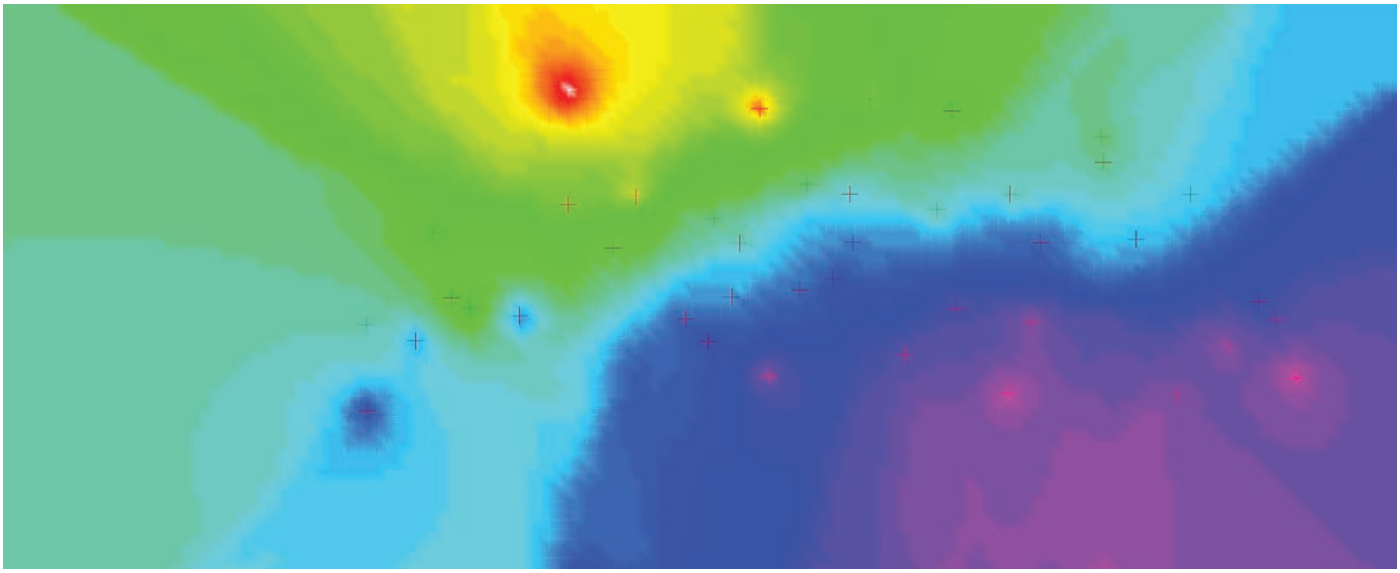
MAPTEK™ Vulcan™

COAL QUALITY MODELLING

Maptek™ Vulcan™ contains effective tools to enable geologists to create and update coal quality models.



Updating geological models for structurally complex or multi seam coal deposits can prove challenging.

USING VULCAN TECHNIQUES APPROPRIATELY WILL CREATE ROBUST COAL QUALITY MODELS THAT STAND UP TO REVIEW AND REGULATORY AUDITS.

Validation

Database validation is an essential stage. Vulcan includes comprehensive tools for collar and downhole checks, as well as coal quality variables. Tools exist for checking individual fields, data ranges and outliers, as well as along record checks on the sum of multiple values. Checks should be made for overlapping samples and for mismatches between lithology and quality tables.

Compositing

Intuitive compositing tools streamline setup of structural and coal quality data. First define whether to look up intervals and match the quality by sample numbers or by depth. The sample numbers in the quality table may not always match those in the lithology record, for example if samples have been combined for analysis. Depth is then relied on, so the depths in the lithology sheet must be checked against the quality intervals.

Tolerances can be set for missing and mismatched data. A coal seam fully covered by multiple samples is easily composited, but when estimating part of a seam, creating an allowance for samples to overlap slightly ensures valid composites are calculated without bias.

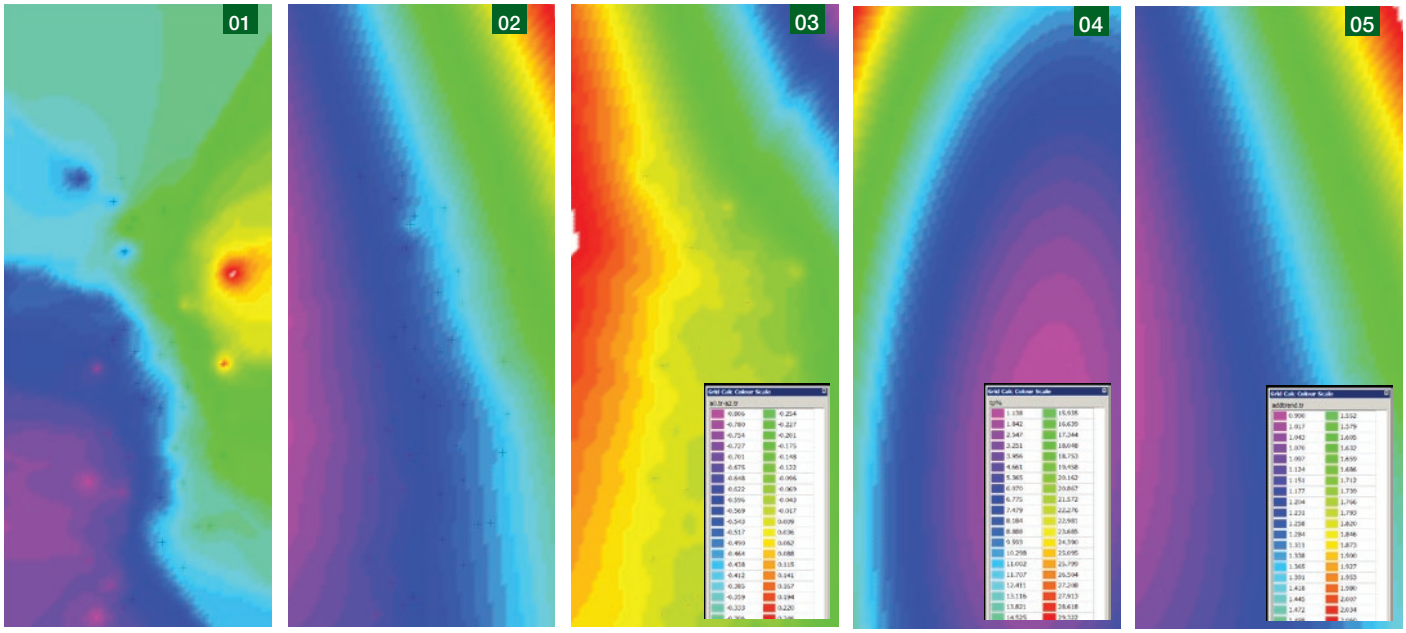
When core loss results in missing data, rules can be set to ignore minor gaps. If new drilling data is available, but the depths do not match due to adjusted geophysics, it is tempting to just use data rules to allow tolerances. However, it is important to amend the data to ensure the core samples are reporting to the correct interval.

A critical aspect of compositing is to weight the samples - by length for RD, by mass for raw qualities, and by mass and yield for washed product qualities.

Seam splitting

Seam splitting poses compositing problems where drillhole data is scarce. A database constructed from the FixDHD structural mapfiles can capture all valid ply combinations and can be a better alternative than the original lithology database for compositing.

Trending can give better results when data is sparse.



01 Without trending, cells beyond the data limits have unrealistic values
02 Cells beyond the data limits exhibit the regional trend when a trend surface is applied
03 The difference between trended and untrended models is only significant beyond the data limits
04 Minor seams may not have enough data to properly establish trend
05 Trend equation from a major seam is 'borrowed' to create a regionally consistent model

Vulcan will scan the parent seam as its child components, taking the true top and base of the seam while also estimating the location of the plies. Taking the FixDHD output as the reference for the quality model will bring in sampled drillhole data from all of the seams before and after splitting, resulting in better representation across the parent and child seams.

Merging grids

Vulcan tools are useful for merging the thousands of grids generated in quality modelling. The create multiple surfaces panel populates after the compositing run. Extents should equal the structural model and cell size should be a multiple of the model to avoid reserving problems.

In some cases it is necessary to include data from outside the final model extents. Vulcan Grid Calc replay files can be used to create a modelling macro, only setting the grid extents after all the data has been loaded. Resulting models more accurately honour the available data and better reflect the observed quality trends.

Trending

Care must be taken when using trending tools. When there is not enough data to properly establish the trend of minor seams, the trend surface can be 'borrowed' from a major seam or seam group. Noise in the data should first be removed. The differences between the original data points and the trend surface, called residuals, are modelled to form a grid. The trend equation is then added to each node of the residuals grid to produce the final seam variable grid.

Trending is ideal for quality variables that exhibit a regional, rank related trend, such as RoMax, Fluidity and Volatile Matter.

Some quality variables are best estimated by their correlation to other variables where there is little data, bore core results are inaccurate, or there is inconsistent handling of the samples. Trends in any of the input variables will usually be better reflected if the calculations are made from the component grids in Grid Calc rather than the base data. Grid Calc allows the use of complicated equations for derived quality variables.

Summary

Due care at each step of the validation and modelling process results in better coal quality models. Vulcan has tools to quickly and easily generate the many grids involved in coal quality modelling and the Grid Calc menus allow advanced manipulation of the data and calculations between grids. Scripts make complex and repetitive tasks easy, repeatable and auditable.

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