



Accident Report

Aoraki

Fatality – Southern Ocean,
Campbell Plateau on
7 September 2004

Class A Final Draft



This draft relates to the investigation of an accident, incident or mishap that has resulted in prosecution. It has not been distributed to interested parties for comment as the information it contains has been superseded by the findings of a Court.



Aoraki



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REPORT NO.: 04 3544

VESSEL NAME: AORAKI

Ship Type:	Deep Sea Fishing Vessel
Certified Operating Limit:	Unlimited
Port of Registry:	Nelson
Flag:	New Zealand
MSA No.:	105555
Built:	1988
Construction Material:	Steel
Length Overall (m):	67.5
Maximum Breadth:	15.5
Gross Tonnage:	2 926
Net Tonnage:	1 048
Registered Owner:	Sealord Group Limited
Ship Operator/Manager:	Sealord Group Limited
SSM Company:	Lloyds Register SSM
Accident Investigator:	Zoe Brangwin



SUMMARY

At 0730 hours New Zealand Standard Time (NZST) on Monday 6 September 2004, a fish meal plant operator, Mr Hugh Hope, was found trapped in the fish meal plant cooker. He was alive but both legs were caught in the auger up to his hips and he was unable to be removed. One leg was severed and the other was crushed and almost completely severed by the force of the auger as it rotated inside the cooker.

Over the next 18 hours the crew of **Aoraki**, a medic from **Aorere**, and a paramedic (who was flown to the vessel) battled to keep Mr Hope alive, with the assistance of many people including surgeons ashore. Mr Hope passed away at 0145 hours, Tuesday 7 September.

The report concludes that:

- Sealord failed to take all practicable steps to ensure the safety of Mr Hope by systematically identifying existing and new hazards and taking all practicable steps to eliminate, isolate or minimize them.
- Sealord failed to provide proper training for Mr Hope in respect of the use of the fish meal plant.
- Sealord failed to install dead man alarms to the fish meal plant as documented in their memorandum of 17 December 2001.
- Sealord failed to provide emergency stop buttons on the side of the fish meal plant cooker.
- Sealord failed to provide adequate safety signage in the fish meal plant.
- Sealord failed to provide any safety signage on the fish meal plant cooker.
- Sealord failed to implement a fatigue management system as required under the New Zealand Safe Ship Management Code and the Health and Safety in Employment Act 1992.
- Mr Hope's foot slipped into the auger as he turned around to clean the next chamber of the cooker.
- Mr Hope did not turn off the auger while he was cleaning this machinery.
- The cooker did not have an adjacent working platform on which to stand. This required Mr Hope to either stand or sit on top of the cooker to clean inside.
- The restricted space in which Mr Hope had to work may have contributed to the accident.
- Mr Hope may have been suffering from fatigue due to the shift patterns he had to work coupled with the bad weather experienced on the way to the fishing grounds.
- Mr Hope was instructed by the head meal plant operator to water blast and then caustic clean the cooker by himself. No action had been taken by Sealord that required the cleaning of the cooker to be a two man operation.
- The vessel's motion in the prevailing weather conditions may have contributed to the accident.
- Mr Hope's isolation from the rest of the factory deck and the absence of a dead man alarm system meant that he was not discovered for some time after the accident occurred.
- The auger continued to rotate inside the cooker until the factory hand turned it off using the stop button in the control room.



The report includes recommendations that Sealord:

- Develop a structured fatigue management plan in accordance with the New Zealand Safe Ship Management (SSM) Code:
- Establish an external auditing system for its vessels to ensure that their health and safety policy is being complied with and is working effectively.
- Critically review the need for the installation of dead man alarms in solo manned machinery spaces.
- Introduce written procedures in the SSM Manuals of vessels fitted with Fish Meal Plant cookers that the safest way to caustic clean or use other methods of cleaning the cooker is at the end of every trip.
- Investigate the further training of ship's medics to include administering intravenous (IV) fluids.
- Implement documented procedures to capture onboard departmental training.
- Implement the Seafood Industry Training Organisation (SITO) unit standard assessment for fish meal plant operators.
- Develop a robust hazard identification system, which is vessel specific and formulated in conjunction with the vessel's crew and divisional managers.

The report further recommends that:

- (1) Maritime New Zealand, in conjunction with Sealord, the fishing industry and FishSAFE, work together to ensure future compliance with health and safety within the industry with special reference to fatigue and stress management.
- (2) The Operations Division of Maritime New Zealand conduct an audit of Sealord Group vessels and other factory deck fishing vessels that operate under SSM, to ensure compliance with the New Zealand Safe Ship Management Code and the Health and Safety in Employment Act 1992.
- (3) The Seafarer Licensing Division of Maritime New Zealand critically review the need for the holders of First Aid Certificates to undergo regular refresher training to keep their First Aid Certificates current.



NARRATIVE

Aoraki

Aoraki is a deep sea fishing vessel built in 1988 and registered in New Zealand. The vessel has an overall length of 67.5 metres and a moulded breadth of 15.5 metres. She has a gross tonnage of 2 926.

Sealord Group Limited (Sealord) owns ***Aoraki***. The vessel has a valid Safe Ship Management (SSM) Certificate with Lloyds Register Safe Ship Management Company, which is due to expire on 30 November 2004. The ship's crew consisted of the Master and 35 crew. The crew was of New Zealand nationality. The above trip was the vessel's last trip with Sealord Group. The vessel is currently laid up for sale in Nelson.

Sealord Group Limited

Sealord is a Nelson based global company. It has a modern fleet of deep-sea factory fillet trawlers, fresh fish trawlers and bottom longliners. The company operates its own vessels and charters. Sealord is owned jointly (50%) by Te Ohu Kai Moana (the Treaty of Waitangi Fisheries Commission) and Nippon Suisan Kaisha (Nissui). Sealord employs over 1,500 staff ashore and at sea.

The Skipper, aged 62, was an employee of Sealord. He held a Skipper Deep Sea Fishing Boat Certificate. Sealord had employed him for ten years as a Master. He has been on ***Aoraki*** for 9½ years. He has over 45 years experience at sea.

The Medic from ***Aoraki***, aged 46, was the First Mate. He held a Mate Deep Sea Fishing Vessel Certificate obtained in 2000 and a valid First Aid Certificate. He underwent a Marine Medic course at Nelson Polytechnic, in 2000.

The Medic from ***Aorere*** held a valid First Aid Certificate, obtained in 2002. She underwent Marine Medic training through St Johns, Nelson in 2002. She had completed two years of a nursing degree.

Details of the Deceased – Mr Hugh Hope

Mr Hope, aged 58 years, was an employee of Sealord. He had been working for Sealord for 11 years. He had been onboard ***Aoraki*** for about eight years. Previous to ***Aoraki***, he had worked onboard ***Will Watch*** as a factory hand.

Mr Hope had been a fish meal plant operator for about 18 months. He joined ***Aoraki*** as a factory hand. While he was a factory hand he struck up a friendship with the head fish meal plant operator. He was interested in becoming a meal man and subsequently transferred to that department in 2001. He received on the job training from the head fish meal plant operator.

His hours of work were 12 hours on and 12 hours off. On the trip of the accident he worked from 0100 hours to 1300 hours daily. The majority of this time was spent in the fish meal plant.

In about 1996, Mr Hope sustained a knee injury whilst at sea that required him to be flown home from the Chatham Islands to undergo surgery. He also suffered from back pain due to a workplace accident onboard ***Aoraki*** in January 2004 when he sustained moderate back injuries while lifting bags of fish meal. He returned to the workforce in April 2004.

Mr Hope's hearing was impaired by industrial deafness. He wore a hearing aid.

Mr Hope suffered extensive injuries at the time of the accident. One leg was severed and the other was crushed and almost completely severed by the force of the auger as it rotated inside the cooker.



Fish Meal Plant

The fish meal plant on **Aoraki** processes raw material and off cuts from processed product into fish meal. The end product is not fit for human consumption. By rendering the product to fish meal it avoids the environmental and financial costs of disposal.

When the fish are processed in the upper factory, the raw material is collected in a hopper in the fish meal plant. To simplify the process, the raw material is moved by augers and lifted to the cooker where it is cooked. It then goes through a press into the fish meal dryer, then a mill, a cyclone and finally to a silo. The finished product is then bagged for export.

The raw material is rotated through a Stord Batrz cooker via an auger. Steam is piped through the centre of the auger, which cooks the material as it passes through. The auger is powered by a 1 000 revolutions per minute (rpm) motor with a reduction of 60 to 1, rotating at four revolutions per minute (4 rpm).



Chamber in which both Mr Hope's legs were caught.



Photograph 1

The cooker with its top plates lifted to show the auger inside

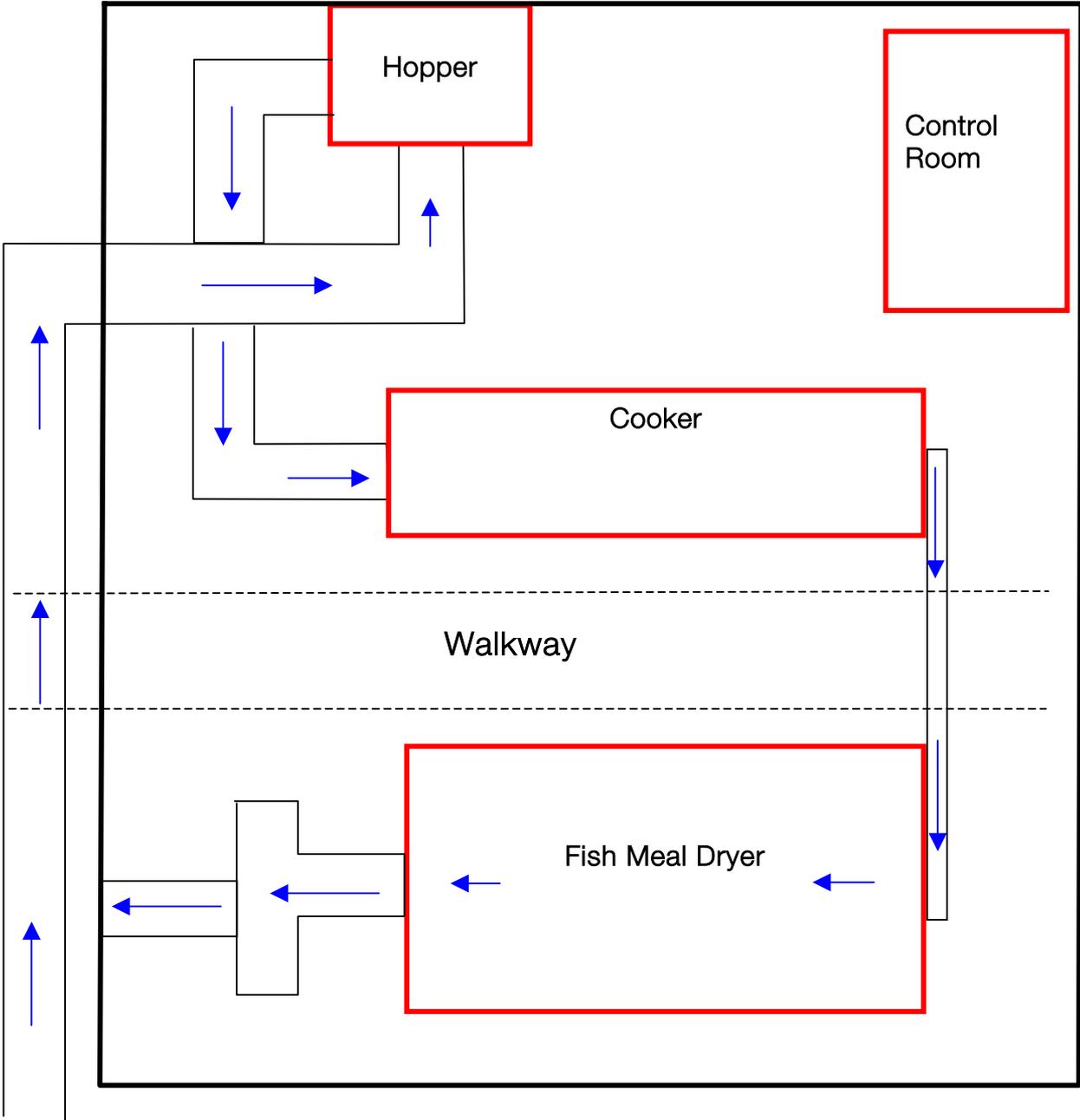


Diagram 1
Fish Meal Plant

THE ACCIDENT

At approximately 1800 hours, New Zealand Standard Time (NZST) on Friday 3 September 2004, **Aoraki** departed Dunedin for the fishing grounds.

On Sunday 5 September 2004, at breakfast time, Mr Hope started the fish meal plant. It took about six hours for the fish to process through the plant, before the crew was able to start removing fish meal from the drier.

The head meal plant operator was a Bader technician. He was covering the factory and the meal plant because the crew was a meal plant operator short that trip. The head meal plant operator started his shift at about 1300 hours, just as they were starting to take fish meal out of the drier. He ran the plant until about 2200 hours, at which time he started to run out of fish in the holding tanks. He then shut the plant down. During the course of his shift, he noticed that he was having trouble cooking the fish. The problem reminded him of a previous occasion when this had occurred. This was during the Southern Whiting season, about one year earlier, when the fish had baked hard onto the auger blades and could not be removed by the usual caustic soda wash.

On this trip, an inspection of the cooker revealed a build up of thick hard scaly fish product on the auger blades. It was obvious to the head meal plant operator that this build up had occurred from the earlier time when the vessel was in Australia discharging fish. The vessel had then returned to New Zealand, before proceeding to the fishing grounds on 3 September. In the intervening period, the build up of fish product in the cooker had dried and gone hard to the extent that the application of caustic soda wash would not remove it. The heavy build up of scale meant that the crew could not get the heat to transfer from the cooker shell into the fish to cook it properly.

At about 0100 hours on 6 September, Mr Hope arrived to take over the shift. During the handover the head meal plant operator told him that they were having a problem cooking the fish, referring to a similar problem the year before. He asked him to get out the water blaster and try and remove the build up.

At approximately 0300 hours, Mr Hope approached a factory hand in the fish processing plant by the weigh station. He asked where the saltwater connection for the water blaster was located. He was shown this by the factory hand.

Sometime between 0615 and 0630 hours, the factory hand went to check on Mr Hope, as he thought it was taking a long time to water blast the meal plant. He stood at the doorway to the fish meal plant room for about 30-60 seconds. During this time, he could see Mr Hope, who had his back to him. Mr Hope appeared to be sitting on top of the cooker, operating the water blaster. The factory hand did not go and speak to him as he did not want to give Mr Hope a fright. The factory hand then left.

At approximately 0735 hours, the on watch Factory Engineer entered the fish meal plant as part of his rounds. He saw Mr Hope on top of the cooker. It appeared to him that Mr Hope was cleaning the cooker auger and was standing inside the auger with his back to the engineer. By Mr Hope's own account, whilst water blasting the auger he turned around, slipped and fell feet first into the moving auger. He thought Mr Hope was all right and was about to walk out of the plant room when he thought he heard a cry for help.

He approached Mr Hope and saw that he looked distressed. Mr Hope mouthed to him to turn the cooker off. The factory engineer rushed to the control room and hit the emergency stop button, which shut down the whole plant. He then informed the chief engineer. Together, they both climbed on top of the cooker to assess the extent of Mr Hope's injuries. They found Mr Hope trapped in the cooker auger with one of his legs amputated and the other leg almost completely severed. Notwithstanding the extremely traumatic situation, Mr Hope was conscious, coherent and calm.



The engineer informed the master and asked for a medic. At this time, **Aoraki** was approximately 500 nautical miles from the nearest mainland. The first mate took over the first aid care of Mr Hope with assistance from other crewmembers. The master administered morphine to Mr Hope, and the mate put on oxygen mask and made him as comfortable as possible. It was clear that Mr Hope could not be moved and would need urgent medical attention. A helicopter transfer was organised from ashore, to include a paramedic who would be flown to the vessel as soon as **Aoraki** was in operational range.

At approximately 1000 hours, the medic from **Aorere** was transferred to **Aoraki**.

At approximately 1500 hours, the paramedic from ashore was winched onboard **Aoraki**.

At approximately 2000 hours, a New Zealand Air Force Orion dropped a canister with medical supplies to the vessel.

The paramedic, medic and crew continued to assist Mr Hope throughout the evening and night of 6 and 7 September. At 0145 hours on Tuesday 7 September, Mr Hope passed away.

Aoraki continued towards Bluff and berthed at 1800 hours, on Tuesday 7 September. The body of Mr Hope was subsequently taken ashore.



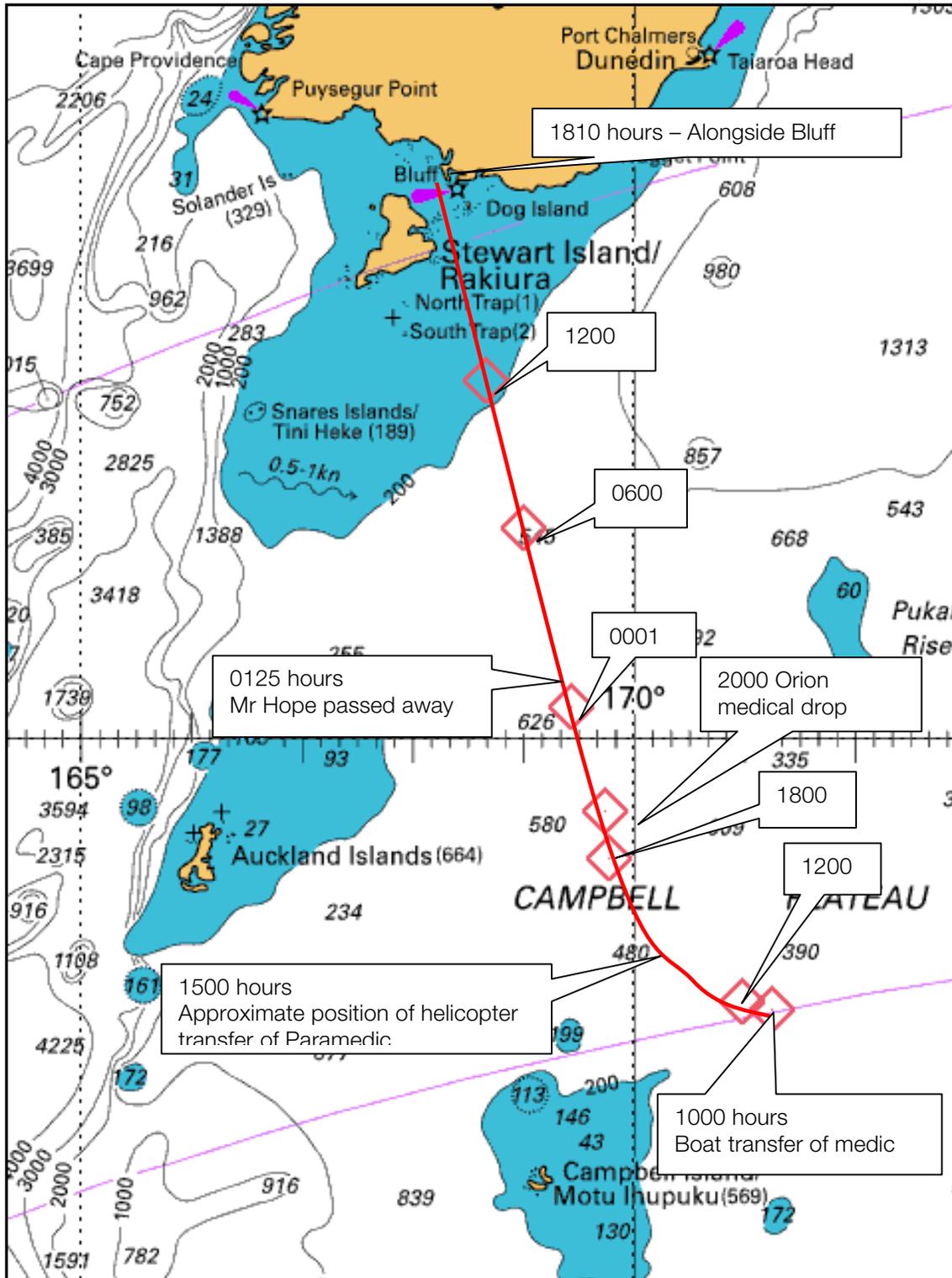


Diagram 2

Chart Extract from LINZ Chart NZ14065 Showing Times & Positions of *Aoraki*

COMMENT & ANALYSIS

Evidence

On 8 September 2004, a Maritime New Zealand Accident Investigator and the Maritime Safety Inspector from Dunedin attended **Aoraki** at Bluff.

The Skipper and four crew were interviewed and provided accounts of the accident. Copies of relevant ship's documents, to include the Safe Ship Management manual and deck logbook, were obtained.

The paramedic was interviewed and his recollections documented.

The Management of Sealord was interviewed in Nelson regarding the company's Health and Safety compliance of the Health & Safety in Employment Act 1992.

Meal Plant Operation

At the beginning of each trip the oncoming fish meal plant operators ensure everything is oiled, greased and that all the machinery is run up and tested. They then caustic clean the cooker.

On 5 September, Mr Hope mentioned to the chief engineer as he was starting to try and cook the fish, that it was using a lot more steam. The chief engineer told him that they would probably have a look at it after the processing of the fish had been completed.

The head meal man did not consult the chief engineer regarding the decision to water blast the cooker as he should have done. The chief engineer stated that he would not have allowed them to water blast first. The procedure was to clean it by hand first and then water blast.



Cleaning

Cleaning the cooker is normally done using caustic soda. It is usually conducted at the start of a each trip, but can sometimes occur half way through a trip, depending on how much steam is needed to cook the fish product. The process of cleaning the cooker, using caustic soda, was as follows:

Stord Batrz Cooker Instructions

"Cleaning heating surface

Deposits on the heating surface cannot be avoided by indirect cooking of raw material containing protein. The deposits consist primarily of burnt protein fibres, but phosphates and other mineral components as well. By using formaldehyde for preservation one will find a special type of scaling.

It is rather easy to remove the scaling of protein solids, as these are soluble in caustic solution. The scaling of phosphate and salts, however, is much more difficult to remove, as it must be scrapped off.

Complete cleaning of the cooker should be done as follows:

- *Run the cooker empty and wash out thoroughly with freshwater.*
- *Open the direct steam valves in order to heat the water. Drain off with the cooker rotor in motion.*
- *If necessary when running difficult raw material, fill the cooker with 2-3% caustic soda solution and rotate it slowly on order to obtain best possible cleaning.*
- *Keep caustic soda solution warm by admitting steam to the jacket, but without boiling.*

- *The period of this process depends on the thickness of the scaling and the time at disposal. Recommended is two hours minimum.*
- *After draining the cooker for caustic solution and after washing with hot water, the remaining white scale of phosphate and insoluble salts can be removed by scrapper, scaling hammer etc.”*

When de-scaling the build up of fish product on the auger blades by manually scraping them or using a water blaster, the safest method necessitated stopping the cooker first, using a stop/start button located remotely in the control room. The steel covers located on top of the fish meal cooker then had to be removed to gain access to the auger. Having cleaned the exposed parts of the auger blades, an operator then had to climb down from the cooker and proceed to the control room. The auger was then re-started and moved a distance of approximately one third of a turn so that the next section of the auger blades to be cleaned, was exposed. Afterwards, the auger was stopped and the operator returned to the fish meal plant room. He then climbed back to the top of the cooker and resumed cleaning. This process had to be repeated several times before the cleaning process was fully completed. On this occasion, to circumvent this lengthy process, Mr Hope allowed the auger to continue turning whilst he remained on the top of the cooker, operating the water blaster.

Previous Action Taken with the Auger

A year prior to this accident the fish product had baked hard onto the auger blades and could not be removed by a caustic soda wash alone. This happened during the Southern Whiting season immediately after the vessel had been to Australia to catch Hoki.

The heavy build up of fish meant that they could not get the heat transfer from the cooker shell into the fish to be able to cook it properly. On that occasion, the crew removed the build up of fish by first chipping off the majority of fish using screwdrivers and scrapers and then using a water blaster. This took two crew about 12 hours to complete.

The above process was slow as the crew had to frequently start and stop the auger to expose further parts of the auger blades prior to cleaning. In order to conduct the cleaning process, the crew had to sit on top of the cooker, sometimes with their legs inside. However, the auger was always switched off during this period of time.

The process of cleaning the auger with the water blaster required the auger to be started and stopped, thereby progressively exposing the build up of fish on the blades that needed to be removed.



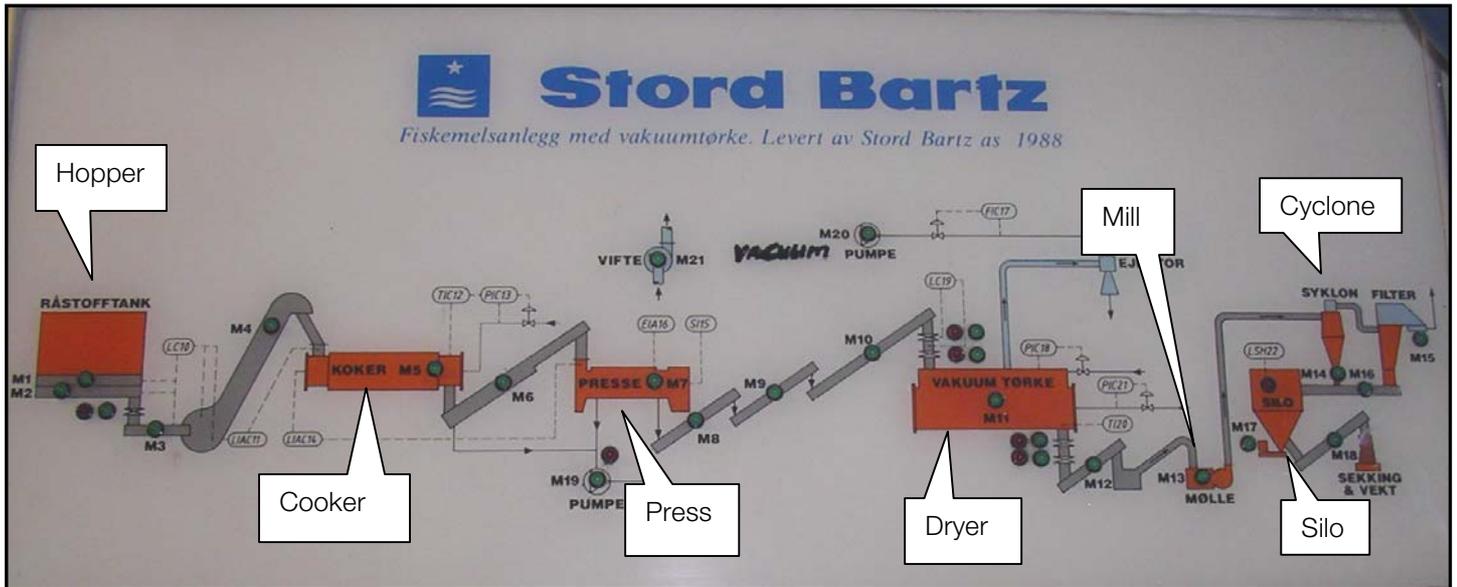
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Photograph 2
The cooker view from the side



Photograph 3
The auger in which Mr Hope was trapped



Photograph 4
Meal Plant Diagram from the Control Room



Photograph 5
Control Room & Emergency Stop

Weather Conditions

At the time of the accident the wind direction and strength was recorded as Westerly 20-25 knots. The wind would have been abaft the port beam, with a resultant corkscrew motion of the vessel.

The wind had reduced in comparison to the day before, when the wind strength was 40-50 knots with large heavy swells and snowstorms. The crew described the weather as being terrible since the vessel had left Dunedin.

Health and Safety Policy

At the time of this accident, Sealord had developed a comprehensive Health and Safety Policy. Their health and safety goal was “No Injuries”. The policy stated that Sealord was committed to providing a safe working place for all employees, contractors and visitors.

Serious Misconduct Policy. Sealord had specific misconduct guidelines in place. These were promulgated in a staff handbook, which was given to all new Sealord employees and contractors. The handbook stated that the following behaviour constituted serious misconduct that would normally result in summary dismissal.

- *“Failure to observe posted safety rules, or working in an unsafe manner.*
- *Irresponsible action affecting quality or safety, or which may result in injury to you or other persons. This includes:*
 - *Unauthorized removal of “hold clips/tags” or other lock out mechanism,*
 - *Failure to follow safety rules/procedures,*
 - *Failure to report any accident, near miss or fire; to a team leader, supervisor or manager*
 - *Failure to make proper use of safety equipment where such equipment is installed or provided.”*

The following information was obtained by the Investigator during the course of the investigation:

Initiatives Implemented by Sealord:

A “Stay Safe” program was being implemented throughout the Sealord fleet and was being trialed on **Aorere** at the time of this accident. Pending the completion of this trial, the programme had yet to be implemented on **Aoraki**. The Stay Safe programme was a behaviour-based system and focused on management and employee participation across the whole company. Sealord had set strategies in place to help achieve their health and safety vision.

Sealord is part of the Accident Compensation Corporation (ACC) Partnership programme.

Safety Signage:

Signage onboard **Aoraki** was found to be old, faded and in some cases covered by equipment. Safety signage in the fish meal plant was inadequate and, in respect of the cooker and auger, there was no safety signage at all.

Emergency Stops & Dead Man Alarms:

There was a single emergency stop button for all the machinery, including the cooker in the fish meal plant. This was located remotely in the control room. There was no dead man alarm system.

Training:

No formal training procedures had been established for the meal plant operators. The training was on the job under supervision. However, there were no documented records of such training. SITO has developed a unit standard for fish meal plant operation, but this had yet to be incorporated into the Sealord Training system (*See Figure 1 below*).

Health & Safety Meetings:

These were held on each vessel once a trip. The findings of this meeting were passed to shore based management for action. The minutes of these were sent ashore and collated. A copy remained onboard the vessel and was available to the crew (posted on the notice board).

Auditing:

Skippers were held responsible for ensuring all company policy and health and safety responsibilities were carried out satisfactorily. However, there was no auditing system, either internal or external, to ensure compliance.



OPERATE A FISH MEAL PLANT

Unit Standard: 20313 Version: 1 Level: 3 Credit: 10 Domain: Seafood Processing

What is purpose of this unit standard?

People holding this unit standard can **describe** processing of fish meal product; **carry out** the assessment of raw materials and **set up** the plant for production; **carry out** the processing of fish meal product; **shutdown and clean** the fish meal plant, and **repair and maintain** the fish meal plant for operational purposes.

What do I need to know and be able to do to achieve this unit standard?

1. Describe the processing of fish meal product.

To do this you need to:

- Describe the main processing steps for the production of the fish meal product.
- Outline the important processing control parameters for the main processing steps.
- Describe the procedures for handling out of specification product.

2. Carry out the assessment of raw materials and set up the plant for production.

To do this you need to:

- Assess the raw materials.
- Identify, from the raw material assessment, product to be processed.
- Set up the plant for production.

3. Carry out the processing of fish meal product.

To do this you need to:

- Process fish meal as per company requirements.
- Handle any out of specification product appropriately.
- Use safe work practices when processing fish meal product.
- Complete records.

4. Shutdown and clean the fish meal plant.

To do this you need to:

- Shutdown the fish meal plant.
- Clean the fish meal plant.
- Use safe work practices when shutting down and cleaning the fish meal plant.

5. Repair and maintain the fish meal plant for operational purposes.

To do this you need to:

- Outline knowledge of any likely plant and machinery faults, and describe ways to fix faults and the requirements for fault reporting.
- Repair and maintain the fish meal plant, so that the plant operates normally.
- Notify any repair and maintenance needs outside your level of expertise.
- Use safe work practices when repairing and maintaining the fish meal plant.



Figure 1 – Unit Standard for the Operation of the Fish Meal Plant

July 2001 Aorere Fish Meal Plant Accident

On 4 July 2001, a junior fish meal plant operator attempted to clear a blockage by removing the cover of a cyclone while it was still operating. During this process, his hand became trapped in the cyclone. The operator banged on the bulkhead with a hammer to get attention but was not found until some fifteen minutes later. It took another fifteen minutes before he was freed.

The Maritime Safety Authority (MSA), as it then was, investigated this accident and promulgated a number of recommendations in its report, to which Sealord replied as follows:

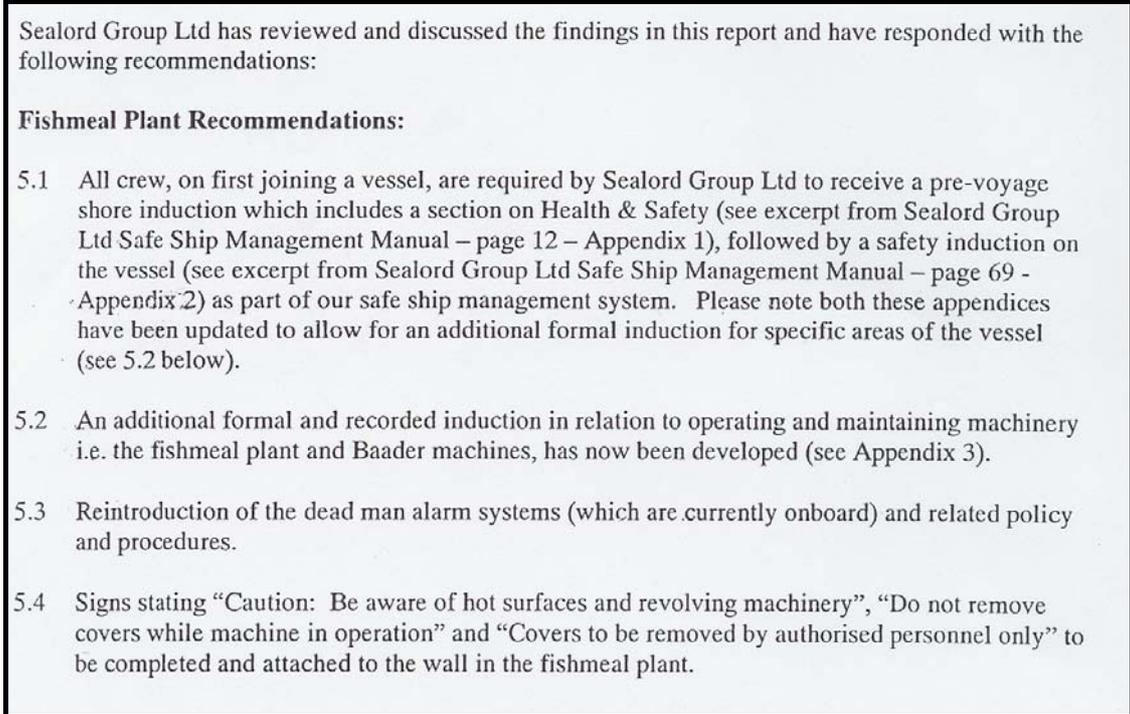


Diagram 3 – Sealord Response to *Aorere* Recommendations



Pursuant to a recommendation in the MSA report, dead man alarms were installed in the fish meal plants on both *Aorere* and *Rehua*. However, these alarms had not been fitted to *Aoraki* at the time the accident occurred.

Training And Induction

Induction. Sealord Group has a comprehensive induction training system for new employees. They are provided with a staff handbook, which explains about health and safety, general housekeeping, emergency evacuation, company standards, dress code, hygiene etc. New employees also watch an induction video, which includes Health and Safety in the workplace.

Induction sheets are filled out onboard and filed for record when a new crewmember joins the ship. These forms have been improved over time. However, a number of crewmembers joined the company before this system was started and had yet to be inducted properly. This included Mr Hope.

Aoraki had been using the old induction forms and not the new induction form that was developed after the accident on *Aorere* in 2001 (See Figure 2 below).

Appendix 3 – Fishmeal Induction

“VESSEL” SSM INDUCTION SAFETY TRAINING – FISHMEAL DEPARTMENT

CREW MEMBERS NAME: _____

INDUCTION SAFETY TRAINING DETAIL

<i>Induction Training has included, as a minimum, the following:</i>	Check
• Location and correct use of Emergency Breathing Apparatus	<input type="checkbox"/>
• Location and correct use of fire fighting equipment	<input type="checkbox"/>
• Responsibilities in fire/emergency party	<input type="checkbox"/>
• Noise and other personal hazards explained, including ear protection to be worn when in factory or machine spaces	<input type="checkbox"/>
• Location of Alarms and Emergency Stops throughout Fishmeal Plant and Fish Factory	<input type="checkbox"/>
• All safety guards to be in place while machinery is in operation	<input type="checkbox"/>
• Care taken to minimise hazards associated with moving machinery in cases of blockage or stoppage i.e. ensure machinery is turned off	<input type="checkbox"/>
• Full safety clothing to be worn when handling chemicals used in cleaning or operating of plant.	<input type="checkbox"/>
• Demonstrated the correct method and use of Heating Steam from Ships Boilers	<input type="checkbox"/>
• Demonstrated the correct method of bagging, carrying and stacking of meal bags in hold.	<input type="checkbox"/>
• Only Trained Personal to Operate or Service the Machinery	<input type="checkbox"/>
• Responsibilities explained as to safety of the vessel and all aboard	<input type="checkbox"/>
• Because of sole nature of position all care for own safety (and others if applicable) must be taken i.e. no jewellery worn when running plant	<input type="checkbox"/>
<i>Extra issues covered (insert here):</i>	<input type="checkbox"/>
• Operation of E/R alarms and emergency procedures explained	
• Deadman alarm explained and demonstrated, and required response.	

SAFETY OFFICER SIGNATURE: _____

CREW MEMBERS SIGNATURE: _____

VOYAGE NO: _____

DATE: _____



Figure 3a – Department Specific Induction Sheet

Code	Area	Equipment	Used for	Adequately guarded	Lockouts fitted	Tag outs used	Emergency stops	Signage	Current cleaning / maintenance procedure exists (includes lock out / tag out procedures if fitted)	Current operating procedure exists	Training record exists for staff using machine	Risk score from Sealord Risk Assessment Matrix	Comments
1	MP	COOKER		Y	N	Y	N	N	Y	N	N		NOTE E&H
2	MP	DRIER		Y	N	Y	N	N	Y	N	N		NOTE E&H
3	MP	CYCLONE		Y	N	Y	N	N	Y	N	N		NOTE E&H
4	MP	HAMMER MILL		Y	N	Y	N	N	Y	N	N		NOTE E&H
5	MP	BUFFER TANK		N	N	Y	Y	N	Y	N	N		NOTE E, H& F
6	MP	AUGER	TO COOKER	Y	N	Y	N	N	Y	N	N		NOTE E&H
7	MP	AUGER	DRAIN SCREW	Y	N	Y	N	N	Y	N	N		NOTE E&H
8	MP	PRESS		Y	N	Y	N	Y	Y	N	N		NOTE E
9	MP	AUGER	PRESS CAKE SCREW	Y	N	Y	N	N	Y	N	N		NOTE E&H
10	MP	AUGER	SILLO	Y	N	Y	N	N	Y	N	N		NOTE E&H
11	MP	MEAL SILO		Y	N	Y	N	N	Y	N	N		NOTE E&H
12	MP	BAGGING AUGER		Y	Y	Y	N	N	Y	N	N		NOTE E&H
13	MP	BAG CONVEYOR		N	N	Y	N	N	Y	N	N		NOTE E&H
14	MP	BILGE PUMPS		Y	N	Y	N	N	Y	N	N		NOTE E&H
15	MP	FANS	VENTILATION	Y	N	Y	N	N	Y	N	N		NOTE E, G& H
16													NOTE E
17													
18													
19													
20													
21													
22													
23													
24													
25													
26													
27													
28													
29													
30													
31													
32													
													NOTE A
													NO EMERGENCY STOPS IN FACTORY FOR ANY CONVEYORS
													NOTE B
													EXPOSED CHAINS MAY REQUIRE COVERS
													NOTE C
													REMOTE STOPS ONLY NO EMERGENCY STOPS ON THIS MACHINES
													NOTE D
													MORE SIGNAGE REQUIRED
													NOTE E
													EMERGENCY STOP FITTED TO MAIN CONTROL PANEL ONLY NO STOPS ON THIS PIECE OF MACHINERY
													NOTE F
													BETTER GUARD REQUIRED AROUND OFFAL SHOOT IN FACTORY TO BUFFER TANK
													NOTE G
													NO GRATING OVER AFT BILGE SUMP

Figure 3b - Department Specific Induction Sheet



There was no evidence to show that Mr Hope had received any induction training when he joined **Aoraki**; he had not completed either of the two induction sheets shown in Figures 3a and 3b.

Although there was a Safe Ship Management (SSM) manual available in the crew room it had not been signed by any of the ship's crew to show they had read and understood its contents.

There was no formal training in place for the meal plant operators. The chief engineer had assessed the operators during previous watches and was satisfied with their ability.

Fatigue

The following issues might have caused Mr Hope to become fatigued, thereby impacting on his ability to make informed decisions.

- Mr Hope commenced his 12-hour shift at 0100 hours, on 6 September. He had been at work for 6½ hours at the time he was found trapped in the cooker. Fish meal plant operators worked a rotation of 12 hours on and 12 hours off.
- Mr Hope had been working in hot, noisy conditions. These environmental factors can impact negatively on the fatigued state of those exposed.
- The weather conditions had been poor for several days before the accident.

A study undertaken by the Transport Safety Bureau (TSB) of Canada made the following relevant findings in relation to fatigue:

"Fatigue can affect a person's ability to respond to stimuli; from a failure to respond altogether to slowed reactions to normal, abnormal, or even emergency stimuli. Fatigue affects the ability to judge distance, speed, and time.



- *The circadian clock is perfectly synchronized to the traditional pattern of daytime wakefulness and night time sleep. Alertness cycles closely follow the body temperature cycle, with peak alertness occurring when the body temperature is the highest (near midday) and low alertness occurring when the body temperature is lowest (between 3:00 and 5:00 am).*
- *The time of day that one works has far greater effect on alertness than the number of consecutive hours worked. People can work extended hours per day and maintain high levels of alertness and performance, as long as those work hours are between 7:00 am and 11:00 pm in their normal cycle.*
- *The main problem with shift work is that it desynchronizes the body rhythms.*
- *Workers who are required to sleep during the day are more likely to experience shortened sleep and frequent awakenings.*
- *During daytime sleep, the more restorative types of sleep and rapid eye movement (REM) sleep time are shortened. This reduction means that the individual will still feel fatigued despite having spent 6 or 8 hours asleep.*
- *The body can adjust slowly to successive nights of shift work and daytime sleeping. On the first two nights of shift work, there is a drop in alertness during the early morning hours. Within a few days, alertness is more easily sustained at night and daytime sleep improves."*

No formal fatigue management system had been introduced by Sealord Group on board their vessels at the time of this accident to assist Skippers and crew in managing fatigue and stress.

Safe Ship Management Code and Health and Safety in Employment Act 1992 (the Act)

There were no documented procedures in place to manage fatigue or formal instructions for watch keeping.

The Owner failed to establish a fatigue management system and document this in the SSM manual as required in the New Zealand Safe Ship Management Code.

The Act defines harm and hazard as follows:

"Harm"

(a) means illness, injury, or both; and

(b) includes physical or mental harm caused by work-related stress

"Hazard"

(a) means an activity, arrangement, circumstance, event, occurrence, phenomenon, process, situation, or substance (whether arising or caused within or outside a place of work) that is an actual or potential cause or source of harm; and

(b) includes—

(i) a situation where a person's behaviour may be an actual or potential cause or source of harm to the person or another person; and

(ii) without limitation, a situation described in subparagraph (i) resulting from physical or mental fatigue, drugs, alcohol, traumatic shock, or another temporary condition that affects a person's behaviour



These definitions require the incorporation of fatigue and stress management into company and vessel operations.

Sealord Group Limited New Zealand

Sealord employed Mr Hope.

Sealord, as the employer of Mr Hope, owed him a number of duties under the Act. These were as follows:

Section 6

This required Sealord to take all practicable steps to ensure the safety of employees while at work. This includes the need to ensure that plant is so arranged, designed, made and maintained that it is safe for the employee to use and ensure that while at work, employees are not exposed to hazards in their workplace.

Section 7

This required Sealord to ensure that there were effective measures in place for systematically identifying existing and new hazards and regularly assessing such hazards.

Sections 8, 9 & 10

These required Sealord to take all practicable steps to eliminate significant hazards or isolate them if elimination is not possible or take all practicable steps to minimise the likelihood that the hazard will be a cause of harm to employees.

Section 13

This required Sealord to take all practicable steps to ensure that Mr Hope was adequately trained in the safe use of the plant.

Sealord Group Limited failed to identify the cleaning of the cooker as a hazard. In this regard, the hazard identification sheets had not been updated properly since 2001 and, in respect of the Fish Meal Plant on **Aoraki**, were inadequate.

Whilst Sealord had instituted a number of initiatives to improve work place safety and were continuing work in this area, **Aoraki** was below the fleet standard at the time of the accident with regard to the compliance of safety issues, induction training, safety signage, hazard identification and auditing.

Specifically, Sealord failed to take the following practicable steps to eliminate or minimise the hazard of the cooker:

- **The erection of a working platform** level with the top of the cooker, to avoid the need to straddle the cooker while it was being cleaned.
- **The installation of emergency stop buttons** on the side of the cooker, given the need to stop and start the auger frequently to expose all parts during the cleaning process.
- **The installation of a dead man alarm system** as had been recommended in the MSA report into the accident on **Aorere** in 2001. Dead man alarms sound at regular intervals until turned off by a crew member. Accordingly, if a crew member is injured and cannot turn off the alarm, fellow crew members will be alerted by the sounding of the alarm.
- **Lack of proper induction training.** There is no evidence that Mr Hope received proper induction training when he joined **Aoraki**. He had not completed the two induction sheets and had not signed the SSM manual. Moreover, the chief engineer did not have any formal training in place for the meal plant operators.
- **The failure to ensure that the cleaning of the cooker be a two man operation.** According to the factory engineer on **Aoraki**, it took several trips back from the control room, where the auger could be stopped/started to complete the cleaning process. The use of two men would have minimised the risk the auger posed by being left running during the cleaning process.
- **The implementation of a fatigue management system.**
- **The lockout or tag-out procedure for when working with moving machinery.**



Following the Accident, Sealord Group Initiated the Following Measures:

The Fleet Manager instructed skippers to take the meal plant operators to the wheelhouse and sit down with them and have a one on one talk to make sure that they knew what had happened and to remind them that they must stop machinery if working around it. They then reported back to the fleet manager by email that this had happened.

Sealord Group have sent a checklist to all the vessels, instructing employees to go through all the moving machinery on the vessel to identify hazards involved and how they can safeguard against them.

Lockouts have been fitted on machinery in fish meal plants, the factories and conveyors throughout the fleet.

In the days following the accident, a platform was erected adjacent to the cooker and emergency stop buttons attached to the side of the cooker.

This draft relates to the investigation of an accident, incident or mishap that has resulted in prosecution. It has not been distributed to interested parties for comment as the information it contains has been superseded by the findings of a Court.



Photograph 6
The Cooker with Newly Erected Platform and Emergency Stops



CONCLUSIONS

- Sealord failed to take all practicable steps to ensure the safety of Mr Hope by systematically identifying existing and new hazards and taking all practicable steps to eliminate, isolate or minimise them.
- Sealord failed to provide proper training for Mr Hope in respect of the use of the fish meal plant.
- Sealord failed to install dead man alarms to the fish meal plant as documented in their memorandum of 17 December 2001.
- Sealord failed to erect an adjacent platform beside the cooker on which to stand. This required Mr Hope to stand or sit on the cooker for cleaning.
- Sealord failed to provide emergency stop buttons on the side of the cooker.
- Sealord failed to install dead man alarms to the fish meal plant as documented in their memorandum of 17 December 2001.
- Sealord failed to provide adequate safety signage in the fish meal plant.
- Sealord failed to provide any safety signage in respect of the cooker.
- Sealord failed to implement a fatigue management system.
- Sealord failed to implement a fatigue management system as required under the New Zealand Safe Ship Management Code and the Health and Safety in Employment Act 1992.
- Mr Hope's feet slipped into the auger as he turned around to clean the next chamber.
- Mr Hope failed to turn the auger off while he was cleaning the cooker.
- The restricted space in which Mr Hope had to work may have contributed to the accident.
- Mr Hope may have been suffering from fatigue due to the shift patterns coupled with the bad weather experienced on the way to the fishing grounds.
- Mr Hope was instructed by the head meal plant operator to water blast and then caustic clean the cooker by himself. No action had been taken by Sealord that required the cleaning of the cooker to be a two man operation.
- The vessel's motion in the prevailing weather conditions may have contributed to the accident.
- Mr Hope's isolation from the rest of the factory deck and the absence of a dead man alarm meant that he was not discovered for some time after the accident occurred.
- The auger continued to rotate until the factory hand turned it off using the emergency stop button in the control room.



SAFETY RECOMMENDATIONS

1. It is recommended that Sealord develop a fatigue management plan in accordance with the New Zealand Safe Ship Management Code:
2. It is recommended that Sealord establish an external auditing system for its vessels to ensure that their health and safety policy is being complied with and is working effectively.
3. It is recommended that Sealord critically review the need for the installation of dead man alarms in solo manned machinery spaces.
4. It is recommended that Sealord introduce written procedures in the SSM manuals of vessels fitted with fish meal plant cookers that the safest way to caustic clean or use other methods of cleaning the cooker, is at the end of every trip.
5. It is recommended that Sealord investigate the further training of medics to include the administering of intravenous (IV) fluids.
6. It is recommended that Sealord implement documented procedures to capture onboard departmental training.
7. It is recommended that Sealord implement the Seafood Industry Training Organisation (SITO) unit standard assessment for fish meal plant operators.
8. It is recommended that Sealord develop a robust hazard identification, which is vessel specific and formulated in conjunction with the vessel's crew and divisional managers.
9. It is further recommended that:
 - (1) Maritime New Zealand, in conjunction with Sealord, the fishing industry and FishSAFE, work together to ensure future compliance with health and safety within the industry with special reference to fatigue and stress management.
 - (2) The Operations Division of Maritime New Zealand conduct an audit of Sealord vessels and other factory deck fishing vessels that are operating under SSM, to ensure compliance with the New Zealand Safe Ship Management Code and the Health and Safety in Employment Act 1992.
 - (3) The Seafarer Licensing Division of Maritime New Zealand critically review the need for the holders of First Aid Certificates to undergo regular refresher training to keep their First Aid Certificates current.



ACTION TAKEN

Sealord was prosecuted under two sections of the Health and Safety in Employment Act 1992.

Section 6 For their failure to take all practicable steps to ensure the safety of employees while at work.

Section 13 For their failure to provide adequate training and supervision of the meal plant operator, Mr Hope, with regard to the use and operation of the fish meal plant.

On 24 June 2005, at the District Court in Nelson, Sealord pleaded guilty to both charges and were fined as follows:

Section 6 A fine of \$5 000 and reparation to the family of Mr Hope of \$120 000.

Section 13 A fine of \$5 000 and reparation to the family of Mr Hope of \$75 000.

