

Survey Uncertainty and Implications for Development with Horizontal Wells

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Summary

Directional survey uncertainty and survey error stems from many sources, from inherent rounding errors to magnetic interference to BHA geometry and finally user error. While the best-known type is the cone of uncertainty, many other variables induce error in determining spatial location of a well.

The precise position of a wellbore relative to its surface location, but also relative to stratigraphic markers is of paramount importance for drilling, production, subsurface evaluation and Return on Investment.

Theory / Method / Workflow

The presentation lists potential sources of survey uncertainty and survey error, along with techniques used to mitigate and reduce error. It continues by demonstrating how correlation based geosteering compensates for survey error and concludes with potential downfalls of integrating geomodel and geosteering interpretation.

Results, Observations, Conclusions

Directional survey error and uncertainty can be reduced with mitigation methods. Still, it is entirely possible to be faced with errors in the range of 2-5 meters TVD and 10-20 meters azimuth when drilling a horizontal well of 1500 m length.

Drilling wells to geomodel carries a large risk in actual well placement.

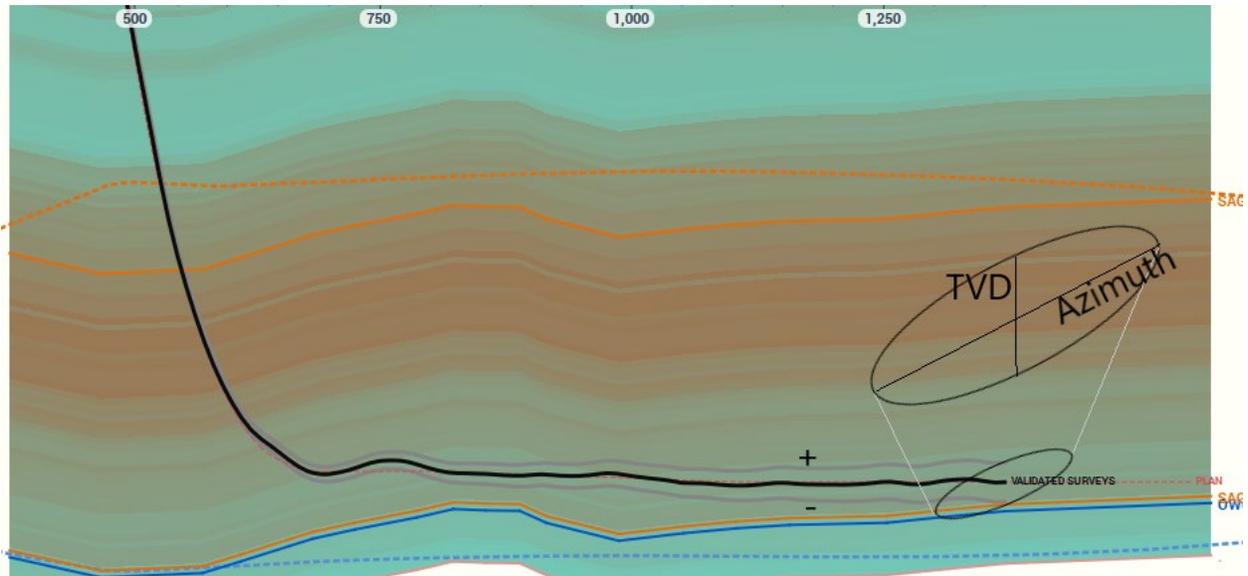
Correlation geosteering methods can and should compensate for survey error in the build (curve) section and in the lateral section.

Calibrating geomodels with geosteering interpretation data carries the risk of introducing survey errors into the geomodel, and potentially compromising the accuracy of the geomodel.

Adjusting geosteering interpretation to geomodel by retroactively adjusting surveys introduces the risk of propagating geomodel errors into subsequent drilling programs.

Novel/Additive Information

Directional survey uncertainty, when not taken in account, leads to incorrect placement of wellbores. While this is a well-known fact, it is often disregarded in executing development programs “to plan”. Mitigation strategies need to be a combination of reducing survey uncertainty and application of geosteering techniques.



Acknowledgements

References

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