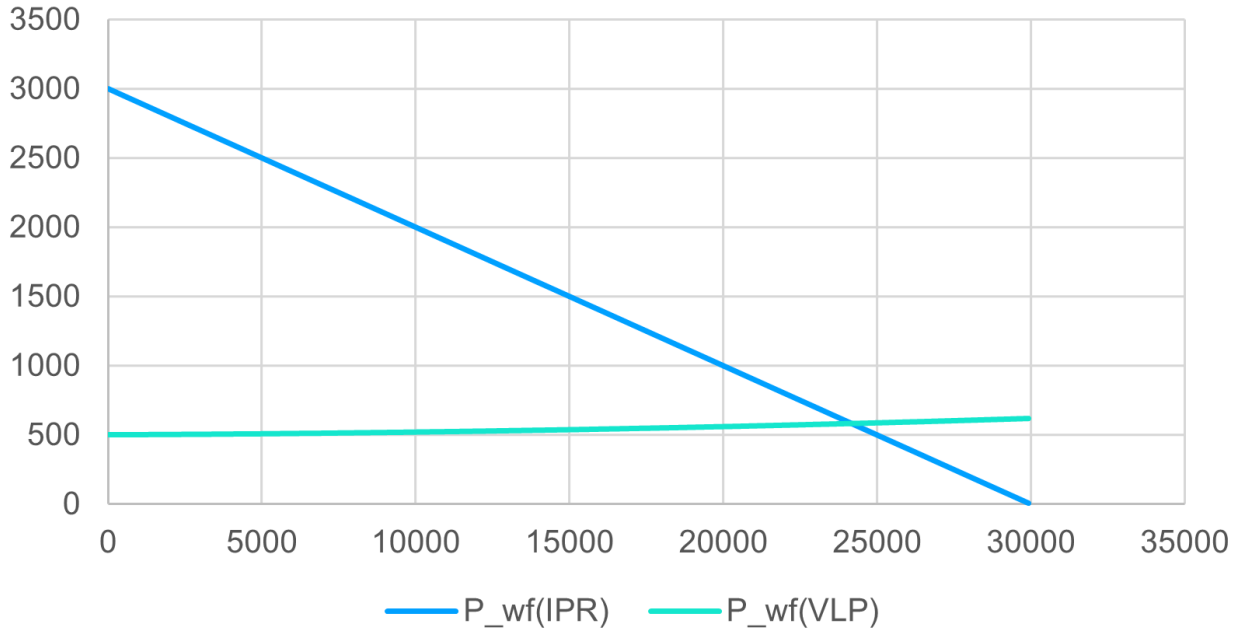
3. Nodal Analysis and Liquid Loading

To understand the well's operational performance, a nodal analysis was performed. This analysis compared the reservoir's supply capacity (IPR - Inflow Performance Relationship) with the well's backpressure (VLP - Vertical Lift Performance). The objective was to identify the optimal production rate and the impact of liquid loading, a common phenomenon where liquid accumulates in the wellbore, reducing production.

Nodal Analysis Results:

Scenario	Flow Rate (Q) (MCF/month)	Pressure Point (P) (psi)
Optimal Operation	4,166.67	2,583.33
With Liquid Loading	3,125.00	2,687.50

Fig2.Nodal Analysis



Caption: IPR vs. VLP graph showing the optimized operating point and the impact of liquid loading.

Impact of Liquid Loading:

- **Production Reduction: 25%**

The analysis demonstrated that liquid loading represents a significant threat, with the potential to reduce production by 25%, highlighting the need for mitigation strategies to keep the well operating efficiently.

General Conclusion

Although the PEGASUS (DEVONIAN) Well No.: 70279125 has a long production history and a stable decline curve (validated by a good R2), the economic analysis suggests that the project is **not financially attractive** with current prices and costs. Additionally, the risk of liquid loading increases operational complexity, which reinforces the conclusion of the project's economic non-viability.