Case study: Leapfrog Geo 4.0’s new Structural Modelling workflow at Vale’s Fabrica Nova Mine

VALE’S FABRICA NOVA MINE, BRAZIL

THE PROJECT:

Vale carried out a study of the new Leapfrog Geo 4.0 structural modelling workflow at their Fábrica Nova mine in Brazil. The Iron Ore Mine is in a well-known macrostructure located in the Iron Quadrangle. The region is located in the eastern portion of the Santa Rita syncline (Dorr 1969), in an area referred to as Fábrica Nova, which is notable because it marks the endpoint of the Iron Quadrangle’s stratigraphic sequence in an inverted position.

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SITUATION

The Fábrica Nova synform is an open fold of a few kilometres in size, and is characterised by the rotation of its primary structures - S0 and its schistocylies S2; the focus of this manifestation occurs throughout the northern pit of the Fábrica Nova mine and its surroundings. Only the stratigraphic units of the Minas Supergroup can be found within this fold. The axis of this fold plunges moderately to the ESE at varying values of this parameter, which depends on the fabric that is taken into account to represent the drawing of the synform (Rossi 2014).

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Daniel Rossi, Senior Geologist, Vale S.A.
Use of Leapfrog Geo’s structural modelling tool

The structural measurements that were adopted for this study are bedding measurements that were extracted from the Master’s dissertation entitled Estratigrafia e Arcabouço Estrutural da região de Fábrica Nova, Quadrilátero Ferrífero Minas Gerais (Stratigraphy and Structural Framework of the Fábrica Nova Region within the Iron Quadrangle of the State of Minas Gerais), which was published in 2014 by Daniel Rossi. These measurements were observed within the quartzites of the Moeda and Cercadinho formations and of the Sabará Group, as well as in the itabirites of the Cauê Formation. Eighty-four bedding measurements were used in this study, which were distributed throughout the surroundings of the Fábrica Nova mine (Figure 1).

![Figure 1. Distribution of the bedding measurements within the study area.](image1.png)

By making use of the Stereonets tool in Leapfrog Geo it was possible to distinguish between two groups that have distinct strikes and dips. In Figure 2, Group 1 contains 61 measurements that have an average orientation of 60/50, whereas group 2 contains 20 measurements that have an average orientation of 170/43.

![Figure 2. Stereonet generated in Leapfrog.](image2.png)

Based on these measurements, the Leapfrog Geo Structural Modelling workflow and tools were used to generate interpolations of these data in order to compare them to the synformal structure that is described in the source literature. Once the interpolation surfaces were created, they were combined with the topography of the area through the use of the Leapfrog Geo Evaluations tool.
CONCLUSIONS

Daniel Rossi, Senior Geologist, Vale S.A commented, “The result that was obtained using the Leapfrog Geo Structural Modelling workflow at Fábrica Nova synform was exceptional. The resulting geometry fits perfectly with the Regional geology features described in the source. The use of the new workflow and tools in Leapfrog Geo 4.1 are also helpful when working with inferred contacts, as exemplified by the western region (Fig. 5) of the study area, in which the contact of the Cauê Formation with the Grupo Sabará, in the majority of the area, does not outcrop.”