ROXBURGH

INTERCARGO
INTERNATIONAL ASSOCIATION
OF DRY CARGO SHIPOWNERS

IGP&I

Safe Carriage of Nickel Ore Cargoes in the South-Western Pacific Ocean

Introduction

Since 2024 there has been a significant increase in the volume of nickel ore exports from both the Philippines and the Solomon Islands located in the south-western Pacific Ocean. This surge in exports corresponds with heightened mining investments in these regions, driven by global demand for nickel in applications such as electric vehicle battery production and new processing facilities in Indonesia and China. However, this growth has raised substantial concerns about the suitability of some export materials for safe shipment.

The exports from both regions are expected to increase as investment has been diverted into alternative supply sources. Without improved practices, the frequency of nickel ore cargo incidents is likely to continue to occur.

This Circular has been prepared by the International Group of P&I Clubs in conjunction with INTERCARGO and Roxburgh. It aims to highlight the challenges associated with the export of nickel ore from this region and to provide recommendations to Members to help mitigate the associated risk.

Regional Geology and Material Characteristics

Nickel ore from the Philippines

(e.g. Surigao, Dinagat) and Solomon Islands is typically direct-shipped ore (DSO) with minimal processing on shore prior to loading, leading to variability in appearance, composition, and particle size. Cargoes presented for loading mainly consist of finer materials, such as soil and clay. The presence and proportions of these finer fractions (silt and clay) in a consignment is vitally important as they typically dominate how the material will behave.

The underlying geology of the nickel export products is dominated by high proportions of mineral clays and fine particles resulting in cohesive and low-drainage characteristics that retain moisture. It is these underlying characteristics that make the nickel ore from these regions more susceptible to strength loss (liquefaction, dynamic separation and cyclic softening) and stow instability (cargo shift) when exposed to cumulative stress from ship motions, even when cargoes presented for loading do not appear overly wet and include a combination of large and small particles.

The cohesive nature of finer fractions generates interparticle forces that retain water, reducing material strength under cyclic stress from ship motions. This induces cyclic softening (commonly termed liquefaction or dynamic separation), where a cargo

compacts and the degree of saturation increases, resulting in a rise in pore water pressure and incremental degradation of strength. In saturated states, the material transitions from solid-like to plastic or fluid behaviour, leading to stow instability.

Regulatory Framework

Nickel ore has a Group A hazard classification and is listed in the IMSBC Code appendix 1 individual schedules.

When a Group A cargo is carried, the shipper shall provide the ship's Master or their representative with a signed certificate of the TML and a signed certificate or declaration of the moisture content, each issued by an entity recognized by the competent authority of the port of loading. The certificate of TML shall contain, or be accompanied by, the result of the test for determining the TML.

When a Group A cargo is carried, the shipper must establish procedures for sampling, testing and controlling moisture content to ensure the moisture content is less than the TML when it is on board the ship. If the cargo is loaded on to the ship from barges, the shipper must include procedures to protect the cargo on the barges from any precipitation and water ingress. Such procedures must be approved and their implementation checked by the competent authority of the port of loading. The document issued by the competent authority stating that the procedures have been approved shall be provided to the ship's Master or their representative.

When a Group A cargo is to be loaded into more than one cargo space of a ship, the certificate or the declaration of moisture content shall certify the moisture content of each type of finely grained material loaded into each cargo space. Notwithstanding this requirement, if sampling according to internationally or nationally accepted standard procedures indicates that the moisture content is uniform throughout the consignment, then one certificate or declaration of average moisture content for all cargo spaces is acceptable.

Operational Challenges in Exporting Regions

1. In both the Philippines and Solomon Islands, the size and effectiveness of shipper's operations are highly variable. Established Philippine operations may have some material management procedures in place, but there are typically significant inconsistencies and a lack of controls over material composition and moisture content prior to loading.
2. The newer or reopened Solomon Islands mines often lack robust procedures, with sampling quality ranging from superficial pit methods to full-depth drilling, resulting in limited availability of accurate data on how a material composition varies.
3. It has been observed that many shippers have become increasingly restrictive and do not permit surveyors appointed on Members' behalf to attend pre-loading surveys, instead accepting only those survey companies nominated by themselves.
4. In some places, competent local qualified surveyors are not available. Pre-loading surveys can only be conducted remotely, and the results are generally unsatisfactory.
5. Roxburgh has noted there is a limited shipper understanding of the risks associated with the shipment of nickel ore cargoes and that some operations and local surveyors solely rely upon the fact that previous shipments have allegedly arrived at the disport without incident, leading to systemic issues such as self-regulation and unverified "in-house" material testing.
6. Roxburgh also notes that a small number of operations in the Solomon Islands have engaged credible third-party experts for sampling and testing protocol / procedural set-up. However, even in those situations, inconsistencies and errors in the interpretation of the test data is commonplace.
7. Incorrect selection and application of the flow table TML test procedure is commonplace.
8. Local surveyors regularly demonstrate an incorrect application and interpretation of complementary test procedures, such as the can test and grasp test.
9. Apparent inaccuracies of moisture content and the TML test certification is commonplace. The Shippers Declarations and FMP/TML/moisture content certificates provided by shippers often show errors of approximately 6–10%, with moisture content sometimes showing even greater deviations.
10. Shippers have inadequate moisture management procedures to protect the material from exposure to repeated or significant rainfall during stockpiling, transportation via barges and transhipment.

11. Roxburgh has observed that a shipper's particle size distribution (PSD) data, when provided, is often derived from a dry screening method, which can under report the fines and clays size fractions that typically control the behaviour of the consignment, resulting in a misunderstanding and misrepresentation of the risks associated with the shipment of the consignment.
12. Average moisture contents being declared to within 0.2 to 1% of the TML are commonplace. A key challenge with unprocessed direct shipped ores (DSO) is the inherent variability in its composition, which is beyond the shipper's control and directly leads to significant fluctuations in moisture content. As a result, it is not realistically possible for any shipper to maintain moisture levels within a narrow tolerance of 0.2–1% below the TML. In practice, moisture content can vary by 2–3% across a single consignment, meaning that even where the declared average is compliant, portions of the cargo are likely to be loaded above the TML.
13. Declared moisture content is typically around 35% yet the cargo can appear dry due to water being bound by the finer fractions, which make the use by local surveyors of complementary test procedures that rely upon a visual assessment methodology, such as the can test and grasp test, highly inaccurate and misleading.
14. This growing trend has coincided with reported 'near misses' involving minor cargo shifts during voyages, as well as more severe incidents, including significant cargo shifts and liquefaction events.

Shipper Sampling and Testing Requirements

Representative sampling of the consignment by the shipper is therefore essential to allow an accurate assessment of its cohesive tendencies, ability to drain and likely response to stress from vessel motions, taking into consideration:

1. Type of material;
2. Particle size distribution (PSD);
3. Composition of the material and its variability;
4. Manner in which the material is stored and transported in stockpiles, barges, rail wagons or other containers, and transferred or loaded by material-handling systems such as conveyors, loading chutes, crane grabs, etc;
5. Chemical hazards (toxicity, corrosivity, etc.);
6. Characteristics which have to be determined: moisture content, TML, bulk density/stowage factor, angle of repose, etc.;

7. Variations in moisture distribution throughout the consignment which may occur due to weather conditions, natural drainage, e.g. to lower levels of stockpiles or containers, or other forms of moisture migration;
8. Variations which may occur following freezing of the material;
9. Aspects such as the PSD, composition and variability of each portion of the consignment are essential to allow an accurate safety assessment of the material's cohesive properties, ability for moisture to drain and its likely response to stress from vessel motions; and
10. In accordance with IMSBC Code section 4.4.4, any substantial portions of the material which appear to be contaminated or significantly different in characteristics or moisture content from the bulk of the consignment must be sampled and analysed separately. Depending upon the results obtained in these tests, it may be necessary to reject those particular portions as unfit for shipment.

Recommended Information to be Requested prior to fixing

A shipper of Group A cargo shall be able to provide advanced information demonstrating how they comply with the requirements of the Code. When conducting due diligence with charterers prior to fixing the ship (or accepting an order), it is advised that Members request information such as that set out in the points below. If there is a reluctance or inability to provide this information it may indicate that the shipper is not complying with SOLAS Convention Chapter 6 Regulation 1, Regulation 1-1, Regulation 1-2 & Regulation 2. The information provided by shippers will likely need reviewing by an expert and which can create an opportunity for proactive dialogue.

1. Detailed procedures on sampling, testing and moisture control.
2. Evidence that the procedures have been approved and their implementation checked by the competent authority of the port of loading.
3. What national or international standards the shipper's laboratory employs for sampling and testing purposes.
4. Evidence that the shipper's laboratory has been recognised by the competent authority of the port of loading.
5. Laboratory test data, including moisture content, TML and particle size distribution range.
6. What assessment was undertaken by the shipper to ensure the TML test procedure selected is appropriate for the material intended for loading.
7. What methodology the shipper's laboratory uses to determine the flow moisture point and/or TML.

8. Photographs of the stockpiles and sampling activities.
9. What procedures the shipper has for predicting and monitoring rainfall events.
10. How the shipper assesses and evidences the impact of a rainfall event on the moisture content of each portion of the consignment.

Loading and Voyage Considerations

The ship's Master should monitor weather forecasts and ensure that cargo loading operations are suspended during periods of rain.

As cargo consignments are typically barge-delivered and tarpaulin-covered to mitigate against moisture ingress, the covers are removed for loading and should be reapplied prior to or during rainfall events. A ship's Master should monitor for rainfall at the barge loading location and reject uncovered barges that have been exposed to significant rainfall until the shipper can demonstrate the cargo has been re-sampled through its depth profile, re-tested and has a demonstrable moisture content profile less than its TML.

Shippers often attempt to air-dry rejected barges, but this is highly ineffective for clay-rich materials such as nickel ores, typically only yielding limited surface drying. The ship's Master should therefore be sceptical of any previously rejected portions of the consignment that are allegedly air-dried and re-presented for loading.

The ship's Master should carefully examine cargo offered for loading from barges / landing craft and if in any doubt of the moisture content, conduct can tests particularly when rain has been experienced. The can test is described in section 8 of the IMSBC Code as a spot check a Master can conduct if he is suspicious of the condition of the cargo, but it is not meant to replace or supersede laboratory testing which is the responsibility of the shipper. Section 8 states that if the sample shows signs of free moisture or fluid conditions, arrangements should be made to have additional laboratory tests conducted on the material before it is accepted for loading. Nevertheless, the cargo should never be accepted on the basis of the can test alone as it is difficult to accurately interpret the behaviour of the sample in the can and accordingly its moisture content.

The high clay content of nickel ore often predisposes cargo consignments to a reduction in strength from repeated shore handling, barge loading, transhipment and vessel motions on passage. This characteristic can result in an unexpected and rapid failure of the cargo stow occurring on passage.

It is therefore important for a ship's crew to undertake regular daily cargo inspections during the voyage where safe to do so. The inspections should look for any of the following changes to the cargo stow:

1. Reduction in height;
2. Flattening profile;
3. Softening of the periphery;
4. Surface water/slurry (dynamic separation);
5. Gaps developing between stow and bulkheads / side shells;
6. Cargo holds bilge soundings.
7. Rhythmic stow movement with vessel motions;
8. Cargo shift.

If any of the above changes appear to be occurring then the ship's crew should seek third party expert support and take action to reduce the energy input into the cargo (e.g., avoiding beam seas). The provision of photographic / video evidence during the cargo inspections significantly aids the effectiveness of the third-party support.

Additional Recommended Precautions

1. Loading should not be commenced until the Master is in possession of all requisite cargo information and documentation/certificates that a shipper is obliged to provide under the IMSBC Code or local regulations (where not in conflict with the IMSBC Code) and is satisfied that the cargo is safe to load and carry. The Moisture Content Certificate should be issued no more than seven days before loading commences, in accordance with the IMSBC Code; and
2. Following consultation with the Association, Members should consider appointing a surveyor on behalf of the ship in advance of loading to assist the Master. However, when communicating with the competent authority shippers and charterers it should be made clear that the appointment of a surveyor by the ship is not intended to and does not relieve the shipper of his obligations under the IMSBC Code or local regulations (when not in conflict with the IMSBC Code).

   The terms of the surveyor's appointment may include but are not necessarily limited to the following:

   (a) To assist the Master with compliance with his obligations under the IMSBC Code and local regulations (when not in conflict with the IMSBC Code).

(b) To contact and liaise with shippers to identify the stockpiles from which the cargoes are to be shipped on the subject vessel and to confirm that representative samples are correctly taken by the shipper in accordance with sections 4.4 and 4.6 of the IMSBC Code.

(c) To take Members' own representative samples for testing in an independent laboratory working to recognised national and/or international standards which may be located outside the country.

(d) To liaise with an independent expert to ensure that the shippers laboratory conducts its moisture content and TML testing in accordance with Appendix 2 of the IMSBC Code and/or recognised national/international standards.

(e) To compare the shipper's certificates with Members own test results for TML and moisture content. Masters should be wary of moisture content certificates provided by the mines laboratories and average moisture content percentages that are very close to the TML, and/or do not represent the compositional variability of the consignment. If there is significant rain between the time of testing and the time of loading the shipper must conduct check tests to confirm the moisture content of cargo consignment is less than the TML.

(f) To monitor the loading operation from start to finish, paying particular attention to the weather conditions and the presence of any moist and compositionally variable cargo in the barges / landing craft.

(g) To stop loading if further moisture and/or can tests are required, as necessary, on any parts of the cargo presented for shipment (sections 4.5.2 and 8.4 of the IMSBC Code).

(h) To monitor the stockpiles and/or barges to confirm that the cargo presented for shipment is from the designated and tested stockpiles and/or barges. This will involve keeping a careful tally and identification of barges / landing craft offered for loading.

3. If the Master or the appointed surveyor is presented with any document seeking their confirmation that the cargo is safe to carry, they should refuse to sign it. The obligation under the IMSBC Code is on the shipper to declare that the cargo is safe to carry and signing such a document could prejudice a Members rights of recourse against a shipper in the event of a subsequent casualty.

4. Report any instance of commercial pressure exerted on or intimidation of the Master, surveyor or experts to the Association so that this may be taken up by the Group with the Indonesian/Philippine/ Solomon Islands authorities.
5. Members should consider how they might protect themselves contractually before agreeing to carry nickel ore cargoes e.g. including BIMCO Solid Bulk Cargoes that Can Liquefy Clause for Charter Parties 2012. Equally Members should not be pressured to enter into charterparties which restrict their right to fully apply the provisions of the IMSBC Code, appoint independent surveyors of their choice or take and test cargo samples.
6. Members should refer to the Club any contractual and/or safe carriage concerns it may have relating to nickel ore cargoes loaded in Indonesia, the Philippines and Solomon Islands

Possible Prejudice to Club Cover

Members should be aware that they may be prejudicing Club cover if they fail to notify the Clubs that they plan to fix or charter a ship, or that a ship has been ordered, to load nickel ore from a port in Indonesia, the Philippines or the Solomon Islands.

All Clubs in the International Group have issued a similar Circular.