Super Continental Pte Ltd *v* Essential Engineering & Construction Pte Ltd [2010] SGHC 365

Case Number	: Suit No 458 of 2008
Decision Date	: 21 December 2010
Tribunal/Court	: High Court
Coram	: Judith Prakash J
Counsel Name(s)	: Hee Theng Fong, Seet Siok Lin Noelle and Lin Ying Clare (KhattarWong) for the plaintiff; Foo Yeung Chern Mervyn and Esther Yee (Lee & Lee) for the defendant.
Parties	: Super Continental Pte Ltd — Essential Engineering & Construction Pte Ltd

Contract – Sale of Goods

21 December 2010 Judgment reserved.

Judith Prakash J:

Introduction

1 This action arises out of a contract for the supply and installation of machinery intended to produce ultra high temperature ("UHT") treated liquid products. The purchaser, the plaintiff in this action, is Super Continental Pte Ltd, a subsidiary of a well known beverage manufacturing company. The defendant, the supplier of the machinery, is Essential Engineering & Construction Pte Ltd, a company which has been in the business of manufacturing, supplying and repairing machinery for processing food products since 1987.

2 In December 2004, the plaintiff and defendant entered into a contract under which the defendant was to supply, deliver, install and commission at the plaintiff's premises the following machinery:

(a) one Automatic UHT Plant ("UHT plant") complete and based on certain specifications set out in the defendant's quotation dated 5 November 2004 ("the November quotation");

(b) one insulated, vertical and cylindrical buffer tank;

(c) one Homogenizer in aseptic execution;

(d) one Aseptic Tank with controls and accessories;

(e) one control system for the Aseptic Tank's pre-sterilisation and production function; and

(f) one Aseptic-Form-Fill-Seal Machine ("AFFS machine").

The specifications provided that the UHT plant would be able to work at a capacity of 500 litres per hour to produce fresh milk, non-dairy creamer ("NDC"), liquid coffee, liquid sugar and liquid "3-in-1" coffee (collectively, "the products") in portion cups of 23 grammes per cup. The AFFS machine was to have an output of 18,000 cups per hour. The products were intended for human consumption.

3 The UHT plant was delivered on 28 July 2005 and the AFFS machine was delivered on 25 November 2005. Upon delivery, they were installed in the plaintiff's premises but the plaintiff complained that it had constant problems with the system from August 2005 up to September 2007. Various rectification works were undertaken but the plaintiff was not satisfied and alleged that the machines, in particular, the UHT plant, were not fit for the purpose for which they had been supplied. On 11 April 2008, the plaintiff informed the defendant that because of the defendant's fundamental breach of the contract, it was not bound by the same. This action for rescission and/or damages was started shortly thereafter.

The claim

4 The first cause of action in the Statement of Claim (Amendment No 4) ("Statement of Claim") is for breach of contract. The plaintiff's position is that the contract was not merely for the supply of parts but was a turnkey contract for the design, supply, installation of a system ("the System") which comprised, *inter alia*, the UHT plant and the AFFS machine working inter-dependently to produce the products for sale in the course of the plaintiff's business.

5 The contract itself, however, contains no language indicating it is a turnkey contract. The plaintiff's stand is that the nature of the contract was determined by the defendant's representations. The plaintiff pleaded that Mr KK Lee ("KK Lee"), the managing director of the defendant, represented that the defendant was able to design and assemble a UHT plant for the plaintiff and to set up the entire system for the production of UHT treated milk in portion cups for sale to consumers, and that he had the relevant expertise in turnkey projects in this field. In setting up the System, the defendant would advise the plaintiff on the appropriate machinery, supply such appropriate machinery, install the same and provide the plaintiff with the necessary formulae, packaging material and requisite training. The plaintiff relied on the defendant's expertise and experience when it accepted the November quotation by its letter of award dated 17 December 2004 ("Letter of Award"). By virtue of the November quotation, the Letter of Award, the drawing submitted by the defendant and the plaintiff's purchase order dated 20 December 2004, the parties entered into an agreement for a turnkey project in respect of the System.

6 Secondly, the plaintiff alleged that the defendant was in breach of some of the following express terms of the contract:

(a) the description of the various components of the UHT plant;

(b) the requirement that the AFFS machine would have the capacity to produce 18,000 portion cups of 23g each per hour;

(c) the performance guarantee "based on milk with throughput of 500L/Hr for the UHT plant"; and

(d) the System was to be installed over a period of two working weeks and one UHT plant engineer was to check and commission the System over a period of ten days, including the training of operators.

7 Thirdly, the plaintiff alleged that the following terms, implied by law in the contract, had not been complied with:

(a) that the System shall be reasonably fit for the following common purposes:

(i) to safely sterilise the liquid in the UHT plant and make it suitable for the aseptic packing and production of the finished product; and

(ii) to consistently produce finished products of satisfactory quality at the rate stated in the contract.

(b) that the System shall be reasonably fit for the purpose of:

(i) producing 18,000 cups of the finished product per hour of satisfactory quality in a safe and efficient manner, and for a reasonable period of time; and

(ii) commercial use in the course of the plaintiff's business.

(c) that the System and its components shall be of satisfactory quality;

(d) that the System and its components shall be of reasonable durability;

(e) that the System and its components shall function in a safe and efficient manner;

(f) the capacity and performance of the System and its components shall comply with the specifications in the contract; and

(g) the System and the operation thereof shall comply with local laws and regulations.

8 The Statement of Claim set out in detail the manner in which the defendant had allegedly breached these three components of the contract and the damages that the plaintiff had allegedly sustained by reason thereof. At this stage, I need not repeat or examine these allegations.

9 Although para 17 of the Statement of Claim asserted that the defendant owed the plaintiff a duty in contract and in tort to use reasonable care, skill, competence and due diligence in designing, supplying and installing the System, the closing submissions did not emphasise any breach of any tortious duty that had been pleaded. The case therefore falls to be decided purely in a contractual context.

10 In reply, the defendant denied that KK Lee had made representations to the plaintiff that the defendant was able to set up an entire system for the production of UHT-treated milk in portion cups. Further, he had never represented that the defendant would advise, recommend, supply or install the machinery for the System or that the defendant would provide the plaintiff with the formulae, packaging material and requisite training. As far as the defendant was concerned, its responsibility was simply to supply the UHT plant and AFFS machine. The contract was not a turnkey project for the entire system but only a contract for the supply of machines. The defendant also denied the various allegations of breach of contract and defects in the machines supplied. The defendant asserted that any defects observed were due to the failure, refusal or neglect of the plaintiff's staff to maintain and operate the System properly or to the fact that the cooling tower supplied by the plaintiff was unable to provide an adequate cooling function. The defendant also put in a counterclaim for amounts due under the contract which it averred the plaintiff had not paid.

11 From the pleadings and the closing submissions, the following broad issues arise:

(a) what was the nature of the contract between the plaintiff and the defendant and what documents make up this contract;

(b) what terms, if any, are to be implied into the contract;

(c) were there any shortcomings in the System, and if so, did the same arise from the breach of any express or implied term of the contract; and

(d) if the plaintiff is able to establish breach, what remedies would be available to the plaintiff?

The nature of the contract

12 The contract was concluded after a substantial period of negotiation between the parties. The plaintiff had first become interested in producing UHT dairy creamer in portion cups in 2001. At that time, its executive director, Mr Charles Li ("Charles Li"), had discussions on the issue with KK Lee in the course of which they visited a factory in Hong Kong to see how a UHT dairy production system with an AFFS machine worked. Negotiations commenced seriously in July 2004 and from then up to November 2004, the defendant rendered a number of quotations to the plaintiff. The price and the specifications changed somewhat over the months and eventually it was the eighth quotation that was accepted. This was the November quotation and it ran to some 20 pages which contained the descriptions and specifications of the various components of the UHT plant and AFFS machine that

were to be supplied, and also basic terms and conditions regarding matters like delivery, warranty, commissioning and acceptance.

13 The plaintiff's acceptance of the November quotation was expressed in the Letter of Award and it is worth quoting most of this document. It reads:

> This serves to inform you that M/s Essential Engineering & Construction Pte Ltd has been awarded the contract for:
>
> i) The supply of the full set of UHT plant and form-fill-seal machine for the production of portion cup at 18,000 cups/hr based on 23g/cup, come with auxiliary equipment;
>
> ii) The installation and commissioning of the complete set of UHT and form-fill-seal machine at 18,000 cups/hr based on 23g/cup, come with auxiliary equipment;
>
> iii) The provision of the necessary training for the staff on the good housekeeping and Good Manufacturing Practice (GMP) for the aseptic production of the portion cup.
>
> In addition, please note that you are to ensure the performance of the machineries meet the stated specifications by providing a sample milk formulation during the commissioning trial and acceptance test as dictated in Section III of the quotation (ref: ES/0379/KKL/04/vk). Also, you are to provide a list of at least 3 suppliers each for the raw materials (i.e. milk) and packaging materials for the production of portion cup after acknowledging the contract. All the certificates of compliance and/or sterility from the relevant authorities would need to be furnished for our record purpose as stated in the quotation. Furthermore, any requirements for the building structure would need to be made known to us to facilitate the building work on our side.
>
> *The entire scope of the contract would be according to the quotation submitted on 5th November 2004* (Ref: ES/0379/KKL/04/vk) for the following sum:
>
> 1) UHT plant come with auxiliary equipment S$242,000.00
>
> 2) Aseptic form-fill-seal machine (18,000 cups/hr) Euro $632,783.00
>
> 3) Installation and commissioning S$10,125.00 (excluding prevailing GST)
>
> Lastly, the dates of delivery for the machineries to our site at Super Continental are as such:
>
> 1) 5 months for the UHT plant and Aseptic Tank (Latest by end of May 2005)
>
> 2) 6 months for the Aseptic Form Fill Seal machine (Latest by middle of June 2005)
>
> Upon acknowledging this contract, M/s Essential Engineering & Construction Pte Ltd has agreed to uphold the various job scopes, terms and conditions pertaining to the contract.
>
> [emphasis added]

14 It would be observed that the plaintiff had been careful to specify the main particulars of the contract it was awarding to the defendant under sub-paras i), ii) and iii) of the first paragraph of the Letter of Award. Additionally, the plaintiff had detailed other matters which were important to it and

had emphasised that the scope of the contract would be according to the November quotation. Nowhere in the Letter of Award did the plaintiff mention the phrase "turnkey project" or indicate that it was relying on the defendant to take care of everything apart from the raw materials and utilities.

15 The plaintiff, however, contended that it had entered into the contract based on the defendant's representations that it had the necessary expertise in UHT treatment systems. Charles Li stated in court that the plaintiff's only concerns during negotiations with the defendant were price and capacity of the System (*ie* the production rate) and that he eventually chose the defendant rather than other suppliers because the defendant could give the plaintiff "the formula and ... ensure the shelf-life of the product. That was why after comparison I decided to use [the defendant] because ... he was able to give me a turnkey project".

16 The plaintiff also emphasised that KK Lee had admitted in court that the defendant was not merely a trading agent who sold the UHT plant to the plaintiff but that the defendant had designed the flow sheet and layout plants showing the arrangement of the System within the plaintiff's factory. Also, KK Lee had been the person who had derived the flow rate of 500 litres per hour to satisfy the plaintiff's requirement of 18,000 portion cups per hour. The defendant's evidence was that the UHT plant and AFFS machine were supplied as a set. The defendant had obtained the components of the UHT plant from various manufacturers and had assembled them. KK Lee had admitted that it had been the defendant's obligation to prepare a drawing of the layout of the UHT plant and to put the UHT plant and AFFS machine together.

17 The plaintiff submitted that the defendant's obligations under the contract covered all aspects o f production. KK Lee had agreed in court that it was the defendant's obligation to ensure satisfactory performance of the UHT plant. The defendant had also agreed to supply the formulae for dairy creamer and was responsible for the sterility of the intended products and a guaranteed shelf-life of six months. Furthermore, as the plaintiff had had no prior experience in UHT treatment systems at the time of contracting with the defendant and had relied entirely on the defendant, it was probable that the plaintiff had entered into a contract on a turnkey basis for an integrated system rather than just a contract for parts.

18 It is not quite clear to me exactly what the plaintiff hopes to achieve from a finding that the contract was for a "turnkey project". The express terms of the contract as contained in the November quotation and the Letter of Award are quite detailed and these are supplemented by terms implied by law as I will discuss below. The defendant's obligations as expressed and implied are fairly extensive and I am not sure how much further it takes the plaintiff to be able to establish that there was a turnkey project. The plaintiff did not define either "turnkey project" or "turnkey contract" and, as far as I am aware, no legal definitions of those terms exist. As one of the defendant's witnesses testified, the word "turnkey" is open to subjective interpretation and even when parties agree on a turnkey project, the scope of the contractor's contractual obligations would still depend on the terms of the contract.

19 In the Statement of Claim, the plaintiff alleged that the defendant was responsible for the failure of the System to produce NDC because the defendant was not only responsible for supplying and installing the UHT plant and AFFS machine, but it was also responsible for the effectiveness of the System as a whole. In contrast, the defendant's position was that under the contract, the defendant's only responsibility was to supply, deliver and install individual component parts of the System. Both parties have taken extreme positions. On the one hand, there is nothing in the contract which implies that the defendant is guaranteeing that, whatever the plaintiff may do or put into the System, the resulting product will be satisfactory to the plaintiff. Such an interpretation would be contrary to the express provision of the November quotation to the effect that the defendant does

not guarantee the physical properties of the products such as taste and colour. The plaintiff's witnesses admitted that the formulation of the NDC, the preparation of the raw materials and the proper supply of utilities were all factors that could affect the quality of the NDC produced. The defendant was not responsible for the formulation of the NDC which was the plaintiff's trade secret and, whilst the defendant agreed to recommend certain suppliers and give a recommendation for the formulation of dairy creamer, the plaintiff did not always follow the defendant's recommendation and the defendant could not force the plaintiff to do so.

20 On the other hand, I agree with the plaintiff that the defendant had undertaken an obligation to supply a system rather than simply components. The defendant denied designing the System and averred that a drawing that it supplied to the plaintiff was not the design of the System but was only intended to illustrate generally how the UHT plant and AFFS machine would have to fit in with the other key component of the System. This stand, however, was contradicted by testimony given by KK Lee and his project manager, Ms Maznah Ismawi (as summarised in [16] above). The defendant's responsibility for supplying a system was clear from the context of the contract, the specific obligations undertaken by the defendant as set out in the contract and the evidence, including KK Lee's admissions in court. Therefore, generally, the defendant's responsibility extended to ensuring that the System worked in that the components supplied by the defendant were suitable in design and manufacture to perform together to produce the products in the manner intended by the contract. Exactly how the System was intended to perform is something that must be established from the express terms of the contract as supplemented by the implied terms.

21 At this stage, I should also say that the express terms of the contract are in my judgment contained in the November quotation and the Letter of Award only. The plaintiff contended that two other documents, a drawing and its own purchase order, also formed part of the contract. The purchase order was only issued after the Letter of Award accepted the November quotation without reference to the terms of the purchase order. Therefore, it cannot be included as a contractual document. As for the drawing, this was something that the defendant supplied to the plaintiff during the negotiations as an indication of the layout of the System but it was not referred to in either the November quotation or the Letter of Award and therefore there is no reason to include it as a contractual document.

What terms are implied into the contract?

22 In its closing submissions, the plaintiff contended that various provisions of the Sale of Goods Act (Cap 393, 1999 Rev Ed) ("SOGA") applied to the contract so as to impose legal obligations of fitness for purpose and quality on the defendant. The defendant's response was that the plaintiff could not rely on s 14(2) and s 14(3) of SOGA because it had not pleaded such reliance. Instead, the plaintiff had pleaded that it was relying on the terms and conditions implied by the Supply of Goods and Services Act 1982 (c 29)(UK), an English statute. The defendant pointed out that only Part I of this statute applied in Singapore, having been enacted as the Supply of Goods Act (Cap 394, 1999 Rev Ed) ("Supply Act"), and that even this part was inapplicable since it does not govern contracts under which a seller transfers property in goods to a buyer for a monetary consideration. The contract between the plaintiff and the defendant was clearly a contract by which the defendant transferred property in equipment and machinery to the plaintiff for a monetary consideration. Therefore, the defendant argued, no terms could be implied into the contract by virtue of either SOGA or the Supply Act.

23 I agree with the defendant's contentions in relation to the inapplicability of the Supply Act. The position in regard to SOGA is, however, different. I consider that the plaintiff is entitled to rely on that statute although it did not quote it specifically in the Statement of Claim. It is not necessary for

a plaintiff to specifically cite the legal provisions on which he relies as long as he pleads sufficient facts to indicate to the defendant the case that he is making so as to enable the defendant to put forward his defence to that case. In a situation where a plaintiff is relying on obligations imposed by law, it would be a matter of good pleading for him to cite the relevant legal provisions in his Statement of Claim. Failure to do so would not, however, be fatal provided that the pleading sufficiently indicates the nature of his case.

24 In this case, in para 14 of the Statement of Claim, the plaintiff set out certain terms which it said must be implied into the contract as a matter of law or fact to give the contract business efficacy. I have reproduced these at [7] above. The plaintiff also pleaded in para 6 of the Statement of Claim that the defendant knew or ought to have known that the purpose of producing the products using the System was for the plaintiff to sell the same to retailers in the course of the plaintiff's business.

25 Section 14(2) of SOGA provides that where a seller sells goods in the course of a business, there is an implied condition that the goods supplied under the contract are of satisfactory quality. According to s 14(2A), goods are of a satisfactory quality if they meet the standard that a reasonable person would regard as satisfactory, taking into account any description of the goods, the price and all other relevant circumstances. By s 14(2B), the quality of goods includes aspects like fitness for all purposes for which goods of the kind in question are commonly supplied, safety, freedom from minor defects and durability. Further, under s 14(3), where the seller sells goods in the course of a business and the buyer makes known to the seller any particular purpose for which the goods are being bought, there is an implied condition that the goods supplied under that contract are reasonably fit for that purpose. In my judgment, the language used in paras 6 and 14 of the Statement of Claim sufficiently tracked the language of parts of s14 of SOGA as to make it clear to the defendant that although SOGA was not expressly mentioned some of the obligations it imposed were being relied on by the plaintiff. Although the plaintiff also sought in its closing submissions to rely on s 13(1) of SOGA relating to a sale by description, there was no language in the Statement of Claim that indicated such reliance or in what way the goods did not comply with their description. Accordingly, since the plaintiff did not afford the defendant the opportunity to make a defence to a claim that the contract was a contract for the sale of goods by description and the goods did not comply with the description, I will not consider any such claim in this judgment.

26 I have set out in [7] above the various terms which the plaintiff sought to have implied into the contract, and I will now decide whether these are terms permitted or contemplated by s 14 of SOGA. Some of the terms that the plaintiff sought to imply were actually provided as express terms of the contract and there is no need to imply terms that overlap with the express terms. These included the terms that the System would produce 18,000 cups of the products per hour and that the capacity and performance of the System shall comply with the specifications in the contract. There is no express term stating that the System and its operation shall comply with local laws and regulations but I do not need to consider that as an implied term for two reasons. The first is that there is no allegation that such term if it existed was breached. Secondly, nothing in the SOGA implies such a term.

27 The plaintiff submitted that the common or usual purpose of the System was to treat raw products using UHT treatment and to have such products aseptically packed into portion cups with the objective of extending the shelf-life of the treated products without the need for refrigeration. Apart from its fitness for the common purpose, the System also had to be fit for the "particular purpose" which was known to the defendant at the time of the sale (see s 14(3) of SOGA). In this connection, the plaintiff submitted, the particular purpose of the UHT plant and AFFS machine was to produce the products with a shelf-life of six months for dairy creamer and NDC, at the rate of 18,000

cups per hour for commercial sale. The products had to be fit for consumption throughout their intended shelf-life.

28 As the plaintiff emphasised, the defendant by its defence accepted that the contract contained the following implied terms:

(a) that the UHT plant and AFFS machine had to be reasonably fit for the common purpose of safely sterilising the liquid in the UHT plant and making it suitable for the aseptic packing and production of the products; and

(b) that the UHT plant and AFFS machine had to be reasonably fit for the plaintiff's particular purposes as set out in [7(b) to (g)] above.

Where the defendant disagreed with the plaintiff was in relation to the assertion that the implied terms referred to the System as a whole. As far as the defendant was concerned, it was only willing to accept contractual obligations in respect of the specified machines. Thus, the defendant had no difficulty with the nature of the terms which the plaintiff sought to have implied into the contract. Its only quarrel was regarding the extent of the application of those terms.

29 Having held that the defendant's obligations under the contract were in respect of the supply of a system for a particular purpose rather than a provision of individual machines (see [20] above), I agree with the plaintiff that any terms to be implied must relate to the System as a whole and not only to the UHT plant and AFFS machine individually. Therefore, as I see it, the terms that were implied into the contract were the following:

(a) That the System was of satisfactory quality in that:

(1) It was fit for its common purpose of safely sterilising liquid in the UHT plant and rendering the same suitable for aseptic packing and production of the products; and

(2) It was fit for the purpose of consistently producing products of satisfactory quality at the rate stated in the contract.

(b) That the System was reasonably fit for the plaintiff's purpose which was to produce 18,000 cups of the products (of a satisfactory quality) per hour in a safe and efficient manner and that the System would be capable of being used for the purpose of the plaintiff's business of retailing the products commercially.

(c) That the System and its components would be of satisfactory quality and reasonable durability and function in a safe and efficient manner.

30 Apart from the physical functioning of the System after it was delivered, there was a great deal of contention regarding whether the System was capable of producing a satisfactory product. In this

connection, the defendant pointed out that the implied condition regarding satisfactory quality under s 14(2) of SOGA does not, by virtue of s 14(2C)(a), extend to any matter making the quality of goods unsatisfactory which is specifically drawn to the buyer's attention before the contract is made. Counsel emphasised that in August 2004, the defendant had informed the plaintiff that although there was a one year shelf-life for the product, the stability of the product and its quality might change over the period. In the November quotation, the defendant also stated it would not be responsible for the physical properties of the NDC. Accordingly, in so far as problems with the physical properties of the NDC formed the plaintiff's basis for alleging that the UHT plant and the AFFS machine were not of satisfactory quality, the defendant argued that the plaintiff could not rely on s 14(2). The defendant also argued that the plaintiff did not rely on the defendant's skill or judgment for the formulation of the NDC or for preparing the raw materials for the NDC. The defendant had only provided the machinery and it was not correct for the plaintiff to contend that it had relied on the defendant for the suitability of the ingredients, the manner in which there had been prepared or the suitability of the end product. These are matters that I will consider further in the course of considering the evidence on the alleged breaches of contract.

Alleged breaches and alleged defects

31 The plaintiff complained that it experienced constant problems with the System from August 2005 to September 2007.

32 Its first complaint was that both the UHT plant and the AFFS machine were delivered late. The UHT plant was delivered around 28 July 2005 when it should have been delivered by the end of May. Similarly, the AFFS machine came in November 2005 when, contractually, it was due in mid June 2005. The defendant did not accept that the delay was its fault but asserted that it arose from the delay on the plaintiff's part to be ready to receive the machines. There is, however, no need for me to go into these allegations because, as the defendant also pointed out, the plaintiff did not show how it had suffered loss or damage as a result of the delay in delivery.

33 The major complaint was that the plaintiff was unable to operate the System on a full time basis from August 2005 to September 2007 because of numerous problems that continually plagued the UHT plant and the AFFS machine. The plaintiff set out a list of the defects in Schedule B of the Statement of Claim ("Schedule B"). This list ran to some four pages of defects which the plaintiff had detected and informed the defendant about during the period in question. To give an example of these defects, between 26 August 2005 and 29 August 2005, the plaintiff informed the defendant that it had experienced certain electrical faults in the System; on 16 November 2005, the plaintiff informed the defendant that there were unusual noises when it operated the aseptic homogeniser; on 27 June 2006, the plaintiff informed the defendant of leaks from the rotating shaft of Product Pump 2, and on 15 August 2007, the plaintiff repeatedly informed the defendant about cooling problems in the System. It can be seen that the complaints varied from minor operational and mechanical matters, to serious seeming defects. The plaintiff in its closing submissions did not deal with all the defects set out in Schedule B but highlighted only some of them. The defendant sought to answer the highlighted defects, though it did also assert that the other defects were operational matters that were ironed out in the course of the period in question. I, too, will focus in this judgment on the major allegations as I am satisfied that most of the more minor complaints were sorted out over the period in question.

34 The plaintiff asserted that whenever the System underwent testing by the defendant, different parts of the UHT plant and AFFS machine would break down or mal-function necessitating repairs. In July 2007, the plaintiff attempted to produce NDC for commercial sale during a trial run ("July trial run") that operated on a full-time basis *ie* one shift a day, five days a week. The result of the July trial run confirmed that the UHT plant and AFFS machine were unable to produce NDC in portion cups

that could be sold commercially. The defendant did not resolve the problems that arose during the July trial run and thereafter the plaintiff stopped attempts at production. In the plaintiff's opinion, it did not derive any benefit from the System throughout the two years that it attempted to operate it. There was a total failure of consideration and the implied terms had been breached as the System was not of satisfactory quality due to the frequent breakdowns and lack of durability. Not only was the System unfit for the particular purpose for which the plaintiff required it, but it was also unfit for the common purposes of such a system.

35 To a large extent the plaintiff, in seeking to justify its complaints about the System, relied on observations and evidence arising out of the July trial run. It did not place as much reliance on problems in the System observed before then. The defendant, however, sought to show that the System functioned properly after installation and that the plaintiff's complaints could not be ascribed to matters for which the defendant was responsible. Before I deal with the plaintiff's main complaints, I should assess the strength of the defendant's assertions.

Was the UHT plant successfully commissioned in January 2006?

36 The portions of the contract relating to commissioning and acceptance are set out in Sections II and III of the November quotation. The relevant paragraphs of Section II are:

> (b) During the commissioning period, the plant will be operated by client operation under the supervision of the commissioning engineer.
>
> (d) Commissioning will be considered completed when the product is processed and packed.

37 The relevant paragraphs of Section III are:

> Acceptance Test
>
> The plant will be operated in accordance to the instruction of the commissioning engineer where the operator will be operating.
>
> ...
>
> Three (3) batches of product will be processed. ... Samples will be taken ... during the filling operation. ... A minimum of 5% of the total production run should be collected during each of the trial run.
>
> The sample should be incubated for Seven (7) days at 30ºC - 35ºC before examination. The sample should be tested for spoilage by smell and taste. At the same time, sample should be taken from the packages to do the micro biological examination by colony count. ...
>
> If the result of these test [*sic*] show there are fewer than one per thousand (0.1) spoiled packages which cannot be attributed to faulty packaging, during the filling of the trial run, the plant shall be considered satisfactory. ...

38 The defendant asserted that the UHT plant was successfully commissioned in January 2006 when three trial runs with product were carried out in co-operation with the plaintiff and a representative of the supplier of the AFFS machine. The trial runs were done on 20, 23 and 26 January 2006 with the intention of producing three batches of product and taking samples of the same for testing. Samples were in fact taken from the first two batches and handed to the plaintiff to

send the same for micro-biological testing as shown from an e-mail sent by the defendant to the plaintiff on 24 January 2006. The defendant also declared its intention to take similar samples from the third batch. The plaintiff had not shown that no such samples were taken from the third batch.

39 KK Lee had testified that these samples taken in January 2006 passed all the tests for smell, taste and sterility. It was notable that the plaintiff had not produced any evidence showing that the samples had failed the tests. There were no test results showing that more than 0.1 percent of the product had spoiled and therefore the UHT plant had to be considered satisfactory. The defendant emphasised that the plaintiff had not produced evidence to substantiate any allegation that in January 2006, the UHT plant was unsatisfactory. Further, on 6 March 2006, Tay Chiew Teck ("Mr Tay"), the plaintiff's research and development manager, had signed the defendant's Final Acceptance Testing/Equipment form ("Acceptance form") for the UHT plant. This form clearly stated that:

(a) the defendant had completed and tested the UHT plant from 12 January 2006 to 26 January 2006;

(b) the defendant had imparted operation methods to the plaintiff's designated officer, Mr Tay; and

(c) the warranty would take effect from 6 March 2006 with a duration of 12 months for mechanical parts and six months for electrical parts, but excluding damage caused by wear and tear, misuse and abuse.

40 The plaintiff, on the other hand, argued that the commissioning of the UHT plant had not been successfully completed because:

(a) the condition in the contract that, during the commissioning period, the UHT plant was to be operated by the plaintiff's operators under the supervision of the commissioning engineer had not been complied with;

(b) Mr Tay had testified that he had signed the Acceptance form solely to acknowledge receipt of the instruction manual for the UHT plant;

(c) the criteria for the commissioning, trial and acceptance test set out in Section (III) of the November quotation were not reflected in the Acceptance form;

(d) the plaintiff's personnel were not trained to operate the System in January 2006;

(e) the micro-biological test was only conducted in August 2006; and

(f) there was no acceptance of the UHT plant because it was fraught with defects from the time it was installed until the plaintiff stopped attempting production in September 2007.

41 Dealing with the last point raised by the plaintiff, the fact that the plaintiff may have experienced many difficulties after Mr Tay signed the Acceptance form does not mean that the UHT plant was not successfully commissioned. It may have had defects which only manifested themselves during continuing operations after the commissioning. Therefore, a successful commissioning would not by itself mean that the plaintiff's complaints had no substance.

42 I am satisfied on the evidence that on a balance of probabilities, the UHT plant was

commissioned in January 2006 or if not then, then by 6 March 2006 when Mr Tay signed the Acceptance form. During re-examination, Mr Tay sought to explain why his signing of the Acceptance form should not be treated as an admission that the UHT plant had been successfully commissioned. I do not accept his explanations. First, he said that the three batches of product were not run and the samples were not taken. This was contrary to the defendant's e-mail showing that at least two samples had been taken and the third would be taken on completion of the third run. Further, Mr Tay could have refused to sign the Acceptance form for this reason or could have noted the failure on the form. As for the fact that there were no test results showing that the product met the required standards, the contemporaneous documentary evidence indicated that it was the plaintiff who had to send the product for testing. Since the plaintiff did not produce the test results, I infer that the tests results were satisfactory. There was also KK Lee's unchallenged evidence that the product looked, smelled and tasted good.

43 The evidence showed that contrary to the plaintiff's allegation that there could not have been a commissioning/acceptance trial in January 2006 because the plaintiff's operators were only employed in February 2006, there were at least two persons in the plaintiff's employ in January 2006 who were trained by the defendant to operate the machines. These were Mr Tay and a Burmese employee, Zaw Myo. The defendant also asserted that there was another employee of the plaintiff who was trained to operate the machines. Mr Zaw testified that both he and Mr Tay had operated the UHT plant in January 2006. They were supervised by Mr Huang Zhiliang who was employed as a project engineer by the defendant. He had been sent to Italy with Mr Tay for training by the manufacturers of the AFFS machine. Mr Huang's unchallenged testimony was that from 3 January 2006 to 26 January 2006 he had supervised the commissioning trial of the UHT plant and that it had been operated by the plaintiff's personnel during this time.

44 In the Acceptance form, Mr Tay specifically agreed that the defendant had imparted the operation methods to him as the plaintiff's designated person. Mr Tay is a food science graduate from Cornell University and thus fully capable of reading and understanding the contents of the Acceptance form. It is apparent from the wording of this form that it does not refer only to the receipt of instruction manuals but to the completion and testing of the UHT plant and buffer tank and aseptic tank. The form acknowledges that the same had been formally handed over by the defendant to Mr Tay, the plaintiff's representative. Mr Tay confirmed that he read the form carefully. He must therefore have understood the nature of the form. I cannot accept his evidence that he did not understand its significance. He signed the Acceptance form without reservation or qualification though he admitted in court that he could have qualified the form had he wished to.

45 It is also relevant that Schedule B does not contain particulars of any alleged defects noted between January 2006 and March 2006. No evidence has been produced by the plaintiff of any serious complaints made in respect of the UHT plant during this period. Mr Zaw's affidavit mentions complaints made in September 2005 (before the commissioning and acceptance tests were carried out) but does not specifically describe problems that were noticed with the UHT plant during the two months from January to March 2006. In all I am satisfied that the commissioning of the UHT plant took place at the latest on 6 March 2006 when the Acceptance form was signed.

Problems with the System from August 2005 to September 2007

46 The plaintiff complained that it was unable to operate the System on a full-time basis from August 2005 to September 2007 because of numerous problems that continually plagued the UHT plant and AFFS machine. In view of my finding that the UHT plant was commissioned and accepted in March 2006, the period to be considered must start in April 2006 and not in August 2005.

47 The plaintiff stressed that it continually encountered problems with one of the pumps which it referred to as Product Pump 2. It complained:

(a) on 19 May 2006, the shaft of Product Pump 2 broke and the next day, the defendant took the pump back for repairs. The plaintiff's operations were at a standstill for the next few days until repairs were effected;

(b) on 27 June 2006, the rotating shaft of Product Pump 2 leaked and this leak was still evident in July 2006 when the defendant tested the System. The defendant had to take the pump back for repairs again and in so doing, disrupted operations once more;

(c) on 21 December 2006, the plaintiff discovered that the rotor in Product Pump 2 was damaged;

(d) on 24 January 2007, the defendant affixed a safety valve onto Product Pump 2 and subsequently the plaintiff observed that the safety valve leaked constantly and the System was unable to attain the contracted flow rate of 500 litres per hour;

(e) on 30 March 2007, the shaft complement of Product Pump 2 broke; and

(f) on 13 June 2007, the defendant replaced Product Pump 2 with a new pump (referred to as Product Pump 3).

48 The defendant did not consider the problems with Product Pump 2 to be as serious as the plaintiff claimed. Product Pump 2 was covered under a 12-month warranty which commenced on 6 March 2006 and during the duration of the warranty period, the defendant took reasonable steps to repair Product Pump 2. However, the defendant was aware that its efforts to repair Product Pump 2 had not been entirely successful and had replaced it with Product Pump 3 free of charge even after the warranty period expired.

49 The defendant would like me to consider the problems with Product Pump 2 as teething problems which were satisfactorily dealt with. However, since the defendant saw fit to replace Product Pump 2 free of charge even after the warranty period had expired, it would seem that the defendant had acknowledged that that Product Pump 2 was not a satisfactory component of the System. The difficulties with Product Pump 2 illustrated some problems that the plaintiff had in operating the System during the first year after commissioning of the UHT plant. Given that that pump was replaced, the plaintiff could not rely on those difficulties to justify its wholesale repudiation of the System. In its submissions therefore, it concentrated on problems observed during the July trial run which took place after Product Pump 3 had been installed and also highlighted its concerns about the suitability of Product Pump 3.

Gelation of dairy creamer and NDC

50 It was common ground that the products of the System were to have a shelf-life of at least six months. The plaintiff's complaint was that the products produced during the July trial run did not meet this requirement. It should be noted that although the plaintiff complained about the condition of two types of products, the only product that was processed in the System during the July trial run was NDC. Dairy creamer had been processed previously but was not produced during the July trial run. Further, the name NDC is somewhat misleading in that the ingredients of NDC as produced by the plaintiff include milk proteins.

51 The plaintiff emphasised the evidence showing that its systematic shelf-life tests showed that NDC in properly sealed portion cups showed signs of spoilage as early as the second week after production. Tests were carried out by mixing the NDC with coffee on 14 August 2007, 18 September 2007 and 2 October 2007. On the first test date, a little bit of fine free fat was seen in the coffee, on the second test date, fine free fat and a few white flakes were seen in the coffee and on the third date (some nine weeks after production), the NDC had gelled. KK Lee agreed in court that he had no reason to doubt the truth of the shelf-life test reports. The plaintiff complained that it was unable to sell any of the NDC produced during the July trial run because the same had gelled. This result defeated the purpose of the System. The question that arises is as to the cause of this gelation.

52 The plaintiff's position is that the NDC and the dairy creamer produced by the System gelled because of the extremely long holding time of the UHT plant. The way that the UHT plant operates is that first the liquid to be processed is heated in the Tubular Heat Exchanger to a sterilisation temperature of 140ºC. It then flows from a valve called valve VII through a connecting tube into an insulated tube called the Holding Tube. The purpose of the insulation is to maintain the temperature of the liquid in the Holding Tube at a stable level. From the Holding Tube, the liquid flows through another connecting tube into a component called the Sterile Cooler where it should be cooled to about 30ºC to 35ºC. The duration of the time that the liquid spends at about sterilisation temperature (*ie* 140ºC) is called the Holding Time.

53 The plaintiff emphasised that the specification in the November quotation was "Holding Time: 5 sec" but asserted that the *de facto* holding time was much longer. The insulated Holding Tube supplied is 6.3 metres long and at a flow rate of 500 litres per hour the heated liquid would remain in the Holding Tube for 17 seconds. This length of time in itself exceeds the intended holding time of five seconds specified in the contract by 12 seconds. The plaintiff, however, contended that it was insufficient to go on the basis of the length of the Holding Tube itself and that the total length of what the plaintiff called "the *de facto* holding tube" had to be considered. This total length is 9.48 metres and is made up of the length of the Holding Tube added to the lengths of:

(a) the tube connecting valve VII to the Holding Tube; and

(b) the tube connecting the Holding Tube to the Sterile Cooler.

It takes approximately 28.3 seconds for the product to pass through "the *de facto* holding tube". The plaintiff argued that the longer period of time had to be used because the liquid is held almost consistently at the sterilisation temperature from the time it passes through valve V11 until it gets to the sterile cooler. The plaintiff noted that its expert Mr Allan Jensen ("Mr Jensen") had stated that the temperature of the liquid from the time it left valve V11 till it reached the end of the insulated Holding Tube was at least 140ºC and that the drop in the temperature of the liquid as it travelled through the connection tube from the insulated Holding Tube to the Sterile Cooler would be insignificant (about 0.5ºC). The plaintiff contended that it was the excessive holding time that the product was subjected to that caused the gelation.

54 The defendant disputed the plaintiff's position on two counts. First, it contended that the holding time was only 17 seconds. It noted that Mr Jensen's initial calculations in his first report ("First Report") placed the length of the Holding Tube at 6.3 metres and it was only in his supplementary report ("Supplementary Report") that he changed his position. In the Supplementary Report, Mr Jensen stated that due to the way the pipe work was connected within the UHT plant, the

length of the tubes connecting the insulated Holding Tube to the Tubular Heat Exchanger and to the Sterile Cooler had to be factored in as well, making the length of the holding time 28.3 seconds. The defendant submitted that this explanation should not be believed because Mr Jensen had claimed to have prior experience in measuring holding tubes and to have come across holding tubes with connecting tubes. It was therefore highly improbable that, with this knowledge and experience, if the connecting tubes formed part of the Holding Tube, he would have omitted to include the same in his calculations in the first place. Further, he had agreed that once the product passed the temperature sensor at the end of insulated Holding Tube, its temperature would start to drop. The defendant also relied on the evidence of Mr Ho Lai-Ki Tony ("Mr Ho"), another of its experts, who had seen the sensor and who had stated that the correct holding time should be 17 seconds. Mr Ho explained that for a tube to be designated as a Holding Tube, one must have some degree of control over the temperature of the product in it. Accordingly, when the product is in another length of tube where there is no control over the temperature fluctuation, that length is not considered part of the Holding Tube. Therefore, the defendant said the NDC was not held at 140ºC for the entire 28.3 seconds but was kept at this temperature for not more than 17 seconds.

55 Having considered the arguments and the evidence, I agree with the plaintiff that the essential point to be determined is not so much whether the Holding Tube is 6.3 metres long as contended by the defendant or 9.48 metres long as contended by the plaintiff, but, considering the design of the UHT plant, how long the product which had been heated to 140ºC remained at or about that temperature before it was cooled. Technically, the defendant must be correct and the Holding Tube itself is only 6.3 metres long and the product remains there for only 17 seconds. There is, however, sufficient evidence to satisfy me that the design of the UHT plant is such that once the product had been heated to 140ºC in the Tubular Heat Exchanger it remained at or close to that level for 28.3 seconds whilst it travelled from the Tubular Heat Exchanger to the Sterile Cooler.

56 The defendant also argued that I should not interpret the contract as requiring a holding time of exactly five seconds. It relied on KK Lee's evidence that this provision actually referred to a *minimum* holding time and on the fact that the defendant had all along admitted that the holding time exceeded five seconds. This was because under the contract documents, the UHT plant was supposed to be able to handle other products in addition to NDC. Each product would have its own minimum holding time before it could be properly sterilised. In this connection, Mr Ho who is a project consultant for dairy processes and training and who has had experience designing and handling numerous UHT plants and aseptic fillers, had testified that five seconds is insufficient to properly sterilise liquid sugar and 3-in-1 coffee mix. His evidence was that a holding time of about 15 to 16 seconds was required for these products. The defendant submitted that it would be inconsistent with this requirement for me to interpret the relevant term of the contract as an agreement by the defendant to provide an exact holding time of five seconds when such a specification would impair the overall function of the UHT plant.

57 The November quotation contained the following relevant specifications of the UHT plant:

Product	:	- Non Dairy creamer - Liquid Coffee - Fresh Milk - Liquid Sugar - Liquid 3-in-1 Coffee (NDC, Coffee, Sugar)

Infeed Temp	:	60ºC
Sterilization Temp	:	140ºC
Holding Time	:	5 sec

It was the defendant's document and its phraseology was entirely up to the defendant. There was nothing to stop the defendant from specifying that the holding time would be "minimum 5 seconds" if it had chosen to word the quotation in that way. The defendant did not do so and it did not do so for a good technical reason. This is that the length of the holding time determines the length of the Holding Tube. If the defendant had specified a minimum holding time, the manufacturers of the Holding Tube would not have been able to determine its length. Secondly, if the defendant had wanted to ensure that the Holding Tube was long enough to sterilise liquid 3-in-1 coffee and liquid sugar for the requisite 15 to 16 seconds, it would have specified that the holding time was 16 seconds. Specifying five seconds as the minimum holding time would mean that a Holding Tube which was long enough to hold the product for ten seconds would meet the specification but would still be inadequate to sterilise liquid 3-in-l coffee and liquid sugar. I do not accept the defendant's argument that the holding time was meant to be a minimum of five seconds as such a specification would be technically impossible and also not achieve what the defendant asserted it wanted to achieve.

58 It is therefore my finding that the defendant was in breach of contract when it provided a UHT plant with a Holding Tube which held the liquid being treated for 17 seconds. It was in further breach of contract because the UHT plant in fact held the product at or close to the sterilisation temperature for a total period of 28.3 seconds instead of for five seconds. The next question is whether this breach caused the products to gel prematurely as contended by the plaintiff.

59 The defendant disagreed that the long holding time was the most probable cause of the gelation observed in the products from the July trial run. In this connection, it relied on evidence given by Gregory Peter Mergen ("Mr Mergen"). Mr Mergen is the president of a company which designs and supplies dairy and food machinery. He has a degree in food science and 30 years of personal experience in the design and operations of all types of dairy processing systems.

60 In preparing his expert report, Mr Mergen referred to a text called *Dairy Chemistry & Physics* by Pieter Walstra & Robert Jenness, published in 1984 ("*DCP*"). *DCP* contains a discussion of the gelation of sterilized concentrated milk products and considers that gelation is typically a problem in UHT products. It also states that when milk is held at temperatures above the boiling point, it eventually coagulates, the higher the temperature the sooner. The component of milk that undergoes heat coagulation is a protein called casein.

61 In his report, Mr Mergen noted that the ingredients of the plaintiff's NDC were water, vegetable oil, milk protein, stabilizers, emulsifiers, natural milk flavour and beta carotene. A product test indicated that these ingredients resulted in 26% - 28% fat content, 33% - 35% total solids and 2% - 3% milk protein. Mr Mergen assumed the milk protein here to be sodium caseinate. He stated that it is common knowledge within the food industry that, under various conditions, proteins will coagulate. In this case, however, Mr Mergen concluded that the higher than usual fat content (usual fat content being in the region of 3% - 18%) and use of fats that will turn solid easily were considerable factors to explain the product gelation. Secondly, he postulated that the formulation contained an inadequate proportion of stabilisers and this could also have been a cause of gelation. Another contributing factor was that in the UHT process here, insufficient time was allowed for hydration of the casein or sodium caseinate. He concluded that ingredients and formulation procedures and not the mechanical systems

were to blame for the defects in the product.

62 The plaintiff's expert witness on this point was Professor Zhang Guonong ("Prof Zhang"), an associate professor in the School of Food Science and Technology at Jiangnan University, China. His evidence was that generally the temperature/time combinations used for sterilisation of milk are: 85ºC/15 seconds, 120ºC/15 seconds and 137ºC/4 seconds. He had not previously come across a milk sterilisation temperature/time combination of 140ºC/28 seconds. He was of the opinion that it was because product in the UHT plant was kept at 140ºC for 28 seconds that the product gelled. He gave the following reasons for his opinion:

(a) when a casein solution is heated to more than 140ºC, it starts to coagulate or solidify; and

(b) the heat stability of whey protein is lower than that of casein and it may be completely denatured if it is heated at a temperature exceeding 90ºC for a long time and therefore heating at 140ºC for 28 seconds could be one reason for coagulation.

The relevant paragraph of Prof Zhang's report (see p 2) stated:

> When the casein solution is being heated at 100ºC for 30 minutes, there would not be any changes to its physical form. When the casein solution is being heated at 120ºC for more than 30 minutes, there would be some form of electrophoresis changes. The peaks of α- and β-casein tend to be flat and partial hydrolyzation and dephosphorylation occurs. When the casein solution is being heated to more than 140ºC, it starts to coagulate or solidify. (The Technology of modern Dairy and Dairy Products, Editor: Zeng Shouying, p 47-48, China Agriculture Press, 2003)

63 The plaintiff pointed out that Mr Ho did not challenge Prof Zhang's evidence that casein would start to coagulate when heated to more than 140ºC because he admitted that he did not have the relevant knowledge to do so. Further, during cross-examination, Mr Mergen accepted this piece of Prof Zhang's evidence as being correct. He was not able to say definitely that the casein would not coagulate if kept at a temperature of 140ºC for 28 seconds. Mr Mergen suggested that casein being only one of the components of NDC, other components may stop or slow the coagulation. On questioning he elaborated that of these ingredients, water would not slow down the coagulation of milk solids but the qualities of the frozen cream added would affect the coagulation. The witness was not able to say, however, whether such frozen cream would accelerate or decelerate the coagulation process. He maintained that stabilisers were added to slow down or stop the coagulation of milk solids but said that he did not know whether they would have this effect when the product was heated to a 140ºC for 28 seconds. Thereafter, he confirmed that he was unable to say whether, under these conditions, any of the other components of the NDC would slow down or stop coagulation of the milk solids in the NDC. During cross-examination, Mr Mergen did not accept that this was the main reason why the NDC produced by the UHT plant coagulated. The furthest he was willing to go was to say that it may be one of the reasons for that result but he had no evidence to say that definitively that it was the only reason. He was, however, willing to agree that at a temperature of 140ºC, casein would coagulate and the higher the temperature rose above 100ºC, the sooner coagulation would take place.

64 The text cited by Mr Mergen, *DCP*, states emphatically at p 248 under section 13.5 "When milk is held at temperatures above the boiling point it eventually coagulates, the higher the temperature the sooner". The following extract from this text is also useful:

13.5.1. Phenomena Involved

> It is the casein that undergoes heat coagulation. The cause is not heat denaturation as suffered by globular proteins. Casein is not denaturable, ... The casein micelles aggregate, and this is not merely a flocculation caused by a lack of colloidal stability of the micelles at the prevailing temperature, because the aggregates do not redisperse after cooling again. The composition of the milk serum is changed considerably because of the heating ...

65 The defendant referred to an extract from the *Dairy Processing Handbook* exhibited and relied on by Mr Allan Jensen, the plaintiff's dairy engineering expert, which stated that "the major protein in milk, casein, is not affected by heat treatment" and other materials referred to by Mr Ho that stated that casein was relatively unaffected by UHT treatment. These references were to discredit Prof Zhang's attribution of the gelation to "denaturation" of casein. It seems probable that Prof Zhang was wrong in stating that gelation occurred because the casein was denatured by the high temperature it was exposed to but that does not mean that the process of gelation in the NDC did not result from it being kept at 140ºC for an extended period. The *Dairy Processing Handbook* states that UHT treatment of proteins and milk causes marginal changes only in their nutritional value. Nutritional value is something separate from gelation.

66 The same text notes in a section entitled "Production of long life milk" that when long life milk is produced by UHT treatment "the product [is] heated at 135ºC - 150ºC for 4 - 15 seconds followed by aseptic packaging". That is some indication that a holding time of longer than 15 seconds is not recommended. This inference is also supported by the evidence of Mr Ho. Mr Ho stated in his report that the recommended holding time for dairy products using the UHT plant could range from around 8.56 to 17 seconds. He conceded under cross-examination, however, that he did not know whether dairy creamer would coagulate if held at 140ºC for 17 seconds because he had never come across a UHT plant with this specification. His experience was that when dairy creamer was sterilised at 140ºC, the holding time would be 10 seconds. He also said that based on his experience the most common time/temperature combination for non-dairy creamer would be a temperature range of between 137ºC and 142ºC and a holding time range of between 4 and 20 seconds. Subsequently, when asked whether he had experience of UHT treatment in the production of non-dairy creamer, Mr Ho said that he had not. He further confirmed that he was not in a position to make a recommendation of a holding time of 17 seconds for non-dairy creamer. The defendant's other expert, Mr Mergen, said that in relation to dairy creamer he was not qualified to say what temperature and what holding time would cause the defects complained of by the plaintiff. When asked specifically whether he could tell the court, from his experience, if non-dairy creamer would coagulate if heated to 140ºC and held at that temperature for 28 seconds, his response was that he did not know because he had not had the opportunity to run this process and also his research did not specifically cover anything relating to coagulation of a non-dairy creamer.

67 The plaintiff submitted that the sum total of the defendant's evidence was that its experts were unable to tell with any degree of certainty what acceptable holding times for the plaintiff's dairy creamer and NDC would be. The defendant on the other hand submitted that, on a balance, the plaintiff's experts could not show any significant degradation of the NDC if it was held at 140ºC for 28 seconds.

68 The alternative explanation given by the defendant was that the gelation was probably caused by the ingredients and/or mixing process used by the plaintiff in preparing the NDC. It noted that the plaintiff's formula used substantially more fat than the formulae of other manufacturers and pointed to evidence that the role of phosphates as stabilisers in food products was to prevent coalescence of fat droplets and thus reduce the chances of gelation. Both Mr Mergen and Mr Jensen had agreed that the amount of stabiliser used by the plaintiff was on the low side of the recommended amount and the defendant theorised that the effect of there being less phosphate in the mix may have been

aggravated due to the high fat content. As for the mixing process, Mr Mergen's inspection at the plaintiff's premises revealed that the likwifier (a machine for blending powders into liquids) used by the plaintiff was an inferior model and there was also no de-aerator system. Mr Mergen's opinion was that this would almost certainly lead to improper homogenisation because air would be incorporated into the NDC. The defendant therefore submitted that both the product formula and the mixing process were not perfect and the plaintiff's questions to its witnesses had been based on the assumption that a perfect formula perfectly mixed had been found to coagulate after being heated to 140ºC for 28 seconds. The defendant submitted that the plaintiff had to produce evidence that its product formula and mixing process were "perfect" as alleged, and if it was unable to do so, an inference should be drawn that these areas were unfavourable to the plaintiff.

69 It appears to me that the defendant's objections about the imperfection of the product and the process do not assist it. Mr Mergen conceded in court that, on the assumption that the product was perfect, the most likely cause of gelation was the holding time of 28 seconds at the temperature of 140ºC. If even a perfect product would gel under those conditions, then the defendant cannot be in a better position to dispute the cause of gelation on the basis that the product was imperfect because of its ingredients or mixing process. As regards the amount of stabiliser, whilst Mr Mergen suggested at one point that there was insufficient stabiliser in the plaintiff's products, he then agreed that the amount of stabiliser was in the range of that required although on the low side of the recommended amount. He also stated that his calculation leading to the conclusion that the stabiliser was insufficient was a rough calculation based on inadequate information. The defendant also took a contradictory stand in its cross-examination of Mr Tay when it was put to the latter that it was the addition of stabiliser to the product (rather than the addition of an inadequate amount of stabiliser) that caused the gelation. Mr Mergen was not emphatic in his suggestions regarding the inadequacy of stabilisers and, overall, I find the defendant's evidence inconclusive as to whether the proportion of stabilisers in the NDC caused or contributed to the gelation.

70 As noted above in [68], Mr Mergen gave various other possible reasons why the NDC could have gelled. These related mainly to the formulation of the product. Although I accept that such matters may theoretically contribute to gelation, I think that the significance of these theories must fade in the light of Mr Mergen's admission that even if a perfect product would have gelled if it had been subjected to the conditions that the plaintiff's NDC was subjected to.

71 In the final analysis, on a consideration of all the evidence, I find that on a balance of probabilities, the holding time of 28 seconds at 140ºC was the cause of the early gelling of the NDC (within nine weeks of production) produced during the July trial run. I also find that if the plaintiff had used dairy creamer or fresh milk, in all probability there would have been a similar result since these products would have contained an equal amount of milk protein if not more than the NDC did.

Is operation of the UHT plant unsafe?

72 After the defendant replaced Product Pump 2 with Product Pump 3, the plaintiff installed a pressure gauge at the outlet of Product Pump 3. The gauge recorded an operating pressure of 17 to 18 bars immediately after the UHT plant was started and that this pressure thereafter increased to 22 bars. The plaintiff noted that in the defence, the defendant had admitted that the UHT plant had to be operated at a high operating pressure in order to achieve the required flow rate of 500 litres per hour. It was Mr Ho's evidence that the operating pressure of the UHT plant had to be at least 18 bars to achieve this rate.

73 The plaintiff submitted that the high operating pressure of the UHT plant coupled with the high temperature of the liquid in it (55ºC before entering the Tubular Heat Exchanger and 140ºC from that

component to the Sterile Cooler) created a real risk to persons within the vicinity of the plant. This made the System unstable, hazardous, unsafe and/or unsuitable for normal operations.

Product Pump 3

74 The plaintiff was concerned about the safe operation of Product Pump 3. It noted that the operating pressure of this pump is about 22 bars. The plaintiff referred to an instructions manual in respect of a type of pump known as "Helicoidal Pump Kiber KS" which states that the maximum operating pressure of this type of pump is 10 bars.

75 The defendant's position was that Product Pump 3 was a one-off, custom made pump. The defendant referred to an e-mail that apparently was from the manufacturers of the pump ("Inoxpa") recommending that it be run without any pressure by-pass apparatus and stating that it was of a completely different design from Product Pump 2. The defendant said that the manual that the plaintiff referred to was a general manual for all of Inoxpa's standard Kiber KS/KST/KSF Helicoidal Pumps and did not apply to Product Pump 3 because Inoxpa had assured the defendant that this pump could be run at 22 bars without a pressure by-pass apparatus. The defendant also relied on a document from Inoxpa stating that Product Pump 3 is a customised design especially made to the order of the defendant and would be able to operate safely at a pressure of 22 bars. The defendant argued that the plaintiff had not adduced any evidence to show that Product Pump 3 had broken down or would break down. Mr Tay had admitted that during the July trial run Product Pump 3 had not broken down or leaked. He also admitted that he was speculating that the pump might break down or leak if it was run for more than one and half months. While Mr Zaw had maintained that Product Pump 3 had leaked and he had reported this leak to his manager, neither Mr Tay nor the defendant seems to have been notified of the leak so it could not have been a serious matter. Mr Jensen had also admitted that he did not see Product Pump 3 break down and therefore, probably, it could sustain 22 bars. He agreed he had not given the court any evidence that the pump would break under that pressure. Mr Jensen maintained, however, that the inner tubes of the pump had become deformed because of the level of pressure.

76 The defendant also emphasised the evidence of Mr Mergen that Product Pump 3 is a progressive cavity pump and that the pressure rating of such pumps falls within a standard fixed range. He affirmed that 22 bars would be within that range. Mr Jensen had agreed that he had no knowledge pertaining to the design and specifications of such pumps and that he did not do any comparison between Product Pump 3 and such pumps.

77 In my opinion, the evidence regarding the capability of Product Pump 3 is inconclusive. On the one hand, the catalogue for the standard Helicoidal pump shows an operating pressure of 10 bars with a by-pass valve. On the other hand, in the absence of any contradictory evidence, I accept the defendant's evidence that Product Pump 3 was custom-made because of the problems that Product Pump 2 had encountered during the operation of the UHT plant. Thus, the specifications in the catalogue most likely do not apply to Product Pump 3. However, I cannot place any weight on the e-mail from Inoxpa as to the capability of Product Pump 3 since this was hearsay and no one from Inoxpa was called to testify as to the actual capability of Product Pump 3. I am left with the evidence of Mr Mergen on the capability of pumps of the type of Product Pump 3 and the further evidence that during the July trial run when Product Pump 3 was run every day for a month it did not break down and functioned much better that Product Pump 2 had. The plaintiff has the onus of showing that Product Pump 3 is unsafe and, in my judgment, it has not discharged this onus. According to the evidence, since its installation, Product Pump 3 has not broken down or leaked even though it was used continuously during the July trial run. Product Pump 2, which was of a different model (and probably not designed to withstand the same pressures as Product Pump 3), in comparison broke

down twice before the UHT plant was commissioned and handed over, twice during the warranty period and one further time after the warranty period had expired. It therefore gave signs of inadequacy very early on. Such signs were not present when Product Pump 3 was operated. In all the circumstances, I cannot infer that, on a balance of probabilities, Product Pump 3 is unsafe.

Joints and valves

78 Three witnesses for the plaintiff testified that the joints of the UHT plant in the vicinity of the Tubular Heat Exchanger leaked when the System operated during the July trial run. Mr Jensen's opinion was that such leakage was an early warning sign that the weakest links in the pipe work (*ie* the joints) were unable to withstand the high operating pressure. He also testified that the inner tubes of the Sterile Cooler had bent due to the high pressure.

79 The defendant responded by doubting the veracity of this evidence. It pointed out that Mr Tay had admitted that the plaintiff had no documentary evidence of any leaks relating to the Tubular Heat Exchanger. This admission contradicted the allegations of Mr Zaw and Mr Ji De Qiang (another of the plaintiff's employees) who both operated the UHT plant, that they had submitted reports of the alleged leaks to their supervisor. I agree that the omission of any written record of the leaks and the failure of the plaintiff to make a contemporaneous complaint about the same to the defendant are indications that either no leakage occurred or, if it did, the leaks were minor matters easily attended to by the plaintiff's operators.

The difficulties with the Tubular Heat Exchanger

80 The plaintiff's position was that the operating pressures of between 18 and 22 bars within the UHT plant were very high. Mr Jensen testified that these high operating pressures were due to resistance within the tubes of the Tubular Heat Exchanger which had resulted from the following defects in that component:

(a) small inner diameters of some of the tubes;

(b) the Tubular Heat Exchanger tubes having only one inner tube;

(c) improper welding of the Tubular Heat Exchanger tubes and clamp unions;

(d) non-alignment of the Tubular Heat Exchanger tubes; and/or

(e) gaskets of the wrong size being used. Some gaskets did not conform to the shape of the inner tube openings whilst others were misaligned. This had the effect of reducing the size of the inner tube openings.

The plaintiff contended that any fault, blockage or resistance within the tubes rendered the UHT plant susceptible to damage, leaks and even explosions.

81 First, regarding the narrow inner tube and single tube design ((a) and (b) in [80] above), the plaintiff cited Mr Ho's evidence to the effect that the "tube size is dependent on the manufacturer's design and would have been calculated in accordance with the requirements of the customer". The plaintiff alleged it was incumbent on the defendant to choose a proper tube size and design for the plaintiff. According to Mr Jensen, using inner tubes with an internal diameter of 10mm, as in this case, would be unacceptable where there are many bends in the tubes and impediments to flow. Further, Mr Ho had testified that in the context of the present case, a multi-tube design would have been

better than a single tube design.

82 In response, the defendant stressed evidence from Mr Ho and Mr Mergen that using inner tubes of a larger size in a UHT plant with a capacity of 500 litres per hour would create problems. According to Mr Mergen, the machine was designed with a 10mm tube because the flow rate was 500 litres per hour. He testified that if the diameter of the inner tube was increased from 10mm to 23mm, then he would not be able to guarantee its performance. He said that it was necessary, as the product was flowing through the tube, that the velocity of the product matched the tube size so that the heat exchange would be continuous and correct. If the tube was too large for the velocity, there would be gaps in the product and it would roll around and hit hot surfaces "and ultimately burn on will occur at these high temperatures". That was why the engineers had managed the tube size based on the flow rate and velocity.

83 As far as the multi-tube design was concerned (see [81] above), the defendant stressed that the manufacturer, Feldmeier, could have supplied a Tubular Heat Exchanger with a multi-tube design but this would have cost the plaintiff significantly more.

84 Turning to the next "defect", the plaintiff stated that the inner tubes of the UHT plant had to be properly aligned so as not to reduce the size of the openings (see (d) in [80] above). The smaller the opening, the greater would be the flow resistance. In this case, Mr Jensen had testified that he had observed one side of a U-tube to have an opening that was larger than the other side. The plaintiff referred to photographs of the U-tube to illustrate the evidence and observed that even though a clamp may be used to force the openings of the U-tube to align with the connecting pipes, the inner tubes will never be completely aligned. Mr Jensen's opinion was that the inner tubes would be constricted due to the slight misalignment resulting in greater flow resistance, causing higher pressure inside the tubes as the product flows through the tubes.

85 Mr Ho and Mr Mergen did not consider misalignment to be such a serious problem. They asserted that it was normal for the tubes to warp slightly over time due to heat expansion. They also said that proper alignment could be achieved by attaching the clamp unions. Further, the defendant emphasised, Mr Jensen had conceded that he had assumed that the components of the UHT plant were rated to handle a pressure of no more than 9 bars. He admitted that there was no evidence to show that any of the inner tubes or components of the UHT plant would break at a pressure of 22 bars though he emphasised that they had been deformed by that pressure. Mr Ho and Mr Mergen's evidence was that the pressure rating for standard half inch (10mm) tubes and clamp unions used in the manufacture of tubular heat exchangers are rated well above the alleged operating pressure of 22 bars which the System experienced.

86 The plaintiff did not accept the suggested cure for warping. It pointed out that clamp unions would distort the gaskets and this was one of the reasons cited by Mr Jensen for the deformed gaskets seen in the plant. In any event, the defendant had to supply a UHT plant of reasonable durability and it was not fulfilling that obligation by supplying a plant with components that warped easily during normal operations.

87 The plaintiff also criticised the gaskets. It alleged that gaskets with openings that were too small were used, the shapes of some gaskets failed to conform to the inner openings of the Tubular Heat Exchanger tubes and some gaskets were not aligned with the openings of those tubes (see (e) in [80] above). The plaintiff submitted that the gaskets were distorted because pipes with openings of different sizes were forced together with the use of clamps.

88 Mr Jensen had supported his evidence on the deformed gaskets by referring to a number of

photographs. These photographs were taken between October 2008 and December 2008. The defendant emphasised that that was nearly three years after the plant had been delivered to the plaintiff and after it was subject to wear and tear, particularly after the July trial run. Further, the plaintiff had purchased its own gaskets for use as spare parts from various suppliers including the defendant. Mr Tay had admitted that the defendant would not have known what gaskets the plaintiff had bought and whether they were suitable. He also admitted that the defendant would have no control over how the gaskets were inserted and whether this had been done properly. Mr Jensen agreed that if gaskets of wrong size were used, it could result in deformation and deterioration of the type seen by him. He also agreed that he had assumed that the deformed gaskets shown in the photographs were gaskets that had been installed in the UHT plant at the time when it was supplied. The defendant stressed Mr Mergen's evidence that during his inspection of the UHT plant, he had observed that one section of inner tube had two different types of gasket. The defendant said this showed that the plaintiff had replaced the gaskets initially supplied by the defendant with different ones and the plaintiff had not shown that there were problems with the original gaskets other than ordinary wear and tear.

89 Turning to the allegation of improper welding (see (c) in [80] above), Mr Jensen had stated the following in his First Report at p 16:

> Looking at the outside weldings of the pipes and the clamp unions, improper weldings are a possibility, especially with the inner 10 mm tubes. Any minor deviation on the weldings will decrease the opening and thus increase the pressure dramatically.

Mr Jensen arranged for the inner tubes to be x-rayed and the plaintiff submitted that the results of this x-ray showed that many of the tubes had failed the acceptance test due to concavity which must have resulted from improper welding. It should be noted that the actual test report shows that x-rays of 17 locations on the UHT tubes were taken and out of these 17 locations, four were found to be concave whilst three others were rejected for different reasons. Also, Mr Jensen admitted during cross-examination that the radiographic test report did not show whether the internal diameter of the inner tubes had been decreased and if so by how much. The defendant submitted that it was unclear from that report whether the welds referred to were on the inner or outer tube and argued that the report was of no assistance. It preferred that I rely on the evidence of its witnesses which was to the effect that minor imperfections in welding would not create as serious a problem as alleged by Mr Jensen. Mr Ho considered that it was common to have minor imperfections in welding. His view was that the high resistance was due to the fact that the length of the Tubular Heat Exchanger was reduced and that it was of a single tube design. He did not ascribe any responsibility to welding imperfections.

Conclusion on allegations of unsafe operation

90 The plaintiff has not been able, in my view, to establish that the operating pressure experienced in the UHT plant has had a serious deleterious effect on the operation and components of the System. All machinery has to be properly operated and kept in good working condition. Some machinery may require more effort in this regard than other equipment but that in itself does not make the equipment unfit for its purpose. The plaintiff has the obligation to maintain the System and must ensure that it takes proper steps in this regard such as by replacing worn out items with the correct parts. The plaintiff has not shown any break down or impairment in the function of the Tubular Heat Exchanger which can be ascribed to the operating pressure experienced by the System. Further, there is no reason for me to give more weight to the views of Mr Jensen than to the views of Mr Ho and Mr Mergen in relation to the operation of the machinery. Accordingly, on a balance of probabilities, it has not been established that the pressure conditions experienced rendered the

System liable to leaks, damage and explosions.

Whether the CIP system in the UHT plant is ineffective

91 The CIP (cleaning in place) system is an essential component of the UHT plant. This is because deposits start to form when milk is heated above 60ºC and such deposits stick tightly to the inner surfaces of the tubes. The purpose of the CIP system is to remove such deposits so that they do not contaminate the liquid flowing through the tubes. Apart from affecting the quality of the product, such sedimentation will reduce the size of the inner tubes and this will lead to an increase in the operating pressure of the UHT plant. Thus, after each production run, it is essential that the tubes of the UHT plant be cleaned and disinfected.

92 The plaintiff's case is that it first realised that the CIP system was not effective during the July trial run. Before then production had been carried out on a sporadic basis only. During the July trial run production was carried out on a daily basis five times a week and Mr Tay, Mr Ji and Mr Zaw noticed white spots in the feed tank when the UHT plant was flushed with water before the start of production each day. These white spots were solidified remnants of non-dairy creamer which had remained in the inner tubes despite CIP having been carried out after production had ended the previous day. The plaintiff submitted that the ineffective CIP was due to:

(a) varying sizes of the pipes in the UHT plant; and/or

(b) a low CIP flow rate of 410 litres per hour.

93 The defendant cast doubt on the existence of the white spots. It noted that the plaintiff's witnesses had admitted that there were no photographs of such white spots, nor were the same recorded in writing anywhere, not even in the plaintiff's production records, or communicated to the defendant. The white spots were not collected and sent for testing to determine what exactly they were. Further, there was no mention of the white spots in Schedule B, the plaintiff's master list of complaints.

94 The plaintiff's contention was that in any case the CIP flow rate was inadequate to effect a proper cleaning of the pipe system. In this regard, it relied on Mr Jensen's evidence that during CIP cleaning the velocity in the pipe should be higher than the product velocity. Mr Jensen noted that in this case the stainless steel tube immediately connected to the product feed pump started with an internal diameter of three inches. It was gradually reduced in stages down to a diameter of 10mm and then increased again up to an internal diameter of 23mm in the Holding Tube. After the Holding Tube, the internal diameter of the pipe is 10mm followed by an increase to 23mm for the pipe connected to the aseptic tank. As stated in Mr Jensen's First Report at p 25, to clean the various pipe sizes properly, the following CIP volumes would be required:

(a) 3 inch pipe : 20,000 – 25,000 l/hr

(b) 2 inch pipe : 10,000 – 12,000 l/hr

(c) 1½ inch pipe : 6,000 – 8,000 l/hr

(d) 1 inch pipe : 2,000 – 3,000 l/hr

(e) ½ inch pipe : 800 – 1,000 l/hr

Mr Jensen noted that a multistage centrifugal pump had been installed for CIP cleaning of the UHT plant. This pump runs in an alternating programme with the product feed pump during the CIP circle. He noted that the measured pressure with the CIP pump activated was between 15 and 16 bars and had a CIP flow return rate of 410 litres per hour back to the balance tank. As the smallest pipe size in the UHT plant (in this case 10mm) will be the limiting factor for the liquid flowing through all the other pipe sizes, Mr Jensen thought it was obvious that, with a volume of 410 litres per hour, proper cleaning of the pipe system could not take place. He also opined that while the flow rate in the 10mm pipe would be at the border level, the flow rate in all the other pipe sizes is a far cry from acceptable levels. To use five different pipe sizes within the same pipe system disregards all standards for proper engineering.

95 The plaintiff noted that the defendant had claimed that its Commissioning Reports showed that the CIP pump generated a flow rate of 700 to 750 litres per hour during the commissioning trial held in August 2006. The plaintiff said that was irrelevant because the defendant was unable to show that in July 2007 the CIP pump could still generate a sufficient flow rate. As regards Mr Ho's evidence that the CIP pump had generated a flow rate of 700 litres per hour when he tested the UHT plant in December 2008, cross-examination had shown that Mr Ho did not know whether the CIP pump or the product pump had been used during the test. Mr Jensen, however, had testified that when he tested the UHT plant in February 2009, the CIP flow rate was 410 litres per hour. In any event, Mr Ho had admitted that even a flow rate of 700 litres per hour was inadequate.

96 The defendant submitted that the specifications of the CIP pump clearly showed that it can achieve a flow rate of 5,800 litres per hour and it had been demonstrated in August 2006 that the pump was capable of delivering a flow rate of 410 litres per hours, the entries there showing rates between 710 and 720 litres per hour. The defendant also submitted that the flow rate of 410 litres per hour relied on by Mr Jensen had been recorded off the control panel of the UHT plant. That flow rate was the flow rate of the homogeniser that was affixed with a variable speed controller that can be adjusted to achieve the required flow rate.

97 Whilst the defendant was able to show that in August 2006 the CIP pump had delivered a flow greater than 410 litres per hour, it did not put forward any evidence which indicated that the pump could produce a flow of 800 litres per hour. Mr Jensen's evidence, which was not challenged by the defence, was that for a 10mm pipe, a flow rate of at least 800 litres per hour was required to clean the same. The defence did not challenge the other evidence of greater flow rates required for bigger pipes.

98 Although there was no documentary evidence of the existence of the white spots which the plaintiff's witnesses had observed in July 2008, I am inclined to accept the oral evidence on this point. It is consistent with the fact that the flow rate through the CIP pump even when Mr Ho tested it in February 2009 was below the level required to clean a 10mm pipe. Accordingly, I find that the plaintiff has established that the CIP system was inadequate. I note that the microbiological tests carried out on the products produced during the July trial run did not show any evidence of spoilage but the System was only operated for a month and the chances of spoilage would increase with longer operation.

Alleged problems with temperature of the liquid entering the aseptic tank

99 The next problem complained of by the plaintiff relates to the temperature of the product after it has undergone UHT treatment in the Tubular Heat Exchanger. After leaving the Tubular Heat

Exchanger, the product flows through the Sterile Cooler for cooling prior to being discharged into the aseptic tank. From the aseptic tank it is routed to the AFFS machine for packing into portion cups. According to the contract, the temperature of the product as it leaves the Sterile Cooler (referred to by the parties as "the dosing temperature") should be between 30ºC to 35ºC.

100 The plaintiff complained that this specification was not met and that in fact the dosing temperature during the July trial run was found to range between 55ºC and 60ºC, *ie* some 20ºC to 30ºC higher than it should have been. The defendant disputed this and adduced the three Commissioning Reports produced in August 2006 to show that as of that date, the NDC was successfully cooled to the required dosing temperature. These reports indicated that the UHT plant was operated by Mr Ji and that the readings were verified by both parties. The reports for 1 August 2006 and 3 August 2006 showed that the temperature of the NDC as it entered the Sterile Cooler was about 52ºC whilst the temperature of the products in the aseptic tank was 32ºC on 1 August and 32.7ºC on 3 August. The defendant also asked me to draw an adverse inference from the fact that only three production records for July 2007 were produced when the plaintiff, having carried out continuous production that month, should have had many more records. I am not inclined to draw any such adverse inference. If the defendant was not satisfied with what was disclosed by the three production records produced, it could have compelled discovery of all the July 2007 production records.

101 Whilst in August 2006, the dosing temperatures fell within the correct range, by July 2007 the position had changed. The excessive temperatures were recorded on three different days in July (*viz* 4 July, 5 July and 13 July 2007). I accept the accuracy of the plaintiff's records as establishing that the Sterile Cooler failed to reduce the dosing temperature to the levels required by the contract. It is worth noting that Mr Ho recorded a product temperature of 60ºC at the outlet of the Sterile Cooler in December 2008.

102 The next point to consider is why the Sterile Cooler did not function as required. The Sterile Cooler is made up of inner tubes with an internal diameter of 10mm which are located within one inch pipes filled with water. The water comes from a cooling tower and is pumped through the pipes in order to cool the product. As the product flows through the inner tubes some of its heat would be transferred to the water. The plaintiff's case is that the ineffectiveness of the Sterile Cooler is due to the small heat transfer area of the inner tubes whereas the defendant says that it is due to the plaintiff having provided an inadequate supply of cooling water.

103 I deal first with the supply of cooling water. Under the contract, it was the plaintiff's obligation to supply cooling water for the UHT plant at the rate of 3,500 litres per hour and at a temperature of 28ºC. Mr Tay testified that the plaintiff had installed a cooling tower with a capacity that was higher than 3,500 litres per hour in order to cater to the needs of the UHT plant as well as to other needs of the plaintiff. In fact the plaintiff had two cooling towers and each cooling tower had the capacity to supply up to 150 cubic metres (*ie* 150,000 litres) of cooling water per hour.

104 Mr Ho in his report stated that during his testing of the UHT plant, he recorded the flow rate of the cooling water supply and found it to be around 1,940 litres per hour which was considerably less than the required flow rate of 3,500 litres per hour. He highlighted that the cooling water supply travels to two coolers, the Sterile Cooler and the Divert Cooler. He found that when the valves to the Divert Cooler were closed, the flow rate to the Sterile Cooler was only 1,570 litres per hour. He also observed the cooling tower being used to service machinery other than the UHT plant and commented that the flow rate to the UHT plant would fluctuate depending on how many machines were in use at the same time.

105 Mr Jensen's evidence was somewhat different. In his first report dated 20 April 2009, he stated that during product cooling, the rate of the cooling tower water flow was measured to be approximately 2,000 litres per hour. Due to the narrow internal diameters of the pipes, the tube transfer surface area is only 0.22m², which is insufficient to transfer the heat down to the required level and even if the volume of the cooling tower was increased by two or five fold (which was not possible in a one-inch pipe), the increase in volume would not be able to rectify the cooling problem. This was accepted by Mr Mergen who agreed in cross-examination that if the System was wrongly designed, then the amount of water used would not matter. In his supplementary report, Mr Jensen said that he had conducted a study of the cooling tower facilities and that these did have the capacity to supply the cooling water requirement of "3500L/HR at 1.2BAR at 28ºC (max period)" specified in page 16 of the November quotation even when only one cooling tower was in operation. He then concluded as follows at p 5 of his Supplementary Report:

> Insufficient cooling is either due to insufficient circulation of cooling water from the cooling tower or because the surface area for cooling is insufficient. As the cooling water from the cooling tower is sufficient, the cooling surface area is too small, meaning not enough tubes or because some of the tubes has [*sic*] collapsed as can be seen from the X-rays.

106 The defendant's attempt to ascribe all the responsibility for the inadequate cooling to an inadequate supply of cooling water is a rather belated one. When the plaintiff complained in September 2007 of the excessive temperatures in the Sterile Cooler, the defendant replied on 14 September 2007 advising that cooling water should be supplied to the Sterile Cooler at the rate of 5,000 litres per hour. Subsequently, in an e-mail dated 2 November 2007, the defendant changed its advice and stated that 15 RTons (approximately 9,100 litres per hour at 28ºC) of cooling water were required mainly for the Sterile Cooler and the Divert Cooler.

107 Turning to the plaintiff's position, its contention was that the inadequate heat transfer area was a result of the narrow internal diameter of the inner tubes and this was exacerbated by the bent inner tubes in the pipes which greatly reduced the space for the flow of the cooling water. The defendant's response was that this contention could not stand as a matter of logic. The theory that insufficient surface area for heat transfer was the cause of the inadequate cooling was flawed. The UHT plant was delivered with a sterile cooler whose inner tubes had a certain surface area. This surface area remained constant throughout and could not have changed between 2006 and 2008 since no modification was effected to the same. If insufficient surface area was indeed the cause, one would have expected the dosing temperature to have been constantly above the required dosing temperature range and more or less about the same temperature each time. Instead the evidence showed a significant fluctuation in the dosing temperature from time to time. Under cross-examination Mr Jensen had conceded that this was probably correct and that he had only considered the issue from his perspective which was that the total heat transfer area of the inner tubes would be reduced if they are bent. As Mr Mergen had explained, however, even bending the inner tubes would not reduce the surface area, instead it would remain the same and therefore the heat exchange would remain the same whether the inner tubes were bent or not.

108 Having considered the evidence, I think it was established that the plaintiff's cooling water facility was able to deliver cooling water at the rate of at least 3,500 litres per hour. The capacity of both cooling water towers was much greater than this. Mr Jensen carried out a detailed study of the facility and he found that the required cooling water flow rate could be met. During cross-examination Mr Jensen maintained that there was one cooling tower purely dedicated to the UHT plant and the chiller that formed part of the UHT plant. The other cooling tower was used to supplement the dedicated tower and also for other machines. Mr Jensen asserted that even if there were different machines placing a load on the cooling towers at different times, this would not cause fluctuation of

the flow rate of the cooling water to the dedicated chiller for the UHT plant. He ran various tests to try to figure out whether there was enough cooling water for the UHT plant and for other purposes. He was satisfied from these tests that that was indeed the case. His tests showed that when the UHT plant was on, the flow rate from two cooling towers was 4,462.81 litres per hour and 2,780 litres per hour from one cooling tower. His tests also showed that when the UHT plant was not on, the flow rate from one cooling tower alone was more than 3,500 litres per hour. It was only when the pipes were connected to the System that the flow rate dropped and Mr Jensen opined that this was because the internal diameter of the pipe from the cooling tower was 1.25 inches whereas the internal diameter of the pipe in the UHT plant which the cooling water entered was only one inch.

109 Having considered the evidence as a whole, I have come to the conclusion that the high dosing temperatures experienced in July 2007 were more likely due to problems in the design of the tubes of the Sterile Cooler than to an inadequate supply of cooling water by the plaintiff. I accept the evidence that the plaintiff's water cooling facility was more than adequate to meet the needs of the UHT plant. However, how the cooling load was distributed within the UHT plant was determined by the design of the UHT plant. The rate at which the cooling water travelled probably slowed down once it entered the System due to the smaller internal dimensions of the pipes in the System. As the plaintiff submitted, whether or not the UHT plant was able to receive a particular flow rate of cooling tower water was not within the plaintiff's control. Accordingly, I find that the inadequate cooling experienced in July 2007 was not the fault of the plaintiff.

110 Further, the defendant's reaction to the plaintiff's complaint was telling: the defendant recommended an increased flow rate. An increased flow rate would only be needed if there was a possibility of the area of the heat transfer surface being inadequate. Although it is correct that the surface area of the inner tubes of the Sterile Cooler could not have changed after the UHT plant was delivered, I do not think that the fact that the two dosing temperatures noted in August 2006 were in the required range, was a positive indicator that the area of the heat transfer surface was adequate. They did not indicate, either, how the dimension of the pipes affected the cooling water flowing into the System. In any case, these two temperatures were not accepted by the plaintiff as being typical. There was also evidence in the form of e-mails from the plaintiff that in July 2006, the temperature of the product in the aseptic tank (*ie* after cooling) was around 40ºC to 45ºC and that on 16 August 2006, that temperature was around 55ºC. So even at the beginning, problems with the dosing temperature were noted.

111 Accordingly, I find the defendant in breach of contract for failing to supply a sterile cooler that could cool the product to the required dosing temperature.

Would the high dosing temperatures have an adverse effect?

112 The plaintiff contended that high dosing temperature would impede the effective operation of the AFFS machine. The function of the AFFS machine is to fill empty portion cups with the product coming from the aseptic tank and to seal the top of those cups with aluminium foil. The plaintiff contended that if the temperature of the product leaving the Sterile Cooler is far higher than the dosing temperature, it would impair the sealing function of the AFFS machine and would result in the portion cups being improperly sealed.

113 During the July trial run, the plaintiff observed that there was a difference in the performance of the AFFS machine depending on whether the temperature of the product during filling was 33ºC or 41ºC. At the higher temperature, the AFFS machine was unable to seal all the portion cups properly and leaks from improperly sealed portion cups resulted in entire cartons of the product being unfit for sale. The plaintiff pointed out that a dosing temperature that was lower than the range specified in

the November quotation had in fact been recommended by the manufacturer of the AFFS machine ("TMCI"). An e-mail from TMCI on 8 August 2007 stated:

> For product pastorized and sterilized the best temperature is between 12-20ºC but also 25 or 30ºC is not bad lowest is better!

114 The plaintiff submitted that the excessively high dosing temperature caused the portion cups to be filled with a lot of foam from the filler of the AFFS machine and this foam prevented the aluminium foil seals from sealing the portion cups properly. The foaming problem was noted as early as mid December 2006 by TMCI who had discussed the problem with the plaintiff and recommended that the temperature of the product be kept between 10ºC and 20ºC.

115 In order to remedy the high dosing temperatures found during the July trial run, the plaintiff allowed a certain quantity of treated product to accumulate within the aseptic tank and left it to cool there. During this time, no additional product was treated and the product in the aseptic tank was channelled into the AFFS machine only when it reached the correct dosing temperature of between 30ºC and 35ºC. The plaintiff observed that the AFFS machine performed better when filling was done at the lower temperatures. The adoption of this method meant, however, that production had to stop temporarily and packing of the product could only take place when it had cooled off sufficiently within the aseptic tank. The plaintiff considered this to be inefficient and definitely not what the plaintiff and the defendant had intended since it meant that the contracted production rate of 18,000 cups per hour could not be achieved.

116 The defendant responded that the allegation that some of the portion cups had leaked in July 2007 because of the high dosing temperatures had not been properly proved. The plaintiff had not produced any photographs of the alleged leaks. The plaintiff's employee, Zhang Zi Long, who was the operator of the AFFS machine, had admitted that the plaintiff had no records of the alleged leaks. Further, the plaintiff had not complained in writing to the defendant about these leaks. Mr Tay had confirmed during cross-examination that no written complaints had been sent out. The plaintiff failed to provide any technical reports showing the frequency with which leaks occurred or the percentage of portion cups that allegedly had leaked even when TMCI specifically asked for such reports. Mr Tay had admitted that during the July trial run, the plaintiff's employees would have been taking new boxes of NDC to the warehouse for storage everyday and would have been able to smell any NDC that had leaked or gone bad due to exposure. Despite this, the plaintiff continued uninterrupted production five days a week for at least one month. The defendant submitted that if the leaks were as serious as the plaintiff alleged, the plaintiff would have stopped production immediately and brought the matter up with the defendant which it had not done.

117 The documents show that for some time prior to July 2007, the plaintiff had complained both to the defendant and to TMCI about the leakage problem encountered when the portion cups were being filled. An e-mail dated 24 May 2007 stated that the frequency of this problem varied. The range was between once every 15 to 20 sets of portion cups (one set contained 12 cups) to once every four to six sets. At such a rate, there would be one or two cups in a carton leaking and that would cause the whole carton to be ruined. In this e-mail Mr Tay wrote that most of the cups that were produced from the test runs and which leaked had been thrown away and the plaintiff had not computed the exact percentage of leaking cups. He said that if he had full technical reports for all the runs, the documentation would be very thick. Although the plaintiff made frequent complaints about this problem, for some reason, it never gathered the technical data that TMCI and the defendant asked for. I am, however, satisfied from Mr Tay's evidence and from the written record that this problem was serious enough to be of concern to the plaintiff and to cause it to change the production method during the July trial run by allowing the product to cool in the aseptic tank to the required dosing

temperate before putting it through the AFFS machine. There was no other reason proferred why the plaintiff would interrupt the production process and slow the rate of production in this way. I therefore find that the high dosing temperature had an adverse effect on the sealing of the portion cups and that in order to avert this effect, the plaintiff had to slow down production and consequentially, the contractual rate of 18,000 cups per hour could not be achieved.

Other complaints about the AFFS machine

118 The plaintiff complained that the foil covering the portion cups was sometimes misaligned. This was despite the existence of a photocell sensor in the AFFS machine that was supposed to automatically adjust the foil so as to ensure proper alignment with the opening of the portion cup. The amount of product pumped by the AFFS machine into the portion cups was also not uniform. Empty portion cups would come in trays of 12 for filling by the AFFS machine. The product would be pumped from nozzles into the empty portion cups. However, as the nozzle dripped in between pumps, drops of the product would fall onto the edges of the portion cups and, in some instances, overflow onto the tray. The sealing function of the AFFS machine was impaired by the droplets and the overflow. These problems were recorded by the plaintiff from the time the AFFS machine was installed in its factory in November 2005 until the end of 2007.

119 The defendant submitted that the plaintiff had no basis to complain about the AFFS machine because it had accepted that the machine was in proper working order. On 26 January 2006, there was a meeting between the representatives of the plaintiff, the defendant and TMCI. During the meeting, Charles Li pointed out four areas in which the AFFS machine was unsatisfactory. During cross-examination, Mr Tay was shown a copy of the minutes of the meeting and he agreed that all four of the outstanding issues which had been mentioned by Charles Li in January 2006 were looked into during a further test that took place in June 2006. Immediately after that test, the plaintiff issued a letter dated 8 June 2006 to TMCI. The first paragraph of this letter states:

> We can accept the performance of the machine. However, there might be other unforeseen problems that may arise in future.

Mr Tay was asked whether he agreed that the mention of "unforeseen problems which may arise in the future" meant that all the foreseen problems at that point in time would already have been resolved. Mr Tay's answer was a rather cagey "Most of the problems have been resolved, Your Honour".

120 The defendant also pointed out that a further test was conducted from 25 June 2007 to 4 July 2007 at the end of which the plaintiff signed a form confirming that the AFFS machine had been "tested satisfactorily" albeit subject to "the outstanding issues" referred to in an appendix. Under cross-examination, Charles Li admitted that these "outstanding issues" actually related to the provision of spare seals and the signing of the contract with TMCI and not to any defects in the AFFS machine. Mr Tay agreed in court that after the further tests were carried out on the AFFS machine in June and July 2007, the plaintiff had agreed that the machine was working well. It was also pointed out by the defendant that in November 2007, the plaintiff had indicated to the defendant that it had started the processing of the final five percent payment due in respect of the AFFS machine. This amounted to some Euro 31,639.15.

121 Having considered the evidence, it appears to me that apart from the foaming problem which was the result of the high temperature of the product when it left Sterile Cooler, there were no serious problems experienced with the operation of the AFFS machine in July 2007. By that time, the defendant and TMCI had, between them, managed to iron out with the plaintiff's technical personnel

the various problems that had previously been encountered with the operation of the AFFS machine. The fact that the plaintiff told the defendant that it was starting to process the payment of the outstanding five percent of the machine's price (in the event payment was not made) was an indication that the plaintiff had no further basis on which to withhold this sum. Whilst there may have been some complaints about the machine in July and thereafter, these cannot have been serious matters but were more likely to have been day-to-day operational issues that could be dealt with accordingly. It was also telling that at the beginning of the trial, the plaintiff was prepared to retain the AFFS machine for use in a new UHT system whilst it insisted that the present UHT plant itself had to be totally scrapped.

Other problems complained of by the plaintiff

122 The plaintiff raised several other matters which it considered to be problems affecting the product. The first of these was the allegation that the product deteriorated due to excessively high velocity when it was travelling through the inner tubes inside the pipes of the UHT plant. Mr Jensen's testimony was that the velocity of milk-based products within the inner tubes should not exceed 1.8m/s. The plaintiff calculated that the velocity of the product within an inner tube which had an internal diameter of 10mm would be 1.77m/s if the inner tube did not have bends or obstacles like gaskets. If such circumstances existed, velocity would increase. In his calculations, Mr Jensen applied an internal diameter of 8mm to account for bends in the pipes and other factors which would add to flow resistance and came up with a velocity of 2.76m/s which would exceed the acceptable velocity.

123 There was, however, no proof that the velocity of the milk through the inner tubes actually exceeded the recommended velocity and if so, by how much. Mr Jensen's calculations were theoretical. Further, there was no evidence that the product was spoilt by reason of an excessively high velocity. The only damage to the product which the plaintiff proved was the early gelation and the plaintiff itself never linked early gelation with high velocity.

124 The other alleged problem was that deformity and the deterioration of the gaskets had resulted in contamination of the liquid. The plaintiff noticed that the gaskets deteriorated very quickly even though the System was only in operation sporadically except in July 2007. There was therefore a possibility that bits of rubber material from the flaking gaskets might contaminate the product. However, there was no evidence that bits of rubber material had actually contaminated the product. This was speculation on the plaintiff's part. Additionally, the plaintiff's photographs of damaged gaskets were taken between October and December 2008, nearly three years after the UHT plant had been delivered to the plaintiff. The gaskets would have been subject to wear and tear and in any case there is no evidence that the gaskets photographed were supplied by the defendant. The plaintiff had purchased its own gaskets for use as spare parts and the defendant had no control over how the gaskets were inserted and whether this was done properly. Accordingly, I do not find any substance in this complaint.

Summary of findings

125 I have found that the UHT plant is defective in that:

(a) it holds the product at a temperature of 140ºC for 28 seconds and this causes an acceleration of the process of gelation so that the product does not have a shelf-life of six months as required under the contract;

(b) the CIP system is inadequate; and

(c) the Sterile Cooler does not work effectively to reduce the temperature of the product to the contractually specified dosing temperature and therefore efficient sealing of the portion cups is inhibited.

126 The defects that I have found mean that the UHT plant does not consistently produce finished products of satisfactory quality at the rate stated in the contract. It cannot produce 18,000 portion cups per hour and it cannot produce products that consistently have the shelf-life of six months which is necessary for the plaintiff's commercial purposes. There is also a danger of spoilage caused by the inadequate CIP system. I am satisfied that the defendant was in breach of both express and implied terms of the contract as a result of these defects and that the UHT plant was not of satisfactory quality.

127 As regards the AFFS machine, I have found that the plaintiff has not proved its case. It has not been established that the machine is defective.

Remedies

128 The plaintiff contended that it was entitled to rescind the contract because the defendant had:

(a) failed to provide substantially the whole of the benefit that the plaintiff expected to get from the contract; and/or

(b) breached the conditions implied by SOGA.

The plaintiff therefore claimed that it was entitled to a refund of all amounts paid for the UHT plant and AFFS machine.

129 In addition, the plaintiff claimed damages as follows:

(a) loss of profit amounting to US$1,159,526;

(b) wasted costs amounting to $823,649.26, Euros 168,827.95 and US$51,323; and

(c) the difference in price between the cost of the existing UHT plant and AFFS machine and the cost of replacements.

Rejection and refund

130 As regards the rejection of the machines, I do not think that the plaintiff is entitled to reject both machines. Initially, the plaintiff was willing to keep the AFFS machine and wanted only to replace the UHT plant. It was only in the course of proceedings that the plaintiff changed its mind. In any case, I have found that there are no defects in the AFFS machine and that there was no overarching contract such that the plaintiff would be entitled to reject all machinery supplied because one independent machine did not function properly. The AFFS machine, in my judgment, met the contractual specifications and, since it is a separate machine which has been accepted by the plaintiff and can be run in conjunction with any new UHT machine acquired by the plaintiff, I hold that the plaintiff is not entitled to reject it. The plaintiff must therefore pay the full price for this machine and the unpaid balance due to the defendant should be set off against any damages which the defendant is liable to pay the plaintiff.

131 The defendant argued that it was unreasonable for the plaintiff to reject the whole UHT plant when the crux of its complaint relates to the length of the holding tube. Mr Mergen's opinion was that the holding tube could be replaced easily and the plaintiff had not challenged that. The defendant therefore submitted that the plaintiff would only be entitled to the cost of replacing the holding tube. I do not accept this argument. It is clear from my findings that it was not only the holding tube itself that was defective but also the connecting tubes leading to and from it. There were also problems with the Sterile Cooler and the CIP system. Thus, remedying the defects is not as simple as the defendant has suggested.

132 The defendant did not argue that the plaintiff had lost its right to reject the UHT plant in the event that the defects could not be cured by the replacement of the holding tube. *McGregor on Damages* (Sweet & Maxwell, 18th Ed, 2009) para 20-056 states:

> If the buyer has lawfully rejected the goods the case becomes in effect one of non-delivery and the measure of damages is therefore the same as that applicable to non-delivery, with the one addition of recovery for expenses which stem from the receipt of the defective goods.

Under s 51(2) of SOGA, the measure of damages for non-delivery is the estimated loss directly and naturally resulting, in the ordinary course of events, from the seller's breach of contract. In this case, it is evident that one of the items of loss arising from the defendant's breach of contract is that the plaintiff has paid the purchase price of the UHT plant and has received no value for that price since the machine is defective. The plaintiff is entitled to be refunded all sums paid for the UHT plant and the defendant upon payment shall be entitled to remove the plant from the plaintiff's premises. I note in passing that no argument was made that damages should be measured in accordance with s 51(3) of SOGA. This must have been because there was no evidence of an available market for the UHT plant and therefore the section could not be applied.

Loss of profits

133 The next claim made by the plaintiff was for loss of profit. In this connection, the following extract from *Benjamin Sale of Goods* (London Sweet & Maxwell, 6th Ed, 2002) is relevant:

> **17–066 Warranty as to profit-earning capacity**. Where the goods sold were a profit-earning machine, which the seller undertook would perform in a specified manner or at a specified rate, the buyer may claim (subject to his "duty" to take reasonable steps to mitigate his loss) his loss of profits caused by the failure of the machine to perform as warranted. Thus where the seller warranted that a clay-pulverising machine had a certain productive capacity, but the machine failed to achieve this, the Court of Appeal held that the buyer was entitled to recover his net loss of profits during the normal commercial life of the machine. The plant having been supplied in contemplation by both parties that it should be used by the plaintiff in the commercial production of pulverised clay, the case is one in which the plaintiff can claim as damages for the breach of warranty the loss of the profit he can show that he would have made if the plant had been as warranted ...
>
> But any claim for loss of profits must be considered in the light of the rules of mitigation: for a period after delivery it may be reasonable for the buyer to use the machine to see if it meets the warranty, but as soon as a reasonable buyer would have replaced the defective machine with one which functioned properly or efficiently, the buyer should not be entitled to claim for any further loss of profits. Only if no suitable replacement can reasonably be found should the buyer's claim for loss of profits extend over the full period of the original machine's expected life.

134 The plaintiff is claiming loss of profits for five years totalling US$1,159,526 taking into account the fact that a new UHT plant and AFFS machine may take one to two years to be capable of producing at full capacity of three shifts per day. This amount is based on the expected profits which the plaintiff would have obtained from the sale of the UHT creamer in portion cups to either Singapore Airport Terminal Services ("SATS") or Changi International Airport Services ("CIAS") for Singapore Airlines ("SIA") and Star Cruises. Alternatively, the plaintiff submitted that an order be made for damages representing the plaintiff's loss of a chance to make a profit based on the *Chaplin v Hicks* [1911] 2 KB 786.

135 As a matter of principle, I find that the plaintiff is entitled to make a claim for loss of profits on the basis that the defendant knew that the plaintiff was purchasing the System for the purpose of producing the products for sale. The defendant also warranted that the System would be able to produce the product at a certain rate and that it would be suitable for sale for a certain period. The question of whether the plaintiff has in fact lost profits as a result of the defendant's breach, and if so how much, is a question of fact to be proved by the plaintiff. There is also the requirement of mitigation which would relate to the period for which the plaintiff is entitled to recover damages. The question is thus, when should the plaintiff have taken steps to replace the UHT plant?

136 The plaintiff's case is that profits would have been derived from the sale of the product to SATS and CIAS for SIA, Star Cruises, hotels, restaurants and institutes which required liquid creamers. The plaintiff stated that its biggest customer would be SATS and CIAS for the supply of liquid creamer to SIA since the quantity of liquid creamer imported by SIA from overseas annually exceeds the plaintiff's expected maximum annual production capacity of 72 million cups. The plaintiff, however, did not have any contract to supply SIA with liquid creamer. It submitted, however, that its parent company, Super Coffeemix Manufacturing Ltd ("SCM"), would have secured such a supply contract from SIA because:

(a) "Super" is an established brand in the food and beverage industry in Singapore and South East Asia and has significant goodwill;

(b) SCM had been supplying powdered non-dairy creamer produced by the plaintiff to SilkAir (Singapore) Pte Ltd through SATS and CIAS and thus would be in a better position than others to obtain a contract for the supply of liquid creamer to SIA when the opportunity to do so arose; and

(c) there are no manufacturers of UHT liquid creamer in portion cups in South East Asia and the plaintiff would have been the only manufacturer of the same in the region if the UHT system had functioned properly. SIA which currently imports liquid creamer from abroad would be likely to purchase liquid creamer from a local manufacturer if one was available as this would be cheaper.

137 The plaintiff submitted that it was not necessary for it to prove with certainty that it would have been awarded the SIA contract for supply of liquid creamer before an award of loss of profit could be made as long as the circumstances showed that the chance of the plaintiff making profits was not speculative. In the case of *Robertson Quay Investment Pte Ltd v Steen Consultants Pte Ltd and another* [2008] 2 SLR(R) 623 ("*Robertson Quay*"), a case which dealt with the proof of damage, the Court of Appeal held that "court had to adopt a flexible approach with regard to the proof of damage. Different occasions may call for different evidence with regard to certainty of proof, depending on the circumstances of the case and the nature of the damages claimed".

138 At this juncture I should note that whilst the Court of Appeal in *Robertson Quay* had stated that the law did not demand that a plaintiff prove with complete certainty the exact amount of

damage that he had suffered, it still required sufficient proof of the loss claimed to be adduced. At [31] the Court of Appeal indicated that:

> a plaintiff cannot simply make a claim for damages without placing before the court sufficient evidence of the loss it has suffered even if it is otherwise entitled in principle to recover damages. On the other hand, where the plaintiff has attempted its level best to prove its loss *and* the evidence is cogent, the court should allow it to recover the damages claimed.
>
> [emphasis in original]

139 The defendant submitted that the plaintiff had not been able to show a real and substantial chance of being able to supply its liquid creamer to the various parties mentioned. First, the prospective customers that the plaintiff had named already had existing suppliers. The chance of the plaintiff being able to supply its product to those customers would depend on how the price and quality of its product compared with those of the existing suppliers. The plaintiff had not adduced any evidence to show that its product was equal to or superior to those products or that it was cheaper. Its allegation that there were no other manufacturers of UHT liquid creamer in portion cups in South East Asia had not been substantiated. The plaintiff had not shown that its chance of ousting any of the existing suppliers was more than speculative.

140 The defendant further submitted that the chance of the plaintiff being able to sell its product to SIA was speculative because there was no evidence to suggest that SIA would be interested in purchasing NDC from any supplier other than its existing ones. The plaintiff had conceded that if SIA intended to look for new suppliers it would have invited prospective contractors to provide tender proposals. Whilst Charles Li had alleged in court that he had met a senior manager from SIA to discuss an invitation to tender, he had not stated this in his affidavit. Further, no evidence of any tender invitation had been produced although tender invitations are document intensive exercises.

141 Apart from selling to SIA, the defendant submitted that the plaintiff could not show a real chance of making a profit from selling its NDC because:

(a) the plaintiff's profit forecast was premised on the assumption that it could sell all the portion cups it produced within a period of five years to SCM at US$9 per carton. Whilst the plaintiff had alleged that it had an agreement for such sales to SCM, its witness, Mr Alex Khor, who had prepared the forecast, had admitted that SCM was the plaintiff's marketing agent and did not purchase NDC from the plaintiff. The plaintiff had to bear the cost of disposing of whatever product it could not sell. The premise of the plaintiff's forecast could not be substantiated;

(b) the plaintiff alleged that because there was one customer who bought NDC at $16 per carton, US$9 was a reasonable projection but this single example did not establish that the plaintiff's price was competitive. There was no evidence that US$9 per carton would be competitive *vis-a-vis* existing suppliers;

(c) the plaintiff's estimate of sales volume was not based on any empirical evidence whatsoever. The plaintiff had not produced any estimates of sales to SIA arising out of Charles Li's alleged meeting with SIA but purported to justify its forecast by multiplying a speculative estimate of outgoing air traffic from the airport against the speculative estimate of the number of passengers per flight;

(d) whilst the plaintiff had referred to "feasibility studies" showing an existing market for the

product, Alex Khor had admitted that he was not aware of the outcome of these studies. Therefore the forecast must have been based on speculation rather than on results of studies;

(e) the plaintiff had not carried out a marketing campaign for its NDC and as a brand new product, proper marketing would be crucial to the volume of sales;

(f) the plaintiff had no records of the number of cartons that SCM had sold or given away as free samples and according to Alex Khor, over a period of four months only one customer had bought the plaintiff's NDC. The demand for the plaintiff's NDC had not been established; and

(g) the plaintiff failed to take into account in its forecast the fact that its NDC production line could not run continuously for up to 16 hours per day as assumed. Mr Tay had admitted that during continuous production, production at the UHT plant was faster than production at the AFFS machine and therefore the UHT plant had to be stopped until the AFFS machine could finish.

142 The plaintiff responded to the above criticisms of its lack of evidence of profit earning ability by saying that it merely had to show a real or substantial chance to obtain a profit in order for the court to award damages for loss of profits. In this connection, I think the plaintiff has mixed up two different bases of claim. A plaintiff can make a claim for actual loss of profits if he can show that on a balance of probabilities, he would, apart from the defendant's breach, have earned such profits. Alternatively, he can make a claim for the loss of a chance to make a profit. The cases that the plaintiff cited to substantiate its contention that it only needed to show a real or substantial chance to obtain a profit were *Asia Hotel Investments Ltd v Starwood Asia Pacific Management Pte Ltd and another* [2005] 1 SLR(R) 661 and *Straits Engineering Contracting Pte Ltd v Merteks Pte Ltd* [1996] 1 SLR 227. In both these cases, damages were awarded to the plaintiff to compensate the plaintiff for the fact that the defendant's breach of the contract caused the plaintiff to lose the chance to make a profit. Damages were not awarded for actual foreseeable loss of profits.

143 In the present case, the defendant's criticisms of the plaintiff's evidence on its forecast loss of profits are cogent. The plaintiff was not able to prove that it would have made the sums it forecasted if it had been able to operate the System as contemplated by the contract. The plaintiff was entering a new field of enterprise and there was insufficient evidence that in the first few years of operation, it would have been able to sell most if not all of the products at the prices that it used in its calculation of profits. The plaintiff did not have even a letter of interest from SIA indicating a desire to try and perhaps use the plaintiff's product, let alone a full-fledged contract. The plaintiff has not been able to convince me that it would have been able to sell all or any of its output to SIA or other established users of liquid creamer. The plaintiff's marketing efforts as disclosed to the court seemed inadequate to support the plaintiff's contentions. I therefore hold that the plaintiff has not established that it would have earned the profits forecasted by Mr Khor. The plaintiff's claim for actual loss of profits is speculative and cannot be admitted.

144 On the other hand, it is clear from the evidence that the plaintiff had embarked on the production of liquid creamer in portion cups in a serious manner and was committed to making an effort to break into the local and regional markets for this product. The plaintiff invested time and money not only in acquiring the UHT plant and the AFFS machine, but also in modifying its premises and in hiring and training its staff. The plaintiff also lined up a distributor and was making marketing efforts. There is also an existing market for the product in the region although the plaintiff would have to compete in the market with existing suppliers. The defendant's breach of contract means that the plaintiff was deprived (through the inability of the System to operate as it should have) of the chance of making a profit from the products. I am satisfied on the evidence that the chance which was lost

was a real and substantial chance and not a speculative one. The plaintiff is therefore entitled to recover damages for loss of this chance.

145 The next issue is how to quantify those damages. In this connection, I must take into account the period during which the plaintiff lost the chance to make profits. The plaintiff contended that this period was a five year period bearing in mind the time spent setting up and testing the System and obtaining a new system and bringing that up to full capacity. I do not agree. The plaintiff knew that the UHT plant was defective and could not meet its purpose at the latest by September 2007. It should then have mitigated its damages by acquiring a new UHT plant. It did not do so and did not offer any reasonable explanation why it remained inactive. The UHT plant was delivered on 28 July 2005 and the AFFS machine was delivered on 25 November 2005. The AFFS machine was accepted as working satisfactorily in March 2006. By that time, the UHT plant should also have been able to function at full capacity. I would therefore calculate that the period during which the chance to obtain profits was lost started in April 2006. The defendant needed seven months to deliver the UHT plant after the letter of award was issued. Therefore, if the plaintiff had ordered a new UHT plant in September 2007, it would have been delivered by about March 2008 and should have been installed and commissioned within another three to four months. I therefore consider that the period during which the chance to make profit was lost ran from April 2006 to July 2008 – a period of about two and a quarter years.

146 Mr Khor's evidence was that he had calculated that for the first year of production, the plaintiff would have made a profit of US$38,526, for the second year of production, the profit would have been US$212,414 and for the third year and subsequent years, it would have been US$302,862. Taking the average of those figures, I get US$231,905.20 per year for five years. Therefore, the figure for two and a quarter years would be US$521,786.70. This is the average profit that would have been earned if there was full production and good marketing techniques and the plaintiff had been able to draw business away from already established suppliers at the price the plaintiff said in court it would be quoting for the product. Bearing in mind the vagaries of the market and the difficulties of launching a new product and breaking into an established market, I award the plaintiff 30% of that figure *ie* US$156,536 as damages for loss of the chance of making profits for two and a quarter years of production.

Wasted costs

147 The plaintiff also claimed the following costs which it said had been wasted because the defendant supplied a defective UHT plant:

(i)	Costs of purchase of a second compressor for the AFFS machine		$50,000
(ii)	Cost of building alterations made to the plaintiff's factory		$459,950
	- for the UHT plant	$316,360	
	- for the AFFS machine	$143,590	
(iii)	Cost of electrical installation in the plaintiff's factory		$31,538.65
	- for the UHT plant	$17,438.65	
	- for the AFFS machine	$14,100	

(iv)	Cost of furniture and fittings		$700
(v)	Cost of raw materials		US$51,323
(vi)	Cost of packing materials incurred by the plaintiff during the period June 2005 to September 2007		Euro138,599.36 and $6,826
(vii)	Freight charges incurred by the plaintiff for raw materials and packing materials		Euro 300 and $3,251.93
(viii)	Costs of personnel (i.e. 1 Manager, 1 technician and 8 operators) from February 2006 to September 2007		$230,260.50
(ix)	Costs of repair and maintenance		$41,122.18 and Euro29,928.59
	- for the UHT plant	$34,694.66	
	- for the AFFS machine	$6,427.52 and Euro29,928.59	
	Total		**$823,649.26** **Euro168,827.95** **US$51,323**

148 It is clear from *McGregor on Damages* (see [132] above) that the plaintiff can make a claim to recover expenses that had been wasted by reason of the defendant's breach of contract. I will consider each item claimed by the plaintiff to determine whether in fact these expenses were wasted:

(i) Cost of second compressor

I have not allowed the plaintiff to reject the AFFS machine. Accordingly, the cost of the second compressor is not wasted. The second compressor can still be used for the machine. Additionally, Charles Li had admitted in court that the first compressor had been purchased for the plaintiff's other needs and not specifically for the AFFS machine. The plaintiff had originally thought that it could use its existing compressor with the AFFS machine but after arrival of the machine, it found that the capacity of the existing compressor was inadequate and this led it to buy the second compressor. As the second compressor would have had to be bought in any case and is still useable, I do not allow this claim.

(ii) Cost of building alterations made to the plaintiff's factory

Since the plaintiff has not been allowed to reject the AFFS machine, the sum of $143,590 spent in altering its building to accommodate this machine has not been wasted and cannot be recovered. As regards the building alterations costing $316,360 to accommodate the UHT plant, the plaintiff has not shown that all these alterations will have to be redone if the UHT plant is removed and the new machine is put in its place. I am not satisfied that these costs were entirely wasted and I do not have any evidence to help me distinguish between the work that has to be redone and the work that can be used for a new machine. This claim is not allowed.

(iii) Cost of electrical installations

I allow the plaintiff to recover the sum of $17,438.65 which was spent on electrical installations for the UHT plant which has been rejected. The amount claimed in respect of installations for the AFFS machine is rejected for reasons given earlier.

(iv) Cost of furniture and fittings

This is a small item. According to Mr Tay, these items were mainly items of furniture like steel tables. These are reusable. I am not satisfied on the evidence that these items were wasted. The claim is not allowed.

(v) Cost of raw materials

The amount claimed consists of US$38,973 for raw materials for dairy creamer and US$12,349.64 for raw materials for NDC. The defendant submitted that the amount claimed for the dairy creamer materials could not be recovered because they had been purchased in December 2005 and these items reached their expiry date in June 2006. The defendant argued that it was unreasonable for the plaintiff to buy so much in December 2005 when the commissioning tests for the System had not been done. I do not accept the defendant's argument. The plaintiff was entitled to buy materials early on the basis that commissioning would be completed within the next two to three months and I accept Charles Li's evidence that the quantity of materials ordered was the minimum allowed by the supplier. All raw materials were wasted because the UHT plant could not perform. I allow this claim.

(vi) Cost of packing materials

The defendant challenged the claim on the basis that the evidence was inadequate as to how much material was required, how much was used, when it was used, when it would have expired and why the plaintiff made no effort to sell the unused and unexpired materials. Further, the plaintiff caused its own loss by purchasing too much packaging material. Although Charles Li had testified that the quantities of aluminium foil and the plastic sheeting ordered were the minimum quantities required by the respective suppliers, he conceded that he could have bought less aluminium foil at a higher price. On the other hand, the plaintiff asserted that it was reasonable for it to buy larger quantities in anticipation of its continuing operation of the System. Moreover, it would be difficult to sell off the excess packing materials as the aluminium foil and plastic sheets were tailored specifically for the use of the AFFS machine. I am not satisfied that the plaintiff has proved this claim. The AFFS machine was of acceptable quality and the plaintiff could have operated it with another UHT machine and then used the existing packaging material. Mr Khor agreed in court that the plaintiff had placed an order for 144 reels of plastic sheeting in April 2007 when it still had 107 reels which would not expire until May 2008. I am not satisfied that all the packaging material could not have been used by July 2008 (being the date by which a new UHT machine could have been installed).

(vii) Freight charges

The defendant submitted that the amounts of Euro 300 and $3,251.93 being the sums claimed included the sums of Euro 300 and $1,433.23 which were incurred to ship the raw materials for the commissioning tests and that Mr Tay had conceded that the defendant was not liable for those amounts. I disallow these latter amounts accordingly. The balance of the freight charges is $1,818.70. I have disallowed the claim for packaging materials and as these freight charges relate

to packaging materials, they must also be disallowed. Therefore no part of this claim is allowed.

(viii) Costs of personnel

The plaintiff claimed the labour costs of one manager, one technician and eight operators for the period from February 2006 to September 2007 amounting in total to$230,260.50. The defendant submitted that the plaintiff could not show that these expenses would not have been incurred except for the contract because Mr Tay, Mr Zaw and two others each filed an affidavit of evidence-in-chief on behalf of the plaintiff in the action and were presented as its representatives with the most knowledge and experience concerning the UHT plant and the AFFS machine. They remained employed by the plaintiff and this contradicted Charles Li's allegation that the plaintiff would not have employed them if not to operate the UHT system. Further, Charles Li had conceded that the employment contracts of the ten persons did not stipulate that they were only employed to operate these machines and that their job scope included work that was unrelated to operating the UHT system and that they did in fact do such unrelated work.

The plaintiff's response was that the four employees who testified had as their main job scope the operation of the UHT system. If they had not been so employed, they would not have been so familiar with the problems encountered during operation and would not have been able to file the relevant affidavits. The other six employees had been operators employed under two-year contracts and when the UHT system could not be operated the plaintiff had no choice but to transfer the operators to other positions until the expiry of their contracts.

According to the affidavits, Mr Tay was employed by the plaintiff as a manager in July 2002, Mr Zaw was employed in January 2003, Mr Ji was employed in February 2006 and Mr Zhang was also employed in February 2006. It appears to me that Mr Tay and Mr Zaw were employed for purposes other than the operation of the UHT plant and, whilst they were utilised in operating that plant during the period concerned, they would also have had other duties. The evidence does not establish sufficiently that their main duties related to the UHT plant. The other employees (including the six contract workers), however, appear to have been dedicated to the UHT plant and they would not have been hired otherwise. I therefore allow the salaries of these eight employees which total $119,899.70 for the period in question.

(ix) Costs of repair and maintenance

The plaintiff claimed the sum of $41,112.18 and Euro 29,928.59 being the costs of repairing and maintaining the UHT plant during the period between February 2006 and September 2007. The defendant pointed out that Charles Li had agreed during cross-examination that the sum claimed included the costs of items that were not necessary for repairing the UHT plant or AFFS machine. Also, the plaintiff had erroneously recorded unused items as used items and Alex Khor had admitted that the plaintiff had included unused items in its claim. He also conceded that he did not know whether these items would have a resale market though the metal parts would definitely have a scrap value. The plaintiff on the other hand argued that it was reasonable to stock pile spare parts in anticipation of need. On balance, I hold that the plaintiff has not proved that this expenditure was necessarily and reasonably incurred. I disallow this claim.

Replacement cost of UHT plant

149 The plaintiff's last claim was for the additional cost it would incur to purchase a replacement UHT plant. It submitted that the cost of designing, purchasing the components of and installing a new UHT plant would be approximately US$515,000. The original UHT plant cost US$175,362. The plaintiff

therefore estimated that the extra amount it would have to pay for a new plant would be about US$339,638. In addition, it would incur further costs in commissioning the new system.

150 The defendant objected to this head of claim on the basis that it was a duplication. The plaintiff had not only wanted a refund of the price of the UHT plant and a cost of its installation fees but also wanted damages for loss of profit and the costs of replacing the UHT plant. The defendant argued that such an award would place the plaintiff in a better position than if the contract had been performed.

151 I agree that the plaintiff is not entitled to this alleged head of loss. The plaintiff has rejected the UHT plant provided by the defendant because the design is defective. Any replacement UHT plant is likely to have significant differences and this would have a cost impact. The evidence of the experts was that different designs of holding tubes and inner tubing would carry different price tags. The plaintiff kept bargaining with the defendant on the price of the equipment supplied and now that it has found that the cheaper equipment does not suit it, it cannot ask the defendant to pay the cost of more expensive equipment. Once the plaintiff has received the refund of the price of the original UHT plant, it will be back in its original position and it can then decide what sort of replacement equipment it wants to buy and how much it is prepared to pay for it. The goods supplied in this case are not generic but specific and distinctive and therefore it is not possible to assess damages on the basis of price differences between the date of supply and the date of replacement. In any case, the plaintiff has taken no steps to replace the equipment as yet and the defendant should not be held responsible for price increases that may have resulted from such delay. I therefore disallow this claim.

Conclusion

152 The plaintiff has succeeded on its claim. The defendant has succeeded on its counterclaim. I award the plaintiff judgment on the following:

(a) refund of all sums paid for the UHT plant;

(b) US$156,536 as damages for loss of a chance;

(c) $17,438.65 being the cost of electrical installation;

(d) US$38,973 for dairy creamer and US$12,349.64 for raw materials for NDC; and

(e) $119,899.70 being cost of personnel.

The plaintiff is also entitled to the costs of this action and interest at the court rate on the sums ordered as from the date of the writ. As against the amounts which the defendant must pay, it shall be entitled to set off the sum of Euro 33,221.10 and interest thereon at the court rate from the date of the writ.