

JUDGMENT : Mr Justice Tomlinson : Commercial Court. 9th March 2001

Introduction

1. This is a damage to cargo claim of a somewhat unusual nature. The Defendant shipowners admit that their vessel was unfit to carry the cargo in question, ethylene, the owners having failed in their duty to exercise due diligence to clean or purge the vessel's tanks and lines of a previous cargo of butadiene. Their breach must have been particularly gross since, according to the owners' expert cargo surveyor, the extent of the contamination observed during sampling at the initial stage of loading is likely to have exceeded anything which the attending independent surveyor then acting for the cargo interest had previously experienced. However the owners seek to pray in aid the grossness of the contamination then observed in support of their contention that the bulk of the loss sustained by cargo interests is to be regarded as having been caused by their own decision to continue loading. That was, say the Defendants, a decision for which there was no rational basis and which they even characterise as reckless. Foolhardly is another expression employed to describe the cargo interests' decision. That decision was, say the Defendants, so aberrant that it must be regarded as breaking the causal link between the owners' admitted breach and the ensuing contamination of the balance of the ethylene parcel thereafter loaded.
2. The court has had to resolve the questions which arise in this case without the benefit of any oral evidence from any of those who were or should have been most immediately involved in the relevant activities and decisions. The cargo interests called one witness whose evidence was helpful but at one remove. They did not call those who were present at the loading operation and whose recommendation it was to continue. The shipowners called no oral factual evidence, in particular they did not call the Master who might perhaps have been expected to intervene if it was so obviously wrong to continue loading. They did however tender in evidence a written statement from the Master in which he explained that when he was told that samples taken and analysed at the initial stage of loading showed that the cargo was contaminated he did not believe that that was so. If it was contaminated he thought that the most likely explanation was that there had been a small slug in a shore line at the start of loading and that the loading of contaminated cargo would not continue. Any contamination would thus be diluted out. However the Master for his part did not believe that the analysis of the samples truly showed the cargo to be out of specification. He thought that the cargo interests were playing a trick on him so as to justify putting his vessel off the berth in order to load another vessel ahead of his own. Even more than four years after the event and with the benefit, no doubt, of an explanation that the cargo came from a dedicated shore tank though a dedicated shore line the Master recorded his view that he still had difficulty in believing that the contamination had come from the ship. The Defendants did not tender evidence in any form from their gas engineer who had been responsible for the cleaning and purging operation and the documentary records were in some respects unreliable and inadequate. Thus the expert cargo surveyors were left to speculate as to how the operation had been carried out and what were the possibilities so far as concerned the location and amount of the contaminant butadiene present on board when loading of ethylene began. The surveyors did their best but the exercise was, as they both frankly recognised, far from satisfactory. The court is confronted with further controversy as to whether all of the contaminant found on discharge had in fact found its way into the cargo tanks by the end of loading or whether, by contrast, the greater part of it found its way into those cargo tanks from various reservoirs in the vessel's complex pipework during the course of the carrying voyage. Again, there is a dearth of evidence relevant to this question.

The Facts

3. The Second Claimants PMI Trading Ltd hereinafter "PMI" ceased to be a party to the action at the outset of the trial. The First Claimants Vinmar International Ltd "Vinmar" purchased the relevant parcel of 4000 tonnes of ethylene from PMI pursuant to a contract concluded on 20 June 1995. The contract was on cost and freight (CFR) terms calling for delivery by PMI at Moerdijk, Rotterdam. Loading was to be during the window 24-30 June with the origin of the product given as Pajaritos, Mexico. Title and risk were to pass from seller to buyer at ship's flange connection at loadport. The carrying vessel was to be "Atrice" or substitute. Quantity and quality were to be inspected at load port by independent inspectors with costs to be shared between seller and buyer. Quality was to be determined using shore tanks at load port, a feature of the contract of which Miss Theresa Bigg, the operations contact at Vinmar, subsequently lost sight assuming that she ever knew it or appreciated its significance. The specification called for testing for the presence of various gases and compounds. In particular the parcel was to be tested for the presence of "PROPYLENE +" by the ASTM Method D2505. "Propylene" denotes propylene and heavier hydrocarbons. Method D2505 is the standard test method for determining by gas chromatography the presence of carbon dioxide and hydrocarbons in high purity ethylene. Butadiene if present in a sample will be captured by this test method in the hexamethylphosphoramide column used to detect propylene and heavier hydrocarbons. Butadiene will not by this method be identified as such. Its presence will however contribute to the peak indicating the overall concentration of propylene and heavier hydrocarbons. The contract provided that propylene + as ascertained by this method was not to exceed a maximum of 15 ppm by weight or 10 ppm by volume.
4. This parcel was purchased by Vinmar in order to fulfil an outstanding commitment to BP Chemicals Ltd, "BP". That commitment arose pursuant to a contract dated 7 March 1995 under which Vinmar were to supply four cargoes each of 4000 tonnes to arrive during the months of June, July, August and September 1995. Each cargo was to be delivered ex ship (DES) either at Stenungsund or Antwerp/Rotterdam area. Thus title and risk passed on discharge, probably on passing the vessel's flange connection. Quality was to be confirmed by independent

inspector at the discharge port. The specification included provision that "C3 and higher", which would include butadiene which is a C4, in fact C4 H₆, should be a maximum of 10 ppm by volume.

5. The Defendants Theresa Navigation S.A. are or were at all material times demise charterers of the vessel "Atrice". Atrice is a gas carrier, a sophisticated vessel dedicated to the carriage of liquefied gas products. She has three sets of tanks, designated 1-3 port and starboard. Tanks 1 P/S and 3 P/S have fully segregated liquid phases, i.e. they are separated by a solid centre bulkhead. Tanks 2 P/S are linked in the liquid phase by a perforated bulkhead. All three sets of tanks are linked, port and starboard, in the vapour phase by means of a pipeline. The design of the vessel is such that two cargoes may be carried in complete segregation, loaded and discharged as necessary via two liquid manifold crossovers and two associated vapour manifolds, designated L1, V1, L2 and V2 respectively. Cargo is handled via a complex system of pipework which includes three reliquefaction units, for cooling, and an inert gas plant for purging. Liquefied gas products are typically carried at low temperature. Thus Vinmar's contract with BP called for a discharge temperature of minus 102.5°C. The inert gas/nitrogen generator is used during change of grade procedures to purge tanks and lines. The operators of the vessel were GasChem Services GmbH and the managing owners were Reederei Bernhard Schulte.
6. Atrice was voyage chartered by PMI on 16 June 1995 from her disponent owners Cheminster S.A. to carry a full cargo of ethylene from Pajaritos to North Western Europe. She was instructed to proceed to Pajaritos on 19 June 1995 for what was to be voyage 9/95. In so far as relevant, pursuant to the voyage charter the vessel should have presented ready to load with two tanks under ethylene vapours. The third tank was to be prepared whilst the other two tanks were being loaded.
7. The vessel had in the immediate past been engaged in the carriage of both ethylene and butadiene. In April 1995 on voyage 7/95 a full cargo of ethylene was carried in all tanks from Pajaritos to Bahia Blanca, Argentina. Discharge was completed on 25 May and the vessel was instructed to gas-free tanks 1 and 2. Tanks 3 were to be kept under ethylene vapours.
8. On voyage 8/95 the vessel carried a cargo of butadiene at ambient temperature, i.e. no on board cooling was carried out. This cargo was carried in tanks 1 and 2 port and starboard. Residual ethylene from voyage 7/95 remained segregated in tanks 3 port and starboard. The butadiene was loaded in Santa Clara and Rio Grande in Brazil and carried to San Lorenzo Argentina.
9. After the discharge at San Lorenzo the vessel was unfixed so initially no tank preparation or change of grade procedure was carried out. On 15 June instructions were given to the vessel that she would load a full consignment of ethylene at either Pajaritos or Ras Lanuf, Libya. Those instructions necessitated the vessel removing all traces of butadiene from tanks 1 and 2 and from the lines. Tanks 1 and 2 were reportedly inserted with nitrogen following which they were gas-freed and visually inspected by the Master and Chief Officer who "*found visually no stains or traces of inhibitor from the last cargo*". After visual inspection tanks 1 and 2 were placed under a nitrogen blanket. Thereafter the ethylene vapour contained in tanks 3 PS was used in order to "gas-up" tanks 1 and 2. The process of "gassing-up" means, at any rate in this context, the removal of all nitrogen in those tanks and, thereby, the rendering of those tanks "*under ethylene vapours*" as in fact required by the charterparty. Compliance with the charterparty would have required also that tanks 1 and 2 be cooled down to the required temperature for loading ethylene. However the quantity of ethylene in tanks 3 PS was insufficient to achieve full gassing-up of tanks 1 and 2 and it is unclear why the Master in fact attempted this exercise. Probably it was because he regarded himself as under some pressure of time in order to get on to the berth and load before the arrival of another vessel, Tarquin Rover, whose laycan spread was, he was advised, in fact earlier than his own. At all events the upshot was that the vessel arrived at Pajaritos on 24 June with tanks 1 and 2 PS containing a mixture of ethylene and nitrogen vapour, and with temperatures of the order of +30°C. Tanks 3PS, which should have contained ethylene, were only partially cooled down - temperatures of about -70°C. Loading could not therefore begin.
10. By this time Societe Generale de Surveillance de Mexico S.A. de CV, a member of the very well known international group of SGS superintendent companies, had been jointly appointed by PMI and Vinmar to act as the independent inspectors at the loading port. Hereafter I will refer to the independent inspectors simply as SGS. They noted protest at the condition of the tanks as I have described it, and recorded also their consequent inability to perform a visual inspection of the tanks, remarking that their inspection had been based upon a measurement of residues from a deck level gauging point. It should perhaps be noted that had the vessel arrived in the condition required by the charterparty a visual inspection of the tanks would have been equally impossible.
11. Ordinarily it would have required a "*coolant parcel*" of some 50 to 60 tonnes of ethylene to achieve full "*gassing-up*" and cooling down of the vessel's tanks so as to enable her to load ethylene in all tanks, on the assumption that there was already no ethylene on board. Given that there was already some ethylene on board a parcel somewhat smaller than this would therefore have sufficed. However, because of the urgency created by the imminent arrival of the Tarquin Rover the Master was under instructions from GasChem to gas-up and cool down as quickly as possible. Accordingly the Master directed that a coolant parcel of about 100 tonnes be loaded as this would enable him to complete the gassing-up and cooling down operation more quickly. The coolant parcel of approximately 100 tonnes was loaded into number 3 tanks between 13.20 and 15.00 hours on 24 June.
12. Samples were taken from the discharge side of the two deepwell cargo pumps in tanks 3 PS which were recirculating cargo in the bottom of each tank. This is the usual practice. At the trial only pump recirculation

sample analysis results were considered so as to ensure that like was compared with like. The sampling was carried out by personnel employed by the loading terminal, Pemex, apparently witnessed by SGS. Pemex is the Mexican state owned oil company. I understand that PMI is a subsidiary of Pemex. The samples were taken ashore to be analysed at the Pemex laboratory. The samples were indeed analysed in the laboratory, apparently again in the presence of SGS. Analysis was completed by 1700 hours on 24 June. The analysis indicated that, as SGS put in their time log, the samples were "out specifications" for propylene and heavies. In fact the analysis showed that the sample from tank 3P had a "propylene and heavies" content of 867 ppm by volume whereas tank 3S had a corresponding content of 467 ppm.

13. Elementary calculations which could have been carried out by either the Master or SGS would have revealed that, if these analyses were taken at face value, the total quantity of propylene and heavies contaminant present in tanks 3P and S was 111.181 litres in 165,591 litres of cargo which, if thereafter diluted by the loading of a full cargo, would nonetheless result in a contamination overall of 14.880 ppm. There is no evidence that any such calculation was carried out by anyone and I infer that it was not.
14. According to an SGS document prepared in July 1995, i.e. after it was known that on arrival in Europe the vessel's cargo had been found to be very seriously contaminated, at 1710 hours on 24 June a Mr Sura of SGS telephonically advised both PMI (in the person of Mr Maya) and Vinmar (described in this document addressed to Miss Theresa Bigg as "your good selves") that "the analysis in the first two tanks failed to meet the specification". The same document records that at 2130 hours on the same day Mr Sura received authorisation from PMI and Vinmar to continue loading to first foot level, and loading was indeed resumed at 2155 hours.
15. Miss Theresa Bigg was at the time the operations co-ordinator for Vinmar and was specifically responsible within Vinmar for the loading of cargo on board Atrice. She was based in Houston. On the strength of this document she accepted in cross examination that she must have given authorisation to load to the first foot level after having been told that the coolant sample was off specification. She had no recollection of so doing - her first recollection of any indication of any problem with the cargo was on receipt of a telephone call before dawn in the very early hours of 25 June - there is no time difference between Pajaritos and Houston. Despite Miss Bigg's willingness to accept that she must have given authority to load to first foot level I am not wholly persuaded that in fact she did. I think that her willingness to accept that she must have done so because the SGS document says that Vinmar did tell me more about her frankness and straightforwardness than anything else. She was plainly a truthful witness. Ultimately I do not think it matters whether she was told at that stage about the outcome of the analysis of the coolant sample, or whether she authorised loading to first foot level. If she was told that the coolant sample was out of specification it would not have surprised her. It was for her a common experience that a coolant parcel should prove to be off-specification. There could be a number of reasons and because of sampling difficulties she regarded figures derived from coolant parcels as unreliable. On any view by mid-morning on 25 June Miss Bigg knew or had the means of knowing that the coolant samples had been found out of specification because she received a fax timed at about 1230 which, among other things, so informed her. The fax merely recorded that the product was out of specifications for propylene and heavies without indicating to what extent. It was clear from her evidence that the coolant stage was not of much importance to Miss Bigg. Her only enquiry, had she made one at all, would have been to enquire whether the contamination would dilute out. She regarded the responsibility at this stage as resting with PMI, as charterers of the ship. It was "their call" with the ship - i.e. their responsibility to decide whether the vessel they had chartered was fit to receive the cargo and whether loading should continue.
16. Loading was interrupted at 0123 on 25 June so that "first foot" samples could be taken from all tanks. In fact the tanks were loaded up to levels of approximately 1.5 to 2 metres, a total of some 540 tonnes or 13% of the total cargo. Whilst "first foot" is a term of art rather than of precision there is no doubt that this represented loading of a greater quantity of cargo than would conventionally be expected if loading to first foot level. However nothing turns on this. The results of the first foot analysis, again carried out at the Pemex laboratory, were received at 0450 on 25 June. The results indicated that the samples taken from all six tanks were out of specification due to the presence of "propylene and heavies" in excess of 10 ppm. The results for 1PS, 2PS, 3PS were, respectively, 125, 111, 112, 106, 52 and 87 ppm. A volumetric calculation, had it been carried out, would have revealed that this equated to 91.155 litres of contaminant in 950,785 litres of cargo. The overall quantity of contaminant present had therefore apparently decreased, which is of course impossible. However the amount now indicated as being present was still sufficient to produce a contamination in the full cargo of 12.2 ppm had the extrapolation been carried out. There is no evidence that any such calculation was carried out by anyone.
17. The results for propylene or C3 and heavies for each tank were given to Miss Bigg over the telephone before dawn on 25 June. She recorded in her notepad that the product was "off spec on C3 and heavier" and that "every tank [was] up". She was not told what the contaminant was more specifically than C3 and heavier and she derived the impression that SGS did not know what the contaminant was or where it was coming from. Miss Bigg's response was that Vinmar could not accept the cargo. Miss Bigg did not like the figures she had been given. Without doing any calculation she thought that the figures were quite high. Based on those numbers it was her "gut feeling" that Vinmar would not be wishing to accept the cargo. Her response was that Vinmar could not accept the cargo articulated her own feeling that further dilution of contamination of that order would not lead to the cargo becoming acceptable.

18. At 1420 hours on 25 June the vessel left the berth, reaching the anchorage by 1525. She left the berth at the request of the Loading Master. Both Pemex and the vessel's Master noted protest. The Master for his part apparently felt positive about the analysis results from the first foot samples. He did not think that the reported drop in the contamination in number 3 tanks made sense. This, combined with the fact that the shore had decided to load in the face of the reported analysis of the coolant sample, tended to confirm his suspicion that the cargo loaded on board was not in fact out of specification. Whilst the vessel was at anchor the Master was not requested to take any steps to ascertain the source of the contamination and he took none.
19. During the course of 25 June Miss Bigg received a telephone call in her office from Mr Chapman of SGS Mexico. She was told that the vessel was going to the anchorage. She was not specifically told what was the purpose of the vessel going to the anchorage although she assumed that the purpose was to enable those on board to make investigations to see from where the contamination was coming. She was told that Pemex and PMI were certain that the cargo being delivered from the shore was contaminated and she could understand why this should be so since she knew that the shore tanks and lines were dedicated.
20. On 26 June late in the evening Miss Bigg received another telephone call at her home from SGS. She was told that the refinery had checked their product and ascertained that it was clean. She was told that Pemex wanted to resume loading and load to the 50% level and then recheck. She was told that the expectation was that by adding further clean product the overall level of contamination in the tanks would be reduced. She was not told that any calculation had been carried out with a view to extrapolating from first foot level to full cargo, nor did she enquire whether it had. She told SGS that she had no objection to the refinery making the attempt but that if it did not solve the problem then Vinmar did not want the product. The expression she recorded on her notepad was "okay but if does not fix we do not want product". Subject to that caveat she was relying on the expertise of SGS and the terminal. In her mind, the decision to load to 50% was at the risk of Pemex/PMI - I doubt if she drew a distinction between the two for this purpose. It was obviously not in her mind that as between PMI and Vinmar quality was to be determined in the shore tanks, as it had been by SBS on 24 June, with a nil result for propylene and heavies. The vessel reberthed at 1215 on 27 June. Prior to her so doing no-one asked the Master whether he had ascertained the source of the contamination. Loading recommenced at 1345 hours.
21. At some stage on 27 June PMI delivered a letter to the Master which read, in part:-
*".....And Taking into account that before receiving liquid for the conditioning, the analysis results were out of the specification for propylene + heavies and in order to avoid any vessels delay, PMI is requesting that before resume loading, the Master issue a letter of guaranty wherein he state that the product will be on specification after the completion of loading.
Please acknowledge and confirm by return."*

The Master contacted his owners concerning this request. They told him to sign the document, if at all, for receipt only, which the Master did, thereby signifying that he accepted no responsibility.

22. Loading was suspended at 2230 on 27 June at which point the cargo loaded amounted to 50% of a full cargo. A third set of samples was taken between 2240 and 2330 hours on 27 June. The samples were delivered to the Pemex laboratory at about 2330 or 2340 hours and analysis began. At 2345 hours loading resumed. At 0-125 hours on 28 June the analysis of the 50% samples was completed. The analysis showed measureable amounts of propylene and heavies in all tanks, the quantities now being 1,3,3,2,11 and 9 ppm respectively. Thus only tank 3P was out of specification. A volumetric extrapolation, if carried out, would have revealed that on these figures contamination in the full cargo, assuming the introduction of no further contaminant, would be 2.468 ppm. Analysis of the figures would also however have revealed that whereas the total amount of contaminant present at coolant and first foot stage had been, reportedly, 111.181 and 91.155 litres respectively, the quantity now present was, apparently, 18.439 litres - on the face of it an impossibility.
23. Miss Bigg recorded in her notebook receiving another telephone call from SGS "27 [June] late pm". Her full note of the conversation was:- *"27 late pm. 50% better but not perfect. Terminal and SGS want to continue. Feel it will fix and be okay. PMI's ship. Lets hope."*

I have no doubt that that is an accurate record of the conversation. In her Witness Statement Miss Bigg amplified her recollection of this conversation as follows:-

"17. As far as I can recall the next telephone call I received was, again, at home and was received from SGS during the night of the 27th. The call told me that the cargo had been loaded to the 50% level and that the samples had tested with much better results. The cargo was now only slightly out of specification. I was told that both SGS and the terminal had made calculations that satisfied them that with the cargo fully loaded, the 10 parts per million specification for C3 and heavies would be met. On that basis they wanted to continue loading and I told them that on the basis of their calculations and their advice I would not object."

In cross examination at trial Miss Bigg said that she thought that in the course of this telephone conversation she was given the figure for contamination in each tank. She reiterated that she recalled that Pemex and SGS felt it would fix and be okay. A day or so after the 27th June 1995 Miss Bigg made a note for her colleague Mr Mustafa Say in which she recorded the gist of this conversation as follows:-

"ON 6/27 - NIGHT - TIME NOT NOTED - SGS CALLED WITH THE 50% ANALYSIS WHICH WAS MUCH IMPROVED BUT STILL SLIGHTLY OUT OF SPEC. STS STATED THAT THE TERMINAL AND SGS DID CALCULATIONS AND CONCLUDED THAT THE CARGO FULLY LOADED WILL BE IN SPEC AND THEY WANTED TO CONTINUE NG."

LOADING AGAIN, REPEATED THAT I DID NOT OBJECT TO VESSEL CONTINUING TO LOAD AND WE WOULD HOPE FOR THE BEST"

24. This note would seem to bear out Miss Bigg's recollection that she was told that calculations had been carried out. Miss Bigg must I think, perhaps understandably, have been mistaken when she contemporaneously recorded this telephone call as having been received by her late pm on the 27th. It must I think have been in the early hours of 28 June rather than late pm on the 27th June, if only because the analysis result was not available until 0125 on 28 June. The only alternative explanation is that Miss Bigg is incorrect in her recollection, which is not in fact reflected in her two contemporary notes, that she was given a figure for contamination in each tank. Furthermore, if the telephone call did take place on 27 June, then what Miss Bigg was told by SGS, as recorded in her two contemporary notes, as to the analysis and as to calculations having been done cannot have been based upon any actual results or indeed calculations. I think that this is unlikely but it is nonetheless puzzling that Miss Bigg was told that GS and the terminal wished to continue loading and given the impression, as clearly she was, that she was being asked to give her agreement thereto. She was not told that the terminal had in fact continued loading at 2345 on 27 June without waiting for the analysis result. If the telephone call did not take place before loading had resumed then by definition it must have taken place before the analysis results were known. I infer that loading would not have resumed without the concurrence of SGS.
25. Loading was completed at 0820 on 28 June. Yet further sampling and analysis showed that the cargo in each tank was now within specification, the quantities of propylene and heavies being, respectively, 1,1,1,9 and 7 ppm by volume. This represented a contamination across the cargo as a whole of 3.332 ppm. These results indicated that the total amount of contaminant present was now 24.894 litres. At 1300 hours the vessel sailed for Europe. A bill of lading was issued by the Defendants on 28 June 1995 pursuant to which the cargo was to be delivered at Moerdijk "unto order of B.P. Chemicals Ltd".
26. The vessel arrived at Moerdijk on 13 July 1995 and berthed at the Shell facility. The cargo was intended to be discharged into that facility, albeit for account of the purchasers BP. SGS Nederland, appointed on behalf of Vinmar, took samples on 14 July. Subsequent analysis indicated the presence of propylene and heavier hydrocarbons in each of the tanks, ranging from 22 ppm in tank 1P to 116 ppm in tank 3S. The full figures were - 22, 28, 25, 29, 82 and 116 respectively. This analysis indicated an overall contamination of 374 litres or 50.365 ppm across the whole cargo. It was confirmed that the nature of the contaminant was butadiene.
27. I am unsure whether it was ever conclusively established at the loadport that the contaminant was butadiene. Miss Bigg said in evidence that SGS did not know what it was when they were speaking to her on 25 June, and her evidence did not reveal whether she was ever told whilst the vessel remained at the loadport what the contaminant was thought to be. It is true that the SGS letters of protest issued after finding that both coolant and first foot samples respectively were off-specification for propylene and heavies both carry an identical asterisked foot note which reads:-
"ACCORDING WITH CROMATOGRAPHIC (sic)
RESULT WAS IDENTIFICATED (sic) AS : 1.3
BUTADIENE"
- but the evidence does not throw any light on when those comments were added to the document and I cannot assume that the letters were necessarily so endorsed when first they were drawn up. Furthermore, evidence relating to a subsequent incident in January 1998 concerning the vessel "Igloo Star", whilst far from conclusive, suggested that as at that date the Pemex laboratory may have lacked the calibration standard necessary at any rate to analyse a peak on a chromatograph representing butadiene. The Master in his Witness Statement says that the SGS surveyor asked him, when reporting the analysis results on the coolant parcel, what had been his last cargo to which the Master replied that it had been butadiene. According to the Master the SGS surveyor went ashore and later came back and told him that the contaminant was butadiene. I cannot make any reliable findings on this point, which ultimately may not much matter. What can however fairly be said is that if there were at the loadport amongst those responsible for the critical decisions concerning loading any discussions as to the nature of the contaminant or its likely source, the quantities in which it might be present, and the possibility that there might be present yet further contaminant in the vessel's lines or cargo spaces, there is no evidence as to the nature and content of those discussions. Nor were any such discussions reported to Miss Bigg other than in the very general terms which I have already recounted. This is obviously relevant to my appraisal of the decisions which were taken.
28. SGS carried out a second sampling exercise at Moerdijk and samples were also drawn by a Caleb Brett organisation known as Inchcape Testing Services. Analysis of these samples showed some variation as between tanks compared with the first results but confirmed a substantial contamination of, overall, 46.157 ppm according to SGS and 56.347 ppm according to Caleb Brett. As a result of the contamination Shell refused to accept the cargo into their facilities and BP refused to accept the cargo pursuant to their contract with Vinmar. Further sampling took place either at Moerdijk or whilst the vessel was at anchor off the Hook of Holland. The SGS third sample drawn on 19 July showed an average contamination of 61.121 ppm. The Caleb Brett second sample drawn on 28 July showed contamination at 60.902 ppm. Again there is some inconsistency between the results for individual tanks. It was however common ground at the trial that the sampling and analysis exercise at the discharge ports should be regarded as having, in broad terms, thrown up a properly representative result in which confidence could be placed.

29. On 2 August 1995 Vinmar were able to sell the cargo to Norsk Hydro a.s. for discharge at Rafnes, Norway. As a distressed cargo the price obtained was US \$150 per tonne as opposed to the price which would have been payable under the BP contract, US \$606.07 per tonne. It is common ground that the sale to Norsk Hydro was at the best price obtainable. The bill of lading was endorsed by BP to Vinmar and by Vinmar to Norsk Hydro. Norsk Hydro surrendered the bill of lading in return for delivery on 10 August. It is accepted that Vinmar became lawful holders of the bill of lading and are entitled to sue in that capacity. It is accepted also that the terms of the contract contained in or evidenced by the bill of lading included the Hague Rules duties as set out in sections 3(1) and 3(2) of the United States Carriage of Goods by Sea Act in turn incorporated from the voyage charterparty of 16 June 1995 to which I have already referred.
30. At Rafnes there was further sampling by SGS. This showed an overall contamination of 51.222 ppm.
31. Taking the volumetric average of all pump recirculation sample analyses at the two discharge ports, the contamination found was 54.4 ppm. This reflected the presence overall of 404 litres or some 380 kilograms of butadiene contaminant. The contamination was distributed throughout the tanks. However a clear pattern is discernible. The distribution of the contamination was that about 50% of the overall contaminant was to be found in tanks 3PS, 30% in tanks 2PS and 20% in tanks 1PS. Whilst there are, as I have already recorded, inconsistencies as between the analysis so far as concerns the level of contamination found in individual tanks the distribution pattern which emerges from the overall average is clearly discernible when comparing the analyses one with another.
32. The contamination found at the discharge ports represents, approximately, a 4-fold increase when compared with that found at coolant and first foot level at Pajaritos. Mr Payne, the expert cargo surveyor who gave evidence on behalf of the Claimants, stated in his report that if the extraordinarily high levels of contamination found at the discharge port had been present at Pajaritos there can be no doubt that there would have been some indication thereof during the analysis of the 50% and 100% samples. This led him to conclude that the cargo was further contaminated during the course of the voyage. Mr Payne accepted that his thinking in this regard was informed by the magnitude of the increase in contamination on the voyage. However Mr Payne also asserted that the samples taken at coolant and first foot stage are less likely to be reliably representative than samples taken at the 50% and 100% stage. Eventually this proposition was accepted by Mr Severn, the expert cargo surveyor who gave evidence for the Defendants. That being the case, I do not believe that there is any reliable basis for a finding that there was a 4-fold increase in contamination between the load port and the discharge port. If anything the conclusion would have to be that the increase was more in the order of 16-fold, as compared with the after loading sample, or 22-fold, as compared with the 50% sample. However I cannot reliably make a finding of that sort either. Mr Severn said that it is very very difficult to draw a representative sample and I did not understand Mr Payne to dissent from this proposition. If nothing else the evidence in this case would seem to bear it out. Furthermore there have to be considered the inherent limitations of the ASTM D 2505 test method. The repeatability of the method in measuring propylene in the range 1-15 ppm by volume is that the difference between successive results should exceed 3 ppm only in one case in twenty. The reproducibility in the same range is that the difference between independent results should exceed 11 ppm only in one case in twenty. The evidence was that the repeatability and reproducibility tolerances for butadiene would be slightly better, and it is of course the case that the contaminant here being detected by the test for propylene and heavies was in fact butadiene. However it was also the unchallenged evidence of Mr Jones, a chemist who gave evidence for the Defendants, that when butadiene in concentrations in excess of the range 1-15 ppm was being measured the corresponding repeatability and reproducibility tolerances would be greater on a scale which would be almost if not quite linear. This demonstrates that one must be very cautious about drawing reliable conclusions from the analysis results. The contaminant apparently found to be present at coolant and first foot level cannot, if it was indeed present, have thereafter reduced by the 50% and 100% stages, as the load port analyses seemed to suggest. The coolant and first foot analyses may give an exaggerated picture. On the other hand the results might equally be understated. However looking at all of the analyses, both at loadport and at discharge ports, the 50% and 100% loadport analyses can only be indicative of the true position if (i) the coolant and first foot samples overstated the presence of butadiene by a factor of about 5 and (ii) virtually the entirety of the contamination was introduced during the course of the voyage, i.e. about 20 or so litres present in the cargo on leaving Pajaritos, about 404 litres present in the cargo on arrival at Moerdijk. Even accepting the coolant and first foot sample analyses as properly representative and rejecting the 50% and 100% samples as simply aberrant calls for the introduction of 300 or so litres of contaminant during the voyage.
33. Both parties were at pains to point out that the case could be resolved in their favour without the need for the court to reach any conclusion on the question whether any further contamination occurred during the voyage, and it is tempting to follow them down that route. However regrettably I feel that I should not do so, because it might hereafter become relevant to have such findings of fact on this issue as the court is able to make.
34. In my judgment the pattern of the contamination found at the discharge ports is significant. Whilst pointing, rightly, to a lack of reliable or any information on what was done on an evidently poorly run ship subsequent to her departure from Pajaritos, Mr Payne was nonetheless unable to point to any plausible mechanism of on-voyage leakage of butadiene into the cargo spaces which would result in the pattern of contamination which is clearly and fairly discernible from the discharge port analyses. Leaving aside the pattern of contamination, it is also in my judgment inherently improbable that any of the suggested on-voyage leakage mechanisms would give rise to leakage into all six tanks. On the other hand there is a plausible mechanism whereby butadiene may have been

introduced into all six tanks prior to loading at Pajaritos and moreover in a manner which would result in a pattern approximately reflecting the pattern of contamination found at the discharge ports. I have already referred, briefly, to the "gassing-up" and cooling down exercise carried out prior to the vessel's arrival at Pajaritos. The way in which this was done was, apparently, that the liquid line between tanks 3PS and tanks 2PS was opened and the ethylene vapour in tanks 3SP was displaced by pressure into tanks 2PS via the liquid line. Vapour was then taken from the top of tanks 2SPS into tanks 1PS. This is known as a cascade system. The resulting mixture of nitrogen and ethylene vapour will have been exhausted to atmosphere via the vent mast riser. If butadiene was present in tanks 3PS prior to this gassing-up operation being undertaken, the cascade operation would account for it being distributed in diminishing proportions to tanks 2 and 1. The reported results of the gassing-up operation showed 40% ethylene in tanks 2PS and 10% in tanks 1PS. There was considerable debate as to whether butadiene would or could have been present in tanks 3PS at this stage. However, a plausible mechanism for introduction of butadiene into those spaces was provided by the observation to cargo interests' surveyor at discharge, Mr van Thienen of Messrs R J Kroesen B.V., that all the stripping lines from the tanks up to number 1 manifold were open, leaving separation between tanks dependent on the efficacy of a single hand operated isolating valve at each tank dome. It seems perfectly possible, indeed likely, that the configuration had remained the same since the loading and/or carriage and/or discharge of the previous butadiene cargo. If that be so then the relatively high discharge pressure could have resulted in the leakage of butadiene into tanks 3PS via the isolating valves, although it has to be recognised that given that butadiene was detected at the coolant sample stage in both 3P and 3S, this theory requires that the isolating valves at both tank domes were passing under pressure. This is not unlikely. Hand operated ball valve number 630 was found to be leaking during the discharge operation at Rafnes and it seems unlikely that there were not other valves in a similar condition. Calculations carried out by Mr Severn demonstrated that there was the potential for up to 424 kg of butadiene in tanks numbers 3PS in the liquid phase and up to 198 kg in the vapour phase.

35. In the absence of any other theory which can account for the apparent pattern of contamination found at the discharge port, I consider that it is likely that the contamination occurred in this manner. This theory also has the merit of relative simplicity involving only one mechanism of contamination and involving moreover the easily understood phenomenon of leaking valves.

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leaking at Rafnes. Butadiene could have entered this reservoir during voyage 8/95 if either valve numbers 632 and 633 were leaking or spool piece SP601 was turned towards valve 802 during that voyage. However the evidence suggests that maintenance was carried out to valve XPV702 on 10 June 1995, five days after discharge at San Lorenzo. Valve XPV702 is the outboard portside valve on L2 and no significant maintenance could have been carried out to this valve if the manifold was full of liquid butadiene under pressure. In any event, further unchallenged evidence, this time from Dr Vince, although not easy to follow, when properly understood seems to rule out this theory as a source of on-voyage contamination of the magnitude required if it is to be assumed that a significant part of the overall contamination occurred in this way. Even if valve 630 were assumed to be fully open, only 204 kg would escape in the seventeen days between 28 June and 14 July, the limiting factor during the evaporation phase being not the size of the orifice but the slow rate of heat influx, the latent heat for evaporation of the liquid butadiene being supplied by conduction via insulated pipe walls. 22kg out of the total 204 kg would have flashed off and thus been unavailable to serve as a contaminant.

37. The foregoing is only the briefest distillation of some extremely complex evidence. My conclusion is however that it is unlikely that there was significant addition to the contamination during the loaded voyage from Pajaritos to Moerdijk. This makes the 50% and 100% sample analyses the more difficult to explain.
38. The Defendants accept that the analysis of the coolant parcel indicates that the cargo spaces and/or the associated pipeworks etc were not suitable for the carriage of ethylene. They admit that they were thereby in breach of their duties such that they are liable for the contamination of the coolant parcel, the cause of the contamination of the coolant parcel being that breach. However the Defendants also say that the contamination of the coolant parcel indicated or ought to have indicated to Vinmar and PMI that the cargo spaces and the associated pipeworks were not suitable for the carriage of ethylene, and that Vinmar and PMI knew or ought to have known either that any further cargo loaded would become contaminated by butadiene by reason of its being loaded onto the vessel or alternatively that there was a substantial risk that any further cargo loaded would become so contaminated. In these circumstances the Defendants say that the cause of the contamination of the cargo, over and above the contamination of the coolant parcel, was the decision of Vinmar and/or PMI to recommence loading.
39. Although it remains the Defendants' primary case that the cargo interests should not have loaded beyond coolant level they were of course equally perhaps more critical of the decision to load beyond first foot level. Their fall-back position is therefore that they are not liable for contamination beyond the first foot stage.
40. The first question which I have to resolve is whether the decision to continue loading beyond either coolant or first foot level is sufficiently unreasonable to break the causal chain between the admitted breach and the contamination of the full cargo. I express the question in this perhaps imprecise manner because I do not think it is capable of more precise formulation. Questions of causation arise in many contexts and they are often elusive. They fall to be decided as matters of fact and common sense - see *Galoo Ltd v Bright Graham Murray* [1994] 1 WLR 1360. Where there is an act or decision of a party independent of the contract or duty breaker which is

said to sever the chain of causation between breach and loss the quality of that act or decision must be examined in its context in order to determine whether it should be regarded as having that effect. In principle that enquiry is no different whether the independent party is a stranger to the transaction or is the claimant himself or someone for whose acts the claimant is responsible. However in practice it is perhaps inevitable that it is in general easier to establish a novus actus interveniens where the act relied on is that of the claimant or someone for whom the claimant is responsible. Furthermore, an act or decision is the more likely to be regarded as breaking the chain of causation if it can be characterised as involving a want of appropriate care by a person under a duty to take such care. Hence the characterisation by the Defendants of the decision to resume loading by the use of the various epithets to which I referred at the outset of this judgment.

41. It is accepted by the Claimants that any act or decision of SGS is to be imputed to them. Miss Bigg described SGS as being the “eyes and ears” of Vinmar at Pajaritos. So also in my judgment insofar as it is relevant PMI is a party for whose conduct Vinmar is in this context responsible, notwithstanding that there was of course a conflict of interest between them arising out of the feature of their contract, apparently unappreciated by Miss Bigg at the time, that quality was to be ascertained in the shore tanks rather than on board the vessel. Similarly, in my judgment no distinction is to be drawn between PMI and PEMEX.
42. The conduct of those for whom the Claimants are responsible cannot be regarded as breaking the chain of causation between the admitted breach of contract and the loss to the exclusion of any efficacy of the breach - see per Devlin J in *Heskell v Continental Express* [1950] 1 All ER1033 at 1048. “*The contract breaker is liable so long as his breach was “an” effective cause of [the] loss; the Court need not choose which cause was the most effective*” - Chitty on Contracts, 28th Edition, paragraph 27-033.
43. From this citation of authority it is apparent that I also have to decide whether there was any other breach of contract by the Defendants over and above the admitted breach which was effective to cause the loss. I have already concluded that the Defendants have successfully demonstrated that there was no further breach of contract after completion of loading. However the claimants say that the continuation of loading after coolant or first foot level itself involved a further unadmitted breach of contract by the Defendants in that they failed, through the Master, properly and carefully to load and/or care for the cargo.
44. In answer to this last point the Defendants say that the relevant decisions to load or to continue loading were taken by PMI, Vinmar and SGS without reference to the Master. That does indeed appear to have been more or less the case. To the surprise of both Mr Payne and Mr Severn, both of whom have extensive relevant experience, the Master appears to have played virtually no part in the loading process. Mr Severn for the Defendants was refreshingly critical of him. He felt that he had not played an active enough role - he “had not covered himself in glory”. Mr Severn said that the Master in such a situation has to be sure that the responsible parties are all fully aware of the nature of the problem. At the very least he should have retained the services of a competent P. and I. Surveyor so as to confirm in his own mind that the problem existed. He would have expected the Master to have continued with loading only if the cargo interests accepted responsibility for any ultimate contamination - if they declined so to do then he should have declined to load further cargo. This notwithstanding the Defendants say that it is idle to expect the Master to have reacted in that way when it was unclear to him either that the final cargo would be off-specification or that the contamination was in any event either real or the fault of the vessel. The Defendants also point to the fact that the Master had no knowledge as to the reliability of the samples or of the analysis results and could not know what level of contamination might be acceptable to cargo interests. Moreover there was confusion on this issue - the Pemex letter of protest referred to a maximum permitted propylene plus content of 15ppm by weight whereas the GS letters referred to 10ppm by volume a matter which had confused even Mr Payne when writing his first report. The Defendants also say that the Master was effectively under the orders of both the time charterers Cheminter and the voyage charterers PMI to load the cargo. He was contractually obliged to load and was not entitled to refuse to do so, whether or not there had been a prior breach of contract in presenting the vessel to load in the state in which he did. Moreover because the vessel lacked spare tank capacity, once the contamination was discovered the situation could be remedied only by discharging the cargo already loaded. The cargo obviously did not belong to the shipowners and thus the Master could do nothing to remedy the vessel’s unseaworthiness without the instruction or cooperation of charterers and/or cargo interests.
45. In my judgment these arguments, although attractively and powerfully presented, are wide of the mark. A shipowner cannot in my judgment abdicate responsibility in this manner. It is no answer to an allegation of breach of the contract contained in or evidenced by the bill of lading to say that it was consequent upon performance of an inconsistent contractual obligation owed to others. Furthermore I do not understand how the shipowners can pray in aid the Master’s failure or refusal to accept the reality of the situation. The reality was that through a failure to observe basic tanker practice there was present in the vessel’s tanks and lines at the beginning of loading a large quantity of contaminant which derived from a previous cargo. In my judgment it is inescapable that that is a matter in which the Master should have interested himself. He should have taken whatever steps were necessary to satisfy himself as to the extent and source of the contamination. Consistently with his or more properly his owners’ duties under the bill of lading contract he should not have permitted further cargo to be loaded unless he was satisfied either that the full cargo would be within any relevant specification or that cargo interests would accept responsibility for any eventual contamination. If the only manner in which the vessel could be made fit to receive further cargo was by removal of the cargo already loaded it was the Master’s duty to ensure that all parties were made aware of that fact so that it could be dealt with appropriately. The fact that it

might have led to impasse, or to allegations of breach of charterparty obligations, cannot be an excuse for inactivity. It was the Master's duty to make clear that he could not consistently with his owners' duty to cargo interests load further cargo without first making his vessel fit to receive it. Loading further cargo without rendering the vessel fit to receive it amounted without more (i.e. without being satisfied either that a full cargo would be within any relevant specification or that cargo interests would accept responsibility if it was not) to a breach of duty owed to cargo interests. In my judgment the Claimants succeed in establishing that the Defendants, in consequence of the Master's inactivity, failed properly and carefully to load and/or care for the cargo.

46. That leaves the question whether the Defendants' breach in this latter respect should be regarded as an effective cause of the loss. In my view it should. The argument to the contrary is that since the relevant decisions were taken without reference to the Master they should be regarded as an independent cause of the loss over which the Master had no control and to which therefore his failure did not contribute. In my judgment this is no answer. The owners failed properly to load and care for the cargo precisely because the Master abdicated his own responsibility. In such circumstances the Defendants' breach in this regard remains an effective cause of the loss notwithstanding it can be said that without the decisions to which the Master was not party the cargo would not have been loaded beyond coolant or first foot level. The Master should not have allowed those decisions to have been taken or have been put into effect without input from him. Put shortly, the Master should have been part of the decision making process.
47. In the light of that conclusion it is strictly unnecessary for me to decide whether the decisions to resume loading after coolant and first foot level should properly be regarded as breaking the causal link between the initial unseaworthiness and the contamination beyond those parcels but I must nonetheless address that point in case I am wrong in my view as to the role played by the Master or its causative effect.
48. The Defendants contend that the decisions to load beyond coolant and first foot level lack any rational basis and were negligently, indeed recklessly, made. Any attempt to understand the basis on which those decisions were made has to be a reconstruction since there is no evidence other than what Miss Bigg was told as to the thought processes of SGS and PMI. In fact Miss Bigg was told nothing as to the basis upon which loading continued beyond coolant level to the first foot. She was told that Pemex wanted to load beyond first foot to 50% level and that the expectation was that by adding further clean product the overall level of contamination would be reduced. If any calculations had at either of those two stages been carried out she was not told of them.
49. SGS were asked after the event to explain the apparent decrease in the quantity of contaminant present as between coolant and first foot level - 111 litres reduced to 91 litres, and as between first foot and 50% level - 91 litres reduced to 18 litres. Their response of 1 August 1995 reads in part as follows:-

"With regards to the quantity of the contaminant found in the cargo I agree that the results do show a difference, but in the first instance we had 100 litres dissolved in 164999 litres (0/06%), but by the end of the cargo if we had the same quantity of contaminant (100 litres), this would be dissolved in 7446311 litres, approximately 0.001%. To therefore ensure that this had been adequately mixed into the cargo we would need to circulate the tanks before sampling for a much longer period, a process that would become prohibitive to your goodselves based on the time required to perform the operation.

The marine surveyors, R.J. Kroesen B.V. calculated that initially there were approximately 100 litres present in the cargo, they then imply that we have failed to detect that there had been a decrease in the quantity present. This point had been noted by us but due to the inherent problems associated with sampling gas cargoes it was not questioned. I must also ask at this point, has anyone investigated why with the discharge port figures that there is now a quantity in excess of 370 litres of contaminant on board the vessel."

This is a puzzling response. In the first place it understates the extent of the contamination at the coolant level by 10% - the quantity then apparently present was not 100 litres but 111. However even taking the figures at face value whilst it is true that 100 litres dissolved in 7446311 litres can properly be expressed as approximately 0.001% - which is 10ppm and therefore within albeit on the contractual limit - the actual quotient of the sum is 0.00134%, which is 13.4ppm and therefore outside the specification. The correct figure on the basis of 111 litres of contaminant would, as I have already observed, be a 14.8ppm contamination in the full cargo. This explanation from GS has caused me some concern. It is not however a sufficient basis on which to conclude that the exercise conducted by PMI/Pemex and SGS may have been corrupt, as the Defendants themselves recognised, Mr Cooke QC on their behalf contenting himself with the gentle enquiry of Miss Bigg whether it had ever crossed her mind that Vinmar might have been "stitched up" by PMI and SGS. It had not crossed Miss Bigg's mind that such long term and apparently reputable trading partners and business associates might have behaved in that way and Mr Cooke did not pursue the train of thought.
50. Mr Hancock QC for the Claimants invited me to rationalise the decisions made in this way. The coolant sample may have been regarded as an unrepresentative sample from a small parcel which had not been circulated for long. The analysis results were so high as to be virtually meaningless in the light of the repeatability and reproducibility factors which must obtain at readings at that level. SGS/PMI may have shared Miss Bigg's experience that in 95% of cases a contamination found at coolant level resolves itself by the stage of the full cargo. SGS/PMI may therefore have decided to load more cargo in order to obtain a representative sample. By first foot level the results in 3 PS had dramatically improved. Those tanks now held a substantial amount of cargo loaded over a longer period a sample from which might be expected to be more representative than the earlier

sample. Had an extrapolation been carried out from the tank 3 results at first foot level the result would have been that the full cargo would be expected to be within specification.

51. I have some difficulty with this suggested rationalisation over and above the point which I have already made that there is simply no evidence to support it. There is little point in taking samples if they are then simply to be rejected as unrepresentative. Moreover the analysis could as well have been understating a result as overstating it. It may have been Miss Bigg's experience that in 95% of cases the matter resolves itself but why should this not prove to be one of the 5% of cases where it does not? Furthermore the evidence did not reveal whether Miss Bigg's experience extended to a case indicating initial contamination as gross as was this. If the decision to load beyond first foot level was taken on the basis of the results from number 3 tanks alone that would be to ignore worryingly high and consistent figures for contamination found in the other four tanks which moreover showed that the contamination was present across the ship.
52. There are some further surprising features of this loading exercise. It is common ground that vapour samples should have been taken before loading. Indeed this is a standard procedure recommended by the Institute of Petroleum Procedures for Product Quality Control. There is room for debate as to what such sampling would in this case have revealed but the fact that it was not attempted casts some light on the exercise as a whole. Again it is common ground that it is good practice, when the results of initial samples show cargo to be off-specification, to take a second set of samples. Mr Payne, for the cargo interests, was particularly critical of the failure to carry out this elementary precaution when the vessel came back onto the berth before resuming loading to 50% level. Again the suggestion that second samples might have shown nothing any different from the first is to my mind beside the point. They might have thrown up different results and the fact that these standard procedures were not followed again casts doubt on the care with which the whole loading exercise was conducted and militates against a conclusion that the relevant decisions were reached on a rational basis.
53. Ultimately, I do not feel it safe to conclude that the decisions taken on the ground by PMI/Pemex/SGS were taken on any basis more scientific than that they decided to see what happened and to hope for the best. This is not unlike the attitude adopted by Miss Bigg although of course she was entitled to rely upon advice from SGS who were in this respect the experts and in any event she thought, wrongly, that the risk lay with PMI if things did not turn out for the best. It can however be said of PMI/Pemex/SGS that their approach was apparently vindicated by the results obtained at the 50% stage and after completion of loading of the full cargo. Furthermore, whilst the trial process has inevitably thrown the spotlight on the ease with which volumetric calculations and extrapolations can be carried out, and the story which such calculations might in this case have told, the reality is of course that the outcome of such calculations is as reliable as the analysis results on which they are based. A calculation which indicates an outcome comfortably one side or the other of the 10 ppm limit may in fact tell one little - still less if the margin is itself less than comfortable.
54. In evaluating whether I should regard the relevant decisions as sufficiently unreasonable to break the causal link I must of course have regard to the fact that whatever concern I may feel as to the nature and quality of the decisions taken it was the shipowners who placed the other interests in the dilemma in which they found themselves. In this regard it is also relevant to consider what might have happened had the charterers or the cargo interests in fact declined to continue loading beyond coolant or first foot level and required the shipowners to remedy the unseaworthiness, since any decision to continue loading should in part be informed by consideration of the consequences of not continuing loading. This is necessarily speculation. Dealing with 100 tonnes would obviously have been easier than dealing with 540 tonnes. The two realistic options are said to have been either disposing of the product to the flare at Pajaritos or disposal at sea by venting to the atmosphere. As to the first of these possibilities it would have required the cooperation of the terminal which I can I suppose on this hypothesis assume would willingly have been given. It may be that a vapour return line is a standard piece of equipment or something which could readily have been rigged up. Even so there is actually no evidence that there was a vapour return line. None was offered to the vessel during loading (CWS first report paragraph 4.5.3) and Mr Payne said in evidence that he did not know whether there was one. As best I can recall or trace the point was not explored with Mr Severn. Disposal at sea would in Mr Payne's view have taken very much longer than Mr Severn's suggested two days for the coolant parcel - he thought in the light of his experience that it would take him all day to dispose of 5 tonnes. In this regard Mr Payne's practical experience was the more relevant of the two. Given the Master's attitude it is fair to assume that any request to dispose of 100 tonnes of cargo at sea would not have been well-received and would at the very least have led to considerable delays. Disposal of 540 tonnes may in principle be simply a bigger and longer exercise than disposal of 100 tonnes but the practicality of it was simply not explored in the evidence, and if it had been I am not sure that the speculation involved would have been particularly productive. I am I think entitled to infer that the difficulties involved in such an exercise may have been sufficiently greater in degree as to be different in kind. This is not academic. It is one thing for the parties involved to agree to write off 100 tonnes of contaminated product where the cost of reclaiming it may be disproportionate to its value. It is quite another thing where the quantity concerned is 540 tonnes. The assumption I was invited to make was that the cost of any delays involved in a disposal exercise would be borne by the shipowners and so would not have constituted a loss to the Claimants. As to the cost of product destroyed in this manner, the assumption is that this would represent a claim which Vinmar could recover from the shipowners, although obviously it is not a claim in respect of which the shipowners acknowledged their liability at the time. Indeed, even now the extent of the shipowners' concession is that they are liable for the cost of disposal of the

smaller coolant parcel, since they say that the decision taken at that stage to continue loading should be regarded as the sole cause of the Claimants' loss thereafter.

55. These considerations are the more relevant if, as I conclude the case, the decision to continue beyond first foot level is the more difficult of the two decisions to justify. I can understand the decision to proceed to the first foot level in the expectation that the sampling which could then be effected might be expected to be more fully representative and reliable, informed also by a general if unprincipled feeling that such contamination as apparently emerges at coolant level may prove to have been significantly overstated. Subject to the obvious limitations to which I have already referred, Miss Bigg's evidence suggests that this approach may be both common and generally successful. In my judgment the focus should therefore be on the decision to proceed beyond first foot level. On any view proceeding beyond that stage without further sampling or investigation involved the taking of a very considerable risk. On the other hand the likely consequences of a decision not to continue loading after 540 tonnes of cargo had already been loaded are to say the least uncertain. The decision in fact taken may be approached either in terms of whether it is sufficiently unreasonable to effect a break in the chain of causation or in terms of whether it should be regarded as something reasonably done in mitigation of the consequences flowing from the admitted breach of contract. On either approach it should not be weighed too nicely in the balance. Lord Macmillan in *Banco de Portugal v Waterlow* [1932] AC 452 at page 506 said this:-

"Where the sufferer from a breach of contract finds himself in consequence of that breach placed in a position of embarrassment the measures which he may be driven to adopt in order to extricate himself ought not to be weighed in nice scales at the instance of the party whose breach of contract has occasioned the difficulty. It is often easy after an emergency has passed to criticise the steps which have been taken to meet it, but such criticism does not come well from those who have themselves created the emergency. The law is satisfied if the party placed in a difficult situation by reason of the breach of a duty owed to him has acted reasonably in the adoption of remedial measures and he will not be held disentitled to recover the cost of such measures merely because the party in breach can suggest that other measures less burdensome to him might have been taken."

As the learned editor of McGregory on Damages puts it, 16th Edition at paragraph 322, the claimant is only required to act reasonably and the standard of reasonableness is not high in view of the fact that the defendant is an admitted wrongdoer. Lord Hoffmann in *South Australia Asset Management Corporation v York Montague Ltd.* [1997] AC 191 at 218-219 approached the matter from a slightly different angle. He posed the question in terms of whether the loss could be said to be a reasonably foreseeable consequence of the plaintiff having been placed by the defendants' breach of duty in the predicament to which he found himself. I find that approach of particular assistance. Looked at in the round I have concluded that I cannot regard either decision to continue loading as being the effective cause of the contamination of the full cargo. The decisions are not sufficiently aberrant as wholly to supplant the unfitness of the vessel as the effective cause of the contamination. On the contrary having regard to all of the circumstances prevailing, which of course include the Master's contemporary approach, they are decisions which the evidence demonstrates could reasonably be anticipated might be made consequent upon creation by the owners of the dilemma with which charterers and cargo interests were confronted. I have already pointed out that questions of causation are often difficult and fall to be decided by the application of commonsense. The answer to the question here is not straightforward but on the facts of this case I cannot regard as sensible a conclusion that the shipowners' admitted breach of contract in presenting a vessel unfit to carry ethylene was not a cause of the contamination of the entire cargo.

Quantum

56. The Claimants contend that the measure of their loss is the difference between what they would have earned under the BP contract, US\$606,07 per tonne, and what they achieved on the distress sale - US\$150 per tonne. In my judgment the correct measure is the difference between sound arrived value and actual value - on the footing that normally compensation on this basis would reflect the cost of going into the market in order to buy a substitute cargo which would in turn enable the injured party to achieve whatever price might be obtainable under his forward contract assuming that to be higher. The BP contract was one entered into in March 1995 long before any relevant contract to which the Defendants were party. The BP contract price was calculated by reference to prices published by the ICIS - LOR Group, which Miss Bigg described as a publication commonly used to define price in this market. The average spot price cif NEW quoted in this publication for the week beginning 14 July 1995 was US\$470 per tonne. The loss in respect of which the Claimants are entitled to be compensated is therefore US\$320 per tonne, i.e. US\$1,336,614.40 on the agreed quantity of 4176.92 tonnes. Subject to the issue of limitation on which I have as yet heard no argument there must be judgment for the Claimants accordingly.

Mr Christopher Hancock QC and Miss Karen Maxwell (instructed by Messrs Elborne Mitchell for the Claimants)
Mr Jeremy Cooke QC and Mr Robert Bright (instructed by Messrs Richards Butler for the Defendants)