

Accident Report
Amaltal Enterprise
Serious Harm Injury
East Coast of New Zealand on
10 February 2005
Class A





Amaltal Enterprise

REPORT NO.: 96 367

VESSEL NAME: *AMALTAL ENTERPRISE*

Ship Type:	Factory Stern Trawler (twin)
Certified Operating Limit:	Unlimited
Port of Registry:	Nelson
Flag:	New Zealand
MSA No.:	128379
Built:	1988
Construction Material:	Steel
Length Overall (m):	68.8
Gross Tonnage:	2 412
Registered Owner:	Talley's Fisheries Ltd
Ship Operator/Manager:	Amaltal Fishing Company Ltd
Classification Society:	Det Norske Veritas
SSM Company:	Lloyds Register
Accident Investigator:	Zoe Brangwin

NARRATIVE

Amaltal Enterprise

Amaltal Enterprise is a factory stern trawler (twin) built in 1988 and registered in Nelson, New Zealand. Talley's Fisheries Limited are the owners of *Amaltal Enterprise*. The vessel has a valid Safe Ship Management (SSM) Certificate with Lloyds Safe Ship Management Company. The ship's crew consisted of the Master and 39 crew, who were of New Zealand and Filipino nationality.

Amaltal Fishing Company Limited (*Amaltal*)

Amaltal, the operator of the vessel, is based in Nelson. It was established in 1982 and is New Zealand's third largest fishing company.

Crew Details

The senior fish meal plant operator (Crewmember 2, who was injured in the accident) was an employee of Amaltal. He held no deck or engineering qualifications. He had been working for Amaltal since February 2004 on board *Amaltal Enterprise*. He first joined the vessel as a factory hand and then transferred to the fish meal plant. He had read the fish meal plant manuals and received on the job training. He was buddied up with an experienced meal plant operator who taught him about the running of the plant and who also acted as his supervisor. This process took a few days.

Crewmember 2's hours of work were six hours on and six hours off. On the trip the accident occurred, he worked between 0100-0700 and 1300-1900 hours daily. The majority of this time was spent operating the fish meal plant and helping out in the factory deck. He carried out a number of duties, including monitoring the running of the plant and the end product and bagging the fishmeal.

The junior fish meal plant operator (Crewmember 1) was also an employee of Amaltal. He was of Filipino nationality and had a reasonable grasp of the English language, although his spoken English was at times hard to understand. He was in New Zealand working on a one-year visa. He held a Philippines Certificate of Competency as a Third Engineer. He had been on board the vessel for six continuous trips. This was his second trip in the fish meal plant. The training engineer had given him on the job training in the operation of the meal plant.

Fish Meal Plant

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

When the fish are processed in the upper factory deck, the raw material is collected in a hopper in the fish meal plant. To simplify the process, the raw material is moved by rotating augers and lifted to the fish meal plant cooker where it is cooked (*See Diagram 1*). Steam is piped through the centre of the auger, which cooks the material as it passes through the cooker (*See Photograph 1*). It then goes through a drain screw. The drain screw sits beneath the cooker at the forward end. It has a coarse perforated screen in its base, which allows the free water to drain from the cooked fish product while transporting it to the press.

The product then goes from the press into a fish meal dryer, a mill, a cyclone and then to a silo. The finished product is then bagged for export.

Stord International a.s

FISHMEAL PLANT TYPE T5Wh SUPPLIED 1989 - 92

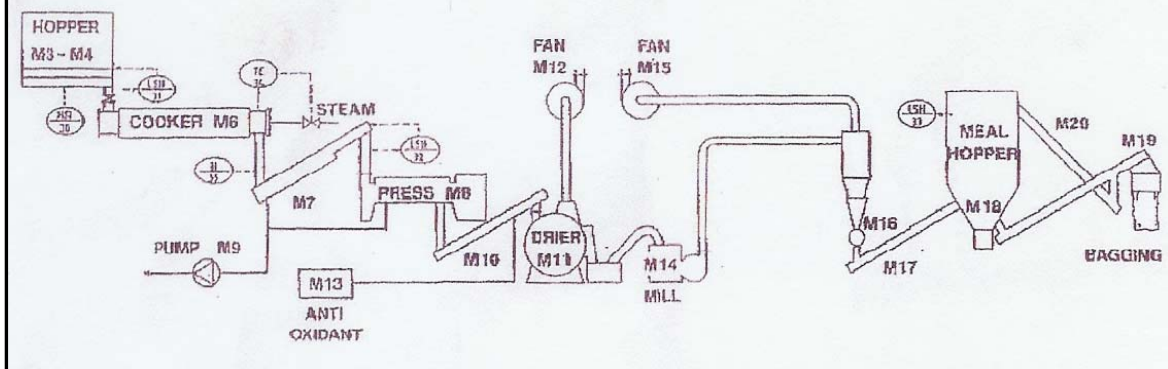
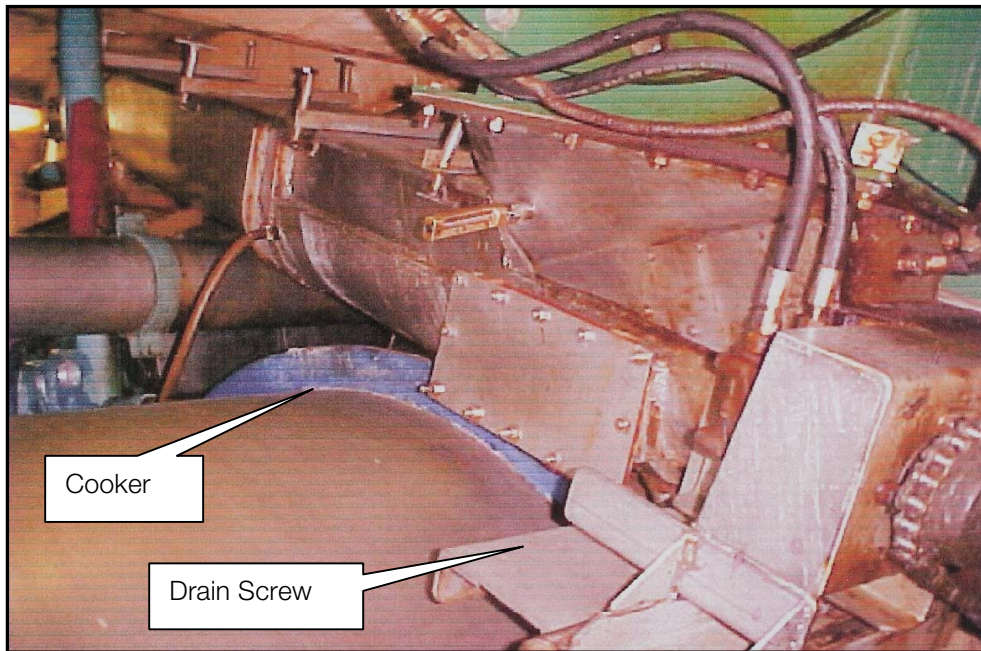


Diagram1- Fish meal Plant



Photograph 1 – Cooker and Drain screw

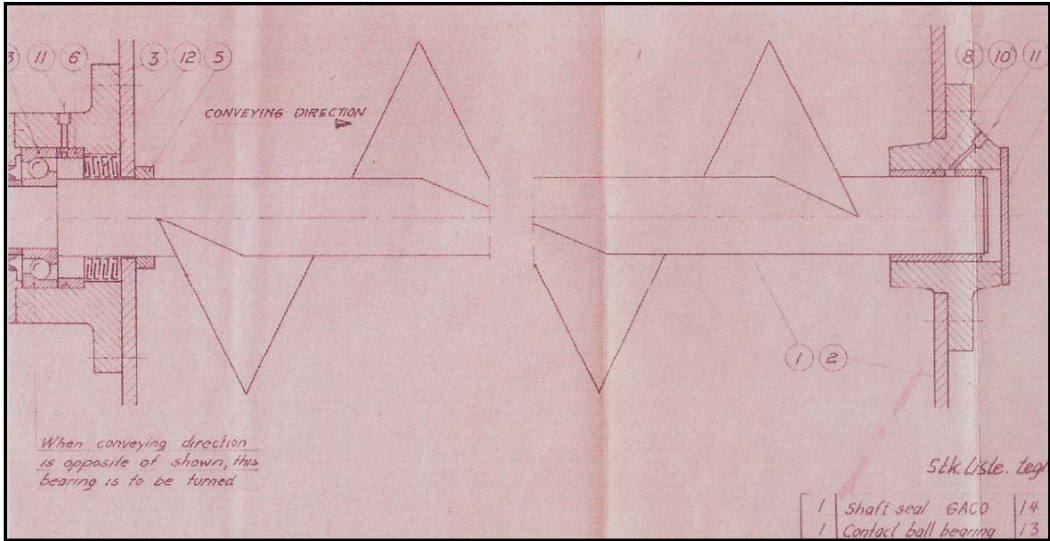


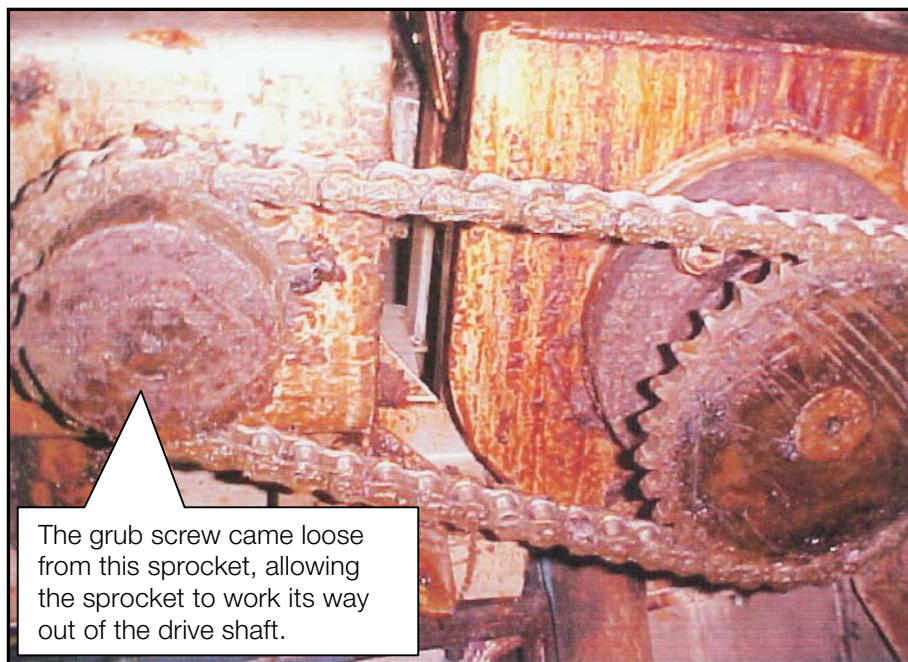
Diagram 2 – Drawing of Drain Screw

THE INCIDENT

Crewmember 1 took over the watch in the fish meal plant at about 0700 hours on 10 February 2005. At the same time, the Chief Engineer took over the engineering watch.

At 0815 hours, the Chief Engineer carried out his first set of rounds, checking the plant and machinery spaces. Everything was running satisfactorily at that time.

At about 0930 hours, Crewmember 1 went to find the Chief Engineer as he was having problems with the drain screw drive (See *Photograph 2*). On returning to the meal plant the Chief Engineer and Crewmember 1 shutdown and isolated the cooker and the drain screw. They found that a drive sprocket had come loose and the drive key had dropped out (See *Diagram 4*).



Photograph 2

Drain Screw drive – the drive is hydraulically driven through a set of sprockets

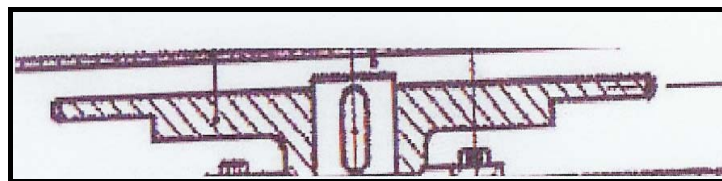


Diagram 4 – Sprocket and drive shaft with a drive key

The Chief Engineer reinstated the drive and guard and then started the cooker and drain screw. He spent the next fifteen minutes monitoring the cooker. Once the Chief Engineer and Crewmember 1 were happy with how the plant was running, the Chief Engineer returned to his normal duties.

At about 1045 hours, Crewmember 1 noticed that no fish meal was being processed through the cooker to the press (See *Diagram 5*). He tried to open the end cooker hatch cover (See *Photograph 3*) but heard the sound of steam escaping and decided therefore to close the cover again.

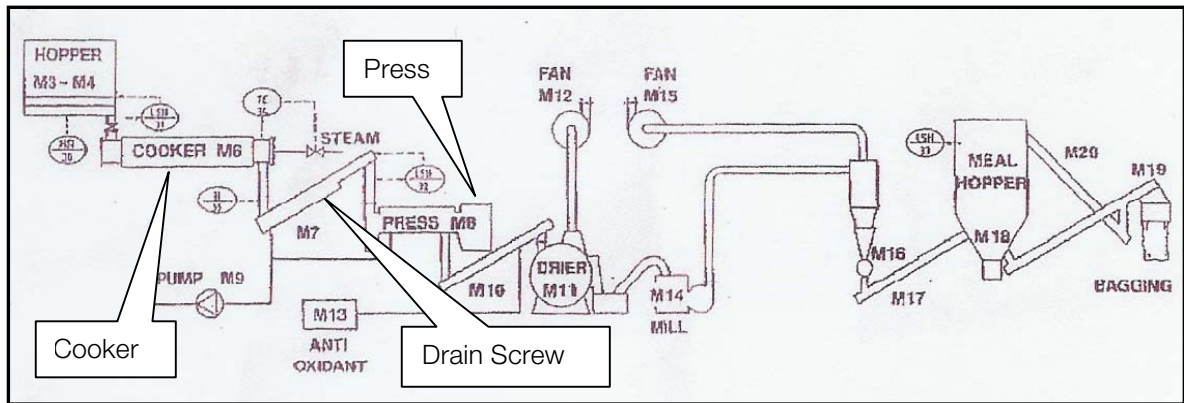
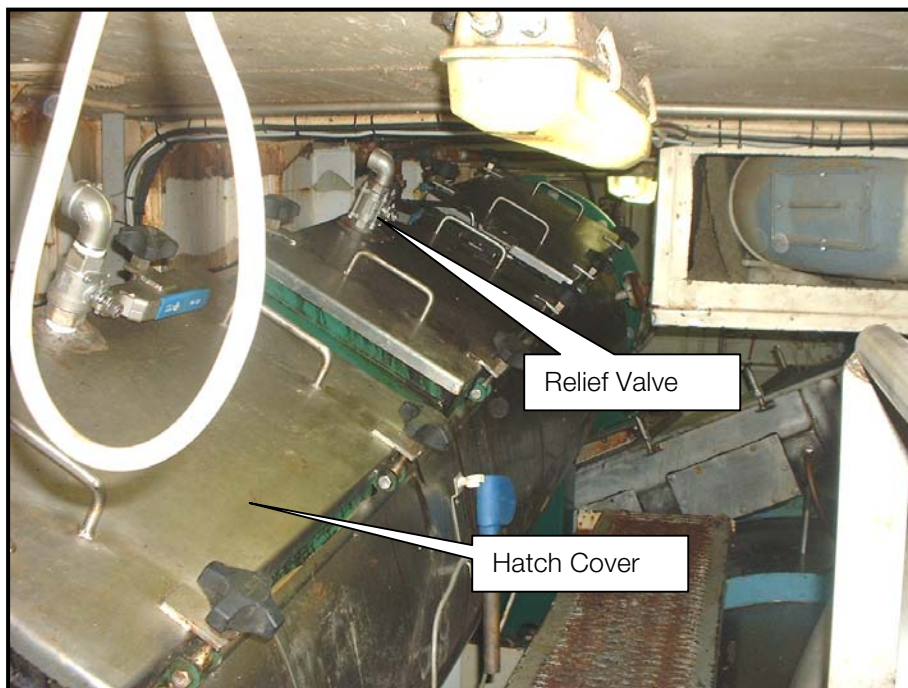


Diagram 5 – Stord Bartz Fish meal Plant



Photograph 3 – Cooker & Hatch Covers

Having been told by Crewmember 2 to call him if he had any problems he was unsure about, Crewmember 1 went to wake him.

After telling Crewmember 2 what had happened, Crewmember 2 got up and proceeded to the meal plant in a t-shirt, shorts and gumboots.

Both crewmembers checked that the supply of steam and power to the cooker had been isolated. Crewmember 2 asked Crewmember 1 if he had opened the inspection hatch at the top of the cooker. Due to language difficulties, the response of Crewmember 1 was not very clear but Crewmember 2 believed Crewmember 1 had released any build up of steam within the cooker after opening the hatch cover.

They found that the fish meal in the cooker had blocked the drain screw. Crewmember 2 deduced that the blockage had occurred after the drain screw had stopped rotating. The drain screw and other machinery in the factory deck and meal plant are driven by an hydraulic pump. Crewmember 2 believed this pump had stopped temporarily at some stage, thereby allowing a build up of fish meal in the cooker that, in turn, caused the blockage. The investigation was unable to determine the cause of this stoppage.

The Chief Engineer, however, did not hear the hydraulic pump stopping that night. He said there could have been a number of other reasons why the fish meal had blocked the drain screw, including incorrect machinery settings for the type of fish being processed, the consistency of the product (i.e. dry or oily), and foreign objects.

Crewmember 2 opened the side inspection plate (See *Diagram 3*) of the cooker and started to dig out the blockage of fish product, using a screwdriver.

After clearing the blockage, a quantity of steam that had built up within the cooker, suddenly vented from the drain screw opening. The steam struck Crewmember 2, who was unable to get clear in time, causing severe burns to his body.

Crewmember 1 immediately started hosing him down with a salt-water hose. Crewmember 2 was taken to the vessel's hospital and put in the shower. The ship's Medic and Master assessed and treated his burns and administered morphine.

The vessel turned and steamed towards Lyttelton, which was 54 nautical miles distant.

At about 1315 hours, the Westpac Rescue helicopter evacuated Crewmember 2 to Christchurch Public Hospital. He spent four days in hospital before being discharged. He has since recovered and is now back at work.

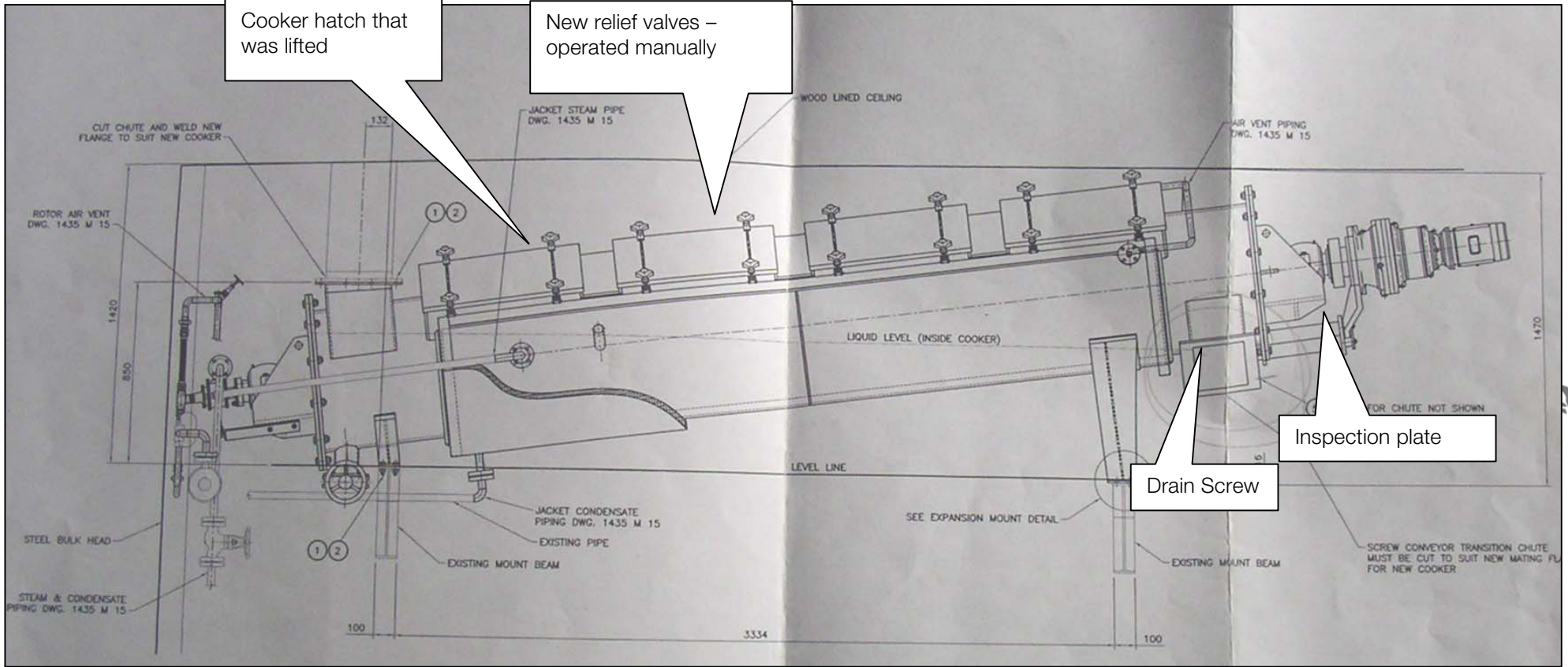


Diagram 3 – Fish Meal Plant Cooker

EVIDENCE

On 17 February 2004, two Accident Investigators from Maritime New Zealand attended ***Amaltal Enterprise*** at Dunedin.

The Skipper and Chief Engineer on board ***Amaltal Enterprise*** carried out an internal investigation into the accident and presented their findings to the Investigators.

It was concluded that: *“The build up of (steam) pressure was not released before he (Crewmember 2) started clearing the blockage; once he started removing the blockage he made no escape route for the pressure.”*

The Skipper, Chief Engineer and Crewmember 1 were interviewed and provided accounts of the accident. Copies of relevant ship’s documents, to include the Safe Ship Management Manual and Deck Log Book, were obtained.

Fishmeal Plant

On previous occasions where a build up of fish meal had occurred in way of the drain screw, the inspection plates were removed to release the fish meal from within the cooker. Crewmember 2 had seen only one blockage of the drain screw. That had been about two trips earlier. On that occasion, he had unblocked the drain screw, in the same manner as he did on the day of the accident, without incident. On this occasion the steam had been released via the hatch covers. A previous meal man had shown Crewmember 2 how to clear the blockage.

The Chief Engineer had never seen any other accidents caused by an escape of steam from the drain screw.

The steam that was trapped within the body of the cooker was caused as a result of condensation from the fish product during the cooking process.

Amaltal Fishing Company Limited

Amaltal employed Crewmembers 1 and 2.

Amaltal had a number of duties, as an employer under the **Health & Safety in Employment Act 1992 (HSEA)**. These were as follows:

Section 6 HSEA

This required Amaltal 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.

The cooker had not been identified as a hazard. There were no documented procedures for the safe operation of the cooker and no relief valves, to allow the release of any build of steam, had been fitted.

Section 7 HSEA

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

Risks arising as a result of blockages inside the cooker were not identified as a hazard. Moreover, the hazard identification sheets for the vessel were inadequate in that they were not vessel specific but were generic to all vessels in the fleet. The several areas of operation on board the vessel should have been broken down and systematically analysed for hazards and risks. The crew had not had any input into hazard identification or the production of a hazard register.

Sections 8, 9 &10 HSEA

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

As stated above, the operation of the cooker had not been identified as a hazard to enable these steps to be taken.

Section 13 HSEA

This required Amaltal to take all practicable steps to ensure that the ship's crew were adequately trained in the safe use of the plant, objects, substances and protective clothing and equipment that the employee is or may be required to use or handle.

At the time of the accident, the vessel had a documented system in place for recording the training of factory hands but there was no formal documented training for the operation of the fish meal plant. This has since been rectified by the company.

Factory hands were supervised during their on the job training by senior operators. Senior operators were also available to assist when required. The Chief Engineer made himself available to assist at any time.

Amaltal had provided Personal Protective Equipment (PPE), to include overalls and gumboots. Crewmember 2 was wearing gumboots after he was called from his bed to assist but he was not wearing any overalls. The Amaltal Introduction Booklet for crew, stated that PPE (gumboots and overalls) were mandatory when working on or in machinery spaces.

No full face mask or gloves had been provided by Amaltal at the time of the accident, to protect crew against steam burns. This has since been rectified by the company.

Injured Crewmember

Crewmember 2 sustained burns to his left hand and wrist, right hand and forearm, left knee, the right leg from the knee to calf muscle. There were also burns to his ankle and neck.

He took two months off work to recover and returned to work with Amaltal in April 2005.

Section 19 HSEA

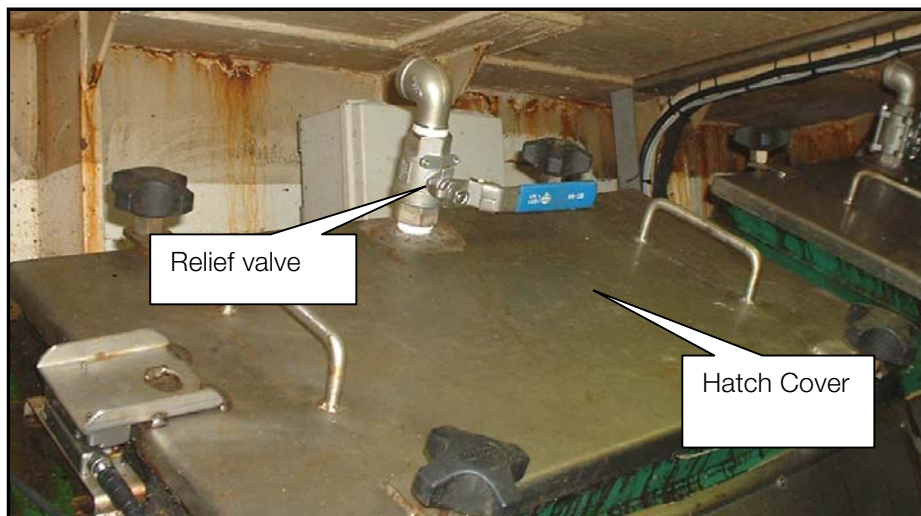
This required Crewmember 2, amongst other things, to take all practicable steps to ensure his own safety while at work, including the use of suitable protective clothing and suitable protective equipment provided by Amaltal.

If the overalls supplied by Amaltal had been worn by Crewmember 2, these may have helped to minimise the injuries caused by the steam.

Following the Accident, Amaltal Initiated the Following Measures:

Before taking any action, following a blockage in the cooker, meal men have been instructed by the company to firstly notify the Chief Engineer or Second Engineer. Further, that a full-face clear welding visor, along with full-length leather welding gloves must be worn when clearing any blockages.

Since the accident, two one-inch relief valves have been installed in way of the hatch covers to the cooker (See *Photograph 3*). These are located above the drain screw, where the pressure or steam tends to collect due to the raised angle of the cooker at this point (see *Diagram 3*). Hoses are attached to the relief valves to direct steam away from the crew. Meal men have been instructed to make sure the relief valves are opened manually, to ensure the release of any steam, before removing the inspection plates to the cooker.



Photograph 3 – Cooker & Relief Valve

Following the accident, a fish meal plant 'Safety Procedures Notice' was issued by the Chief Engineer and posted in the fish meal plant on the vessel (See *Figure 1*).

FISH MEAL PLANT SAFETY PROCEDURES

- 1. SAFETY EQUIPMENT MUST BE WORN AT ALL TIMES WHEN WORKING ON THE PLANT**
- 2. This includes Overalls, Gumboots And Hearing Protection.
] When Dealing With Blockages This Also INCLUDE'S Full Face Clear Visor, And Arm Length Leather Gloves.**
- 3. Any Breakdowns Mechanically Related Or Blockages The On Duty Chief or 2nd Engineer Must Be Contacted Immediately.**
- 4. The Operator Must Have A Clear Understanding Of How To Isolate The Steam And Electrics To The Plant.**
- 5. The Operator Must Have A Clear Knowledge Of How To Safely Release Any Pressure And Or Steam Build Up Through Correct Relieving Valves And Procedure**
- 5. The Operator MUST Have A Clear Understanding Of The Correct Order In Which To Open Hatches And Valves.**
- 6. The Operator Must Be Able To Identify All Valves And Which Ones To Use In Case Of An Emergency**
- 7. Two Persons must Be Present At All Times When Working On A blockage**
- 7. ALWAYS'S PRACTICE SAFETY FIRST**

Figure 1 – Fish Meal Plant Safety Procedures

CONCLUSIONS

N.B. These are not listed in order of importance

- The blockage of fishmeal product originated in the drain screw of the cooker.
- The exact cause of the blockage is unknown.
- Steam trapped within the cooker was caused by condensation from cooking the fish meal.
- Language difficulties between Crewmembers 1 and 2 led to a misunderstanding by the latter that Crewmember 1 had released all the steam when in fact, he had quickly replaced the cover as soon as he saw steam escaping.
- There was no formal documented training for the fish meal plant operators.
- The failure to wear personal protective equipment, which may have minimised the injuries sustained.
- The lack of a documented procedure for clearing blockages in the cooker.

Amaltal failed to take the following practicable steps:

- Ensure up to date vessel specific hazard identification
- To identify the operation of the cooker as a hazard in the event of a blockage
- The elimination, isolation or minimisation of hazards
- To provide documented safety procedures for the operation of the fish meal plant including how to clear blockages
- To provide gloves and a safety mask for work in the fish meal plant
- To provide formal training for the fish meal plant operators

SAFETY RECOMMENDATIONS

It is recommended that Amaltal:

1. Establish a regular internal auditing system and a periodic external auditing system for all vessels in the fleet to ensure effective compliance with their health and safety policy.
2. Critically investigate the installation of dead man alarms for solo manned machinery spaces and the use of emergency stops in strategic locations for specific machinery, where the potential for significant risks has been identified.
3. Establish and implement documented procedures to capture onboard departmental training for the operation and maintenance of the fish meal plant and other critical areas on the vessel.
3. Implement the Seafood Industry Training Organisation (SITO) unit standard assessment for fishmeal plant operators (*See Figure 2*).
4. Develop a robust documented hazard identification process for all vessels in the fleet. This to be vessel and area specific and formulated in conjunction with the vessels' crew and ship management.
5. It is further recommended that Maritime New Zealand in conjunction with Amaltal, the fishing industry and FishSAFE work together to ensure future compliance with health and safety requirements within the industry.

On 11 August 2005, after this report was drafted, an Improvement Notice was served upon Amaltal Fishing Company by Maritime New Zealand, setting out the requirement for them to create a hazard register for each vessel in their fleet that is specific to that vessel. Each register to have a provision to be updated when new hazards are systematically identified or reassessed.

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 2 – Unit Standard for the Operation of the Fish Meal Plant