Cargo liquefaction – Regulatory developments
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Cargo Liquefaction

SYNOPSIS

INTRODUCTION TO LIQUEFACTION – Current regulatory regime; the science of liquefaction

NICKEL ORE - Loading conditions; When liquefaction occurs – the consequences for ships/seafarers;

IRON ORE FINES – Similarities with Nickel Ore; trading patterns

SHIP RELATED ISSUES – Forces on the ship; research discussions; regulatory consequences from IMO: w/e 21 September 2012
Introducing Intercargo

• INTERCARGO: International Association of Dry Cargo Shipowners, established in 1980.

• Promotion of Safety, Quality, Efficiency, Protection of the Environment and Profitability in the dry bulk shipping industry.

• More than 160 members internationally representing over 900 dry bulk vessels.

• Founder of “Round Table” of Maritime Associations with BIMCO, ICS and Intertanko.

• Observer status at the International Maritime Organization (IMO).

• Members include: China Shipping, Vale, Rio Tinto etc
Context: Newbuildings / Internationally trading fleet

- 2011: 1,100 ships delivered
- 2012 (September): 653
- 2012 scrapped (Sep): 335

Characteristics:
- Challenging trading conditions
- Delivery market maturing
- Ordering / replacement much reduced.
- Linked to operating cost reductions?
Cargoes, hazardous

Risks to ships / seafarers

- Liquefaction (e.g. Nickel Ore) (Category “A”)
- Chemical, fire & explosion (e.g. DRI) (Category “B”)
- Others (e.g. environmental hazards, Neither A nor B = (Category “C”)
- IMSBC mandatory since Jan 2011 with two-yearly updates to schedules
Group A Cargoes: Liquefaction

Bulk Cargoes consist of individual particles:

- Under extreme circumstances the solid behaves as a liquid = Liquefaction

- **IMSBC Code, Section 7.1.1**: “Cargoes may appear to be in a relatively dry granular state when loaded, and yet contain sufficient moisture to become fluid under the stimulus of compaction & vibration which occurs during the voyage”

- Liquefaction may occur when the moisture content (MC) exceeds the Transportable Moisture Limit (TML) which is 90% of the Flow Moisture Point (FMP)
Liquefaction – Consequences and Control Mechanisms

- Over 15 months in 2010-11, 4 ships sank with 66 lives lost

- Loss of stability = grounding or total loss

- Regulations tightening & public opinion against irresponsible stakeholders, especially ashore

- Regulatory Oversight by the Competent Authority at the port of loading = Governments

- Commercial – receivers view
Context: The Nickel Ore trades

- Nickel Ore trade
  - Indonesia, Philippines, New Caledonia
  - 45m tonnes shipped in 2011, mainly to China
  - Indonesian Export tax: May 2012 – 50% + reduction in shipments

- Smaller ships: Supramax and below

- Casualties
  - Jian Fu Star, Nasco Diamond, Hong Wei and Vinalines Queen
  - 66 lives lost in just over 15 months
  - Concerns: sampling, testing, certification, stockpile management
Cargoes: Liquefaction – Nickel Ore
Intercargo Work Programme

Cargoes: Liquefaction
Cargoes: Liquefaction – Nickel Ore
Nickel Ore – balancing the responsibilities / addressing failures

Shipper
• No misrepresentation: correct BCSN name
• Sampling, testing and controlling the moisture content
• Allow access to stockpiles
• Competent Authority independent of shipper

Chartering Department
• Refuse C/P clauses banning independent surveys

Owner
• Awareness campaign with Master; P&I mandatory pre-notification from June 2012. Draft IMSBC schedule agreed - September 2012
Intercargo Guide for the Safe Loading of Nickel Ore (1 Feb 2012)

Aims to:

• Raise awareness
• Engage multiple stakeholders
• Encourage due diligence
• Identify responsibilities
• Ship cargo safely
Intercargo Guide for the Safe Loading of Nickel Ore: What Should I Look For?

- **Shipper's Declaration provided?**
  - Yes: Go to next step.
  - No: Do not load.

- **Correct BCSH used?**
  - Yes: Go to next step.
  - No: Do not load.

- **TML Stated?**
  - Yes: Check moisture content.
  - No: Do not load.

- **Moisture Content (MC) certified?**
  - Yes: Go to next step.
  - No: Do not load.

- **MC = TML?**
  - Yes: Check visual inspection.
  - No: Do not load.

- **Visual Inspection OK?**
  - Yes: Continue loading.
  - No: Stop loading.

- **Visual monitoring OK?**
  - Yes: Continue loading.
  - No: Stop loading.

**additional notes:**
- **Independent Testing:** Where doubt exists concerning any cargo declaration, independent testing should be conducted as a verification tool. If below TML and/or the cargo appears wet/jettison when tested, or there is suspicion that the cargo has been mis-sampled, independent cargo testing to determine the MC, TML, and actual moisture content of the cargo to be loaded should be carried out.

- **Scan Tests:** May indicate when a cargo has exceeded its FPR. Confirming the cargo should be rejected and independent testing carried out. The CanTest cannot demonstrate the cargo moisture content is less than the TML. This may only be determined by laboratory tests. A cargo cannot be accepted for loading based on CanTest alone.
Cargoes, hazardous – ‘Group A’: Liquefaction (iron ore fines)
Cargoes: Liquefaction – Iron Ore Fines – the trades

• Very significant trade: (Iron Ore seaborne trade: 1.115b tons 2011 [Unctad])

• Many loading countries including Brazil and Australia

• Geological differences, moisture and “free water”

• Test methods used for analysis of materials
  – Flow Table test
  – Penetration test
  – Proctor Fagerberg test
Cargoes: Liquefaction – Iron Ore Fines and DSC.1/Circ 66

West of England: Loss Prevention Circular

Sinter feed loaded at Ponta da Madeira after liquefaction onboard

Sinter feed covered by free water which developed on passage
Cargoes – Iron Ore fines : Recent developments

- Industry (P&I and Round Table visit to Vale : May 2012

- Interim results ex Brazil (Vale) & Australia (RTZ/BHP) at IMO DSC 17 w/end 21 Sep 2012

- DSC 18 (Sep 2013) to finalise IoF schedule : e.i.f 1.1.2017

- IMO Circ 66 “as is” until finalisation but with “early implementation” .
Cargoes: Iron Ore Fines & Implications for Ship design

- High level but informal Technical Working Group to be formed to progress / harmonise the results of the Australian / Brazilian studies

- Alternative test methods “controversial “

- Non-ship considerations
  - Stopping during rain
  - Blending low M.C materials
Cargoes – liquefaction and Ship-forces / design considerations

- Structural responses to motion / 6 Degrees of freedom
  - Slamming
  - Whipping
  - Bending

- Vibration of engine and the propeller

- Ship size (acceleration less in larger ships?)
Cargoes – liquefaction and Ship-forces / design considerations (2)

- Length of voyage
- Bilge pumps and proprietary Bilge Filters
- “First-aid” : liquefaction en route
- Cargo pile height / dimensions
- Liquefaction in cargo next to shell plate & bulkheads
Cargoes: SCCS

Are Specially Constructed Cargo Ship (SCCS) designs the way forward?
Summary: Main issues for consideration

- Safety - the driver
- IMO Regulation mainly targeting operational issues
- 2013 research on Iron Ore Fines from Brazil and Australia to include ship characteristics.
- Specially Constructed Ships – niche only?
Thank you!
Any questions?

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