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Interaction Between Uncertainty Data and Operational Decisions in the Risk Management in Mature Gas Field

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SUMMARY

The Laslau Mare field is located in the Transylvania Basin, Romania, is a multi-reservoir, brown gas field, vertically split in 6 production packages with different fluid contacts and pressure levels; shale intercalations divide the reservoir layers from each package in several separated sandstone or shaly-sandstone bodies; to add complexity the two upper packages have high water production risk and the lower packages have low permeability as tight reservoirs.

The field requires combining the latest technology from our side with the operational experience of ROMGAZ to refine the understanding of the reservoir and its productivity. The actual phase includes redevelopment and optimization of the field, with newer technologies and well interventions to insure profitable results.

The Uncertainty management and Decision-making have contributed to the successful performance of the project and open another business opportunities. The fact that decisions facing eventualities and weak data were correct has been demonstrated with increased production, almost three times of its value on September 2003.

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The production of the field began in 1975 and the present recovery factor is estimated around 74%. Seventy wells had been drilled and 49 of them are still active. A new infill well has just been drilled in March and completed in April 2014, 20 years after the last well drilled in the field.

The logs and data acquired in the new well allow for a better understanding of the current reservoir conditions and will be useful to update the database, to field redevelopment strategy and reduce the uncertainty in the numerical models therefore in the production profiles forecast.

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During the long exploitation period, the dynamic reservoir conditions had changed, and are expected to continue changing in the future, as the field becomes more mature, negatively impacting gas recovery factor. The negative impact include: decreasing reservoir pressure, reduced gas volume, higher frequency of problems with water loading, scaling, well and facilities aging, and increased operational risk. These problems will become more frequent as the theoretical ultimate gas recovery factor of Laslau Mare field is approaching, requiring more interventions and production optimization work, leading to higher operational costs and investments.

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ROMGAZ and SPM as collaborative partners operating the Laslau Mare field with many uncertainties; the most relevant are shown in figure1. It was understood that the best way to mitigate the uncertainties, is increasing knowledge through log acquisition or field tests. In a brownfield the capital investment is focused in the incremental production but needing to be aware that part of it should be invested in reservoir monitoring. Performing PLT, build up and isochronal tests, , analyzing water samples, minimize the uncertainty range or uncertainty parameters and reduce the risk in the operations.

The wide dispersion of reservoir pressure data represents a challenge that requires the best endeavor to reduce the uncertainty in the future operations.

Five numerical models have been built, one for each reservoir; all of them have uncertainties from static and dynamic variables. Those models which summarize all the knowledge from the reservoirs have been a key tool for the field development plan which includes drilling, deepening and recompletion .They will be updated with the new data from the redevelopment strategy operation.

Risk Management in Mature Gas Field

Figure 1 Risk Management in Laslau Mare Brownfield.

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