Weathering the storm

Brendan Crowley and Shik Sundar, Sofar Ocean, USA, evaluate the importance of data in helping the dry bulk industry become more efficient, make better business decisions, and reduce emissions.

In the open ocean, weather is king. Far from land and its technological creature comforts, the most remote parts of the Earth's seas are data deserts, exposing any industry that interacts with them to hard-to-predict nautical conditions.

For dry bulk carriers, this uncertainty is costly. An unforeseen encounter with stormy seas can turn an uneventful voyage into a financial nightmare, with lost commodities, delayed transit, fuel overconsumption, and an imperiled crew all material risks. Major incidents are rare, but, when they do occur, Mother Nature is sure to be involved.

Climate change is exacerbating these weather impacts. Atmospheric warming has led to ocean warming which, in turn, has increased the strength of waves. Since 1948, global wave power has increased at a rate of 0.4% per year, an annual clip that jumps to 2.3% when limited to years after 1994.[1,2] These bigger waves will lead to bigger losses; according to a study by the Environmental Defense Fund and RTI International, climate change could cost maritime trade up to 11.8 billion t of cargo by the end of the 21st century.[3] Simply put, as the sea continues to energise, it will become an increasingly inhospitable and costly arena for maritime trade.

A sensor-powered solution

Worsening weather is a worrisome trend for the dry bulk industry, which is already bracing for an uncertain future. Forthcoming regulations limiting the amount of carbon dioxide (CO_2) that carriers can emit and the persistent threat of market volatility both have the potential to compress margins, requiring carriers to constantly optimise where they can.

One way to do so is to ensure that vessels can travel from port to port as efficiently as possible. San Francisco-based startup, Sofar Ocean, has built an ocean intelligence platform powered by a global network of weather sensors, which number in the thousands and are distributed along coasts and across all five oceans.The sensors, known as Spotters, are basketball-sized buoys that act as all-in-one marine weather stations, providing real-time wind, wave, and sea surface temperature data.

Sofar compiles the real-time data collected by its distributed global Spotter network, assimilates it with existing models used by the National Oceanic and Atmospheric Administration (NOAA) and data from the European Centre for Medium-Range Weather Forecasts (ECMWF), and produces an improved weather forecast. Critically, forecasts incorporating insights from the Spotter wave buoy network have demonstrated "...end-to-end improvements in forecast skill of significant wave height of 38%, and up to 45% for other bulk parameters."[4] Such substantial error

reduction highlights the importance of increasing both the quantity and quality of in-situ open-ocean wave and weather observations.

The company's sensor network is the engine powering its Wayfinder tool, which provides carriers with continuously optimised routing recommendations based on real-time weather reports generated by the 700 Spotters that Sofar has deployed in the open ocean. Each recommendation is vessel-specific and is tailored to its individual fuel, speed, emissions, and safety goals.

Wayfinder was built with the low bandwidth environment of the open ocean in mind. Each Spotter is connected to the Sofar data platform via an Iridium satellite, which keeps weather data flowing regardless of how remote a vessel's location is. With Spotters covering all major commodity shipping corridors, from the Agulhas Current to the tidal currents between Australia and China, dry bulk carriers can rest assured that they will have access to actionable weather data while transiting any conventional route.

Figure 1. Sofar Ocean's Spotter provides real-time weather data for vessels in the open ocean.

Sector perspective: sustainability

Voyage optimisation, of course, is not as simple as getting a vessel from point A to point B as quickly as possible. Other considerations must be taken into account, perhaps none more pressing than sustainability.

Starting in 2023, the International Maritime Organization (IMO) will implement multiple regulations aimed at helping shipping go green, namely the Carbon Intensity Index (CII). CII will assign every vessel that is above 5000 GT and operating internationally an annual rating between A (best) and E (worst) based on its performance against carbon intensity benchmarks, which will become increasingly stringent over time. Specifically, CII will measure how many grams of CO_2 a transiting vessel emits relative to its fuel consumption, distance travelled, and tonnage. This will provide a snapshot of a ship's environmental impact while it is in motion.[5]

Operators of vessels that receive an E grade will need to immediately produce a corrective action plan, as will vessels that receive a D grade for three consecutive years.[6] According to Campbell Johnston Clark, an international marine shipping law firm, an estimated 60 – 70% of bulk carriers will be subject to CII,[7] a figure that signals that an industry-wide shift towards emissions reduction efforts will be necessary.

If the forecasted CII grades of vessels in adjacent industries are any indication, dry bulk carriers face an uphill compliance battle. According to Panos Mitrou of Lloyd's Register, more than 65% of the existing LNG fleet will likely achieve a D or E grade when regulations go into effect in January 2023.[8]

Sofar's Wayfinder tool was built with CII in mind. When optimising a vessel's route, users can assign a cost function based on a target CII rating, which Wayfinder will factor into its routing recommendations. This enables owners and operators to manage their emissions output in real time.

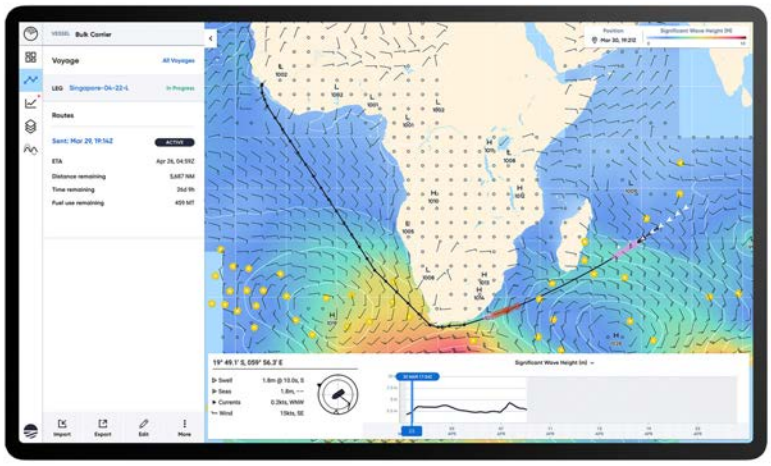

Figure 2. The Sofar Wayfinder dashboard. Optimised routes are pushed out to vessel operators in real time.

Sector perspective: market volatility

It is no secret that the dry bulk market is in the midst of a volatile period. After a sustained period of substandard freight rates following the 2008 global financial crisis, the sector experienced a rapid turnaround in 2021, with rates reaching their highest level this decade. This rally, however, slowed sharply in the final months of the year, contributing to a pattern of instability that is expected to persist.[9,10] Add in the threat of rising fuel prices and the possibility of a global economic slowdown that would compress margins and slow commodity purchases, and dry bulk carriers will be

wise to rapidly optimise what they can and insulate themselves against market swings.

Sofar believes that Wayfinder can help dry bulk carriers do just that. The tool – which requires no hardware installation, no capital expenditure, and minimal product training – uses a vessel's historical noon report data, its physical properties, and real-time weather data, to make fuel efficiency and speed recommendations. These insights save critical funds for ships and help predict performance in all ocean conditions.

Berge Bulk CEO, James Marshall, has seen significant financial savings at the voyage level since implementing Wayfinder. By using Wayfinder's data and voyage optimisation, the company has achieved efficiency gains in the range of 4.5% on dedicated voyages, which translates into up to 14 additional sailing days per year per vessel.

Additionally, Wayfinder allows users to set custom seakeeping thresholds for unfavourable vessel motion alerts, better preparing captains and crews to traverse stormy seas smoothly. What constitutes an unfavourable motion varies based on a vessel's design; for dry bulk carriers, which have low freeboards and are vulnerable to spray, Wayfinder's seakeeping feature is especially critical from a deck operations safety perspective and for preventing weather-induced damage to cargo.[11]

Furthermore, because Wayfinder can help a vessel achieve an improved CII rating via sustainably-minded routing recommendations, owners can expect the value of their asset to increase. As emissions regulations tighten and expenditures rise to meet them, this valuation will be increasingly critical.

Looking Forward

The dry bulk shipping industry will play a critical role in the global effort to usher the ocean economy into its next phase. Having access to real-time data will reduce the uncertainty brought on by this shift and help vessel owners and operators make better business decisions.[12]

Sofar Ocean is building the tools necessary to unlock this data. Its distributed Spotter network is vast and expanding quickly, and via the Wayfinder tool, can feed a vessel critical wind, wave, and sea surface temperature data, no matter what pocket of the ocean it is in. And, because routing priorities are vessel-specific, users can be assured that their unique fuel, speed, sustainability, and seakeeping priorities are reflected in every Wayfinder recommendation.

Dry bulk carriers are navigating a handful of hurdles simultaneously. Volatile markets are introducing rate uncertainty, new regulations are making sustainability a bottom line item, and, intertwined with each, climate change is creating increasingly hostile conditions in the open ocean. As a result, vessel owners and operators must prioritise route optimisation strategies or risk succumbing to forces outside of their control. DB

Figure 3. A Sofar Spotter being deployed via a dry bulk vessel.

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A comprehensive list of this article's references can be found on the *Dry Bulk Magazine* website: https://www.drybulkmagazine.com/special-reports/

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