Pacific Marine & Shipbuilding Pte Ltd *v* Xin Ming Hua Pte Ltd
[2014] SGHC 102

Case Number : Suit No 243 of 2012
Decision Date : 26 May 2014
Tribunal/Court : High Court
Coram : Quentin Loh J
Counsel Name(s) : Ian Teo Ke-wei, Navin Anand and V Bala (Rajah & Tann LLP) for the plaintiff; Dawn Tan Ly-Ru (Adtvance Law LLC) for the defendant.
Parties : Pacific Marine & Shipbuilding Pte Ltd — Xin Ming Hua Pte Ltd

Contract – breach

26 May 2014

Quentin Loh J:

Introduction

1 This is a dispute as to whether certain marine propulsion units supplied by Xin Ming Hua Pte Ltd ("the Defendant") were defective. One part of the marine propulsion unit, namely the governor linkage, was observed to display erratic and excessive movements when the marine propulsion unit operated under certain conditions. The dispute centred on the cause of the erratic and excessive movements.

2 After hearing the evidence and deliberating over the issues, I allowed the claim on 31 March 2014 with brief reasons. The Defendant has filed an appeal against my decision and I now set out the grounds of my decision.

The facts

3 The salient facts of the case are not in dispute. [note: 1]

4 Pacific Marine & Shipbuilding Pte Ltd ("the Plaintiff") carries on the business of shipbuilding. The Plaintiff entered into two shipbuilding contracts ("the Shipbuilding Contracts") with its customer, PT Pelayaran Pandupasifik Karismaraya ("PPK") [note: 2] for the construction of two 31-metre twin-screw tugboats of identical design, named CALVIN I (Hull No PMT 1510) and CLEMENT I (Hull No PMT 1610) (collectively referred to as "the Vessels") at $2,420,000 per vessel. The construction of the Vessels was subcontracted to PT Panbatam Island Shipyard ("PBIS"). [note: 3]

5 The Plaintiff also entered into a contract ("the Sale Contract"), on or about 10 June 2010, with the Defendant, for the supply of four marine propulsion units ("the Propulsion Unit") at ¥16,400,000 each, from the Defendant for installation onto the Vessels, [note: 4] making a total purchase price of ¥65,600,000. Each Propulsion Unit comprised:

(a) One Mitsubishi marine diesel engine, Model No S6R2-MTK3L;

(b) One Reintjes gearbox, Model No WAF562L;

(c) One Centa coupling (CENTAFLEX-R) which sat between the marine diesel engine and the gearbox; and

(d) Standard accessories.

The Defendant is the sole distributor of the above marine diesel engines in Singapore and Indonesia and the sole distributor of the above gearboxes in Indonesia.

6 It is not disputed that the Plaintiff had previously bought eight identical propulsion units from the Defendant; four under a contract dated 30 October 2009 ("the 2009 Sale Contract") and four under a contract dated 3 October 2007 ("the 2007 Sale Contract"). The propulsion units under the 2009 Sale Contract were installed on vessels built by the Plaintiff, called the CHIYADI I (Hull No PMT 1009) and the CHRISPIANTO I (Hull No PMT 1109). It is not disputed that the CALVIN I and the CLEMENT I are of identical design and specifications to the CHIYADI I and the CHRISPIANTO I.

7 At this point, I ought to correct a factual inaccuracy made when I rendered my brief grounds. Following the release of the decision with brief grounds on the 31 March 2014, counsel for the Plaintiff, in his letter dated 30 April 2014, pointed out that a particular finding set out in the brief grounds was not entirely accurate. In the brief grounds, I had stated (at [5]):

> … The propulsion units under the 2007 Sale Contract were installed on vessels built by the Plaintiff for PPK (or for its associated company), called the BERKAH 38 (Hull No PMT 0807) and BERKAH 39 (Hull No PMT 0907).

It was brought to my attention by the counsel for the Plaintiff that only BERKAH 39 (now called CHESTER 1) was sold to PPK's associated company, and that BERKAH 38 remains owned by the Plaintiff's associated company. I should clarify that this factual correction does not, in any way, affect the outcome of the matter.

8 It is also not in dispute that the Vessels, including their propellers and propeller shafts, were built according to specifications and were certified by the Japanese classification society, Nippon Kaiji Kyokai ("NKK"), as designed and built according to NKK requirements.

9 The mechanical governor is an important part of each propulsion unit; it governs or controls the engine speed at a fixed value while power output changes to meet the demand by regulating the supply of fuel to the engine under different load conditions.

10 It is common ground that after the Propulsion Units were installed and commissioned on the CALVIN I and CLEMENT I, during sea trials on 3 May 2011 and 18 May 2011 respectively, and with PPK personnel on board for their familiarization exercise, the governor linkages were observed to display erratic and excessive movements when the Propulsion Units operated under certain conditions and after the engines had been operated for approximately one hour.

11 The Plaintiff called this phenomenon the "governor hunting defect", [note: 5] while the Defendant described it as the "jiggling problem". [note: 6] For present purposes, I shall refer to the phenomenon as the "jiggling problem" as that was most commonly used by the parties and their witnesses at trial. I have noted that the terms "hunt" and "jiggle" are defined in the Woodward Troubleshooting Manual ("the Manual") [note: 7] and that Manual goes on to suggest, *inter alia*, the

possible causes of hunting and jiggling. [note: 8] However, I should clarify that my choice of nomenclature should not be taken as an implicit acceptance or rejection of any possible cause(s) for these respective terms set out in that Manual.

12 It is common ground that the jiggling does not enable the proper amount of fuel to be delivered to the marine diesel engine under various load conditions, and the experts from both sides are in agreement, and I so find, that the Propulsion Units were not "operating normally" and that the Propulsion Units were "unsuitable for operations on board the Vessels" and rendered the Vessels unseaworthy. [note: 9]

13 Over the ensuing months, many checks and tests were carried out to ascertain the cause of the jiggling. For example, the fuel injectors were removed and tested, the fuel pump was replaced and the alignment of the propellers and propeller shafts was re-checked, but the jiggling persisted. There were also many sea trials with various representatives from the interested parties in attendance as each component or group of components was checked and then tested at sea.

14 As a result of the jiggling problem, PPK refused to take delivery of the Vessels but continued to press the Plaintiff to rectify the defect; PPK eventually terminated the Shipbuilding Contracts on 5 July 2011. [note: 10] On 22 August 2011, the Plaintiff rejected the Propulsion Units and requested that the Defendant replace them under the warranty clause in the Sale Contract ("the Warranty Clause"), which provides:

> **Warranty**
>
> 12 months from date of commissioning or 18 months from date of delivery, whichever is earlier.

The Defendant refused to do so. More tests were then carried out, which will be referred to later, and on or about 20 December 2011, the Plaintiff informed the Defendant that the Propulsion Units were held at the Defendant's disposal at the shipyard. [note: 11] In July 2012, the Defendant eventually took back the Propulsion Units. [note: 12] On or about 21 May 2012, the Plaintiff sold the hulls of CALVIN I and CLEMENT I (*ie*, without their propulsion units) to PT Pelnas Fajar Marindo Raya ("PFMR") for $1,200,000 per hull. [note: 13] The hulls were delivered to PFMR on or about 20 July 2012. [note: 14]

15 On 21 March 2012, the Plaintiff commenced the present action, Suit No 243 of 2012 ("S 243/2012"), against the Defendant for the loss and damage incurred by the Plaintiff as a consequence of the Defendant's alleged breaches and/or repudiation of the Sale Contract.

16 The Plaintiff bases its claim on a breach by the Defendant of s 14(2) of the Sale of Goods Act (Cap 393, 1999 Rev Ed) ("the SOGA") in failing to supply goods of a satisfactory quality, and/or the Warranty Clause by failing to remedy the jiggling problem. The parties accept that the Sale Contract is subject to the implied condition of satisfactory quality by virtue of s 14(2), which reads:

> **Implied terms about quality or fitness**
>
> **14**.—
>
> …
>
> (2) Where the seller sells goods in the course of a business, there is an implied condition that the goods supplied under the contract are of satisfactory quality.

17 It should be noted that the Plaintiff abandoned its claim based on s 14(3) of the SOGA before the commencement of the trial, and communicated the same to the Defendant on 30 December 2013. [note: 15]

18 In response, the Defendant contends that the Propulsion Units are not defective and that the jiggling problem can be attributed to external cause(s), [note: 16] *ie*, cause(s) which does/do not emanate from the Propulsion Unit or any of its components but something external to it. As such, neither the Warranty Clause nor s 14(2) of the SOGA would apply. The Defendant counterclaims for the Plaintiff's alleged wrongful rejection of the Propulsion Units and seeks to recover, *inter alia*, the expenses incurred in the investigation and the diminution in value of the Propulsion Units.

The issues

19 The issues before me are as follows:

(a) What caused the jiggling problem in the Propulsion Units?

(b) Whether the Defendant was in breach of the implied condition of satisfactory quality under s 14(2) of the SOGA and/or the Warranty Clause?

(c) If (b) is proven, what is the amount of damages payable by the Defendant?

(d) Whether the Plaintiff is liable for the counterclaim for wrongful rejection of the Propulsion Units?

The factual witnesses

20 A number of witnesses were called by the parties. However, given the narrowing of issues by the experts and their joint report which accepts that the vessels were unseaworthy with their Propulsion Units exhibiting the jiggling problem, the crux of this case boils down to the cause of the jiggling problem and accordingly the responsibility therefor.

21 For the sake of completeness, I shall nevertheless set out briefly the evidence given by the factual witnesses of both parties.

The Plaintiff's factual witnesses

22 At the hearing, the Plaintiff called two factual witnesses, namely Samantha Teo Mong Ping ("Samantha") and Shofchan Jamil ("Jamil").

23 Samantha was the main representative from the Plaintiff who not only liaised with the Defendant in relation to the Propulsion Units but also dealt with PPK and handled the sale of the Vessels' hulls to PFMR. [note: 17] For the purpose of this trial, she was the key person authorised to give evidence on behalf of the Plaintiff. [note: 18] I find that she was a credible witness and her answers in cross-examination were frank and forthcoming. I accept her evidence that the Plaintiff was initially open to the idea that the jiggling problem might have been caused by, among other things, external causes. I do not doubt that the Plaintiff was genuine in its efforts to identify the cause of the jiggling problem, and that it was only after the numerous tests conducted that the Plaintiff narrowed it down to the Propulsion Units. Despite counsel for the Defendant's attempts at making inroads into the veracity of Samantha's evidence, her evidence remained clear, consistent and

credible.

24 The other factual witness that gave evidence on the stand for the Plaintiff was Jamil. He is the project manager of the Plaintiff, and was "overall in charge of the technical aspects of the construction" of the Vessels. [note: 19] He was also personally involved in the investigations into the jiggling problem with the Propulsion Units. [note: 20] From my observations during cross-examination, I find Jamil to be generally honest with his answers. I notice that he was not able to answer some of the questions raised by the counsel for the Defendant. I am also aware that some of his answers might not have addressed the counsel's questions at the first instance. However, I do not think that he was being evasive or trying to withhold information. Even though he understood simple English, it was quite apparent that his proficiency in the language was, at best, basic. In this regard, he was relying to a great extent on the interpreter which, through no fault of hers, might have some difficulties translating certain concepts and technical terms accurately. Some of the questions were also rather long and that certainly did not make it any easier. In any event, I find that Jamil answered as best he could in the circumstances. I also appreciate that he might not know some of the answers as he was not exactly an engineering expert but was more of a person who was acting as a pair of eyes and ears for the Plaintiff on site during the construction of the Vessels.

25 For completeness, I should highlight that the parties agreed to dispense with cross-examination of four of the Plaintiff's factual witnesses, namely Cien, Tjhin Fong, Nimrod Ismael and Muhammad Ramadhan. [note: 21] The first three are employees of PT Asia Foundry & Engineering ("Asia Foundry") holding various positions. [note: 22] The propellers and stern tubes on the Vessels were constructed at Asia Foundry and the witnesses were called to show that the propellers and stern tubes were constructed within specifications. [note: 23] As for the fourth, he is the quality control supervisor of PBIS responsible for ensuring that the work done is in accordance with the engineering drawings and the standard required by the classification society. [note: 24] As I have mentioned earlier (at [8]), it is not in dispute that the Vessels, including their propellers and propeller shafts, were built according to specifications and were certified by NKK.

The Defendant's factual witnesses

26 The Defendant called a total of twelve factual witnesses. They can be divided into three categories, namely the Defendant's employees, the officers from Mitsubishi Heavy Industries, Ltd ("MHI") and the representatives from Trans-Matic Pte Ltd ("Trans-Matic") and Centa Transmission Far East Pte Ltd ("Centa Transmission").

The Defendant's employees

27 The Defendant called the following employees to give evidence at trial:

(a) Heng Lip Joo, the senior sales manager of the Defendant, who gave evidence of the discussions leading to the 2007 Sale Contract and 2009 Sale Contract and the market practice relating to the sale of propulsion units; [note: 25]

(b) Chua Siew Meng, the assistant service engineer (and, at the material time, senior technician) of the Defendant, who gave evidence of the investigations carried out by the Defendants in relation to the Propulsion Units; [note: 26]

(c) Wong Meng Fai, the service manager of the Defendant, [note: 27] who gave evidence of

the arrangements for the dynamometer tests that were conducted by MHI in Japan (after the Propulsion Units were rejected and returned by the Plaintiff); [note: 28]

(d) Chua Tiong Wei, the executive director for sales and business development with the Defendant, [note: 29] who gave evidence of the efforts to sell the Propulsion Units after they were rejected and returned by the Plaintiffs; [note: 30]

(e) Tan Tin Yeow ("Elvin Tan"), the chief executive officer of the Defendant, who was called to give evidence after it was alleged in the middle of the trial that there were other instances of MHI engines suffering from the same jiggling problem;

(f) Yap Lee Ann, the financial controller of the Defendant, who gave evidence in support of the Defendant's request to admit documentary hearsay evidence. [note: 31]

28 These factual witnesses were called primarily to establish the factual background and the sequence of events from the negotiations to the rejection of the Propulsion Units and the efforts thereafter to resell them. Since most of these facts are either undisputed or not in issue I will not discuss them any more than I already have.

The MHI officers

29 I next consider the evidence of Iwao Sekiguchi ("Sekiguchi"), Masayuki Sugiyama ("Sugiyama"), Yoshihiro Koyama ("Koyama") who are officers from MHI.

30 Sekiguchi was the officer who conducted the dynamometer tests on the Propulsion Units on 25 February and 6 March 2013, after they were returned to the Defendant. [note: 32] Sekiguchi's evidence was that he tested for the jiggling problem by *disengaging* rather than engaging the gearbox. [note: 33] At first instance, it appeared that Sekiguchi had misspoke as the parties had agreed that the jiggling problem only manifests when the gear is engaged from neutral to ahead or astern, [note: 34] and not the other way around. However, I am convinced that it was not a slip or mistake on the part of Sekiguchi as he went on subsequently to repeat the same answer several times when counsel for the Plaintiff tried to confirm if that was indeed his evidence. [note: 35] In fact, he gave the same answer when re-examined by the counsel for the Defendant. [note: 36] I will return to this point later (at [89(a)]) when I consider the weight that should be given to the dynamometer tests.

31 Sugiyama was the officer who reviewed the dynamometer tests conducted by Sekiguchi on the Propulsion Units. On the witness stand, he confirmed that the dynamometer was set at 32 kilowatts. As it turns out, this was lower than the usual 57 kilowatts that would be used for other propulsion units on the dynamometer. While there is some doubt over the reason for MHI setting the dynamometer at a lower than usual kilowatt for the Propulsion Units in question, I find that there is no need to make any finding on this point given that the dynamometer test was conducted in a way that would not have triggered the jiggling problem (*ie*, disengaging rather than engaging the gearbox).

32 The last of the three MHI officers was Koyama. He is the manager in the Marine Engine Section, Engine Sales Department, Engine Division, General Machinery and Special Vehicles of MHI, and he gave evidence of, among other things, the views of MHI on the various tests conducted on the Propulsion Units. [note: 37] At the outset, I should note that the Plaintiff had objected to parts of Koyama's AEIC on the basis that they constitute opinion evidence. On cross-examination, Koyama

acknowledged that his AEIC contained the opinion of the MHI's experts and he also confirmed that he is not one of the experts. As none of the MHI's experts had been called to testify at the hearing, I disregarded those parts of Koyama's AEIC which contained the opinion of the MHI's experts. (ss 32 and 32B of the Evidence Act (Cap 97, 1997 Rev Ed) ("EA")).

33 It was also discovered at the hearing that there were significant differences between the signed but unnotarised version of the AEIC ("signed AEIC") and the notarised version of the AEIC ("notarised AEIC"). The Defendant's counsel explained that the signed AEIC was provided to the Plaintiff "in the interest of time" because there were difficulties getting it notarised by the specified deadline. [note: 38] The Defendant's counsel said that the Plaintiff's counsel had asked her to confirm if the notarised AEIC would be in the same terms as the signed AEIC but she did not do so "for various reasons". [note: 39] The Defendant's counsel also explained that the difference was in the numbering of the first few paragraphs. [note: 40]

34 These differences, as the Plaintiff's counsel highlighted, were not immaterial. At first, Koyama's evidence was that he did not remember the reasons why certain paragraphs and exhibits in the signed AEIC did not eventually make their way into the notarised AEIC. [note: 41] Upon further cross-examination, it was revealed that the "service section" or "service department" (presumably the Engine Service Department of MHI where Sugiyama is from) might have had a part to play in deciding what goes into Koyama's AEIC. [note: 42] Specifically, it was revealed that a letter from MHI Engine System Asia Pte Ltd to the Defendant and its attachments were exhibited in his signed AEIC, but some of the attachments (*ie*, attachments "B" and "D") were not included in the notarised AEIC. [note: 43] No effort was made to highlight this, except for an attempt at having nondescript "check marks" made on the letter. [note: 44] Any references to these missing attachments were also removed from the notarised AEIC. [note: 45] Again, Koyama could not explain why those paragraphs were deleted but merely said that he "received [it] as a final version". [note: 46]

35 Looking at the differences between the two AEICs, and Koyama's inability to explain the differences, I have serious doubts over the veracity and reliability of the evidence given by Koyama in his AEIC. In any event, leaving aside the opinion evidence that I have addressed earlier ([32] above), I do not find that Koyama's evidence was of much assistance to the Defendant's case.

The representatives from Trans-Matic and Centa Transmission

36 I move on next to the evidence of Wilson Thomas ("Wilson") and Ang Khai What ("Terry Ang") from Trans-Matic, and Lim Yue Heng from Centa Transmissions.

37 Trans-Matic is the authorised service centre of Reintjes Asia Pacific Pte Ltd, the distributor of Reinjtes marine gearboxes in Singapore. [note: 47] It bears recalling that Reintjes gearboxes were used in the Propulsion Units ([5] above). Terry Ang is the service manager with Trans-Matic and he gave evidence on the "overload breakage" of the Centa coupling on CALVIN I on 19 April 2011 (which occurred before the jiggling problem first manifested) and the noises that appeared to be emanating from the gearbox. He acknowledged during cross-examination that the source of the "overload breakage" was not known, [note: 48] and that he was merely saying that the noises were not due to any inherent defect of the gearbox. [note: 49] According to Wilson, the workshop supervisor with Trans-Matic, the noises from the gearbox on board CALVIN I were due to the vibrations from the jiggling. [note: 50]

38 As for Lim Yue Heng of Centa Transmissions, he became involved in these proceedings because the CENTAFLEX-R coupling was used in the Propulsion Units ([5] above). Centa Transmissions is a member and subsidiary of the CENTA group and they provide servicing and technical support for customers in Singapore and the region. [note: 51] There are two points in Lim Yue Heng's evidence that are of some relevance. First, he explained that the Torsional Vibration Analysis ("TVA") cannot show whether resonance had in fact caused the jiggling problem, but there is a possibility of identifying the component(s) that is/are causing the problem if the Torsional Vibration Measurement ("TVM") is done as well. [note: 52] As things turn out, the TVM was never done. Secondly, he confirmed that the the natural frequency of the propeller shaft is not shown in the TVA. [note: 53] I will address both points later ([86] and [108] below).

Whether the jiggling problem was caused by the Propulsion Units?

39 I will first address a preliminary issue concerning the admissibility of hearsay evidence. Secondly, I will consider the approach towards the evaluation of expert evidence and the burden of proof before I proceed to assess the evidence on the cause of the jiggling problem.

Admissibility of the Defendant's documentary hearsay evidence

40 The Plaintiff objects to the admission of two categories of documents that the Defendant is seeking to admit as evidence on the basis of hearsay, *ie*, the makers of these documents were not called to give evidence at trial. [note: 54] These documents are the certificates issued by NKK for the engines and gearboxes of the Propulsion Units ("the NK Class Certificates") and the records of tests conducted by Woodward on the governors of the Propulsion Units ("the Woodward test records"). [note: 55]

41 The Defendant contends that the documents should be admitted into evidence as they satisfy the requirements under s 32(1)(*j*)(iii) of the EA. [note: 56] Section 32(1)(*j*)(iii) states:

> 32.—(1) Subject to subsections (2) and (3), statements of relevant facts made by a person (whether orally, in a document or otherwise), are themselves relevant facts in the following cases:
>
> …
>
> (*j*) when the statement is made by a person in respect of whom it is shown —
>
> …
>
> (iii) that he is outside Singapore and it is not practicable to secure his attendance; or
>
> …

42 In order to satisfy s 32(1)(*j*)(iii) of the EA, evidence must be produced to show the steps that were taken to persuade the maker of the documents whose admission is challenged to testify at the trial: *Gimpex Ltd v Unity Holding Business Ltd and others* [2013] SGHC 224 at [206]. [note: 57] I would add that the party relying on s 32(1)(*j*)(iii) of the EA must show that it had taken all *reasonable* steps that may be necessary to persuade the maker to testify at trial.

43 I do not accept that the Defendant had taken all reasonable steps to persuade the NKK officers

responsible for the issuing of the NK Class Certificates to testify at trial for two reasons:

(a) First, the Defendant did not make any attempts to contact NKK directly. [note: 58] Instead, the Defendant had only asked MHI if it was possible for the NKK officers responsible for the issuing of the NK Class Certificates to testify at trial. [note: 59] However, the Defendant accepted that it was not impossible to approach NKK directly despite the "language difficulties". [note: 60] In fact, the Defendant cannot even show that there would have been any "language difficulties" given that it was not aware of the identities of the relevant NKK officers. [note: 61]

(b) Secondly, the Defendant did not seek to ascertain the steps taken by MHI to procure the attendance of the relevant NKK officers, [note: 62] but was satisfied with MHI's response that the relevant NKK officers were not in Singapore and that it was not the policy of NKK to give evidence in legal proceedings. [note: 63] It is not even clear from the evidence if MHI had contacted NKK on this issue.

44 In these circumstances, I do not consider that the Defendant had taken all reasonable steps necessary to persuade the maker to testify at trial as required under s 32(1)(*j*)(iii) of the EA. Accordingly, the NK Class Certificates are not admissible as evidence in these proceedings.

45 Even if the NK Class Certificates were admissible, I do not think that they are of much assistance to the Defendant's case. The NK Class Certificates merely show that the Propulsion Units were "batch tested", *ie*, the "parent engine" and parent gearbox were tested and approved; the Propulsion Units in question only had to undergo a dynamometer test before the issuance of the NK Class Certificate. [note: 64] Hence, I do not consider that the NK Class Certificates are sufficient to prove that the Propulsion Units were in "good working order" and free of defects.

46 As for the Woodward test records, there is no evidence to show that the makers were outside Singapore and there is also no evidence of any steps taken by the Defendant to procure the attendance of the makers. [note: 65] Therefore the Woodward test records do not fall within the ambit of s 32(1)(*j*)(iii) of the EA. It follows that they are not admissible as evidence in these proceedings.

Guidelines and approach to evaluating expert evidence

47 The expert evidence "must invariably be sifted, weighed and evaluated in the context of the factual matrix and in particular, the objective facts": *Sakthivel Punithavathi v PP* [2007] 2 SLR(R) 983 ("*Sakthivel*") at [76]. The weight to be accorded to the expert evidence depends on matters such as "[c]ontent credibility, evidence of partiality, coherence and a need to analyse the evidence in the context of established facts": *Sakthivel* at [76].

48 Where there is conflicting evidence between experts, the consistency and logic of the evidence is paramount: *Sakthivel* at [75].

49 Bearing these principles in mind, I proceed to evaluate the evidence presented by the experts on the possible cause(s) of the jiggling problem.

Expert conclave on 11 and 12 September 2013

50 To identify the cause of the jiggling problem, the Plaintiff called A/P Yap Fook Fah and Mr Mark Alexander McGurran and the Defendant called Dr Yap Sau Hee and Mr Gordon John Tennant to give

their expert evidence in these proceedings.

51 On 11 and 12 September 2013, the four experts attended an expert conclave to discuss the issues relating to the possible cause of the jiggling problem. A set of minutes of meeting was agreed and signed by the experts after the conclusion of the meeting ("the Agreed Minutes"). [note: 66] The Agreed Minutes specifies that the issues discussed are non-exhaustive and that any agreement on the issues and/or reasons for disagreement expressed shall not be binding on the parties.

52 During the witness conferencing at trial, Dr Yap and Mr Tennant requested to make certain changes to the Agreed Minutes, [note: 67] namely:

(a) Issue 2 – "The hunting / jiggling problem was observed once the ahead or astern gear was engaged, i.e. as soon as the propeller started to spin without delay". Both sides said "Yes". At trial, the Defendant's experts wanted to add a remark that reads: "Review of the video recordings of the jiggling shows that there was a time lag between engagement of gear and onset of jiggling".

(b) Issue 4 – "The hunting / jiggling problem could be stopped by holding on to the fuel linkage to damp the movement momentarily and letting go". Both sides said "Yes". At trial, the Defendant's experts wanted to add a remark that reads: "The jiggling sometimes returned".

(c) Issue 24 – "When the governor output linkage was moved to another hole, the problem did not present but full fuel could not be achieved. Are you of the opinion that the problem could have been solved by further adjustment of the fuel linkage to accommodate for full fuel whilst at the same time exhibiting stable operation? For instance finding a suitable position in the governor output linkage between the two holes." Both sides said "Yes". I should add that the Plaintiff could not attempt to resolve the jiggling problem by "further adjustment to the fuel linkage" as it would have rendered the warranty void. At trial, the Defendant's experts wanted to change their answers. Mr Tennant changed his answers to "No". Dr Yap remained with "Yes" but only "[a]s far as addressing the symptom of the vibration is concerned".

(d) Issue 29 – "Would TVM data, taken during actual jiggling and normal operation of propulsion units, have been required to determine the actual vibration of the propeller shaft". The Defendant's experts said "[i]t would have been useful to have this data". At trial, they wanted to add that it would be useful "in conjunction with the vibration study carried out by AES [Acoustic & Environmental Solutions Pte Ltd]".

53 After the changes were made, the amended minutes of meeting was signed by the experts, with the "non-exhaustive" and "non-binding" caveats removed ("the Amended Minutes"). I would add that it is of limited use for the experts to go through a conclave only to produce a joint report with such reservations or caveats and such reservations or caveats should be strongly discouraged. It defeats the purpose of such a conclave.

54 The Plaintiff argues that little weight should be given to the expert evidence of Mr Tennant and Dr Yap insofar as the amendments relate to new points that were raised in the middle of the witness conferencing. [note: 68] According to the Plaintiff, Mr Tennant and Dr Yap had requested to amend parts of the Agreed Minutes that were "key points" relied upon by the Plaintiff's experts in their AEICs. [note: 69] The request was made only during the witness conferencing even though they found out about the need to make such amendments much earlier. [note: 70]

55 The Plaintiff contends that experts ought to inform the other party of their change in views as soon as possible. In this regard, the Plaintiff relies on the Note to Expert Witness in Form 58 of the Subordinate Courts Practice Directions (2013 Ed) ("Form 58") and *Pacific Recreation Pte Ltd v S Y Technology Inc* [2008] SGCA 1 ("*Pacific Recreation*"). [note: 71] It is clear from the evidence that there was a significant delay between the time that Mr Tennant and Dr Yap realised the need for the amendments and the time when they actually made the request. [note: 72] Hence, the Plaintiff argues that little weight should be given to the expert evidence of Mr Tennant and Dr Yap in light of the lack of consistency and credibility. [note: 73]

56 In response, the Defendant states that the amendments did not introduce new points and that there was no surprise or prejudice to the Plaintiff. [note: 74] In addition, the Defendant challenges the Plaintiff's reliance on Form 58 and *Pacific Recreation*. [note: 75]

57 I accept that Form 58 applies only to expert witnesses in the Subordinate Courts and it is not mandatory, even though it may be good practice, for proceedings in the Supreme Court: *Pacific Recreation* at [65] and *Ferrero SPA v Sarika Connoisseur Café Pte Ltd* [2011] SGHC 176 ("*Ferrero*") at [128]. I also note that there is no equivalent of Form 58 under the Supreme Court Practice Directions (2012 Ed).

58 However, the fact that it is not mandatory to furnish expert witnesses with Form 58 (which *informs* the expert witnesses of their duties and responsibilities) does not mean that the duties of the expert witness set out in Form 58 would not apply.

59 I am of the view that it is the duty of an expert to communicate his change of view on a material matter to all parties without delay: *Bajumi Wahab and others v Afro-Asia Shipping Company (Private) Limited and others* [2001] SGHC 91 at [12], citing *Ikarian Reefer* [1993] 2 Lloyd's Rep 68 at 81; *Khoo Bee Keong v Ang Chun Hong and another* [2005] SGHC 128 at [83]. In fact, it is considered as one of the common law principles concerning the impartiality of expert evidence, which is now embodied in O 40A of the Rules of Court (Cap 322, R 5, 2006 Rev Ed): Jeffery Pinsler, "Expert's Duty to be Truthful in the Light of the Rules of Court" (2004) 16 SAcLJ 407 at [7]–[8].

60 Unlike the amendments to Issue 2 and Issue 29 which were clarificatory in nature, the amendments to Issue 4 and Issue 24 represented a change of view on a material matter which ought to have been conveyed to the Plaintiff without delay:

(a) In relation to Issue 4, the view of the Defendant's experts was substantially changed with the addition of the remark that "[t]he jiggling sometimes returned". Undoubtedly, this is crucial to the Defendant's case, [note: 76] and thus, a material matter in these proceedings.

(b) In relation to Issue 24, Mr Tennant's view had changed from an unqualified "Yes" to an unqualified "No". Further, Dr Yap's view was amended so that it is consistent with Mr Tennant's view. Like Issue 4, this is crucial to the Defendant's case, [note: 77] and is a material matter in these proceedings.

61 There was a significant delay in the communication of the change of view by the Defendant's experts. [note: 78] At the very least, they should have informed the Plaintiff at the start of the trial. It is also noteworthy that the Defendant's experts did not provide an explanation for the delay. [note: 79]

62 In any event, I find that the reasons given by the Defendant's experts for the amendments to

Issue 4 and Issue 24 leave much to be desired:

(a) In relation to Issue 4, Mr Tennant explained that he did not observe the jiggling return after the fuel linkage was damped temporarily when he was on board CLEMENT I. [note: 80] He changed his view because he saw the jiggling return in the video recording of June 2011 that he reviewed subsequently. [note: 81] However, I have doubts about whether it was possible for anyone to conclude from the video recording that the jiggling returned after the damping. I observed that the June 2011 video recording, unlike the one taken by Mr McGurran on 23 September 2011, does not show the arm of the person at the back operating the lever, so there was no way to ascertain if and when the ahead or astern gear was engaged. [note: 82] In other words, the alleged return of the jiggling problem could have been the engaging of the ahead or astern gear instead.

(b) In relation to Issue 24, Mr Tennant conceded that he "made a mistake" when he said yes during the expert conclave, and acknowledged that he knew his answer was detrimental to the Defendant's case. [note: 83] Mr Tennant explained that the change was because he "now [has] a better understanding of the mechanisms". [note: 84] I am not persuaded. In my view, Mr Tennant had changed his answer to suit the Defendant's case.

63 Accordingly, I place limited weight on the evidence of Mr Tennant and Dr Yap insofar as they relate to the new points that were raised by the amendments to Issue 4 and Issue 24 of the Agreed Minutes.

Burden of proof

64 The Plaintiff accepts that it bears the legal burden of proof to show that the Propulsion Units were not of satisfactory quality. [note: 85] However, the Plaintiff submits that the fact that the governors were not working as they ought to, *ie*, regulate the supply of fuel to the engines, is *prima facie* evidence that the Propulsion Units are defective. [note: 86] As such, the "tactical burden" shifts to the Defendant for it to disprove on the balance of probabilities. [note: 87] It is unnecessary for the Plaintiff to prove the specific cause of the defect within the Propulsion Units, *ie*, to pinpoint the specific part or component within the Propulsion Units which is defective. [note: 88] In support of these propositions, the Plaintiff cites *Anti-Corrosion Pte Ltd v Berger Paints Singapore Pte Ltd* [2012] 1 SLR 427 ("*Anti-Corrosion*").

65 The Defendant contends that the Plaintiff failed to raise a *prima facie* case that the Propulsion Units were inherently defective and thus, the evidential burden does not shift to the Defendant. [note: 89] In particular, the Defendant challenges the Plaintiff's reliance on *Anti-Corrosion*. [note: 90]

66 In the present case, the legal burden lies with the Plaintiff to prove that the Propulsion Units were defective. [note: 91] If the Plaintiff can raise a *prima facie* case that the Propulsion Units were defective, then the evidential burden shifts to the Defendant to show that the Propulsion Units were not defective: *Britestone Pte Ltd v Smith & Associates Far East, Ltd* [2007] 4 SLR(R) 855 at [60]; *Anti-Corrosion* at [37].

67 In my view, it is sufficient to establish a *prima facie* case if the Plaintiff can eliminate the other possible causes of the defect, and should the Defendant fail to show that the Propulsion Units are not defective, then the jiggling problem would, more likely than not, have been caused by the defect in

the Propulsion Units: *Anti-Corrosion* at [36]. The Plaintiff need not pinpoint or prove the specific faulty component within the Propulsion Units; it is sufficient if it can be logically proven by the process of elimination that the defect lies in the Propulsion Unit: *Anti-Corrosion* at [36].

68 I now turn to consider the evidence.

Cause of the jiggling problem

69 As noted at [12] above, it is common ground that the jiggling did not enable the proper amount of fuel to be delivered to the engine under various load conditions and the experts from both sides are in agreement that this defect rendered the Vessels unseaworthy.

70 The Plaintiff's case is that the governor in the Propulsion Unit was unable to regulate the fuel input to bring the engine back to the desired speed when the engine speed dropped as a result of the change in load condition, *ie*, when the gear is engaged from neutral to ahead or astern. [note: 92] At this point, the governor and its linkage linking it to the fuel feed became unstable and the governor linkage started to jiggle. [note: 93] The Plaintiff argues that the cause of the jiggling problem must lie in the Propulsion Unit since the other possible causes apart from the Propulsion Unit itself can be eliminated.

71 The Defendant's case is that the jiggling problem was caused by the excitation force from the propeller blade passing frequency which was compounded by shaft resonance. [note: 94] The vibration was transmitted through the shaft, gearbox, coupling and the engine to the engine governor, [note: 95] and the occurrence of the jiggling was dictated by the magnitude of the load presented by the propeller. [note: 96]

72 The evidence shows that various tests were conducted in an attempt to identify the cause of the jiggling problem:

(a) On 3 June 2011, the governor actuator was replaced with a new one, but the jiggling problem persisted. [note: 97]

(b) On 12 and 13 June 2011, the governor actuator from the starboard side of CALVIN I's starboard Propulsion Unit was removed and installed on the port side Propulsion Unit of BERKAH 38, and no jiggling was observed on the BERKAH 38. [note: 98] However, the jiggling problem persisted when the governor actuator was replaced on the CALVIN I. [note: 99]

(c) On 27 July 2011, the six fuel injectors were removed from the starboard side Propulsion Unit of CALVIN I for testing, and the results did not reveal anything wrong with the injectors. [note: 100] The fuel injector pump was also replaced with a new one, but the jiggling problem persisted. [note: 101]

73 I note that there was damage to the Centa coupling allegedly caused by "overload breakage" which was discovered on 19 April 2011, but the parties accept that this was a one-off occurrence and no significance should be attached to this fact as it was not connected to the jiggling problem. The same can be said of the shaft misalignment which was discovered and remedied when CALVIN I was upslipped from 15 to 30 June 2011. Accordingly, I do not consider it necessary to delve into them any further.

74 At this juncture, I should note that the three possible causes of the jiggling problem in this case, as identified by the experts, are:

(a) the propeller excitation;

(b) the propeller shaft resonance; and

(c) the Propulsion Units. [note: 102]

75 For the avoidance of doubt, I should also note that the experts agree that the jiggling problem is "not due to shaft misalignment". [note: 103] Moreover, the Plaintiff had confirmed that the shaft alignment was in order by conducting various tests, including laser alignment measurements, when CALVIN I was upslipped between 15 and 30 June 2011. [note: 104] In any event, the Defendant removed shaft alignment as one of its alleged causes of the jiggling problem from its Defence and Counterclaim. [note: 105] This eliminated shaft misalignment as a possible cause of the jiggling problem.

76 The Plaintiff submits that the Defendant must fail as its pleaded case is not supported by its expert evidence. The Defendant's pleaded case is that the jiggling problem was caused by propeller shaft resonance. [note: 106] However, Dr Yap's evidence is that the cause of the jiggling problem was propeller excitation which is (or might be) compounded by propeller shaft resonance. [note: 107] Further, Dr Yap indicated for the first time at trial that the jiggling problem was caused by resonance at the governor linkage as well (or what A/P Yap refers to as double resonance). [note: 108]

77 In my view, the reference to propeller shaft resonance in the Defence and Counterclaim at [50] must be understood in the proper context, *ie*, resonance can occur only when the natural frequency coincides with the forcing frequency. [note: 109] In other words, the Defence and Counterclaim must be understood as having identified propeller excitation *and* propeller shaft resonance as the cause of the jiggling problem. However, there is simply no reference, express or implied, to resonance at the governor linkage in the Defence and Counterclaim. In fact, it was not even mentioned in Dr Yap's AEIC and Supplementary AEIC. [note: 110]

78 It is trite law that the court cannot make a finding based on facts which have not been pleaded: *Ong Seow Pheng v Lotus Development* [1997] 2 SLR(R) 113 at [41]. Since resonance at the governor linkage was not pleaded in the Defence and Counterclaim as a cause of the jiggling problem, I will not make any finding or decision based on it. In any event, I do not think that it could have been proven on the balance of probabilities in light of the lack of evidence.

79 In order to identify the cause of the jiggling problem, the Plaintiff decided to switch the starboard side Propulsion Unit of the CALVIN I with the starboard side propulsion unit from the BERKAH 38 to see if the jiggling problem manifested itself as well ("the Swap Test"). [note: 111] It should be noted that the propulsion units of the BERKAH 38 were of the same make and model as the Propulsion Units of the Vessels. However, BERKAH 38 had smaller propellers and Kort nozzles; its design and specifications were largely similar, but not identical, to the Vessels. [note: 112] During the sea trial of the CALVIN I conducted on or about 27 October 2011, no jiggling was observed on the substituted propulsion unit from the BERKAH 38 but the original port side Propulsion Unit of the CALVIN I continued to exhibit the jiggling problem. [note: 113] This is not in dispute, [note: 114] as the Swap Test was attended by the Defendant's representatives. [note: 115]

80 The question, then, is what can be made of the Swap Test results? In my view, the Swap Test does not prove *directly* that the Propulsion Units were defective by identifying the component(s) that was/were defective. However, the Swap Test proves *indirectly*, and certainly on a balance of probabilities, that the Propulsion Units were defective because it eliminated the other possible causes of the jiggling problem put forward and/or relied upon by the Defendant, including shaft misalignment, propeller excitation and propeller shaft resonance, and the Defendant had not been able to prove that the Propulsion Units were not defective. If the propeller excitation and/or the propeller shaft resonance and/or the shaft misalignment or other causes external to the Propulsion Units caused the jiggling, then the BERKAH 38's starboard engine and governor should have exhibited the same problem when it was installed on the CALVIN I.

81 I do not agree with the Defendant's criticisms of the Swap Test:

(a) First, it is not correct to say that it would have been more appropriate to install the Propulsion Unit from CALVIN I on BERKAH 38 and carry out a sea trial on the latter to see if the jiggling problem persists ("the Reverse Swap Test"). [note: 116] Mr Tennant explained that he preferred the Reverse Swap Test because if the Propulsion Unit was the cause of the jiggling problem, then the jiggling would have occurred when the Propulsion Unit was installed on BERKAH 38 as well. [note: 117] Hence, it would have eliminated the Propulsion Unit as a possible cause if jiggling did not occur. But it would have proved little if jiggling did occur. Indeed, the difficulty with the Reverse Swap Test is that the external factors, *ie*, the propeller excitation and propeller shaft resonance, if any, would be different. It does not eliminate the other possible causes.

(b) Secondly, I do not agree with Dr Yap that the Swap Test is unreliable because the vibration measurements will be different once the propulsion unit is removed or the mounting has been changed. [note: 118] As A/P Yap pointed out, the impedance test conducted before and after the Swap Test showed that the installation conditions did not make a difference to the results of the Swap Test. [note: 119] It also defies logic to say that marine diesel engines, which are built to be robust and withstand rough sea conditions, [note: 120] will be adversely affected by such minor changes in the installation conditions.

(c) Thirdly, the Defendant's experts have not convinced me as to how the fact that the propulsion unit from BERKAH 38 was approximately two years older than the Propulsion Unit of CALVIN I would actually affect the results of the Swap Test. [note: 121] Without more, I am not prepared to say that the probative value of the Swap Test is affected. In any event, I agree with and accept the evidence of A/P Yap that even if there is a change in the vibration characteristics due to the age difference, such change would have been due to the propulsion unit. [note: 122] As such, it does not affect the results of the Swap Test in any way.

(d) Fourthly, Mr Tennant accepted during cross-examination that the starboard side Propulsion Unit on CALVIN I never had the 22mm steel pad. [note: 123] This is consistent with the evidence of Jamil, the Plaintiff's project manager, [note: 124] and Mr McGurran. [note: 125] In any event, I note that Dr Yap confirmed that the impedance test proved that there is no significant structural difference between the port and starboard sides of the CALVIN I that would have made a difference to the response at the governor. [note: 126]

82 I next consider the other possible causes of the jiggling problem, namely, propeller excitation and propeller shaft resonance.

83 The view of Dr Yap, the Defendant's vibration expert, is that the jiggling problem was caused by propeller excitation compounded by propeller shaft resonance. On the other hand, A/P Yap, the Plaintiff's vibration expert, takes a diametrically opposed view, *ie*, the jiggling problem was not caused by propeller excitation and/or propeller shaft resonance.

84 I am not persuaded by the Defendant's vibration theory for three reasons:

(a) the vibration theory is inconsistent with established facts;

(b) the vibration theory is inherently flawed; and

(c) the evidence of A/P Yap is preferable to the evidence of Dr Yap.

I will address each of them in turn.

85 First, I consider that the vibration theory is inconsistent with established facts:

(a) The jiggling problem did not manifest (even though full fuel output could not be achieved) when adjustment was made to the governor output lever. This is not in dispute. [note: 127] Out of the four experts, only Mr Tennant disagrees that the adjustment to the governor output lever is a possible solution to the jiggling problem. [note: 128] For the reason I have stated earlier ([60]–[63] above), little weight should be accorded to Mr Tennant's view on this point. More importantly, the Defendant appears to have been mistaken about the significance of this point. In my view, the significance is that it dispels the vibration theory regardless of whether full fuel output can be achieved or not. In this respect, I agree with A/P Yap that if the jiggling was caused by propeller excitation and propeller shaft resonance, then it should not have been resolved by the adjustment to the output lever position as it does not eliminate the alleged source of excitation. [note: 129]

(b) The jiggling problem manifested as soon as the propeller started to spin without delay. [note: 130] The experts agree on this. [note: 131] Having viewed the June and September 2011 video recordings in court, I find that there is a time lag of about two seconds between the engagement of gear and the onset of the jiggling problem. [note: 132] However, this must be taken in the proper context, *ie*, it was about two seconds after the ahead or astern gear was engaged and not when the propeller began to spin. [note: 133] If the jiggling problem was due to propeller excitation and propeller shaft resonance, then it should not have manifested within seconds after the gear clutch was engaged and before the propeller blades could possibly reach a speed where there is a steady blade rate frequency to induce resonance. [note: 134] I do not accept the Defendant's explanation that the propeller was not stationary and thus inertia would have taken less time to overcome. [note: 135] It is clear from the 23 September 2011 video recording that the time lag of about two seconds is observed when the gear is changed from ahead to astern and *vice versa*. The time lag remains about the same even when the propeller was made to spin in the opposite direction, *ie*, from ahead to astern and *vice versa*. This dispels the Defendant's explanation.

(c) The jiggling problem manifested at varying engine idling speeds between 600 rpm and 800 rpm. The experts agree on this. [note: 136] It is also not in dispute that the blade rate frequency increases as the engine speed . [note: 137] The sole point of contention is whether the natural

frequency of the propeller shaft changes with the engine speed such that shaft resonance occurs across various engine speeds. I prefer A/P Yap's evidence that the natural frequency of the propeller shaft does not change. [note: 138] The experts agree that the torsional interference diagram in the TVA deals with the natural frequency of the propulsion system as a whole and not individual components like the propeller shaft. [note: 139] Further, I find that the natural frequency of the propulsion system changes with the engine speed because of the change in the stiffness of the Centa coupling (which is torque-dependent). [note: 140] Since the natural frequency of the propeller shaft does not change according to engine speed, resonance could not have occurred across a range of engine speeds. Accordingly, I accept A/P Yap's explanation that the fact that the jiggling problem manifested at varying engine idling speeds between 600 rpm and 800 rpm suggests that propeller shaft resonance is not the cause. [note: 141]

(d) The jiggling problem manifested only when the Propulsion Units were operated on load for approximately an hour, *ie*, after the Propulsion Units warmed up. The experts agree on this. [note: 142] If the jiggling problem was due to propeller excitation and propeller shaft resonance, then it should have manifested whether or not the Propulsion Units were warmed up. [note: 143] The Defendant tries to explain this based on the effect of temperature on the Centa coupling, [note: 144] but I note that no evidence has been led on this point during the proceedings. [note: 145] As such, I hesitate to draw any conclusion based purely on the Defendant's submissions.

(e) The jiggling problem can be stopped by a person holding on to the governor fuel linkage momentarily to damp the jiggling and then letting it go. The experts agree on this. [note: 146] As I have discussed earlier ([62(a)] above), the June 2011 video recording does not provide any firm basis for the Defendant's experts to suggest that the jiggling problem would sometimes return. If the jiggling problem was due to propeller excitation and propeller shaft resonance, then it should have manifested after the governor fuel linkage was released since the alleged source of excitation, *ie*, the rotation of the propeller, remains. [note: 147] Indeed, Dr Yap's explanation, *ie*, that the jiggling may or may not return depending on the succeeding magnitude of the excitation force from the propellers, [note: 148] does not carry much weight since there is no evidence that the magnitude of the excitation force changed after the damping.

86 Secondly, I find that the vibration theory is inherently flawed:

(a) Dr Yap's view of the "calculated" natural frequency of the propeller shaft (*ie*, 8.3 Hz) is flawed because it was wrongly based on the torsional interference diagram in the TVA. Lim Yue Heng, the managing director of Centa Transmissions, confirmed during cross-examination that the natural frequency of the propeller shaft is not shown in the TVA. [note: 149] As I have pointed out earlier ([85(d)] above), the torsional interference diagram only shows the natural frequency of the propulsion system as a whole and not individual components like the propeller shaft. This was confirmed by Lim Yue Heng and Dr Yap and I accept their evidence on this point. [note: 150]

(b) Dr Yap's view on the "measured" natural frequency of the propeller shaft (*ie*, 7.8 Hz) is also flawed. The natural frequency of the propeller shaft was never actually measured. Instead, Dr Yap derived the "measured" natural frequency based on the vibration measurements taken of the governor linkage. Even if it was possible to ascertain the natural frequency of the propeller shaft from the vibration measurements of the governor linkage (which I do not accept), Dr Yap appears to have ignored some of the measurements when he was deriving the "measured"

frequency. [note: 151]

(c) Dr Yap does not convincingly explain how the vibrations from the propeller excitations and/or propeller shaft resonance are capable of being transmitted to the governor. There was not much evidence presented on the specific path of transmission. [note: 152] Further, I agree with A/P Yap that the gearbox, the Centa coupling, and the vibration isolators in the governor would have in all likelihood reduced any vibrations from the propeller and propeller shaft. [note: 153] Dr Yap does not deny that the vibrations may be reduced by the damping effect, [note: 154] but his response was that the magnitude of the jiggling depends on the magnitude of the excitation. [note: 155] However, no evidence was led on the magnitude of the excitation and how it might have been affected by the damping effect along the driveline.

(d) Dr Yap's evidence on the frequency of the jiggling would, at best, suggest a correlation between the jiggling problem and the propeller excitation and/or propeller shaft resonance. [note: 156] However, correlation is not the same as causation. I agree with A/P Yap that the measurement of the jiggling frequency at the governor linkage only reveals the *effects* of the problem. [note: 157] It does not identify the *cause* of the jiggling problem, *ie*, the source of excitation. It is also strange why the Defendant had not conducted the TVM, which would have verified their vibration theory, even though they had prioritised it over the dynamometer tests earlier. [note: 158] Even if it was not the Defendant's responsibility to do conduct the TVM (which is not accepted), the fact that TVM was not conducted leaves open a gap in the Defendant's vibration theory, *ie*, measurements of the alleged cause. [note: 159]

(e) Dr Yap does not convincingly explain why engine excitation could not have been the cause of the jiggling problem. Dr Yap eliminated the engines as a possible source of excitation as he was told that the engines had been tested previously. [note: 160] I do not think that it was right for him to have proceeded on that premise. The engines were only "batch tested" at the factory, and in any event, the propellers and propeller shafts were also approved by NKK. Dr Yap should not have turned a blind eye to the possibility that the engine might have been the source of excitation. In fact, A/P Yap did not appear to think that it was appropriate to rule out the possibility that the source of excitation might have been from the engine and not the propellers. [note: 161]

87 Thirdly, I prefer the evidence of A/P Yap over the evidence of Dr Yap:

(a) Dr Yap appears to have ignored the other possible causes of the jiggling problem and focused his mind solely on propeller excitation and propeller shaft resonance. [note: 162] Dr Yap's evidence also appears to be inconsistent when it comes to the jiggling frequency [note: 163] and the natural frequency of the propeller shaft. [note: 164] While Dr Yap tried to draw a distinction between the "measured" natural frequency and "calculated" natural frequency of the propeller shaft, he failed to explain why he relied only on the "calculated" natural frequency and not the "measured" natural frequency at trial. Most importantly, Dr Yap's vibration theory does not seem to be supported by the objective facts ([85] above) and, in particular, he cannot provide an adequate explanation for the result of the Swap Test ([81(b)] above) or the adjustment of the governor output linkage ([85(a)] above).

(b) In contrast, A/P Yap's evidence is clear, consistent and coherent. I disagree with the

Defendant's criticisms of A/P Yap. [note: 165] In my view, A/P Yap had been honest and objective with his evidence. I do not think that A/P Yap can be faulted for saying that more tests have to be conducted to identify the specific cause of the jiggling problem conclusively. Indeed, the Plaintiff does not have to pinpoint the specific part or component within the Propulsion Units which is defective ([67] above). It is also apparent from A/P Yap's testimony and his curriculum vitae that he has numerous years of experience in consultancy work. [note: 166]

88 Each of these points independently cast a serious doubt on the vibration theory, and when taken together, it becomes clear that the vibration theory cannot hold water.

89 Apart from the vibration theory, the Defendant also contends that the dynamometer tests conducted by MHI on the Propulsion Units indicate that the cause of the jiggling problem did not lie in the Propulsion Units. However, I do not agree for three reasons:

(a) First, the evidence of Sekiguchi, the MHI officer who conducted the dynamometer tests for the Propulsion Units, was that he tested for the jiggling problem by *disengaging* rather than engaging the gearbox. [note: 167] Since the parties are agreed that the jiggling problem only arose when the gear is engaged from neutral to ahead or astern, [note: 168] it is clear that the "jiggling confirmation test" conducted by MHI is flawed and little, if any, weight should be given to the results.

(b) Secondly, the dynamometer tests do not simulate the actual operating conditions of the Propulsion Units on board the Vessels, or the conditions where the engine is at idle and the gearbox is put to ahead or astern. This has been accepted by the experts on both sides. [note: 169]

(c) Thirdly, the jiggling problem occurs only when the Propulsion Units have been operated on load for approximately an hour, *ie*, after the Propulsion Units have warmed up. [note: 170] However, there is nothing on the test records to show that the Propulsion Units were operated on load for approximately an hour or warmed up before the jiggling confirmation test. [note: 171] I am not prepared to infer that the engine was sufficiently warmed up merely because the records show that the load test was performed before the jiggling confirmation test. [note: 172] There was no evidence to indicate that the jiggling confirmation test was conducted immediately after the load test such that the Propulsion Units would have been sufficiently warmed up.

90 Having rejected the Defendant's vibration theory and the results of the dynamometer tests, I find that there is little to support the Defendant's case that the jiggling problem was caused by propeller excitation and propeller shaft resonance. In my judgment, the Plaintiff has established a *prima facie* case that the Propulsion Units were defective and the Defendant had not been able to show otherwise.

91 Before I conclude on this issue, I should perhaps deal with the issue brought up by the Plaintiff during the trial. Specifically, the Plaintiff asked me to draw certain inferences based on the absence of the jiggling problem on the CHIYADI I and CHRISPIANTO I and the presence of the jiggling problem on the TB BAHAR 1291, TB OASIS IX and the vessel in Taiwan ("the Taiwan case"). As I understood it, the Plaintiff argues that:

(a) the absence of the jiggling problem on CHIYADI I and CHRISPIANTO I, which are of identical specifications and design as the Vessels and have identical propulsion units, [note: 173]

corroborates the Plaintiff's evidence that the jiggling problem was not due to the propeller and propeller shaft; [note: 174] and

(b) the existence of three other known cases of the jiggling problem in marine diesel engines manufactured by MHI (of which two were supplied by the Defendant together with the gearboxes) also serves to corroborate the evidence that the jiggling problem was caused by the Propulsion Units and not the propeller or propeller shaft. [note: 175]

92 I am not prepared to agree with the Plaintiff that, on the evidence placed before me, I should draw such inferences:

(a) In relation to CHIYADI I and CHRISPIANTO I, there was no evidence, apart from the technical drawings and diagrams, to show that the actual "as-built" specifications and natural frequencies of the propeller shafts are the same as CALVIN I and CLEMENT I.

(b) As for TB BAHAR 1291 and TB OASIS IX, the vessel design and specifications, the engines and gearboxes were different from the present case. There is also some indication, albeit shaky, that "Ah Sui" of PT Cahaya Samudera Shipyard had agreed that there was no problem with the engines. [note: 176]

(c) Finally, for the Taiwan case, there is little known about the vessel except that it was a single-engine fishing vessel with different design and specifications and fitted with an engine of the same make and model but with a different gearbox (Nico instead of Reintjes). [note: 177] The characteristics of the problem (*ie*, no jiggling below engine speed of 900 RPM and exhaust sound was "abnormal") appear to be different as well. [note: 178]

93 Be that as it may, I do not think that it would be necessary for the Plaintiff to rely on the inferences to prove its case.

94 Based on the evidence and findings above, I am satisfied that the Plaintiff has shown *prima facie* evidence that the jiggling problem was caused by the Propulsion Unit and that the Defendant is unable to show that this is incorrect on the balance of probabilities.

Whether the Defendant was in breach of the implied condition of satisfactory quality under s 14(2) of the SOGA and/or the Warranty Clause?

95 I will deal first with the implied condition of satisfactory quality under s 14(2) of the SOGA, followed by the Warranty Clause.

Breach of s 14(2) of the SOGA

96 The standard of "satisfactory quality" is embodied in ss 14(2), (2A), (2B) and (2C) of the SOGA and the combined effect of these provisions had been summarised in *Compact Metals Industries Ltd v PPG Industries (Singapore) Ltd* [2006] SGHC 242 ("*Compact Metals*") at [102]. This was affirmed by the Court of Appeal in *National Foods Ltd v Pars Ram Brothers (Pte) Ltd* [2007] 2 SLR(R) 1048 at [58].

97 The question is whether a reasonable person, placed in the position of the buyer and armed with his knowledge of the transaction and background, would regard the quality of the goods as satisfactory: *Compact Metals* at [102]; s 14(2A) of the SOGA. The goods must be fit for *all* the

purposes for which goods of that kind are commonly supplied: *Compact Metals* at [102]; s 14(2B) of the SOGA.

98 In the present case, the Propulsion Units are commonly supplied for use on tugboats. [note: 179] The parties agree that the jiggling problem rendered the Propulsion Units unsuitable for operations on board the Vessels and the Vessels unseaworthy. [note: 180] Given that the jiggling problem was, on the balance of probabilities, caused by a defect in the Propulsion Units, it follows that the Propulsion Units supplied by the Defendant were not of satisfactory quality. I do not accept that the Defendant was merely selling "horsepower" such that the Defendant would have fulfilled their obligation if the engine could achieve the specified horsepower. [note: 181] The Propulsion Unit included the gearbox and governor which had nothing to do with horsepower. This was acknowledged by Chua Tiong Wei, the executive director for sales and business development of the Defendant. [note: 182] Accordingly, I find that the Defendant breached s 14(2) of the SOGA.

Breach of the Warranty Clause

99 It is undisputed that the Propulsion Units were covered by the Warranty Clause at the time the jiggling problem surfaced, *ie*, within 12 months from date of commissioning or 18 months from date of delivery, whichever is earlier. The Defendant's sole ground of contention was that the jiggling problem was not caused by the Propulsion Units. [note: 183]

100 Given the finding that the jiggling problem was caused by the Propulsion Units, it follows that the Defendant's refusal to remedy the jiggling problem or to replace the Propulsion Units would constitute a breach of the Warranty Clause. As such, the Plaintiff was entitled to terminate the Sale Contract and claim for damages.

If (b) is proven, what is the amount of damages payable by the Defendant?

101 The Plaintiff claims for the recovery of the purchase price, the expenses incurred and the losses relating to the Shipbuilding Contracts.

Recovery of purchase price

102 A buyer is entitled to reject goods which were not of satisfactory quality, subject to the defence of acceptance by use: *Sun Qi v Syscon Pte Ltd* [2013] SGHC 38 at [27]; *Clegg and another v Olle Andersson (trading as Nordic Marine)* [2003] 1 All ER (Comm) 721 at [50].

103 I see no reason to say that the Plaintiff cannot reject the Propulsion Units and recover the purchase price paid to the Defendant. In any event, this has not been challenged by the Defendant. [note: 184]

104 Accordingly, I find that the Plaintiff is entitled to reject the Propulsion Units and recover the purchase price of ¥65,600,000 in light of the Defendant's breaches.

Expenses incurred

105 In addition, the Plaintiff claims for certain expenses incurred as a result of the Defendant's breaches, including:

(a) The port dues, berth charges and insurance premium from 31 March 2011 (for CALVIN I)

and 30 April 2011 (for CLEMENT I) to 20 July 2012;

(b) The expenses incurred for investigations and fault-finding, including, the sea trials for the Vessels, the upslipping of CALVIN I and the Swap Test;

(c) The expenses incurred for dismantling, removing and shipping the Propulsion Units to the Defendant in Singapore; and

(d) The expenses incurred in the resale of the Vessels (without the Propulsion Units) in mitigation of its losses, the annual class survey of the Vessels and transportation claims.

106 For item (a), the Defendant contends that the computation of the port dues, berth charges and insurance premium should be based on the date of the discovery of the jiggling problem (*ie*, 3 May 2011 for CALVIN I and 18 May 2011 for CLEMENT I) instead of the dates of delivery specified under the Shipbuilding Contracts (*ie*, 31 March 2011 for CALVIN I and 30 April 2011 for CLEMENT I). [note: 185]

107 I agree. The jiggling problem was first discovered on 3 May 2011 (for CALVIN I) and 18 May 2011 (for CLEMENT I). [note: 186] On the evidence, the delay in the delivery of the Vessels prior to 3 and 18 May 2011 was not caused by the Defendant but delays caused by the Plaintiff in getting the Vessels in a condition suitable for handover to PPK. It appears from the evidence that the delay was because PPK wanted to have the familiarisation trials and certain "cleaning up" and "touch-up" completed before taking delivery of the Vessels. [note: 187] Since the Plaintiff agreed to PPK's request to postpone the delivery of the Vessels, [note: 188] it is irrelevant that the Plaintiff was, in fact, ready to deliver the Vessels. Accordingly, I find that the Plaintiff is only entitled to recover the port dues, berth charges and insurance premium from 3 May 2011 (for CALVIN I) and 18 May 2011 (for CLEMENT I) to 20 July 2012 (*ie*, the date that the Vessel's hull were delivered to PFMR).

108 For item (b), the Defendant's sole objection was that the Swap Test was an "unreasonable act of mitigation". [note: 189] I reject the Defendant's argument for three reasons:

(a) The Defendant had not pleaded this point and is thus not entitled to rely on it. If the Defendant had intended to raise this it would have to be specifically and properly pleaded: *Emjay Enterprises Pte Ltd v Skylift Consolidator (Pte) Ltd (Direct Services (HK) Ltd, third party)* [2006] 2 SLR(R) 268 at [30] and [34]; *Lee Hsien Loong v Singapore Democratic Party and others and another suit* [2009] 1 SLR(R) 642 at [14].

(b) Further, Swap Test was not an "act of mitigation". It was not a step taken in mitigation; it was done to find out if the jiggling problem was caused by the Propulsion Units. Instead, what the Defendant ought to have pleaded or said is that the Plaintiff had failed to mitigate when it did not take reasonable steps to avoid or minimise the expenses incurred, *eg*, by conducting the TVM instead of the Swap Test (see Harvey McGregor, *McGregor on Damages*, 18th ed (Thomson Reuters (Legal) Limited, 2009) at [7-004]).

(c) Even if the Defendant had pleaded this properly (which it had not), I find that the expenses incurred for the Swap Test were reasonable. The TVM, while substantially cheaper, would have only indicated whether there was propeller shaft resonance. The parties would have been none the wiser if the results came back negative. At the time when the Plaintiff decided to proceed with the Swap Test (*ie*, September 2011), the parties had conducted numerous tests but were unable to ascertain the cause of the jiggling problem. There was ample evidence that

the parties were not sure of the cause of the jiggling problem and various tests and steps were taken to eliminate possible causes. It finally boiled down to proving or disproving whether it was caused by, as the Defendant put it, "external causes" or causes external to the Propulsion Units. I find that by this time the Plaintiff were quite desperate to identify the cause of the problem so that it could be rectified. The Plaintiff was unable to conduct direct investigations on the Propulsion Units as it might void the warranty, [note: 190] and in the meantime, the Vessels were incurring substantial port dues and berth charges at PBIS. [note: 191] The Defendant had taken the position that the Propulsion Units were not defective and were reluctant to take further steps to remedy the jiggling problem. [note: 192] It was under such circumstances that the Plaintiff decided to proceed with the Swap Test to overcome the impasse. [note: 193] As such, I cannot agree with the Defendant that the expenses incurred for the Swap Test were unreasonable.

109 Items (c) and (d) were not disputed by the Defendant. [note: 194] Since they were reasonably incurred as a consequence of the Defendant's breaches, I find that the Plaintiff is entitled to recover the expenses under items (c) and (d).

Losses relating to the Shipbuilding Contracts

110 The Plaintiff also claims for the losses relating to the Shipbuilding Contracts. This includes the loss of the Shipbuilding Contracts and the liquidated damages paid to PPK.

111 The sale price for the Vessels under the Shipbuilding Contracts was $2,420,000 each. The Plaintiff would have received a total of $4,840,000 from PPK for the Vessels but for the defective Propulsion Units supplied by the Defendant. To quantify the Plaintiff's loss resulting from the termination of the Shipbuilding Contracts, I must deduct $2,400,000 as the price received from the resale of the hulls of the Vessel to PFMR and ¥65,600,000 as the purchase price payable for the Propulsion Units. This is to ensure that there is no double recovery by the Plaintiff. Hence, the Plaintiff's loss of the Shipbuilding Contracts would be $2,440,000 less ¥65,600,000.

112 Next, I move on to the liquidated damages paid to PPK. Article 3.1.1 of the Shipbuilding Contracts provided that:

> In the event that the Delivery and Acceptance of the Vessel is delayed beyond the Delivery Date, the Seller shall pay to the Buyer as liquidated damages for the Seller's failure to deliver the Vessel on the Delivery Date, the sum of S$1,000 … per day for each day of delay after the Delivery Date after deducting Permissible Delay, up to a maximum of 30 days delay from the Date of Delivery. The Seller's liability (if any) in connection with the delay delivery of the Vessel shall not exceed the sum of S$30,000 …
>
> If the delay in Delivery and Acceptance of the Vessel continues for a period of more than 30 days after the Delivery Date and after deducting Permissible Delay, then, in such event, the Buyer may, at its option, terminate this Contract at any time after such period has expired, by serving upon the Seller Written Notice of cancellation.

113 As a result of the jiggling problem, the Plaintiff could not deliver the Vessels. PPK had terminated the Shipbuilding Contracts on 5 July 2011, and the Plaintiff had to pay liquidated damages of $60,000 to PPK (for CALVIN I and CLEMENT I).

114 I find that there is no issue with remoteness of damages for both claims. The Defendant was aware that the Plaintiff had purchased the Propulsion Units for the vessels that it was building for its

customers, [note: 195] and that liquidated damages would be payable for late delivery of vessels. [note: 196] I also find that in the shipbuilding industry, liquidated damages for delay in delivery was a standard provision that was almost always included in the contracts. It is clear from Chua Tiong Wei's evidence that it is "very, very common for liquidated damages to be payable" for late delivery of vessels under shipbuilding contracts. [note: 197] Accordingly, the losses were well within the reasonable contemplation of the parties at the time of the contract as a natural consequence of the breach: *Robertson Quay Investment Pte Ltd v Steen Consultants Pte Ltd and another* [2008] 2 SLR(R) 623 at [81]. Indeed, the Defendant does not appear to contest this point as well. [note: 198]

115 Accordingly, I find that the Plaintiff is entitled to recover:

(a) $2,440,000 less ¥65,600,000 for loss of the Shipbuilding Contracts; and

(b) $60,000 for liquidated damages paid to PPK.

Whether the Plaintiff is liable for the counterclaim for wrongful rejection of the Propulsion Units?

116 The counterclaim is premised upon the fact that the Propulsion Units are not defective. Since I have found that the Propulsion Units are defective, the counterclaim must necessarily fail.

Conclusion

117 For the reasons set out above, I allow the Plaintiff's claim and dismiss the Defendant's counterclaim and, award the Plaintiff the following:-

(a) ¥65,600,000 as the recovery of the purchase price of the Propulsion Units;

(b) $89,000 as berth charges (at $200 a day) and $16,994.30 as port dues incurred on CALVIN I from 3 May 2011 to 20 July 2012;

(c) $86,000 as berth charges (at $200 a day) and $15,513.89 as port dues incurred on CLEMENT I from 18 May 2011 to 20 July 2012;

(d) $41,478.34 as insurance premium for CALVIN I and CLEMENT I;

(e) $307,889.73 and US$301,612.90 as expenses incurred for investigations and fault-finding, including the sea trials for the Vessels, the upslipping of CALVIN I and the Swap Test;

(f) $22,898.40 as expenses incurred for dismantling, removing and shipping the Propulsion Units to the Defendant in Singapore

(g) $5973.40 and US$5,576 as expenses incurred in the resale of the Vessels (without the Propulsion Units) in mitigation of its losses, the annual class survey of the Vessels and transportation claims

(h) $2,440,000 less ¥65,600,000 as the loss and damage suffered by the Plaintiff for the loss of the Shipbuilding Contracts; and

(i) $60,000 as liquidated damages paid to PPK.

118 In total, the Plaintiff is entitled to recover $3,085,748.06 and US$307,188.90.

119 For the sake of clarity, I should note that there was no evidence to suggest that there was any payment or refund made pursuant to the Shipbuilding Contracts between PPK and the Plaintiff (except for the liquidated damages of $60,000).

120 I will hear the parties on interest and costs.

[note: 1] Defendant's Closing Submissions at para 6.

[note: 2] Statement of Claim (Amendment No 2) ("SOC") at para 10.

[note: 3] SOC at para 14.

[note: 4] SOC at paras 4–6, 10 and 12.

[note: 5] Plaintiff's Closing Submissions at para 4.

[note: 6] Defendant's Closing Submissions at para 7.

[note: 7] Defendant's Closing Submissions at para 7;

[note: 8] AEIC of Gordon John Tennant at 153.

[note: 9] Minutes of Experts Meeting dated 11 and 12 September 2013, Annex 1, AEIC of Yap Fook Fah at paras 8–10.

[note: 10] SOC at para 26.

[note: 11] AEIC of Samantha Teo Mong Ping at para 79.

[note: 12] AEIC of Samantha Teo Mong Ping at paras 91–93.

[note: 13] AEIC of Samantha Teo Mong Ping at para 89.

[note: 14] AEIC of Samantha Teo Mong Ping at para 89.

[note: 15] Defendant's Closing Submissions at para 31.

[note: 16] Defence and Counterclaim (Amendment No 4) ("DCC") at para 42.

[note: 17] AEIC of Samantha Teo Mong Ping at para 1.

[note: 18] AEIC of Samantha Teo Mong Ping at para 1.

[note: 19] AEIC of Shofchan Jamil at para 1.

[note: 20] AEIC of Shofchan Jamil at para 1.

[note: 21] Notes of Evidence, 7 January 2014, page 3 line 24 – page 4 line 7.

[note: 22] AEIC of Cien at para 1; AEIC of Tjhin Fong at para 1; AEIC of Nimrod Ismael at para 1.

[note: 23] AEIC of Cien at para 2; AEIC of Tjhin Fong at paras 2–3; AEIC of Nimrod Ismael at para 2.

[note: 24] AEIC of Muhammad Ramadhan at paras 1–3.

[note: 25] AEIC of Heng Lip Joo at paras 9 and 24.

[note: 26] AEIC of Chua Siew Meng at paras 1, 5–6.

[note: 27] AEIC of Wong Meng Fai at para 1.

[note: 28] AEIC of Wong Meng Fai at para 6.

[note: 29] AEIC of Chua Tiong Wei at para 1.

[note: 30] AEIC of Chua Tiong Wei at para 5.

[note: 31] AEIC of Yap Lee Ann at paras 1 and 3.

[note: 32] AEIC of Masayuki Sugiyama at paras 1 and 5–8; AEIC of Iwao Sekiguchi at paras 1 and 5–7.

[note: 33] Notes of Evidence, 16 January 2014, page 16 line 4 – page 18 line 3; Notes of Evidence, 16 January 2014, page 21 lines 2 – 10; Notes of Evidence, 16 January 2014, page 23 line 20 – page 24 line 18.

[note: 34] Issue 1 of the Amended Minutes; Notes of Evidence, 7 January 2014, page 33 lines 23–25; Notes of Evidence 22 January 2014, page 60 lines 10–20; Notes of Evidence 22 January 2014, page 61 lines 16–19.

[note: 35] Notes of Evidence, 16 January 2014, page 16 line 4 – page 18 line 3; Notes of Evidence, 16 January 2014, page 21 lines 2 – 10.

[note: 36] Notes of Evidence, 16 January 2014, page 23 line 20 – page 24 line 18.

[note: 37] AEIC of Yoshihiro Koyama at paras 1 and 9–18.

[note: 38] Notes of Evidence, 17 January 2014, page 6 lines 7–16.

[note: 39] Notes of Evidence, 17 January 2014, page 6 lines 7–16.

[note: 40] Notes of Evidence, 16 January 2014, page 30 lines 15–23.

[note: 41] Notes of Evidence, 17 January 2014, page 9 lines 2–7.

[note: 42] Notes of Evidence, 17 January 2014, page 12 lines 2–16; Notes of Evidence, 17 January 2014, page 13 lines 16–21.

[note: 43] Notes of Evidence, 17 January 2014, page 8 at lines 3–9; Notes of Evidence, 17 January 2014, page 11 line 23 – page 12 line 6; Notes of Evidence, 17 January 2014, page 13 lines 16–21.

[note: 44] Notes of Evidence, 17 January 2014, page 13 lines 2–15. See Notarised AEIC of Yoshihiro Koyama at 13 (with check marks) and Signed AEIC of Yoshihiro Koyama at 34 (without check marks).

[note: 45] Notes of Evidence, 17 January 2014, page 14 line 14 – page 15 line 4.

[note: 46] Notes of Evidence, 17 January 2014, page 15 lines 15–18.

[note: 47] AEIC of Wilson Thomas at para 5.

[note: 48] Notes of Evidence, 9 January 2014, page 44 lines 4–20.

[note: 49] Notes of Evidence, 9 January 2014, page 46 line 23 – page 47 line 12.

[note: 50] AEIC of Wilson Thomas at para 22; Notes of Evidence, 15 January 2014, page 5 lines 7–18.

[note: 51] AEIC of Lim Yue Heng at paras 5 and 8.

[note: 52] Notes of Evidence, 15 January 2014, page 36 line 18 – page 39 line 6.

[note: 53] Notes of Evidence, 15 January 2014, page 26 line 25 – page 27 line 6 and page 32 line 4–25.

[note: 54] Plaintiff's Closing Submissions at paras 146–150.

[note: 55] Plaintiff's Closing Submissions at paras 148 and 150.

[note: 56] Defendant's Reply Submissions at para 122.

[note: 57] Plaintiff's Closing Submissions at para 147; Defendant's Reply Submissions at para 122.

[note: 58] Plaintiff's Closing Submissions at para 148; Notes of Evidence, 15 January 2014, page 72 lines 10–19.

[note: 59] 10th Affidavit of Yap Lee Ann at paras 12–13.

[note: 60] Notes of Evidence, 15 January 2014, page 74 lines 8–16.

[note: 61] Notes of Evidence, 15 January 2014, page 72 lines 10–14

[note: 62] Plaintiff's Closing Submissions at para 148; Defendant's Reply Submissions at para 124.

[note: 63] 10th Affidavit of Yap Lee Ann at para 13.

[note: 64] Notes of Evidence, 14 January 2014, page 12 line 11 – page 15 line 19; Notes of Evidence, 17 January 2014, page 24 line 9 – page 25 line 8.

[note: 65] Plaintiff's Closing Submissions at para 150; Defendant's Closing Submissions at para 122.

[note: 66] Minutes of Experts Meeting dated 11 and 12 September 2013, Annex 1, AEIC of Yap Fook Fah at paras 8–10.

[note: 67] Notes of Evidence, 23 January 2014, page 49 lines 1–9.

[note: 68] Plaintiff's Closing Submissions at para 38.

[note: 69] Plaintiff's Closing Submissions at para 33.

[note: 70] Notes of Evidence, 23 January 2014, page 49 line 25 – page 51 line 19.

[note: 71] Plaintiff's Closing Submissions at para 37.

[note: 72] Notes of Evidence, 23 January 2014, page 49 line 25 – page 51 line 19.

[note: 73] Plaintiff's Closing Submissions at para 38.

[note: 74] Defendant's Closing Submissions at paras 19–43.

[note: 75] Defendant's Reply Submissions at paras 39–43.

[note: 76] Defendant's Reply Submissions at para 25.

[note: 77] Defendant's Closing Submissions at paras 206–216; Notes of Evidence, 23 January 2014, page 56 lines 7–19.

[note: 78] Notes of Evidence, 23 January 2014, page 49 line 25 – page 51 line 19.

[note: 79] Notes of Evidence, 23 January 2014, page 49 line 1 – page 58 line 4.

[note: 80] Notes of Evidence, 23 January 2014, page 55 lines 7–12.

[note: 81] Notes of Evidence, 23 January 2014, page 55 lines 7–12.

[note: 82] Notes of Evidence, 23 January 2014, page 13 lines 22–23. For the video recording of June 2011, see Defendant's Core Bundle, Tab 10.

[note: 83] Notes of Evidence, 23 January 2014, page 56 lines 7–19.

[note: 84] Notes of Evidence, 23 January 2014, page 56 line 20 – page 57 line 3.

[note: 85] Plaintiff's Closing Submissions at para 154.

[note: 86] Plaintiff's Closing Submissions at para 154.

[note: 87] Plaintiff's Closing Submissions at para 154.

[note: 88] Plaintiff's Closing Submissions at para 139.

[note: 89] Defendant's Closing Submissions at paras 221–235; Defendant's Reply Submissions at paras 128–143.

[note: 90] Defendant's Closing Submissions at paras 230–235; Defendant's Reply Submissions at paras 132–135.

[note: 91] Section 103 of the Evidence Act (Cap 97, 1997 Rev Ed).

[note: 92] Plaintiff's Closing Submissions at para 40.

[note: 93] Plaintiff's Closing Submissions at para 40.

[note: 94] Defendant's Closing Submissions at para 88.

[note: 95] Defendant's Closing Submissions at paras 89–91.

[note: 96] Defendant's Closing Submissions at para 88.

[note: 97] AEIC of Shofchan Jamil at para 42.

[note: 98] AEIC of Shofchan Jamil at para 42.

[note: 99] AEIC of Shofchan Jamil at para 42.

[note: 100] AEIC of Chua Siew Meng at para 10.

[note: 101] AEIC of Chua Siew Meng at para 10.

[note: 102] Notes of Evidence, 22 January 2014, page 70 lines 8–16; Notes of Evidence, 22 January 2014, page 88 lines 20–25.

[note: 103] Issue 6(4) of the Amended Minutes.

[note: 104] AEIC of Samantha Teo Mong Ping at paras 51–53; AEIC of Shofchan Jamil at paras 44, 46–

48.

[note: 105] Plaintiff's Reply Submissions at para 142; DCC at para 49.

[note: 106] DCC at para 50.

[note: 107] AEIC of Yap Sau Hee at 16, 19 and 25. Notes of Evidence, 23 January 2014, page 34 lines 5–11; Notes of Evidence, 23 January 2014, page 35 lines 2–8.

[note: 108] Notes of Evidence, 23 January 2014, page 40 line 22 – page 41 line 25; Notes of Evidence, 22 January 2014, page 127 lines 4–22.

[note: 109] AEIC of Yap Sau Hee at 19.

[note: 110] Notes of Evidence, 23 January 2014, page 40 lines 17–25.

[note: 111] AEIC of Samantha Teo Mong Ping at paras 69–70; Notes of Evidence, 10 January 2014, page 8 line 1–16.

[note: 112] AEIC of Samantha Teo Mong Ping at para 70.

[note: 113] AEIC of Samantha Teo Mong Ping at para 76.

[note: 114] Issue 11(2) of the Amended Minutes

[note: 115] AEIC of Shofchan Jamil at paras 57–59.

[note: 116] Defendant's Closing Submissions at para 179.

[note: 117] AEIC of Gordon John Tennant at 45–46; Notes of Evidence, 22 January 2014, page 57 lines 5–15.

[note: 118] Notes of Evidence, 22 January 2014, page 66 lines 7–10.

[note: 119] Notes of Evidence, 22 January 2014, page 56 lines 3–14.

[note: 120] Notes of Evidence, 22 January 2014, page 80 line 9 – page 81 line 17.

[note: 121] Issue 13 of the Amended Minutes.

[note: 122] Notes of Evidence, 22 January 2014, page 74 line 22 – page 75 line 3.

[note: 123] Notes of Evidence, 22 January 2014, page 57 lines 16–24.

[note: 124] Notes of Evidence, 9 January 2014, page 25 line 22 – page 27 line 12.

[note: 125] Notes of Evidence, 22 January 2014, page 71 lines 14–21.

[note: 126] AEIC of Yap Sau Hee at 14; Notes of Evidence, 22 January 2014, page 64 lines 5–7.

[note: 127] AEIC of Yoshihiro Koyama at para 7; Notes of Evidence, 8 January 2014, page 96 lines 1–12.

[note: 128] Issue 24 of the Amended Minutes.

[note: 129] AEIC of Yap Fook Fah at 34–35.

[note: 130] Issue 2 of the Amended Minutes.

[note: 131] Issue 2 of the Amended Minutes.

[note: 132] Notes of Evidence, 23 January 2014, page 13 lines 11–21; Notes of Evidence, 22 January 2014, page 91 line 21 – page 92 line 2.

[note: 133] Notes of Evidence, 22 January 2014, page 92 lines 7–11.

[note: 134] AEIC of Yap Fook Fah at 33.

[note: 135] Defendant's Closing Submissions at paras 78–81.

[note: 136] Issue 7 of the Amended Minutes.

[note: 137] AEIC of Yap Sau Hee at 22.

[note: 138] Notes of Evidence, 22 January 2014, page 139 line 17 – page 140 line 20; Notes of Evidence, 23 January 2014, page 132 lines 9–22.

[note: 139] Notes of Evidence, 22 January 2014, page 139 lines 5 – 16.

[note: 140] Notes of Evidence, 22 January 2014, page 139 line 17 – page 140 line 19; Notes of Evidence, 22 January 2014, page 144 line 12 – 16. AEIC of Lim Yue Heng at paras 12–14.

[note: 141] AEIC of Yap Fook Fah at 33–34.

[note: 142] Issue 3(1) of the Amended Minutes.

[note: 143] AEIC of Yap Fook Fah at 34.

[note: 144] Defendant's Closing Submissions at paras 75–76.

[note: 145] Plaintiff's Reply Submissions at para 58.

[note: 146] Issue 4 of the Amended Minutes.

[note: 147] AEIC of Yap Fook Fah at 34.

[note: 148] Defendant's Closing Submissions at para 86.

[note: 149] Notes of Evidence, 15 January 2014, page 26 line 25 – page 27 line 6 and page 32 line 4–25.

[note: 150] Notes of Evidence, 15 January 2014, page 25 line 25 – page 26 line 24; Notes of Evidence, 22 January 2014, page 139 line 5–16.

[note: 151] Plaintiff's Closing Submissions at para 92.

[note: 152] Notes of Evidence, 22 January 2014, page 121 line 19 – page 122 line 20.

[note: 153] Notes of Evidence, 22 January 2014, page 117 line 2 – page 118 line 4.

[note: 154] Notes of Evidence, 22 January 2014, page 115 lines 10–18.

[note: 155] Notes of Evidence, 22 January 2014, page 118 lines 5–13.

[note: 156] Defendant's Closing Submissions at para 48; AEIC of Yap Sau Hee at 14.

[note: 157] Notes of Evidence, 23 January 2014, page 22 lines 3–7.

[note: 158] 10 AB 2856, 2869 – 2871; AEIC of Samantha Teo Mong Ping at para 77.

[note: 159] Notes of Evidence, 22 January 2014, page 128 lines 14–22.

[note: 160] Notes of Evidence, 22 January 2014, page 69 lines 4–10.

[note: 161] Notes of Evidence, 23 January 2014, page 22 lines 18–19.

[note: 162] Notes of Evidence, 22 January 2014, page 69 lines 4–10.

[note: 163] AEIC of Yap Sau Hee at 13 (7–8 Hz), 14 (8 Hz) and 19 (7.2 Hz).

[note: 164] AEIC of Yap Sau Hee at 19 (8.3 Hz); Supplementary AEIC of Yap Sau Hee at 6 (7.8 Hz).

[note: 165] Defendant's Closing Submissions at paras 166–171.

[note: 166] Notes of Evidence, 23 January 2014, page 113 lines 1–4; AEIC of Yap Fook Fah at 10–11, 52.

[note: 167] Notes of Evidence, 16 January 2014, page 16 line 4 – page 18 line 3; Notes of Evidence, 16

January 2014, page 21 lines 2 – 10; Notes of Evidence, 16 January 2014, page 23 line 20 – page 24 line 18.

[note: 168] Issue 1 of the Amended Minutes; Notes of Evidence, 7 January 2014, page 33 lines 23–25; Notes of Evidence 22 January 2014, page 60 lines 10–20; Notes of Evidence 22 January 2014, page 61 lines 16–19.

[note: 169] Issues 19 and 20 of the Amended Minutes; Notes of Evidence, 24 January 2014, page 96 line 23 – page 97 line 22.

[note: 170] Issue 3(1) of the Amended Minutes.

[note: 171] Notes of Evidence, 16 January 2014, page 11 lines 23–24; Notes of Evidence, 16 January 2014, page 13 lines 9–13.

[note: 172] AEIC of Yoshihiro Koyama at 42 (a translated copy can be found in the AEIC of Adriel Aloysius Chia Teck Yew at 14).

[note: 173] AEIC of Samantha Teo Mong Ping at paras 13–14; Notes of Evidence, 22 January 2014, page 12 lines 5–19.

[note: 174] Plaintiff's Closing Submissions at para 130.

[note: 175] Plaintiff's Closing Submissions at paras 131–138

[note: 176] Notes of Evidence, 17 January 2014, page 63 line 23 – page 65 line 13; Notes of Evidence, 17 January 2014, page 99 lines 14–21.

[note: 177] AEIC of Tan Tin Yeow at paras 26–27.

[note: 178] AEIC of Tan Tin Yeow at para 27.

[note: 179] Notes of Evidence, 24 January 2014, page 64 line 23 – page 65 line 4; Notes of Evidence, 10 January 2014, page 77 lines 9–14.

[note: 180] Issues 9 and 10 of the Amended Minutes.

[note: 181] Notes of Evidence, 10 January 2014, page 68 lines 11–12.

[note: 182] Notes of Evidence, 14 January 2014, page 89 line 4 – page 90 line 7.

[note: 183] Defendant's Reply Submissions at paras 144–145.

[note: 184] Defendant's Reply Submissions at paras 162–163.

[note: 185] Defendant's Reply Submissions at paras 158–161.

[note: 186] AEIC of Samantha Teo Mong Ping at paras 41–42.

[note: 187] AEIC of Samantha Teo Mong Ping at para 39; Notes of Evidence, 9 January 2014, page 54 line 17 – page 55 line 19; Notes of Evidence, 9 January 2014, page 56 lines 2–14; Notes of Evidence, 9 January 2014, page 57 line 2 – page 60 line 12.

[note: 188] AEIC of Samantha Teo Mong Ping at para 39.

[note: 189] Defendant's Reply Submissions at paras 146–157.

[note: 190] AEIC of Samantha Teo Mong Ping at para 68.

[note: 191] AEIC of Samantha Teo Mong Ping at para 68.

[note: 192] AEIC of Samantha Teo Mong Ping at paras 65 and 68.

[note: 193] AEIC of Samantha Teo Mong Ping at para 69.

[note: 194] Defendant's Reply Submissions at paras 162–163.

[note: 195] Notes of Evidence, 10 January 2014, page 75 lines 2–6; Notes of Evidence, 10 January 2014, page 76 lines 2–6.

[note: 196] Notes of Evidence, 14 January 2014, page 35 lines 3–22.

[note: 197] Notes of Evidence, 14 January 2014, page 35 lines 18–22.

[note: 198] Defendant's Reply Submissions at paras 162–163.