

Ensure Engineering Pte Ltd v Invista (Singapore) Pte Ltd (formerly known as Du Pont
Singapore Pte Ltd)
[2005] SGHC 237

Case Number : Suit 211/2004
Decision Date : 27 December 2005
Tribunal/Court : High Court
Coram : Kan Ting Chiu J
Counsel Name(s) : Lim May Li (Lim and Pillay) for the plaintiffs; Vinodh S Coomaraswamy SC and Elaine Wong (Shook Lin and Bok) for the defendants
Parties : Ensure Engineering Pte Ltd — Invista (Singapore) Pte Ltd (formerly known as Du Pont Singapore Pte Ltd)

Contract – Breach – Plaintiff carrying out maintenance, cleaning and repair services for defendant's industrial boiler – Defendant failing to pay for work done – Whether defendant liable for payment for work done

Debt and Recovery – Counterclaim – Whether defendant having counterclaim against plaintiff for failing to carry out chemical cleaning services in accordance with contract – Whether plaintiff's alleged failure to carry out chemical cleaning services in accordance with contract caused damage to defendant's boiler

27 December 2005

Judgment reserved.

Kan Ting Chiu J:

The parties

1 The plaintiff, Ensure Engineering Pte Ltd, is in the business of providing maintenance, cleaning and repair services for industrial boilers. The defendant (known as Du Pont Singapore Pte Ltd at the material time) owned and operated a boiler purchased from a specialist manufacturer.

2 The main components of the boiler were two drums, called the steam drum and the mud drum, with a system of boiler tubes connected to each drum. The drums were modified to suit the defendant's requirements by blocking off 996 boiler tubes with plugs welded into the tube ends. A plug is a short hollow tube with a top or crown at one end and open at the other end, like an inverted drinking glass. The open end of a plug would be inserted into a tube end and welded in place.

The claims

3 The plaintiff contracted with the defendant to carry out maintenance and repair works on the boiler at the agreed price of \$160,000 and a chemical clean using a solution of hydrochloric acid and inhibitor for a further \$75,000. The plaintiff also asserted that it had carried out additional works on the boiler totalling \$279,467.44.

4 When the defendant refused to make any payment for the work done, the plaintiff took out this action making claims for the following:

Services Rendered

Amount

1(a).	Charges for Work Specified in	
	Purchase Order 228/23087859	\$160,000.00
1(b).	3% GST	<u>\$ 4,800.00</u>
2(a).	Charges for Quoted Optional Chemical	
	Cleaning Work	\$ 75,000.00
2(b).	3% GST	<u>\$ 2,250.00</u>
3(a).	Charges associated with additional	
	charges work (8 Nov 2002) calculated	
	in accordance with basis set by the	
	Defendant on 13 Sept 2002	
i)	Labour Charges of Certified Timesheet	\$140,355.12
ii)	Labour Charges for Other Activities in support	\$ 12,612.00
iii)	Equipment Usage Charges	\$ 42,600.00
iv)	Off-Site Labour Charges	\$ 2,050.00
v)	Materials Charges	\$ 5,201.45
vi)	Sub Contractor Charges	\$ 45,856.25
vii)	Consumable Materials Charges	\$ 10,812.62
viii)	8 hydrotests under Change Order Nos. 2, 16 and 17	\$ 20,000.00
	Total Charges for Change Orders	\$279,467.44
3(b).	3% GST	<u>\$ 8,384.02</u>
a.	Principal Debt	\$514,467.44
b.	GST at 3%	<u>\$ 15,434.02</u>
	Grand Total	<u>\$529,901.46</u>

5 The defendant admitted that the plaintiff was entitled to Claim 1, but denied that the sum was payable because of its counterclaim. It denied liability for Claim 2 on the ground that the

chemical cleaning was not carried out as contracted, or was carried out negligently.

6 The defendant also denied liability under Claim 3 on the ground that the work was done to remedy damage caused by the plaintiff to the boiler, and it put the plaintiff to proof of the charges claimed.

The counterclaim

7 The defendant alleged that the plaintiff failed to carry out the chemical clean in accordance with the method statement submitted by the plaintiff to the defendant which specified that a 0.2% concentration by volume of inhibitor known as A120 was to be applied and that the concentration of the hydrochloric acid used was to be between 4% and 6%. The defendant pleaded in the alternative that the plaintiff was under a duty of care to use an appropriate concentration of inhibitor and acid to avoid causing damage to the boiler.

8 The defendant alleged that the inhibitor concentration which the plaintiff used was below 0.2% when the acid concentration was about 4.36%. It claimed that the boiler was damaged by acid attack to the plug tops and the plug fillet weldment (the area of weld fixing a plug to a boiler tube) which necessitated the removal and replacement of 231 plugs in the steam drum and the mud drum.

9 It put up a counterclaim for \$698,548.71. The largest component of the counterclaim is \$640,945.97 for lost profit from lost production, and the balance is for expenses relating to and arising from the inspection and repair of the boiler.

10 The plaintiff denied that it had failed to comply with the method statement, and put the defendant to strict proof of the alleged damage and loss.

The chemical clean and subsequent events

11 The plaintiff commenced preparation work when it received the defendant's instructions on 23 May 2002 to clean the boiler. The actual dosing of chemicals for the clean commenced at 2.00am on 6 June 2002.

12 Leaking was detected at 11.00am on the same day, and was traced to a south wall tube. This tube was repaired and tested on 9 June 2002. Another leak was discovered on 9 June 2002, which was traced to a plug stub weld in the steam drum. Magnetic particle inspection ("MPI") tests carried out on 12 and 14 June 2002 showed pittings on 31 of the 996 plug tops (13%) and thermal cracks on 221 of the 996 plug-to-stub welds (22%). A layer of refractory on the exterior of the steam drum was found to have fallen off the outside surface of a drum.

13 The plaintiff replaced the fallen refractory on 20 June 2002; 231 plugs were also replaced. The boiler was re-commissioned on 26 June 2002 and was back at full operational capacity on 29 June 2002.

The main issues

14 The trial focused on two main issues, *ie*, the concentration of inhibitor used, and the cause of the damage. Little time and attention was expended on the quantum of the claims and the counterclaim.

The concentration of inhibitor dosed

15 This is a fundamental issue. If there was no short-dosage of inhibitor, the plaintiff would have carried out the chemical clean in accordance with the method statement. In that event, the defendant cannot attach any blame to the plaintiff for the subsequent leaks, repairs and shutdown.

16 The plaintiff claimed to have used 100/ of inhibitor. It maintained a log of the steps taken in the cleaning process.[\[note: 1\]](#) The log contained only one entry of injection of 56/ of inhibitor at 2.00am on 6 June 2002. However, the plaintiff's director, Han Meng Siew ("Han"), contended [\[note: 2\]](#) that the plaintiff had actually injected another 44/ between 5.10am and 7.28am that was not recorded in the log. Han worked out that the first injection of 56/ would result in a concentration of 0.112% (based on a boiler volume of 50,000/), and the unrecorded additional 44/ would boost the concentration to 0.2%.

17 At the trial, the parties presented different figures for the volume of the boiler, the plugged volume and the cleaning volume. According to those calculations, the inhibitor concentration would have been between 0.22% and 0.28% if 100/ of inhibitor were used, but would have been between 0.12% and 0.16% if only 56/ were injected.[\[note: 3\]](#)

18 The plaintiff sought to rely on other records to show that 100/ of inhibitor were injected. Han stated[\[note: 4\]](#) that the plaintiff's assistant manager, Lim Kim Wah Frank ("Lim"), had written a note to the defendant's employee, Justus Chew Ting Loon ("Chew"), dated 4 June 2002 to give notice of the plaintiff's intention to bring 100/ of the inhibitor and acid and other chemicals onto the worksite.

19 This was not consistent with Lim's own evidence that he had meetings with Chew where he was informed of the capacity of the boiler, after which he wrote a note to inform Chew of the plaintiff's need to bring extra chemicals after a re-calculation of the cleaning volume. The note, however, made no reference to any revision of the cleaning volume and did not indicate that it related to additional chemicals required. The inhibitor was referred to by weight as three 35-kilogram carboys. There was no reconciliation of the three 35-kilogram carboys to 100/.

20 Chew did not recall discussing the cleaning with Lim or other representatives of the plaintiff, and denied having seen the handwritten note.

21 After the affidavits of evidence-in-chief of witnesses were filed and exchanged, the plaintiff obtained leave to call its general manager, Wang Lai Suan ("Wang"), to give oral evidence and to produce documents. The documents produced[\[note: 5\]](#) were purchase orders issued by the plaintiff to itself. Wang explained that they served as internal transfer records of the chemicals used for the project.

22 Out of the five purchase orders, only one referred to inhibitor. This purchase order[\[note: 6\]](#) was dated 8 June 2002 for 100/ of inhibitor. Two things are peculiar about this purchase order. First, it was issued only on 8 June 2002 although the date of delivery was stated as 6 June 2002. Second, the date of 6 June 2002 was wrong because the inhibitor was actually delivered on 5 June 2002.

23 In its Closing Submissions, the plaintiff admitted that the delivery date in the purchase order was a mistake. But no explanation was offered as to why the mistake was made and why it was not corrected. I find this document unsatisfactory for being self-serving, irregular and unreliable.

24 In addition to the purchase orders, the plaintiff produced another document, a work progress order dated 6 June 2002 with the entry "Dose in A120 – 100ltrs". This entry was apparently written by a worker identified only as "Vigneshwaran", who was not called as a witness. It was produced in the proceedings by S Murugan ("Murugan"), a supervisor of the plaintiff. He claimed that he was

involved in the cleaning on the morning of 6 June 2002 when one and a half carboys of inhibitor was injected first, followed by a second injection of the balance of the inhibitor. On 6 June 2002, he instructed Vigneshwaran to make the work progress report. On 7 June 2002, after the chemical clean was completed, Murugan made the entries into the log, but omitted to record the second injection of inhibitor.

25 The work progress report was inconsistent with Murugan's evidence. In his Affidavit of Evidence-in-Chief, he said that three 35-litre carboys of inhibitor were used. 105/ of inhibitor would have been injected if all three carboys had been used as he described. If he had intended to have an accurate work progress report (and there was no reason offered for intentional inaccuracy), the report should have stated the dosage as 105/, not 100/.

26 The witness explained from looking at the log that the workers started the circulation pump at 4.55am. Five minutes later (*ie*, at 5.00am), they injected the second dose of inhibitor but omitted to record it in the log. This explanation created a difficulty because it was recorded in the log that acid injection started at 5.10am. Murugan admitted that the 5.10am entry was incorrect.[\[note: 7\]](#) (That was patently incorrect because the injection of 44/ of inhibitor could not possibly have been completed by 5.10pm. Han had claimed that the 44/ were injected between 5.10am and 7.28am). In entering the time of the acid injection as 5.10am in the log, Murugan must have not only forgotten about the second inhibitor injection, but also recorded the wrong time of the acid injection which could only have commenced after the alleged second inhibitor injection was completed at 7.28am. By his explanation, there was not one mistake in the log, but two, the second of which he did not disclose in his Affidavit of Evidence-in-Chief and only acknowledged when he was cross-examined.

27 I find Murugan's explanation for the missing entry in the log unacceptable. I also find the work progress report unsatisfactory because of the description of the total inhibitor dosage as 100/ instead of 105/ if all three carboys were used as alleged. In addition to that, the work progress report was not admissible in evidence because its maker, Vigneshwaran, was not called as a witness.

28 If the plaintiff had intended for Murugan's evidence to make up for the absence of the entry of the second inhibitor injection in the log, it failed. Murugan was an unreliable witness, and his explanations for the missing and the wrong entries in the log only served to strengthen the impression that the plaintiff was prepared to do anything to support its case that 100/ of inhibitor were used.

29 I find on the evidence that the plaintiff only used 56/ of inhibitor in the chemical clean.

The recommended inhibitor dosage

30 The inhibitor used was manufactured by The Dow Company ("Dow"). In an Industrial Research Letter, Dow stated that one gallon of A120 is required for 1,000 gallons of solvent (*ie*, 0.1% by volume) for cleaning temperatures below 175°F and acid concentration below 7.5%. On the basis of this recommendation, a 0.1% inhibitor concentration would be sufficient for cleaning the defendant's boiler.

31 The recommended dosage was not the contracted dosage, and there was a reason for that. A publication referred to by the plaintiff's expert, Dr Asim Bag, "Cleaning Process Equipment and Piping – A Complete How-To Manual", MTI Publications No 51 (Materials Technology Institute of the Chemical Process Industries, Inc) by Joerg Gutzeit, stated at p 308:

Most inhibitors are expensive. The required inhibitor concentration in the cleaning acid should be based on laboratory corrosion test data obtained by the inhibitor supplier, with due consideration

given to the factors noted above. Because many of the factors that affect inhibitor demand are difficult to evaluate in laboratory corrosion tests, it is usually a good idea to add at least twice the recommended amount of inhibitor, and sometimes even more.

32 It was therefore reasonable for a 0.2% inhibitor concentration to be specified, and the 0.12 % to 0.16% concentration used by the plaintiff cannot be taken to be sufficient for practical purposes.

The reports

33 After the leak was detected, tests and inspections were carried out, two of which throw light on the cause and nature of the damage found in the boiler.

The MPI test reports

34 MPI tests were carried out. The test of the plug assembly of the mud drum revealed:

- 1) 38 out of 483 plugs were found to have continuous [sic] indication at plug to seal weld toe.
- 2) One (1) weld of stub to shell found to have indication (crack) of 80mm in length.
- 3) 14 plugs were observed [sic] with pittings ranging from 2 to 3mm in depth with acceptance plug to seal/stub welds.

A similar inspection of the steam drum revealed:

- 1) 183 out of 483 plugs were found to have continuous [sic] indication at plug to seal weld toe.
- 2) One (1) weld of stub to shell found to have indication (crack) of 100mm in length.
- 3) 17 plugs were observed [sic] with pittings ranging from 2 to 3mm in depth with acceptance plug to seal/stub welds.

35 Further inspections were made after some of the corrosion areas were ground flush. The findings were identical and revealing for both drums:

- 1) Toe and thermal cracking were detected on the area examined.
- 2) Cracks were still detected on after repair area.

MPT-Matcor report

36 A report dated 24 June 2002 ("the Matcor report") was submitted by metallurgical specialists, MPT-Matcor Pte Ltd, after a visit by Dr Andy Tack to the site on 15 June 2002 to inspect the drums and to collect plug samples.

37 Three plugs were selected and brought back to the laboratory for analysis. Normal examination revealed that the top surfaces of the plugs were pitted and that the fillet weldment on the plugs had suffered significant attack resulting in a deep irregular gorge along the weldment line.

38 It was recorded that:

Visual examination revealed that the *top surface of the plugs was pitted ...*

The region containing the *fillet weldment* in all three plugs had suffered significant attack resulting in a *deep, irregular gouge along the weldment line. ...*

It can be observed that significant attack and metal loss has occurred from the heat affected zone region of the plug fillet weldment.

[emphasis added]

The plug tops form parts of the bodies of the plugs, while the fillet weldments are the areas of weld fixing the plugs to the boiler tubes. The report went on to state that:

[1] The attack experienced by the *plugs* is consistent with an *acid attack mechanism*. [2] The preferential attack at the *plug fillet weldment* heat affected zone is most likely due to a *localised galvanic effect* (minor compositional and microstructural differences between the base and weld metal can induce a galvanic cell which accelerates corrosion).

Two acid based chemical cleans have been performed on the boiler in the past two years utilising a hydrochloric acid treatment. Few details concerning the application of this treatment are available. However, the damage experienced is consistent with prolonged exposure to the cleaning solution or inadequate process control (e.g. inhibitor performance and iron removal monitoring). ...

It is not possible to determine at which chemical clean the damage occurred.

[Numbering and emphasis added]

The report concluded that:

On the basis of the physical evidence and laboratory analysis the following conclusions are made:

- The damage to the plugs is related to acid attack
- The acid attack is consistent with incorrect process control of a past hydrochloric acid based chemical clean.

From the connection made only between the acid attack and a flawed chemical clean, it is to be inferred that the galvanic damage was not related to inhibitor insufficiency.

The photographs

39 On the eighth day of the trial, the defendant disclosed that there were photographs of the boiler and plugs taken before and after the chemical clean which had not been disclosed earlier. A set of 65 photographs was produced.

40 Included in these photographs were several taken on 3 May 2002, a month before the chemical clean in question ("the May 2002 photographs"). These photographs were important because they showed the state of the drums and plugs before the chemical clean.

41 Only one of those photographs showed a sharp close-up view of the plugs. The photograph [\[note: 8\]](#) showed the full view of one plug and the partial view of another plug next to it. Along the fillet weldment of the plug, a line of damage is visible, and on the partially shown plug, a clear area of pitting on the fillet weldment can be seen. There were two photographs which showed the interior of a drum. [\[note: 9\]](#) Although these two photographs did not give close-up views of the plugs, there appeared to be pitting on the plug tops.

42 It was regrettable that not only were the photographs produced late in the proceedings, but the photographer was also not called as a witness to explain what the photographs were intended to highlight and whether the plugs in the photographs were the only ones with those features shown, or were representative of the plugs with those features.

43 Even assuming that there was no pitting shown in the May 2002 photographs, it must be remembered that Dr Tack stated that it was not possible to determine whether the damage was caused by the earlier 2000 clean or the 2002 clean after he had inspected the plugs *in situ* on 15 June 2002.

The defendant's case

44 I consider the defendant's case first because the issue of the boiler damage was raised in its counterclaim, and the onus of proof is on it.

45 The defendant relied on the evidence of Dr Jonathan Lloyd to support its case. Dr Lloyd is the chief executive officer of MPT-Matcor Pte Ltd and was working with Dr Tack until the latter left the company. In his Affidavit of Evidence-in-Chief of 17 December 2004, he deposed:

14. ... *Dr Tack and I both examined the specimen plugs and discussed our views on the cause of the damage.* Dr Tack and I both considered this to be a straightforward case of acid corrosion.

...

16. It was notable that the crowns of the plugs and the region containing the fillet weldment in all 3 plugs had suffered significant attack and metal loss, that was considered an unusual amount of localised damage. We noted that the corrosion fissure at the edge of the weld corresponded to the location of the "heat-affected zone" (sometimes referred to as "HAZ") of the plug fillet weldment. The heat-affected zone is a narrow band of material that has not melted during welding but the structure and composition of which has changed due to the welding process. It is common for this heat-affected zone material to have properties distinct from the original material and that of the weld. The heat-affected zone is often more susceptible or sensitive to corrosion than the weld metal or other areas.

17. *Such damage was characteristic of acid cleaning damage where the inhibitor used was either ineffective or not present in sufficient concentration.* ...

...

19. ... *It is my firm belief that the damage to the Boiler was caused by an acid attack consistent with incorrect process control of a hydrochloric acid based chemical clean.* The damage features are typical of such an attack and I cannot think of any other possible cause of the damage that I observed inside the Boiler steam drum.

...

2 1 . *The above conclusions and photographs have been summarised by my colleague, Dr Tack, in a report dated 24 June 2002 which I believe has been submitted to the Defendants. I am myself familiar with the contents of this report.*

[emphasis added]

46 Paragraph 21 of the affidavit is of particular interest when the evidence on the cause of the damage is reviewed.

The plaintiff's case

47 The plaintiff's case on this issue is based on the expert evidence of Dr Asim Bag, Section Head, Materials Technology Laboratory, Region Consulting, Asia Pacific, Det Norske Veritas Pte Ltd.

48 Dr Bag prepared a report after he studied the Matcor report and other materials. Dr Bag had not inspected the boiler before or after the chemical test, nor had he conducted any tests.

49 Dr Bag was of the view that:

The failure analysis carried out by MPT-Matcor of the three plug samples was accomplished with a rather limited work scope. They provided slightly detailed examination on just one sample while the remaining two samples were only subjected to visual inspection. In our opinion, little of their laboratory results were relied upon to reach their opinions and conclusions. Their limited sampling and (in our opinion) inadequate technical data did not provide sufficient grounds to their opinions and conclusions rendered. In our opinion, MPT-Matcor's analysis was neither cogent nor consistent with the technical data and correlative information obtained. Their findings did not eliminate various other likely causes, which may have contributed to damage. For example, material/metallurgical conditions of the plug material and weld, which are considered probable causative factors were not addressed and assessed comprehensively. In DNV's opinion, their conclusions are deemed baseless with weak technical evidence and/or findings.

Review of the evidence

50 The Matcor report is a good starting point for this exercise in so far as it represents the considered views of Dr Lloyd and Dr Tack, both of whom had inspected the boiler after the damage occurred. The report was prepared by Dr Tack, whom Dr Lloyd attested to be a very qualified and experienced person in boiler technology. After Dr Tack prepared the report, he discussed it with Dr Lloyd before the latter verified it. Dr Tack did not give evidence and Dr Lloyd did not retract or correct any part of the report.

51 Dr Tack had found two kinds of damage at two areas:

- (a) Attack at the plugs consistent with acid attack; and
- (b) Preferential attack at the plug fillet weldment heat affected zone most likely due to localised galvanic effect.

He concluded that the attack to the plug tops was related to acid attack, but it was not possible to determine in which chemical clean (*ie*, the March 2000 clean or the June 2002 clean) the damage

occurred, while the damage to the fillet weldments was due to galvanic action.

52 There were no photographs of the damage observed by Dr Tack on 15 June 2002 when he inspected the boiler. The May 2002 photographs [\[note: 10\]](#) showed damage consistent with the types described in the Matcor report.

53 There were also descriptions of the damage by other parties who inspected the boiler. Chew, a mechanical engineer then employed by the defendant who inspected the boiler on 11 June 2002, reported in an email [\[note: 11\]](#) to the Ministry of Manpower that "[c]racks were found at weld joint of the steam drum plugs", and mentioned supporting photographs which the defendant did not produce. The MPI test reports confirmed the presence of thermal cracks.

54 Dr Lloyd's position that the damage to the plugs was only consistent with mineral acid attack must be considered together with Dr Tack's finding that the preferential attack at the plug fillet weldment was most likely due to a localised galvanic effect.

55 Dr Lloyd had also referred to localised galvanic effect. He explained that:

Galvanic corrosion means electrochemical, it means that there's a slight different [*sic*] in the composition of the materials, so you have a corrosion cell.

Now corrosion cells can take the form of pitting, where the material surrounding the pit is the cathode and the pit itself is anodic, and that may take the form of a band of material, for example, the heat affected zone around the edge of a weld may be the anode and the material adjacent to the weld metal and the plug itself may be cathodic with respect to that area. [\[note: 12\]](#)

56 The galvanic action would have taken place whether or not there was inhibitor deficiency, as Dr Lloyd explained that:

[T]he cleaning solution is an extremely good electrolyte. It's a mineral acid, which means it conducts corrosion currents very, very well. [\[note: 13\]](#)

He was referring there to a properly constituted cleaning solution. It should be kept in mind that the purpose of the inhibitor is to prevent the acid from attacking metal surfaces exposed to it. The inhibitor does not neutralise the acid in the cleaning solution, which remains acidic after the addition of inhibitor.

57 Counsel for the defendant had made clear during the trial that the defence case was that there were two causes of damages, *ie*, galvanic corrosion due to difference in materials and acid cleaning, [\[note: 14\]](#) and Dr Lloyd also reiterated that the defendant's case was that galvanic corrosion through an electrochemical process contributed to the weld damage. [\[note: 15\]](#)

58 Dr Lloyd had reservations about the cracks in the plug welds referred to in the MPI test reports and Chew's email, which threw doubts on his conclusion that the damage were caused by acid attack. [\[note: 16\]](#)

59 He went so far as to question the correctness of the descriptions in the MPI test reports, but neither he nor the defendant did anything to seek clarification from the makers of the reports or show that the descriptions used were wrong. When Chew gave evidence at the trial after Dr Lloyd had disputed that there were cracks, no clarification was sought from him on the cracks which he had

found.

Evaluation of the evidence

60 Dr Lloyd had discussed the Matcor report with Dr Tack before he verified it. There was no indication that he received further information which caused him to modify his views between the time he verified the report and the time he affirmed his affidavit.

61 The Matcor report attributed the damage of the fillet weldments to galvanic action rather than acid attack. It attributed the damage to the plugs to acid attack, but also stated expressly that it was not possible to determine which chemical clean caused it. That conclusion must have been made after careful consideration and should be accorded appropriate weight.

62 The other relevant evidence are:

(a) the May 2002 photographs taken before the chemical clean, which showed damage to the fillet weldments and the pitting on the plug tops; and

(b) the cracks seen by the MPI tests and Chew after the June 2002 chemical clean.

63 Against this background, it is difficult to accept Dr Lloyd's assertion in his affidavit that the damage was caused by the inadequate inhibitor in the chemical clean, or to reconcile it with the conclusions in the Matcor report. The position taken by Dr Lloyd in his affidavit was an unjustified shift from the conclusions of the Matcor report that he had discussed and verified.

64 The onus was on the defendant to prove that inadequate inhibitor was the cause of the damage on a balance of probabilities. When I take into consideration all the matters I have referred to, I find that the defendant has not established that the damage to the boiler was caused by inadequate inhibitor application in the June 2002 chemical clean.

Conclusion

The plaintiff's claims

65 Claim 1 was not disputed, and is allowed.

66 Claim 2 for the chemical cleaning work is dismissed because the plaintiff had not carried out the work in accordance to the contractual specifications.

67 Claim 3 for additional work was disputed on the basis that the work was done in order to remedy the damage caused by the plaintiff in breach of its contract. As the defendant had not proved that the damage was caused by the insufficiency of the inhibitor used, this claim is allowed. There shall be an assessment by the Registrar of the work done and materials supplied, and the amount to be paid by the defendant to the plaintiff for them.

68 The defendant shall also pay the plaintiff the Goods and Services Tax ("GST") due on the claims allowed.

69 Interest of 3% shall be paid on the payments due under Claims 1(a) and 3(a) from the date of the Writ to the date of judgment, and I will hear submissions as to whether interest is to be paid on the GST.

The counterclaim

70 The counterclaim is pleaded in clear terms in para 11 of the Re-Amended Defence and Counterclaim as follows:

As a result of the Plaintiff's breach of contract and/or negligence, acid attack caused damage to plugs and/or plug fillet weldments in the steam drum and in the mud drum. 192 plugs in the steam drum and 39 plugs in the mud drum had to be replaced.

71 The defendant's case is that the plaintiff's breach of contract or negligence in the June 2002 chemical clean resulted in the acid attack and the damage to the plugs and the fillet weldments. It makes no allowance or concession for damage from galvanic action or acid attack from the March 2000 chemical wash.

72 Although there is a likelihood that some acid-induced damage may have been caused in the June 2002 chemical wash, that is not sufficient to support the defendant's counterclaim.

73 The counterclaim has not been proved, and is dismissed.

[\[note: 1\]](#)AB197

[\[note: 2\]](#)Affidavit of Evidence-in-Chief of Han Siew Meng paras 19-20

[\[note: 3\]](#)Plaintiff's Closing Submissions para 40

[\[note: 4\]](#)Affidavit of Evidence-in-Chief of Han Siew Meng para 22

[\[note: 5\]](#)P1-P5

[\[note: 6\]](#)P5

[\[note: 7\]](#)Notes of Evidence 9 May 2005, pp 34-35

[\[note: 8\]](#)DP9

[\[note: 9\]](#)DP10 and DP11

[\[note: 10\]](#)DP9, DP10 and DP11

[\[note: 11\]](#)AB249

[\[note: 12\]](#)Notes of Evidence 10 May 2005, pp 126-127

[\[note: 13\]](#)Notes of Evidence 11 May 2005, p 96

[\[note: 14\]](#)Notes of Evidence 10 May 2005, pp 120 & 127 read with affidavit of evidence-in-chief of Han Meng Siew para 60

[\[note: 15\]](#)Notes of Evidence 11 May 2005, pp 91-92

[\[note: 16\]](#)Notes of Evidence 10 May 2005 pp 130-131 and Notes of Evidence 11 May 2005 pp 44-45

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