IN THE HIGH COURT OF THE REPUBLIC OF SINGAPORE

[1994] SGHC 29

S272/1991

Between

Agricom Pte Ltd

… Plaintiff

And

Guardian Royal Exchange Assurance Public Limited Company

… Defendant

GROUNDS OF DECISION

Version No 1: 29 Oct 2026 (23:45 hrs)

This judgment is subject to final editorial corrections approved by the court and/or redaction pursuant to the publisher's duty in compliance with the law, for publication in LawNet and/or the Singapore Law Reports.

Agricom Pte Ltd v Guardian Royal Exchange Assurance Public Limited Company

[1994] SGHC 29

S272/1991
Judith Prakash JC
04 February 1994

1 **Judgment:**

2 Coram: Judith Prakash JC

3 **GROUNDS OF DECISION**

4 The plaintiffs in this action were the owners of 8,953 gunny bags of palm kernels which they had imported from the Solomon Islands. After arrival of the goods in Singapore, they were stored in a warehouse in Penjuru Road belonging to M/s Sin Bien Hock Warehousing. On 21 June 1990, a fire broke out among the goods and they were seriously damaged.

5 At the material time, the goods were insured against damage by fire under a policy of insurance issued by the defendant insurance company. The plaintiffs made a claim for $156,641.94 under the policy but the defendants repudiated liability. So the plaintiffs instituted this action. At first, various matters were raised in defence to the suit. By the time this action came to trial,

however, only one issue remained in dispute and that concerned the cause of the fire.

6 Clause 5 (i)(b) of the insurance policy issued by the defendants provided that the policy would not cover "loss or damage to property occasioned by its own fermentation, natural heating or spontaneous combustion ...". The defendants' contention was that this fire was caused by self-heating of the palm kernels and, accordingly, they could not be made liable under the policy.

7 After hearing the evidence, I found in favour of the defendants and dismissed the plaintiffs' claim. The plaintiffs have now appealed.

8 **The Facts**

9 The bags of palm kernels were packed into containers and shipped from the Solomon Islands on or about 1 May 1990. The carrying vessel arrived in Singapore sometime in early June 1990 and the containers were delivered to the warehouse on the 12 and 13 June 1990. The bags of palm kernels were unstuffed from the containers and placed on wooden pallets by labourers employed by the plaintiffs. Each pallet carried 25 bags. The pallets were then stacked in the warehouse, in rows of eight pallets by 15 pallets. Each row was stacked three pallets high. The rows of pallets were stacked compactly next to each other, leaving no gaps in the mass through which someone could walk. The pallets were stored along the right hand wall of the warehouse and towards its front. The stack did not reach the back wall of the warehouse. Storage of the goods was completed by the end of 13 June 1990.

10 When the goods arrived, the warehousemen noticed that they were wet and mouldy. A letter to this effect was sent by the warehouse to the plaintiffs.

Version No 1: 29 Oct 2026 (23:45 hrs)

Subsequently, a survey on the goods was carried by S.G.S. Singapore (Pte) Ltd. According to the SGS certificate produced thereafter, samples were drawn from the bags on a 2% basis selected at random from the consignment. Upon testing of the samples, the content of oil and free fatty acid in the kernels were found to be within normal levels. The certificate also stated "Palm Kernels (mouldy and stained) Mouldy kernels 60.4%".

11 On 21 June 1990, William Wong, who was at that time employed as a supervisor at the warehouse, arrived at work at 8.15 am. At about 9.30 am, he went to look at the goods in the warehouse. It was part of his job to check the warehouse every morning to ensure the goods inside were still properly in position as some goods would become loose or tilt after stacking. To do this, he opened the main doors of the warehouse. Until then, the doors had not been opened that day as the other workers were engaged in stuffing some containers outside the warehouse.

12 During the course of his inspection, Mr Wong noticed that one bag of palm kernels was torn. This bag was in the front row of pallets and was on the lowest pallet. As he bent down to examine the torn bag, he looked into the stack and saw some embers in between the pallets. The embers were at the level of the second pallet at a height of about 4 to 5 feet. Mr Wong could not tell how deep in the stack the embers were as it was quite dark. It could have been more than 3 pallets deep. At this stage, Mr Wong did not see any smoke.

13 Mr Wong then ran out to warn the other workers that there could be a fire. By the time they all went back into the warehouse, smoke could be seen. They tried to extinguish the fire using the fire extinguisher and the water hose. In the meantime, the fire brigade was alerted. Two fire engines arrived at the

warehouse at about 10 am. Five jets were set up to restrict the spread of the fire and also to extinguish the fire. The fire officer in charge of the operation, Warrant Officer Raja Kamaruddin, ascertained that the seat of the fire was deep within the stack. He therefore instructed the warehouse workers to remove the goods to gain access to the fire. About 3 rows of pallets had to be removed in order that the fire brigade could have access to the seat of the fire. The fire brigade found the point of origin of the fire to be at the centre of the stack goods in between the first and second pallets. Neither the floor nor the roof of the warehouse was affected by the fire.

14 After the fire had been extinguished by the fire brigade, the remaining pallets of palm kernel were removed from the warehouse and left outside in the open.

15 The Issue: what caused the fire?

16 The defendants accepted that as the damage to the goods resulted from fire, they would have to indemnify the defendants under the policy unless they could prove that the fire was caused by fermentation of the palm kernels themselves, natural heating or spontaneous combustion. To discharge this onus of proof, the defendants relied mainly on the evidence of Warrant Officer Raja Kamaruddin and on that of an expert, one Mr Gregory Southeard.

17 W.O. Raja Kamaruddin testified that he had conducted an investigation of the fire and produced a report which stated its cause as being heat built up in the palm kernels. He stated that the fire was a smoky and smouldering fire. The seat of the fire was deep but the edges of the stack were not on fire. The origin of the fire was determined to be at the centre of the stack between the first and

Version No 1: 29 Oct 2026 (23:45 hrs)

second pallets. The fire brigade did not find any evidence that the fire had been deliberately set up.

18 W.O. Raja Kamaruddin also checked on the possibility of dropped lights as there was a machine working shop in the unit adjacent to the warehouse. In his opinion, this possibility was very limited because the goods themselves would not support combustion readily. It would also have been difficult for a dropped light to penetrate so deeply to the centre of the stack. On interviewing one of the workers, he was informed that no work was done in the vicinity of the area that caught fire. In his view only heat build up could have led to the smouldering fire which he saw.

19 The defendant's main witness was Mr Gregory Southeard, a partner of the firm of Dr J.H. Burgoyne & Pnrs Ltd which carries on business as consulting scientists and engineers. Mr Southeard, who holds a Bachelor of Science degree, is a Member of the Royal Society of Chemistry, an Associate of the Institute of Fire Engineers, a Member of the Institute of Explosive Engineers and a chartered chemist. He spent 13 years with the Metropolitan Police Forensic Science Laboratory, London. In 1983 Mr Southeard joined the firm and has since investigated fires and explosions all over the world. From March 1990 to March 1993, Mr Southeard was the Resident Director of the firm's Singapore office.

20 According to Mr Southeard, in June 1990, he was instructed on behalf of the defendants to find out the cause of the fire. He went down to the site five days after the fire by which time the goods had been removed and stored in the compound outside the warehouse. He made a visual inspection of the warehouse and the adjoining premises and also interviewed Mr Wong. In a report produced

Version No 1: 29 Oct 2026 (23:45 hrs)

thereafter, Mr Southeard concluded that the cause of the fire was self-heating of the palm kernels.

21 According to his report, it was clear that a number of the gunny bags had been burnt especially those on the outside of each pallet load, and the kernels inside had been heat affected. Although flames had extended throughout a relatively large area of the stack, no significant heat had been sustained at roof level. The fluorescent lights and plastic roof lights were intact and unaffected by heat. The fire had, therefore, been localised to the kernels. It was also clear from the observations of Mr Wong that the fire had occurred in the stack of kernels.

22 Mr Southeard had to look into all the possible causes for fire in or on the stack. In this case the possibilities were electrical cause, deliberate ignition, carelessly discarded smoking materials, hot work (welding or cutting) and self-heating. The first possibility, that of an electrical cause, was discarded by Mr Southeard because the wiring closest to the area where the stack had been was on the roof above it. This wiring led to a fluorescent light. The light was not damaged in any way and therefore the wiring could be eliminated as the cause of the fire.

23 The next possibility, deliberate ignition, was difficult to substantiate. First it was difficult to discover how the inside of the stack had been deliberately ignited. There was no evidence to suggest that anyone had been inside the stack. The only person in the vicinity that morning had been Mr Wong. Mr Southeard ruled out the possibility that Mr Wong had set the fire himself as he could not find any evidence to support such a suspicion. It should be noted at this point that, in their cross-examination of Mr Wong, the plaintiffs themselves did not

Version No 1: 29 Oct 2026 (23:45 hrs)

at any time suggest that he himself or any other worker had deliberately set the fire.

24 Mr Southeard then considered the possibility that the fire had been ignited by hot work. This seemed to him to be a highly remote possibility. Mr Wong and another worker both told him that no hot work had been done in the warehouse or the area at the time the fire was observed nor on the previous day. Whilst there was a machine shop next to the warehouse, in Mr Southeard's opinion, there was no way in which a spark generated by a cutting machine next door could survive the journey over the 15ft wall between the two units, go through the wire mesh above it and then cross the top of the stack, land on the stack, drop down to the centre of the stack and still be incendive enough to set fire to materials such as gunny bags. Mr Southeard said that a shower of cutting sparks landing on paper would not ignite as such sparks are not particularly incendive. While sparks from welding work are actually glowing particles and can set fire to things, they still would have had to undergo that journey, and there was no evidence that welding or cutting had taken place.

25 Next, Mr Southeard considered the possibility of carelessly discarded smoker's material. Mr Wong had informed Mr Southeard that there was a no-smoking policy in force in the warehouse and no one had actually smoked there. Mr Southeard did not accept that statement at face value but tested it against the available evidence. He stated that if someone had been smoking and had dropped a cigarette, the natural termination of the cigarette would have been on the floor. The worst situation would have been that it rolled to the side of the stack. The bags were on wooden pallets and it is not possible to ignite the wood itself directly with a cigarette end. Even if it was accepted that some paper had got trapped in the pallets so that the cigarette happened to contact that paper,

Version No 1: 29 Oct 2026 (23:45 hrs)

once the fire developed, its natural route would be at the outside of the stack because that was where the fuel and air were. The evidence in this case was, however, that the fire was on the inside and not the outside of the stack.

26 Mr Southeard also discounted the possibility that someone had deliberately thrown a cigarette onto the stack at a higher level. Because the sacks were so tightly packed onto each other, he did not see any way in which a cigarette could have survived past one pallet distance.

27 Mr Southeard concluded that whatever caused the fire was in the stack itself and an obvious cause was the self-heating of the palm kernels. Mr Southeard conceded in his report that palm kernel oil is not particularly susceptible to oxidation at ambient temperatures. As he explained in court, by this statement he had meant that compared with other oils like linseed oil, for example, palm kernel oil was relatively less likely to self-ignite. He maintained, however, that it is a known quality of palm oil that it does self-heat and spontaneously combust. According to Mr Southeard, self-heating occurs in this product generally through micro-biological activity which increases the temperature of the product up to 75oC. At that temperature the oil can oxidate and if the palm kernels are well insulated they may go through to ignition.

28 Mr Southeard explained that the oxidation of the oil is an exothermic reaction which produces heat. As long as the product in which the heat is produced is not insulated thus allowing the heat to be lost, nothing happens and the product does not go to ignition. On the other hand where the product is insulated i.e. where there is a large quantity together, the heat is produced but cannot escape and the temperature keeps on rising until the product ignites. This process takes days or months depending on the surrounding circumstances. Mr

Version No 1: 29 Oct 2026 (23:45 hrs)

Southeard was satisfied that the conditions in which the palm kernels here were stacked in the warehouse produced the necessary insulation. The stack was compact and its size was large enough to insulate the products sufficiently that they self-ignited. Mr Southeard also testified that he had had previous experience of fires caused by self- ignition of palm kernels in insulated conditions like stowage in a ship's hold.

29 Mr Southeard came to his conclusion that the fire had been caused by self-ignition on the basis of his investigations. At the time his report was produced, he had not seen the SGS certificate nor had he any knowledge of the report and opinions of the fire brigade. Mr Southeard was in court while W.O. Raja Kamaruddin testified and subsequently stated that this evidence supported his own finding.

30 The plaintiffs produced an expert to rebut Mr Southeard's report and evidence. Their witness, Mr Barry Ian Dillon, is a forensic scientist with Forensic Services (M) Sdn Bhd. He holds both a bachelor's and a master's degree in science and has lectured on fire investigation to the Insurance Institutes of Singapore and Malaysia, the Malaysian Fire Brigade and the Malaysian Fire Protection Association. During the years 1986 to 1993 Mr Dillon resided in Singapore and Malaysia and investigated fires in South East Asia, Hong Kong, China and Taiwan.

31 In this particular instance, Mr Dillon was only appointed by the plaintiffs in mid-1993, some three years after the fire took place. He produced a report based on an inspection of the warehouse itself and copies of the following documents: (i) Mr Southeard's report, (ii) a letter from the shipper, (iii) the SGS certificate, (iv) a standard form FOSFA contract, (v) the bill of lading for the

Version No 1: 29 Oct 2026 (23:45 hrs)

palm kernels, and (vi) the warehouse's letter on condition of the palm kernels upon their receipt.

32 According to Mr Dillon's report, the published research on palm kernels does not prove that spontaneous combustion is impossible, but it does indicate that it is highly unlikely to occur. Thus it is incumbent on an investigator to be absolutely sure that no other mechanism is possible before arriving at a conclusion that is in contradiction with scientific opinion.

33 He stated that spontaneous ignition in produce is preceded by days or weeks of biological reaction which raises the temperature to 70 - 80oC after which oxidation processes take over to raise the temperature to ignition. In his view, whilst the palm kernels in this case must have been wet while the vessel was at sea and would have remained wet in the containers for a minimum of 18 days prior to unstuffing, no significant self-heating occurred. This is because the workers who manually handled the bags on unstuffing did not inform the warehouse staff that the bags were hot. Further, the free fatty acid level of the palm kernels as ascertained by SGS did not show the significant difference from normal levels that you would expect if the palm kernels had degraded.

34 Whilst there was visual evidence that the shipment was wet and mouldy, Mr Dillon concluded that the mould was of a superficial nature, perhaps concentrated on the bags without significantly affecting the kernels themselves. In his opinion if the moisture content had been significantly above normal, the oil content would have been higher. He stated that eight days prior to the fire there was no external evidence of self-heating and no evidence from samples taken from inside the bags. For spontaneous combustion to occur the kernels

Version No 1: 29 Oct 2026 (23:45 hrs)

would have had to heat up from cold to, to quote his report, "a temperature of some hundreds of degrees, within eight days". He found this quite unlikely.

35 Mr Dillon pointed out that self-heating occurs more easily when produce is stacked in large quantities, so that the surface area to volume ratio is minimised and heat is retained instead of being lost to the surroundings. The research he had seen had indicated that a volume of palm kernels as large as 37m cube would be required before spontaneous combustion could occur. In this case, he theorised that if the shipment had been packed as tightly as possible into the warehouse, the resulting dimensions of 18m x 12m x 4.5m would represent a volume that was less than 3% of the size required for self-ignition. He also pointed out that the warehouse was well ventilated in that the jack roof allowed heat to escape and the open side under the walls allowed heat to enter and flow out of the opening at the top thus giving rise to a continual exchange of air.

36 In Mr Dillon's opinion, it was not possible to discount discarded smoker's material as a cause of the fire. He had difficulty accepting that Mr Wong could see the centre of the stack and on the other hand accepting that a cigarette could not reach that position. He said that if the pallets were arranged in a 10 x 10 grid and close together, then Mr Wong could not have seen the centre. If there were passage ways, then a cigarette could be thrown down one of the gaps or a worker could have an illicit smoke between the rows and discard the cigarette at his feet. Mr Dillon also thought that it was possible that a spark or a cigarette could have been introduced through the mesh above the wall between the warehouse and the machine shop.

Version No 1: 29 Oct 2026 (23:45 hrs)

37 Mr Dillon's report concluded that there was strong evidence that as little as eight days prior to the fire none of the bags was hot. There was no reason why some bags should suddenly begin to self-heat when such had not occurred during a preceding longer period of storage in conditions just as favourable. It stated, "When this evidence is combined with the scientific evidence that spontaneous combustion does not occur in palm oil kernels, it can only be concluded that ignition could not have occurred in this way..... In my opinion the evidence overall points strongly towards the fire having been started by some means other than spontaneous combustion, with smoker's material being most likely.".

38 When I considered all the evidence adduced, I was satisfied that the defendants had discharged the burden on them of showing that the fire had been caused by self-heating leading to spontaneous combustion. I also accepted Mr Wong's evidence of the manner of stacking and the physical characteristics of the fire as being accurate. There were minor discrepancies between his original statement to Mr Southeard and his oral testimony but I was satisfied that these did not affect his credibility overall. The evidence given by W.O. Raja Kamaruddin and Mr Southeard was also convincing. Neither of them was undermined by cross-examination.

39 On the other hand, there were various difficulties with Mr Dillon's evidence. First, Mr Dillon had no first hand knowledge of the fire or the circumstances existing shortly thereafter. He based his theories on documents produced by others, two of which, viz the letter from the shipper of the goods and the FOSFA contract, were inadmissible, and partly on hearsay as to how the pallets were stacked.

Version No 1: 29 Oct 2026 (23:45 hrs)

40 Secondly, Mr Dillon omitted certain salient matters from his report. Under the heading "Quality" he omitted all reference to mouldy kernels, a property relevant to the quality of the kernels. Whilst under cross-examination he accepted that mould is significant, the only mention of mould in his report was to discard its significance in the present instance on the basis that the observation of mould was an external observation and probably related more to the bags than to the kernels themselves. He also ignored the SGS report of mould, giving in court the excuse that he was not sure what the statement "Mouldy kernels 60.4%" meant.

41 Mr Dillon stated that the quality of kernels had not degraded to a large extent and therefore mould could not have contributed to self-ignition. The samples on which he based this observation were, however, samples which were taken from the bags either at the time of or prior to the completion of stacking. Thus these samples were not subject to the insulation of the stack for eight days during which time the mould would have degraded the kernels further. Furthermore, the free fatty acid content was measured on lauric acid which does not show degradation by mould during the initial stages of fermentation.

42 Thirdly, Mr Dillon was incorrect in stating that the size of the stack in this case was less than 3% of the volume required to bring self-heating to ignition. He made two errors in this regard. The first related to the critical mass needed. Under cross-examination, Mr Dillon admitted that in the circumstances which existed in the warehouse at the time the critical mass necessary to assist self-ignition would be an 8.2m cube which would have a volume of 551.4m3. The 37m cube which was stated in the research as being the critical size needed for self-ignition was a figure obtained on the basis of experiments conducted on palm kernels without jute bags (which are usually impregnated with oil), such

Version No 1: 29 Oct 2026 (23:45 hrs)

palm kernels being clean air-dried kernels (rather than the moist dirty kernels present in this case) and in atmospheric air temperatures of 20oC (rather than the 30oC applicable in Singapore).

43 Mr Dillon also made a mistake as to the size of the stack here. He calculated that 298 pallets would be needed on the basis that each carried 25 bags. He said that since the pallets were stacked three high, the 298 pallets would occupy floor space equivalent to 99 pallets and if the pallets had been placed as close as possible to each other in a 10 x 10 grid, the mass of kernels would be 18m x 12m x 4.5m. In fact each pallet carried only 25 bags so 358 pallets were needed. Under cross-examination Mr Dillon accepted that the dimensions of the stack were 18m x 14.5m x 4.5m giving a volume of 1187.53m3 which was slightly more than double the critical size.

44 Mr Dillon was also slightly evasive on the issue of calculation of critical size. When he was asked whether he knew of a formula by which the critical size of a stack of moist palm kernels could be calculated, he said he did not. This was extraordinary as such a formula was contained in the pages of one of the reference books on which Mr Dillon relied and made frequent reference to during the trial.

45 It was also interesting that while at the beginning of his report Mr Dillon stated that the published research on palm kernels indicated that spontaneous combustion in palm kernels was "highly unlikely to occur", by the end of his report he had passed on to stating that there was "scientific evidence that spontaneous combustion does not occur in palm oil kernels". In court Mr Dillon admitted that spontaneous combustion was not impossible but emphasised that palm kernels had a low susceptibility to it.

Version No 1: 29 Oct 2026 (23:45 hrs)

46 Whilst in his report Mr Dillon took the stand that the most likely cause of the fire had been discarded smoker's material, in court he agreed that he would not expect a cigarette end to reach more than one pallet's length inside the stack. The uncontroverted evidence of W.O. Raja Kamaruddin was that the site of the fire was deep-seated, at least three pallets' length into the stack. This is totally inconsistent with the fire having been started by a discarded cigarette thrown into the stack. Further, under cross-examination Mr Dillon accepted that the possibility posed by him of a worker having had an illicit smoke between the rows of pallets was, in fact, not a possibility here in view of the evidence as to the manner in which the stack had been arranged.

47 In Mr Dillon's opinion, the fact that there was no complaint that the bags were hot upon discharge from the container was "strong evidence" that no significant self-heating had occurred just eight days prior to the fire. This argument contemplated that the labourers unstuffing the containers were conscientious and intelligent enough to report hot bags and that if they did, their report would be heeded. In this regard Mr Southeard testified that he had come across a case where fish meal had come out of a ship almost glowing and the labourers had just carried it and not said a word. Further, in this case the amount of handling would have been minimal as hooks were used to pick up the bags and place them on the pallets.

48 In view of the evidence of good insulation, wet and mouldy cargo, the point of origin of fire being in the centre of the stack, the fire being localised to the stack with no damage occurring on the floor, roof or walls of the warehouse, and the lack of evidence of any other likely cause, the only conclusion I could draw, on the balance of probabilities, was that self-heating or spontaneous combustion had caused the fire.

Version No 1: 29 Oct 2026 (23:45 hrs)

Agricom Pte Ltd v Guardian Royal Exchange Assurance Public Limited Company
[1994] SGHC 29

Judith Prakash JC

A S Balasubramaniam (S Bala & Associates) for the plaintiffs
Flexie Sion with Subramanian Pillai (Harry Elias & Pnrs) for the defendants

---