3. Guest Article 1 – Image Processing

Manual and Automated Acoustic Scanner Interpretations

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Acoustic scanners are all about interpreting orientation data from defect features identified in boreholes. The data is used for mine design and hazard mitigation, so it must be reliable. Over the years, we have often been asked by clients to manually re-interpret their acoustic scan reports because there were concerns about the automated data they had initially requested.

Comparing manual and automated interpretations from the same 11,000m of scanner images highlighted significant differences in the data output from both core and non-core intervals. It was clear that automation over-emphasises low-angled features and misses a worrying number of higher-angled features. Even more concerning was the disparity in the classification of features between manual and automated data.

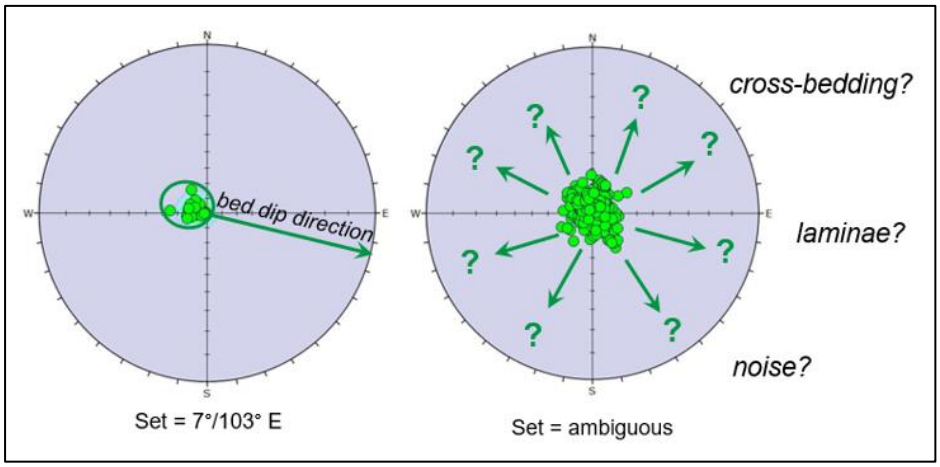

Figure 1: Manual (left) and automated (right) bedding picks from the same borehole

In boreholes with shallow dipping strata, automation picked an excessive number of low-angled features and classified these as bedding, but a large number of these were in fact cross-bedding, laminae and noise in the scanner image. On the other hand, a geologist carrying out a manual interpretation will select bedding on clear and distinct boundaries referencing the gamma and density logs to assist (Figure 1).

While bedding studies can be useful for green-fields projects, or to assist with the structural model, joints and fault zones are the gold we seek in an acoustic scanner interpretation. For core holes, the user should always review all information available that may include core photos, field geotechnical logs and lithology logs.

If the data has been captured, use it!

Remember the general rule of thumb – in sedimentary environments, joints will in general dip normal to bedding, so if bedding tends to be is generally flat-lying expect joint dip angles to be reasonably steep.

Automation seems to have missed the memo regarding this relationship between bedding and joints, as the process regularly classifies features with the same dip and azimuth as *both bedding and joints* (Figure 2). This results in confusing and poor joint set definition. Understanding how joint sets from a deposit interact will highlight any areas of potential rock mass instability, an important requirement for mine planning. Consider the consequences of a mine design that is based on poorly represented data.

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Ultimately, the orientation data from the acoustic scanner log is an *interpretation* only, whether it be manual or automated, the client has to be assured the data is reliable.

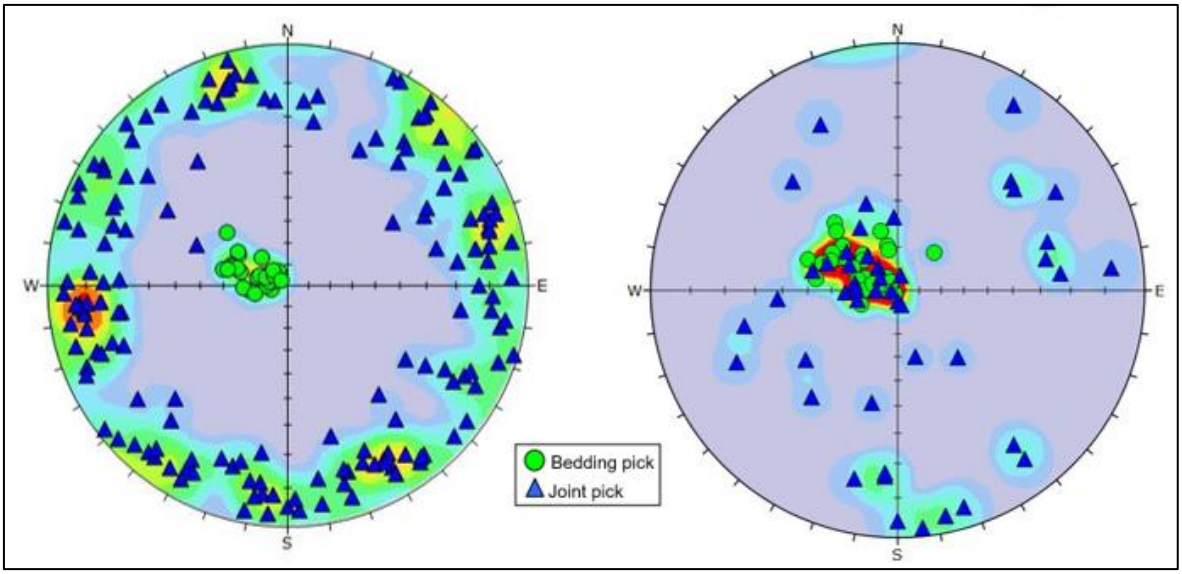

Figure 2 Manual (left) and automated (right) bedding and joint picks from the same hole; notice the overlap of bedding and joints from automation

An important question for mining engineers and planners is…can you use the orientation data with confidence? The answer may lie in the interpretation method.

4. Picking Fractures

We have to confess that our structure log is not precise. It is often better viewed as a polar plot where the general shape and distribution of the clusters is usually representative. It is often the counting of fractures and their classification that is imprecise.

Fractures tend to occur in groups over several metres where the fracture count increases. At the same time the shear wave front disappears and the resistivity drops. Neutron porosity and density might also be affected but to a lesser degree. All indicators are more sensitive to fractures in hard formations. These fractured zones might be highlighted on the final geotechnical log by clever combination or juxta - positioning of the various parameters.

More next time.