Case Study: Azinor Catalyst Hinson Prospect shows dramatic quality improvement and enhanced risk understanding after interactive pre-stack conditioning.

Situation Analysis:

Azinor Catalyst is pursuing an aggressive exploratory drilling campaign in the UK Continental Shelf based upon solid science, using leading-edge technology to augment their high-value asset portfolio. Sharp Reflections is working together with Azinor Catalyst to review their prospect inventory using its Pre-Stack Pro software, which works natively and interactively with pre-stack data. The goal of the Hinson project was to Quality Control (QC) and improve RMO, Multiple and Noise issues in the Hinson interval thereby limiting contamination on the primary reflectors, improving interpretation, and enhancing understanding of subsurface risk.

3D Quality Control:

Successful prospects based upon AVO analysis and inversions requires high-quality amplitude data. Pre-stack data QC is a critical (and sometimes overlooked) step to assess if data are contaminated with noise and remaining move-out. During seismic processing, QC is only done on a few test lines which is very small subset of the data and may not be representative of the prospect area. If the entire dataset is not scanned through, the degree of bias in Quantitative Interpretation (QI) will be unknown.

Health Check attributes are designed to give a quick assessment of seismic quality. They may be run on large volumes and are easy to calculate, at any stage of a data-conditioning flow. The result of each Health Check is one or more attributes, typically a map or a stack-sized volume, which can easily be investigated for anomalous or poor data quality areas. A range of different attributes is used to target specific, commonly observed issues in the seismic data, such as residual multiples, non-flat gathers, etc. Once Health Checks are completed, data conditioning can be applied in a test area, and then risk can be properly understood with the validated data. Two Health Checks were run in this project:

- RMO Attribute
- AVA NRMS

RMO Attribute

The RMO Attribute Health Check assesses event alignment on near, mid and far angle stacks. Colour codes are used to characterize the degree to which peaks (or troughs) are aligned on the three stacks, with white indicating full alignment. The Hinson Prospect shows a red event (i.e. the far stack) not aligned with the near and mid stacks in most places. This made apparent an overall trend of misalignment of the far stacks.

AVA NRMS

The AVA NRMS Health Check measures the similarity between a Shuey-model and the real data. It provides a view of the coherent noise content. A map extracted at the target shows high level of coherent noise contamination throughout the survey. Reds and greens (> 0.3) are used to clearly show what is beyond the threshold for noise contamination.

Post-Migration Processing:

A post-migration processing sequence was designed to reduce noise and improve gather alignment in the Hinson prospect area. Parameters for each filter were tested interactively on a small cluster computer, and optimized in less than a day.

After review, parabolic Radon, linear Radon, 2D Random noise attenuation, 3D Dip-steered noise attenuation, Bandwidth Extension and various other techniques were applied. Deliverables included conditioned CDP Gathers in the angle domain and new partial angle stacks with and without bandwidth extension.

After Radon

Raw   Applied Twice   Final Step
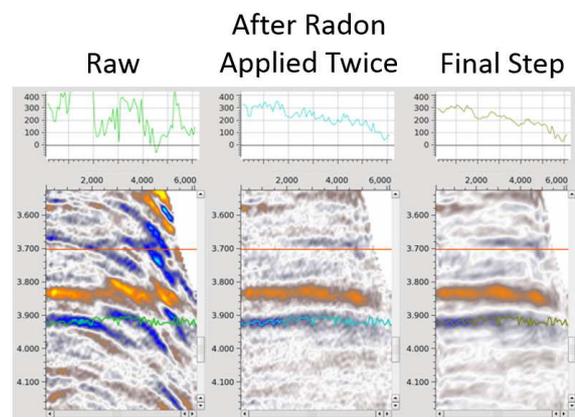
Result:

Azinor Catalyst quickly enhanced the quality of their seismic amplitude data, and gained a better understanding of the risk of the Hinson Prospect. This was done in a matter of days without costly full-reprocessing as all the work was done on post-migration

WITH PRE-STACK PRO, WE'VE SAVED MONTHS OF TIME AND UNCOVERED NEW AVO ANOMALIES IN ADDITION TO NOW BEING ABLE TO CARRY OUT A MORE ACCURATE QI ANALYSIS.

-Tim Bailey, Senior Quantitative Interpreter

data. Results led to better structural and amplitude interpretation through:

- Attenuating residual multiples and coherent noise effectively
- Improving coherency of primary reflections both in offset and spatially
- Improving the flatness of the events across angles
- Decreasing the content of low frequency noise on the far angle stack
- Allowing increase in detail in some areas by bandwidth extension.

About Azinor Catalyst:

Azinor Catalyst is a Seacrest Capital Group-backed E&P company, focused on the United Kingdom Continental Shelf. The company is a qualified UK offshore operator and is focused on generating significant value for its stakeholders through advanced seismic technology and other geotechnical de-risking technologies ahead of drilling oil & gas exploration opportunities.

About Sharp Reflections:

Sharp Reflections is an innovative provider of software and services for pre-stack seismic QC, processing, and amplitude interpretation. Pre-Stack Pro, its flagship software, helps clients mine large pre-stack data sets to quickly extract information and define drill targets. Demand for pre-stack data analysis is growing throughout the industry, and Sharp Reflections is defining the leading edge.
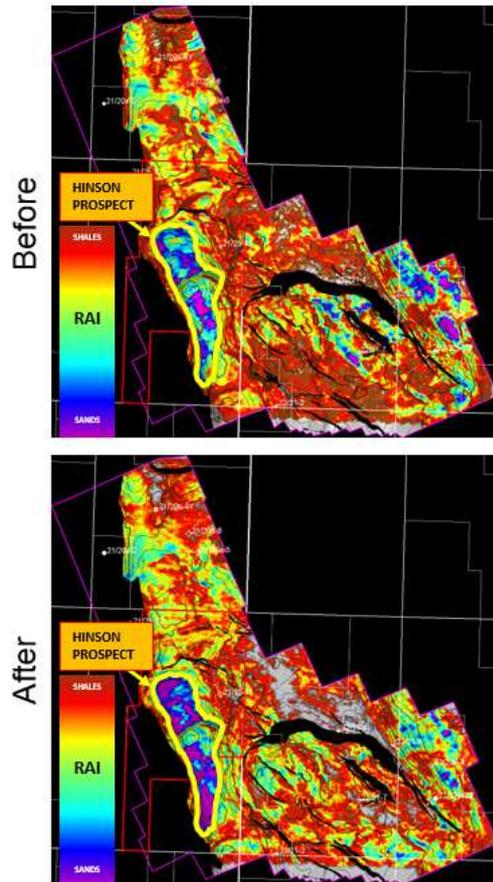
Map of relative AI derived from the conditioned seismic – Before and After. This shows a soft sand becoming more extensive and clearer at the Hinson Prospect.
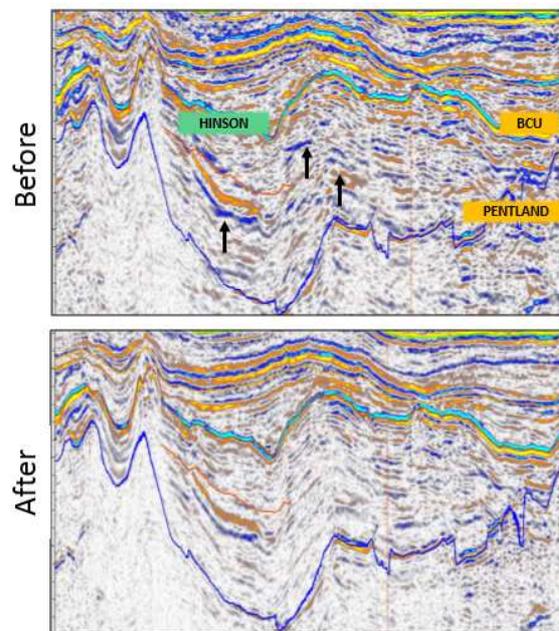
Near stack sections before and after application of Radon, trim statics and both random and coherent noise removal. Significant multiple energy and other coherent noise has been removed resulting in a more interpretable section.
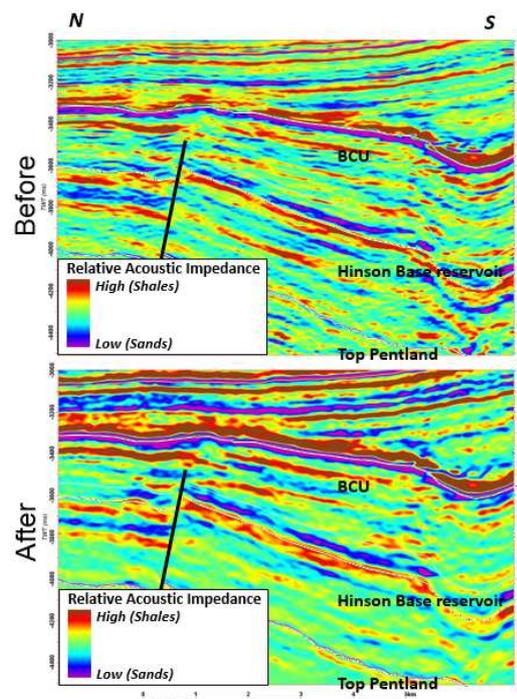
RAI Before and After shows that after targeted data conditioning, a more well-defined contrast between sands and shales becomes apparent.