iON

Swath Matching on Mid North Sea High (MNSH) 3D Survey

Demonstrating the benefits of predicting oceanic currents on survey efficiency

ION's seismic acquisition experts have applied the swath matching technique during the acquisition of a 3D seismic survey in the North Sea, achieving increased efficiency and reducing operational costs.

The Challenge

Towed streamer seismic surveys face many challenges associated with complex sea tides and current patterns which can impact negatively on the overall economy and efficiency of seismic projects. The negative effects can be seen in all areas of the project:

→ Signal to noise ratio of the acquired data
→ Nominal acquisition geometry – pushing the receiver spread out of its intended position
→ Irregular Common Mid Points (CMPs) leading to CMP coverage gaps in between the adjacent passes
→ Excessive CMP over binning of near or far offsets
→ Seismic processing interpolation and regularization algorithms not being able to handle the gap dimensions for each offset group
→ The need to acquire additional infill lines resulting in increased time and cost of the survey

ION Solution

Swath Matching Technique via ION Operations Optimization Software (delivered as a service)

→ Swath matching provides flexibility in the planning process by increasing the number of lines that can be feather matched for optimal CMP coverage
→ As feather changes, it is possible to move between sub-swaths, achieving a more accurate feather match between adjacent sail lines while reducing the need to steer for coverage

→ The method is driven by oceanic current models that are continuously updated in the field: the more accurate current models are the lower infill requirements will be
→ Plan efficiency is measured in Unique Bins Per Hour (UBPH)
→ This provides the infield planning team with the ability to test the economy of an extended plan against a racetrack scenario
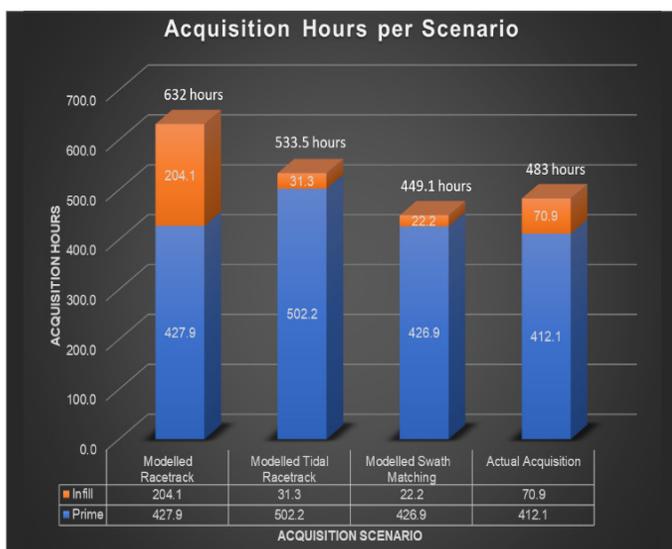
ION Result

The Mid North Sea High (MNSH) 3D survey was located over the Dogger Bank, 200 km east of Newcastle, off the east coast of the United Kingdom in the North Sea. The first phase of the project was acquired during 2020 over an area of 1,750 km^2. Three acquisition strategies were considered when acquiring the MNSH 3D survey: racetrack, tidal racetrack (delaying the start of line to match the tide) and swath matching.
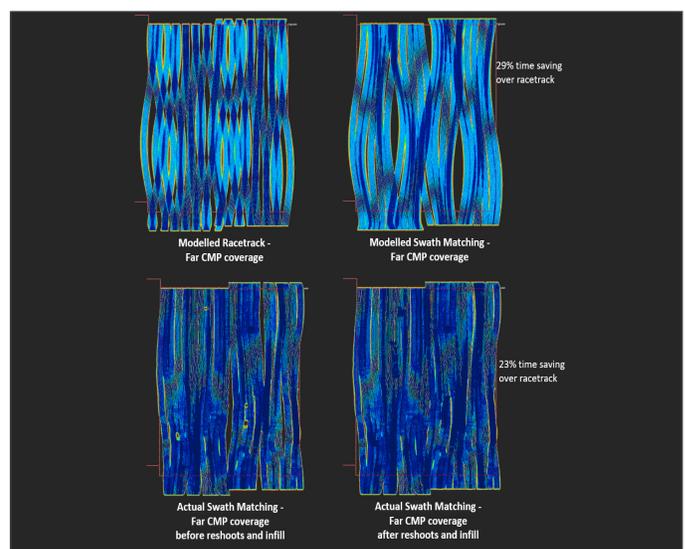
When comparing the different acquisition strategies through time and motion modelling, the swath matching scenario exhibited the most efficient results in terms of infield implementation.

Once implemented in the field, the swath matching method provided excellent results during the acquisition of the MNSH survey Phase 1. Not only were extended line changes minimized but feather matching between adjacent lines was excellent, and resulted in low infill requirements and a very regular dataset in terms of CMP density distribution. Even with additional infill passes and reshoots, actual time savings were about 23% relative to a modelled racetrack scenario.

Finally, the addition of remote QA/QC via web-based dashboards provided project managers with greater visibility on survey progress as well as updated metrics that ensured that stakeholder confidence in the method was maintained for effective decision making.

Macro Planning

ACQUISITION SCENARIO	Modelled Racetrack	Modelled Tidal Racetrack	Modelled Swath Matching	Actual Acquisition
Infill	204.1	31.3	22.2	70.9
Prime	427.9	502.2	426.9	412.1

CMP Coverage

About ION

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