



State of Washington Department of Ecology
Cruise Ship Memorandum of Understanding, Cruise Operations in Washington State Inspection Report

Northwest Regional Office
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 Bellevue, WA 98008
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Inspection Date 08/14/2011	Permit Number NA	County King	Receiving Waters Marine Waters	Ecology Inspector Amy Jankowiak
Entry Time 8:58 am Exit Time 11:38 am	Photos Taken <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Samples Taken <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Inspection Announced <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Discharges to: <input checked="" type="checkbox"/> Surface Water <input type="checkbox"/> Ground Water <input type="checkbox"/> Dewater <input type="checkbox"/> POTW
Name and Location of Site Inspected: OOSTERDAM, Holland America Line Pier 91 Seattle, Washington				Additional Participants/Inspectors: Doug Weeks, HAL
On-Site Representative(s): <i>Name/Title/Phone/e-mail</i> Norman McKay, Safety Environmental Health Officer				
Responsible Official(s): <i>Name/Title/Address/Phone/e-mail</i> William J. Morani Jr., Vice President – Environmental Management Systems Holland America Line 300 Elliott Ave. West, Seattle WA 98119 206-281-3535; WMorani@HollandAmerica.com				Other Facility Data: Notification made to Jon Turvey, HAL on August 11, 2011

Section A: Areas Evaluated

<input checked="" type="checkbox"/> Black/Gray Wastewater System	<input checked="" type="checkbox"/> Residual Solids	<input checked="" type="checkbox"/> Records/Reports	<input checked="" type="checkbox"/> Hazardous Waste/Solid Waste	<input checked="" type="checkbox"/> Sampling/Monitoring
<input checked="" type="checkbox"/> Discharge Locations	<input checked="" type="checkbox"/> Operation & Maintenance	<input checked="" type="checkbox"/> Sludge Handling/Disposal	<input checked="" type="checkbox"/> Oily Bilge Water	<input type="checkbox"/> Other

Section B: For Vessels Discharging ≥ 1nm from Berth and ≥ 6 Knots Only [2.1.3(A)]

<input type="checkbox"/> Schematics Match Black/Gray Wastewater System	
<input type="checkbox"/> Operations as Described in Submitted Documentation	
<input type="checkbox"/> Daily 24-hour Continuous Monitoring for Turbidity or Equivalent Monitoring	
<input type="checkbox"/> Turbidimeter or Equivalent Monitoring Equipment Functioning Properly	
<input type="checkbox"/> Auto Shut Down or Operational Controls to Insure System Shut Down if High Turbidity Occurs	
<u>Turbidity or Equivalent:</u> Last Calibration: Trigger Level for Early Alarm: Trigger Level for Shutdown: Recorded Turbidity/Equivalent Levels Above Triggers:	
<input type="checkbox"/> Daily 24-hour Continuous Monitoring for Disinfection Effectiveness	
<input type="checkbox"/> Disinfection Effectiveness Monitoring Equipment Functioning Properly	
<u>Disinfection Effectiveness Monitoring:</u>	
<input type="checkbox"/> Auto Shut Down or Operational Controls to Insure System Shut Down if Disinfection System Upset Occurs	
<input type="checkbox"/> Disinfection System Operated and Maintained Properly	
Disinfection System:	

NOT APPLICABLE

Section C: For Vessels Discharging Continuously [2.1.3(B)]

<input type="checkbox"/>	Schematics Match Black/Gray Wastewater System	
<input type="checkbox"/>	Operations as Described in Submitted Documentation	
<input type="checkbox"/>	Daily 24-hour Continuous Monitoring for Turbidity or Equivalent Monitoring	
<input type="checkbox"/>	Turbidimeter or Equivalent Monitoring Equipment Functioning Properly	
<input type="checkbox"/>	Auto Shut Down or Operational Controls to Insure System Shut Down if High Turbidity Occurs	
	<p>Turbidity or Equivalent:</p> <p>Last Calibration:</p> <p>Trigger Level for Early Alarm:</p> <p>Trigger Level for Shutdown:</p> <p>Recorded Turbidity/Equivalent Levels Above Triggers:</p>	
<input type="checkbox"/>	Daily 24-hour Continuous Monitoring for Disinfection Effectiveness	
<input type="checkbox"/>	Disinfection Effectiveness Monitoring Equipment Functioning Properly	
	Disinfection Effectiveness Monitoring:	
<input type="checkbox"/>	Auto Shut Down or Operational Controls to Insure System Shut Down if Disinfection System Upset Occurs	
<input type="checkbox"/>	Disinfection System Operated and Maintained Properly	
	Disinfection System:	

Section D: General (Approved to Discharge)

<input type="checkbox"/>	No Discharges Within 1/2 Miles From Shellfish Beds/ Protocol (President's Point, Apple Tree Cove, Tyea Shoal, Middle Point (near Pt Townsend))	
<input type="checkbox"/>	Discharges Immediately Stopped When High Turbidity Occurs	
<input type="checkbox"/>	Discharges Immediately Stopped When Disinfection System Upset Occurs	
<input type="checkbox"/>	Immediate Notifications Made to WA Department of Health for Disinfection System Upset	
<input type="checkbox"/>	Sampling Conducted 2/month, 1/month in Seattle (BOD, TSS, Fecal Coliform, pH, Chlorine Residual)	
<input type="checkbox"/>	Whole Effluent Toxicity Testing 1 per 2 Years (homeported) or 1/40 Calls for Continuous	

Section E: General

<input checked="" type="checkbox"/>	Wastewater Discharge Records Review	Discharge records were reviewed (blackwater/graywater/residual solids) and are maintained properly. No discharges in MOU waters were present from the beginning of the 2011 cruise season to present.
<input checked="" type="checkbox"/>	Wastewater Discharges protocol per MOU and managed properly	The discharge protocol for wastewater is to not discharge in MOU waters, consistent with MOU requirements. Protocols for discharge include clear communications with the bridge on locations.
<input checked="" type="checkbox"/>	Residual Solids Managed Properly/Disposal Protocol per MOU	AWTS screenings from are incinerated. Sewage sludge/biomass from the AWTS is discharged outside of MOU waters, outside the OCNMS and >12 nm from shore.
<input checked="" type="checkbox"/>	Hazardous Waste Managed Properly	All hazardous waste that is collected is being sent off-shore in Victoria, Canada.
<input checked="" type="checkbox"/>	WA Hazardous Waste Guidelines Followed (Appendix vii)	All hazardous waste that is collected is being sent off-shore in Victoria, Canada.
<input checked="" type="checkbox"/>	Solid Waste Managed Properly (zero garbage discharge)	Solid waste is managed properly. The various solid waste streams are collected, sorted, stored, and sent ashore or incinerated as appropriate. The garbage record book was reviewed and showed

	consistency with requirements.
<input checked="" type="checkbox"/> Photo/X-Ray Waste Managed Properly (fluids, cartridges,...) and landed ashore	Waste from the photo processing goes through a silver recovery system prior to offload with hazardous waste materials. X-rays are done digitally.
<input checked="" type="checkbox"/> Dry-Cleaning Wastes and Byproducts (fluids, sludge, filter materials...) Managed Properly (PERC – haz waste – landed ashore)	Dry cleaning is done with a citrus/oil based wet-cleaning system, eliminating PERC type chemical byproducts.
<input checked="" type="checkbox"/> Unused/Outdated Pharmaceuticals Managed Properly (safely disposed of)	Expired and unused medications are either incinerated or off-loaded as appropriate. Narcotics are incinerated with witness.
<input checked="" type="checkbox"/> Fluorescent and Mercury Vapor Lamp Bulbs Managed Properly (prevent release of mercury)	Lamps are sorted, boxed and offloaded. A bulb crusher is on board and is sometimes used. The filter is landed ashore as hazardous waste.
<input checked="" type="checkbox"/> Waste Reduction/Reuse/Recycling Opportunities Maximized (glass, cardboard, aluminum & steel cans)	Glass, aluminum, tin, scrap metal, some plastics, some paper and cardboard, used cooking oil and other materials are recycled. Reduction and reuse opportunities are broadly used to prevent the amount of waste.
<input checked="" type="checkbox"/> Batteries Managed Properly (recycled, reclaimed, disposed of properly)	Batteries are collected, sorted and binned to be offloaded in Victoria for recycling or disposal as appropriate.
<input checked="" type="checkbox"/> Incinerator Ash Managed Properly and minimized volume (haz waste segregation and annual testing)	Incinerator ash is offloaded in Victoria and tested annually. Results have passed. Incinerators are not to be used while in waters contiguous with King/Snohomish/Pierce and Kitsap counties per protocol.
<input checked="" type="checkbox"/> Oily Bilge Water Managed Properly (<15 ppm, no visible sheen and underway)	Oily bilge is treated and with a FACET (down to 50ppm oil content) and SERAP (down to 15ppm) two-part oily water separator. Discharges occur at less than 15 ppm and outside of MOU waters. A white box is used to prevent discharges of more than 15 ppm. Oily sludge is drummed and offloaded for proper disposal.
<input checked="" type="checkbox"/> Ballast Water Managed Properly (per Wash regs – reporting, treated or if open sea exchange >200 nm from outside EEZ, 50nm if not EEZ)	Ballast exchanges occur outside 250nm.
<input checked="" type="checkbox"/> OCNMS rules and regs followed	No discharges occur in OCNMS waters per protocol and records review showed consistency.
Additional General Questions	
<input checked="" type="checkbox"/> How is deck runoff and hull cleaning handled (scuppers...) (non-toxic/phosphate free cleaners, biodegradable)	Hull cleaning is done with phosphate free cleaners and fresh water. Deck runoff goes to the scuppers.
<input checked="" type="checkbox"/> How is maintenance performed on the outside of the vessel (paint chipping, painting, etc)	Paint chipping and painting is done per written protocol using appropriate BMPs such as tarping and containment, use of small amounts of paint and proper handling of brushes and rollers and using a spill kit and painting in less than 10 knots.
<input checked="" type="checkbox"/> Sculleries and Galleys – type of detergents and degreasers used (phosphate free and non-toxic)?	Phosphate free, non-toxic cleaners are used in the galleys.
<input checked="" type="checkbox"/> How are food waste discharges handled (prevention of erroneous materials)?	Food waste is sorted prior to going into the pulpers. Solid food waste is discharged outside of MOU waters after pulping.
<input checked="" type="checkbox"/> Medical sinks/floor drains, chem. stor areas wastes go where (plugged, blackwater, bilge)?	Medical floor drains go to the blackwater tanks and then to the Rochem system.
<input checked="" type="checkbox"/> Where is pool and spa water discharged? Dechlorinated/debrominated and underway?	Pool and spa water is sent to the graywater tanks and then discharged outside of MOU waters.
<input checked="" type="checkbox"/> What type of fuel is used and percent sulfur content?	Shore power is used while in Port. MGO of <1.5% or Intermediate of <2% is used.
Other:	

Section F: Sampling Results

Parameter	Results
Biochemical Oxygen Demand 5-Day (BOD ₅)	NA
Total Suspended Solids (TSS)	NA
Fecal Coliform	NA
Residual Chlorine	NA
pH	NA
Ammonia, Nitrogen	NA

Section G: Summary of Findings/Comments

Introduction

Amy Jankowiak, Washington State Department of Ecology (Ecology) Northwest Regional Office, Water Quality Program (NWRO-WQ) conducted the inspection of the Holland America Line (HAL) OOSTERDAM on August 14, 2011. The main contact on board the OOSTERDAM was Norman McKay, Safety Environmental Health Officer for the OOSTERDAM. Doug Weeks, HAL headquarters Environmental Compliance Program was also part of the inspection. Prior notification of the visit was given on August 11, 2011 for security protocol. The purpose of the inspection was to evaluate compliance with the *Memorandum of Understanding Cruise Operations in Washington State (MOU)*, as amended. The OOSTERDAM is not approved to discharge in MOU waters. The vessel has not been discharging and is holding effluent until outside MOU waters.

The OOSTERDAM was built in 2002 and dedicated in 2003, and is 936 feet long with a width of 106 feet and a maximum draft of 26 feet. The passenger capacity is 1916 and the crew capacity is 817. The ship's wastewater system, Rochem, was installed in 2002. The vessel is powered with on-shore power during port calls in Seattle.

The OOSTERDAM is scheduled for 21 port calls in Seattle and conducts one week cruises to Alaska turning around on Sundays between May 8, 2011 and September 25, 2011.

Inspection

I arrived and boarded the ship (photo #01) at about 8:58 am and began with introductions and a plan for the day with Norman McKay, the Safety, Health and Environmental Officer and Doug Weeks, HAL headquarters Environmental Compliance Program. We discussed various waste streams and discharge protocols. We then reviewed the various discharge and environmental records. We then toured the garbage and recycling area, the hazardous waste storage, and food waste management. Next, we viewed the fuel bunkering operations (photos #02, #12 and #14) and the materials outside vessel maintenance. We then viewed the blackwater and graywater Rochem treatment system and the oily water separator system and white box. The inspection was then finalized with a debriefing and we disembarked the vessel at about 11:38 am.

Discharge Types and Protocols:

If the vessel is in an area where a discharge is allowed, the engineer for the Engine Control Room (ECR) asks the Bridge permission to discharge. The Bridge uses a matrix showing what type of discharges is allowed where and checks the navigational position. The bridge okays the discharge and gives the position to the Engineer and it is repeated and logged in both the Bridge and the ECR. The logs are checked for consistency and the discharge port open and close are recorded electronically. The ports are also locked when not approved to be discharging. All discharges to water occur at greater than 12 nautical miles, outside the MOU waters and outside of the Olympic Coast National Marine Sanctuary. Contact numbers are available in the event of an unauthorized discharge. There is also an overboard valve monitoring system on the bridge with four lights:

- >12 nm
- > 4 nm, <12 nm
- <4 nm
- Special Areas (this one was lit at the time of inspection).

For blackwater and graywater, the latitude and longitude coordinates are recorded in the *Sewage and Graywater Discharge Record Book* and in the deck log. The date, time and location of both the start and the stop of the discharges are recorded, along with port location, effluent type, and volumes. All wastewater discharge records that were reviewed appeared to be in compliance with the MOU and also did not occur in MOU waters.

The advanced wastewater treatment system (AWTS) is a Rochem (photo #24) bio-ultrafiltration system. Currently, all

black water and some graywater is treated by this system. The remaining graywater is collected and held for discharge in an allowed location. The vessel does have a Rochem low pressure reverse osmosis system for graywater installed; however, the system is currently not operational and is not used. The vessel is not approved to discharge in MOU water and holds all discharges of blackwater and graywater while in MOU waters. No discharges occur in the Olympic Coast National Marine Sanctuary. Medical floor drains are plugged.

Screenings and grit from the Rochem system are collected and incinerated. The solids separated out by the system is discharged outside of MOU waters, >12 nautical miles from shore, and outside of the Olympic Coast National Marine Sanctuary.

Oily bilge is treated and with a FACET (down to 50ppm oil content) and SERAP (down to 15ppm) two-part oily water separator (photo #27). Discharges occur at less than 15 ppm and outside of MOU waters. A white box (photo #28) is used to prevent discharges (photo #29) of more than 15 ppm. Oily sludge is drummed and offloaded for proper disposal.

Ballast exchanges occur outside 250nm.

Potable water is either bunkered (photo #13) or is produced by desalinization.

Pool and spa water is sent to the graywater tanks and then discharged outside of MOU waters.

Food waste is sorted (photos #06 and #07) prior to going into the pulpers (photo #08). Solid food waste is discharged outside of MOU waters after pulping (photo #09). Records reviewed were consistent with this protocol. Galleys use phosphate free and non-toxic cleaners.

Hull cleaning is done with phosphate free cleaners and fresh water. Deck runoff goes to the scuppers. Paint chipping and painting is done per written protocol using appropriate BMPs such as tarping and containment (photos #19 and #20), use of small amounts of paint and proper handling of brushes and rollers and using a spill kit and painting in less than 10 knots. Paint materials are stored to prevent spillage (photos #17 and #18).

Dry cleaning is done with a citrus/oil based wet-cleaning system, eliminating PERC type chemical byproducts. Waste from the photo processing goes through a silver recovery system prior to offload with hazardous waste materials. X-rays are done digitally.

Hazardous waste materials (photo #03) include oily rags, used cartridges and filters, paints, batteries (some are reused or recycled), sludge oil, aerosols (punctured) (photo #10), and sharps. Depending on where materials are offloaded, some materials are considered universal waste. All hazardous waste is off-loaded in Victoria. Fluorescent lamps are sorted, boxed and offloaded. A bulb crusher is on board and is sometimes used. The filter is landed ashore as hazardous waste.

Expired and unused medications are either incinerated or off-loaded as appropriate. Narcotics are incinerated with witness.

The various solid waste streams (garbage, recyclables, etc) are collected (photo #04), sorted (photo #05), stored, and sent ashore or incinerated as appropriate. The garbage record book was reviewed and showed consistency with requirements.

Glass, aluminum, tin, scrap metal, some plastics, some paper and cardboard and used cooking oil (photo #11) are recycled. Reduction and reuse opportunities are broadly used to prevent the amount of waste. Waste reduction and management has been tracked and posted to monitor and incentivize reduction opportunities. When tracking was pulled back, reduction rates dropped, and when tracking was fully resumed, reduction rates increased again.

Incinerator ash is offloaded in Victoria and tested annually. Results have passed. Incinerators are not to be used while in waters contiguous with King/Snohomish/Pierce and Kitsap counties per protocol.

Shore power (photos #15 and #16) is used while in Port. MGO of <1.5% or Intermediate of <2% is used.

Rochem Advanced Wastewater System:

Blackwater and some graywater is collected into tanks (photo #21) and then flow is sent to prefiltration through the SWECO system. Screenings are filtered out and sent to incineration. The SWECO system vibrates out the solids to the solids tank where it combines with solids from the bioreactors and is sent to another tank for holding and discharge outside of MOU waters. Filtrate from the SWECO is collected to a tank and then sent (photos #22 and #23) to the bioreactors.

The biological activity takes place in the bioreactors (photo #25). Solids in the bioreactors are returned back to the beginning of the bioreactors to enhance activity. A minimal amount of solids are periodically wasted to the solids tanks. Total Suspended Solids (TSS) are monitored continuously at the bioreactors. From the bioreactors, flow goes through the membranes for ultrafiltration (UF). Turbidity is also monitored continuously after the permeate. Effluent or permeate (photo #26) from the UF's are sent to the permeate tanks. All three lines then combine at one ultraviolet light disinfection system. The UV system consists of 8 lights and a control board has a lighted alarm if any of the bulbs are out. Spare bulbs are available on board. From the UV, the flow can either go straight overboard, or it can go to storage tanks for discharge at an allowed location. The Rochem system is currently not discharging in MOU waters.

Conclusions and Recommendations

It is recommended that staff continue to work towards high functioning wastewater treatment systems for all of the wastewater flow. The staff on board the vessel were very knowledgeable of the systems and protocols.

Attachments:
Photographs

Copies to:

- Norman McKay, SEH OOSTERDAM
- Doug Weeks, HAL
- Jon Turvey, HAL
- William Morani, Jr., HAL
- Bob Diaz, HAL
- Mark Toy, Department of Health
- Greg Wirtz, NWCCA
- Stephanie Jones Stebbins, Port of Seattle
- Kevin Fitzpatrick, Ecology
- Mark Henley, Ecology
- Amy Jankowiak, Ecology

Central Files: Holland America Line - OOSTERDAM; WQ 6.1

Section H: Signatures

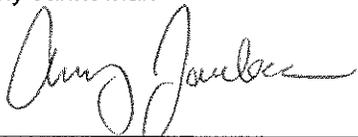
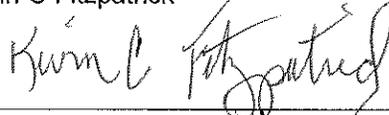
<u>Name and Signature of Inspector:</u>	<u>Agency/Office/Telephone:</u>	<u>Date</u>
Amy Jankowiak 	Department of Ecology Northwest Regional Office Water Quality Program Municipal Compliance Specialist 425-649-7195	9/22/11
<u>Name and Signature of Reviewer:</u>	<u>Agency/Office/Telephone:</u>	<u>Date</u>
Kevin C Fitzpatrick 	Department of Ecology Northwest Regional Office Water Quality Section Manager 425-649-7033	9/22/11



PHOTO #:01 DATE: AUGUST 14, 2011
TAKEN BY: AMY JANKOWIAK FILE No.: P8140044
DESCRIPTION: OOSTERDAM VESSEL

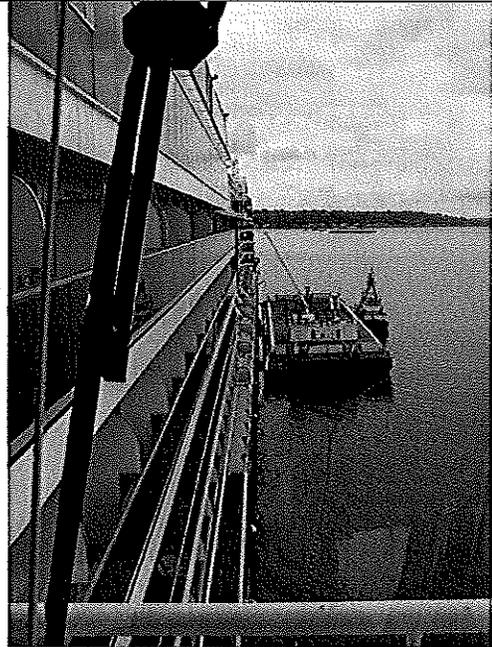


PHOTO #:02 DATE: AUGUST 14, 2011
TAKEN BY: AMY JANKOWIAK FILE No.: P8140013
DESCRIPTION: BUNKERING FUEL

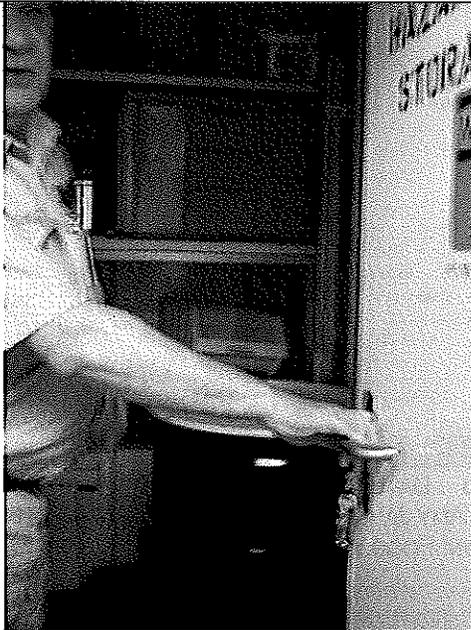


PHOTO #:03 DATE: AUGUST 14, 2011
TAKEN BY: AMY JANKOWIAK FILE No.: P8140014
DESCRIPTION: HAZARDOUS WASTE STORAGE ROOM

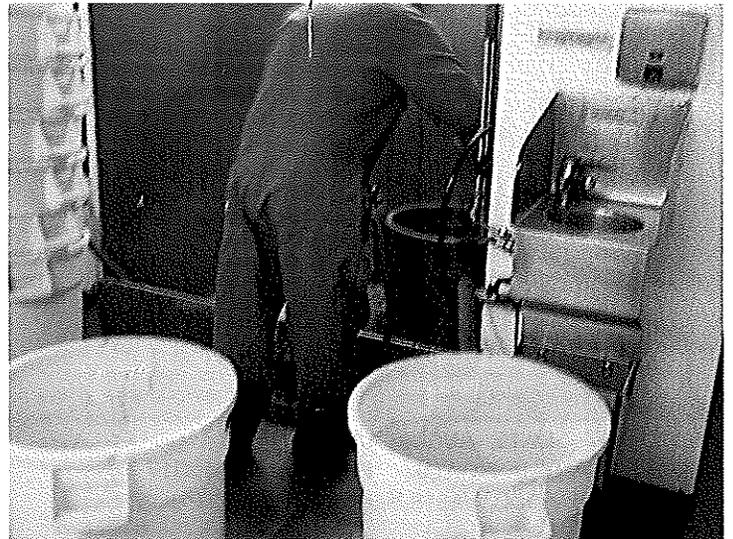


PHOTO #:04 DATE: AUGUST 14, 2011
TAKEN BY: AMY JANKOWIAK FILE No.: P8140015
DESCRIPTION: GARBAGE ROOM – CLEANING CANS

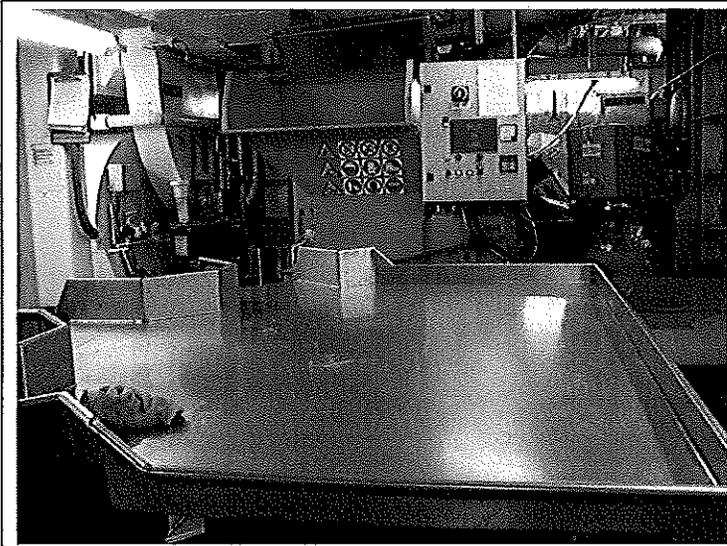


PHOTO #:05 DATE: AUGUST 14, 2011
TAKEN BY: AMY JANKOWIAK FILE No.: P8140018
DESCRIPTION: GARBAGE/RECYCLING SORTING AREA

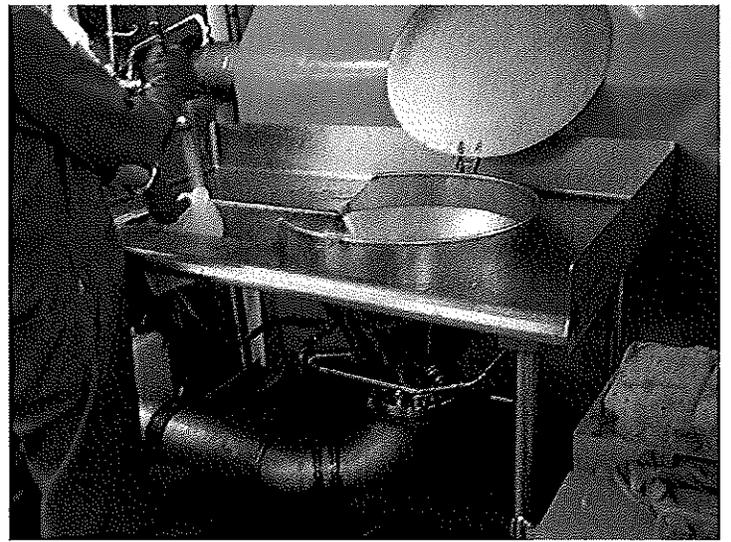


PHOTO #:06 DATE: AUGUST 14, 2011
TAKEN BY: AMY JANKOWIAK FILE No.: P8140016
DESCRIPTION: FOOD WASTE SEPARATION – TO PULPER

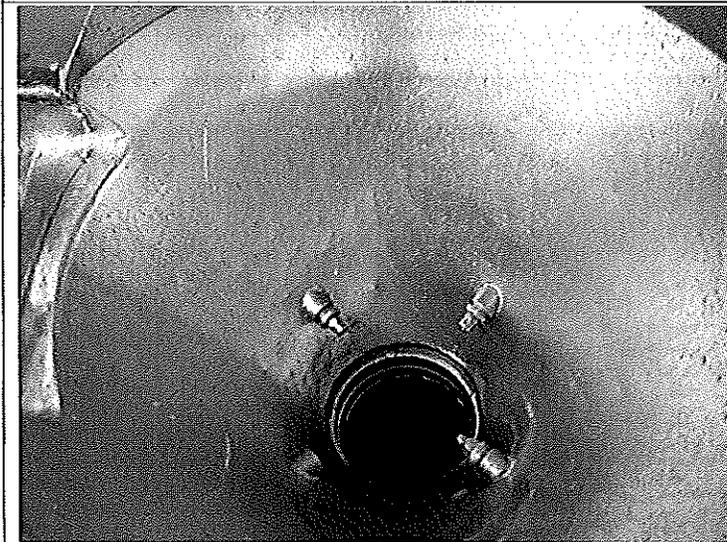


PHOTO #:07 DATE: AUGUST 14, 2011
TAKEN BY: AMY JANKOWIAK FILE No.: P8140017
DESCRIPTION: FOOD WASTE SEPARATION – TO PULPER

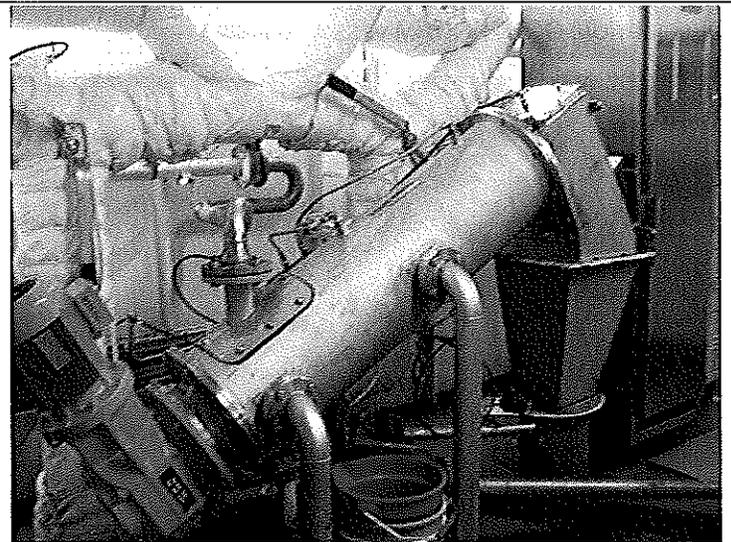


PHOTO #:08 DATE: AUGUST 14, 2011
TAKEN BY: AMY JANKOWIAK FILE No.: P8140021
DESCRIPTION: FOOD WASTE PULPER



PHOTO #:09 DATE: AUGUST 14, 2011
TAKEN BY: AMY JANKOWIAK FILE No.:P8140023
DESCRIPTION: FOOD WASTE PULPER – TOP VIEW

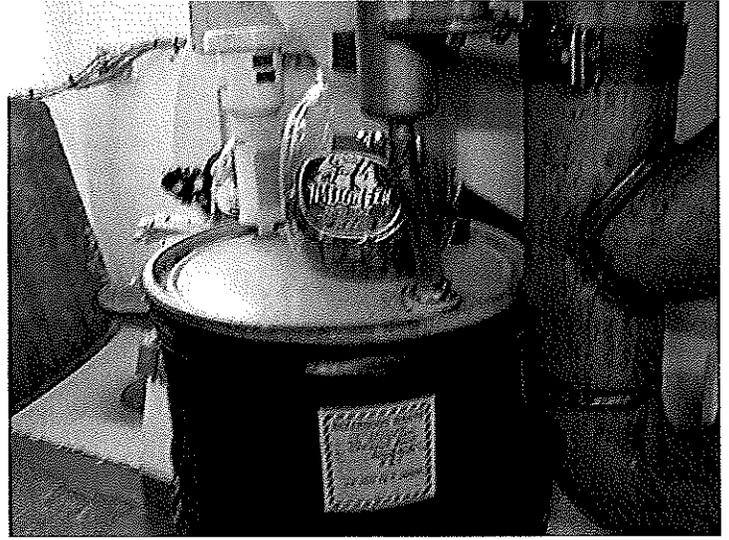


PHOTO #:10 DATE: AUGUST 14, 2011
TAKEN BY: AMY JANKOWIAK FILE No.: P8140019
DESCRIPTION: AEROSOL CAN REMOVAL SYSTEM - RECYCLE

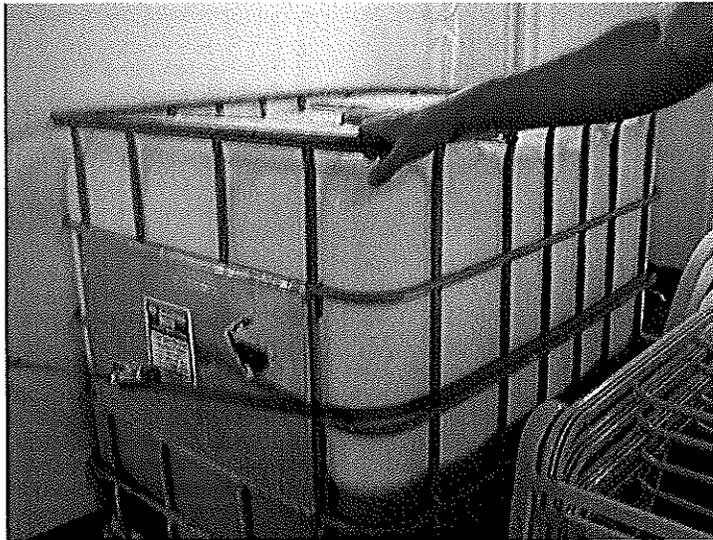


PHOTO #:11 DATE: AUGUST 14, 2011
TAKEN BY: AMY JANKOWIAK FILE No.: P8140024
DESCRIPTION: USED COOKING OIL - RECYCLE



PHOTO #:12 DATE: AUGUST 14, 2011
TAKEN BY: AMY JANKOWIAK FILE No.: P8140025
DESCRIPTION: BUNKERING FUEL



PHOTO #:13 DATE: AUGUST 14, 2011
TAKEN BY: AMY JANKOWIAK FILE No.:P8140026
DESCRIPTION: POTABLE WATER BUNKERING STATION

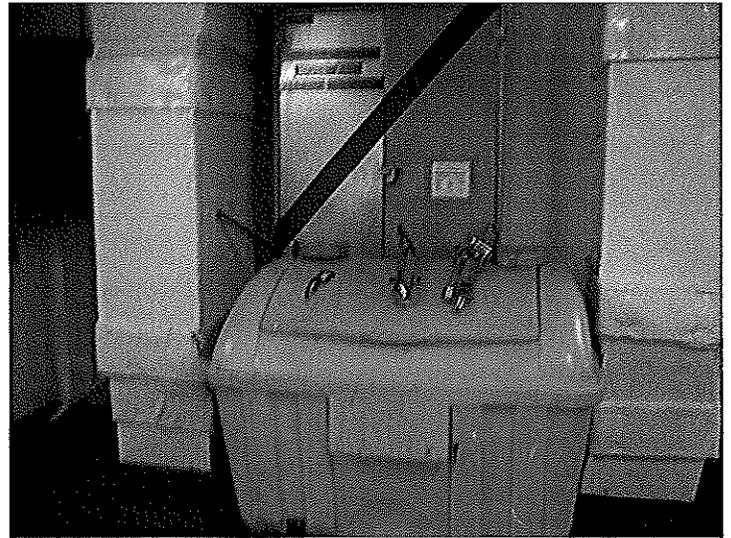


PHOTO #:14 DATE: AUGUST 14, 2011
TAKEN BY: AMY JANKOWIAK FILE No.: P8140027
DESCRIPTION: BUNKERING SPILL KIT

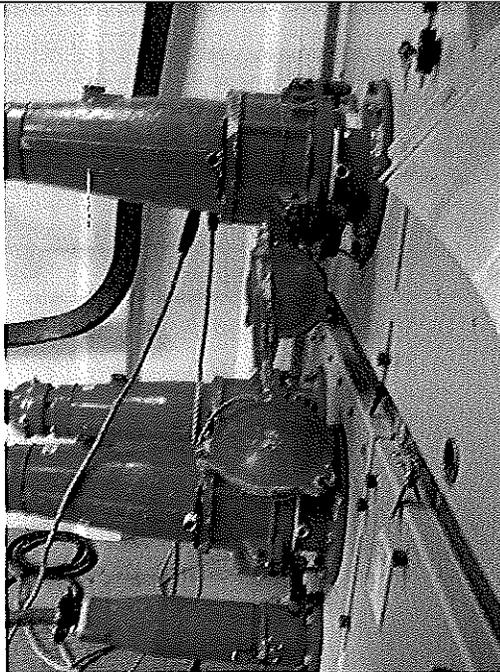


PHOTO #:15 DATE: AUGUST 14, 2011
TAKEN BY: AMY JANKOWIAK FILE No.: P8140028
DESCRIPTION: SHORE POWER CONNECTIONS

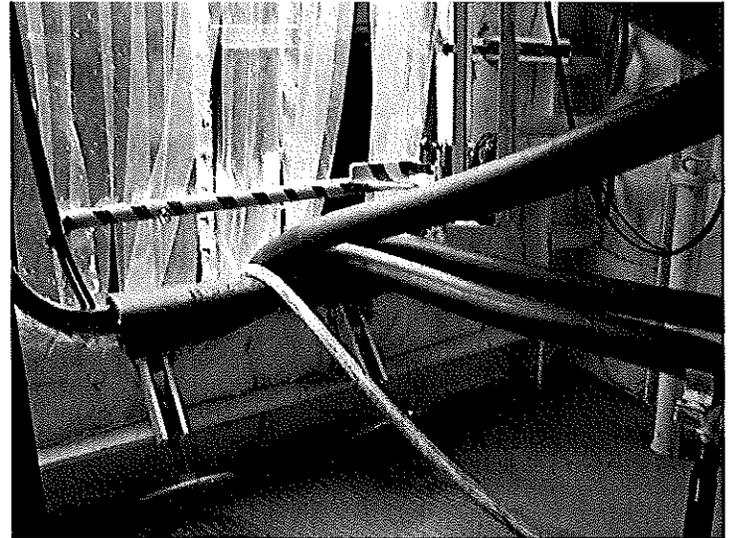


PHOTO #:16 DATE: AUGUST 14, 2011
TAKEN BY: AMY JANKOWIAK FILE No.: P8140029
DESCRIPTION: SHORE POWER CONNECTIONS



PHOTO #:17 DATE: AUGUST 14, 2011
TAKEN BY: AMY JANKOWIAK FILE No.:P8140030
DESCRIPTION: PAINT ROOM STORAGE

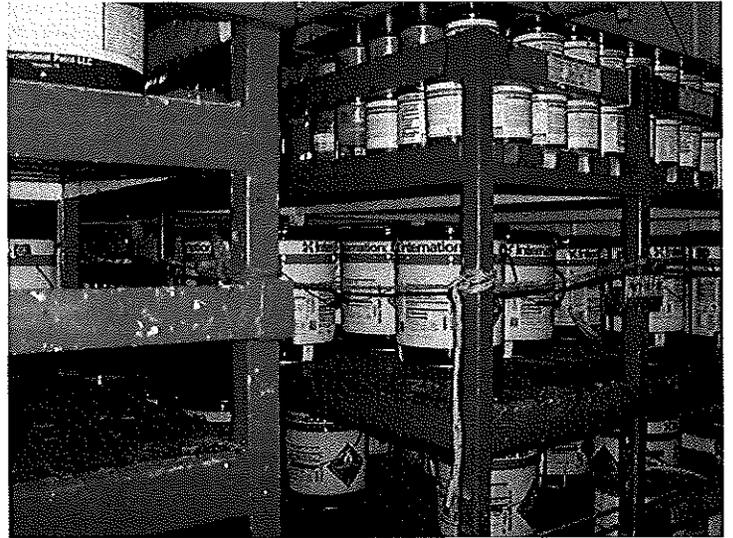


PHOTO #:18 DATE: AUGUST 14, 2011
TAKEN BY: AMY JANKOWIAK FILE No.: P8140032
DESCRIPTION: PAINT ROOM STORAGE

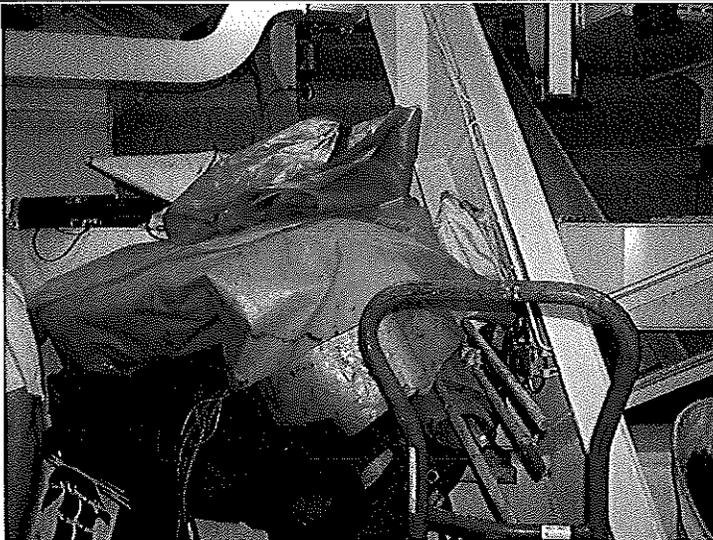


PHOTO #:19 DATE: AUGUST 14, 2011
TAKEN BY: AMY JANKOWIAK FILE No.: P8140033
DESCRIPTION: TARPS FOR OUTSIDE VESSEL PAINTING



PHOTO #:20 DATE: AUGUST 14, 2011
TAKEN BY: AMY JANKOWIAK FILE No.: P8140034
DESCRIPTION: TARPS FOR OUTSIDE VESSEL PAINTING



PHOTO #:21 DATE: AUGUST 14, 2011
TAKEN BY: AMY JANKOWIAK FILE No.:P8140035
DESCRIPTION: BLACK WATER COLLECTION TANK

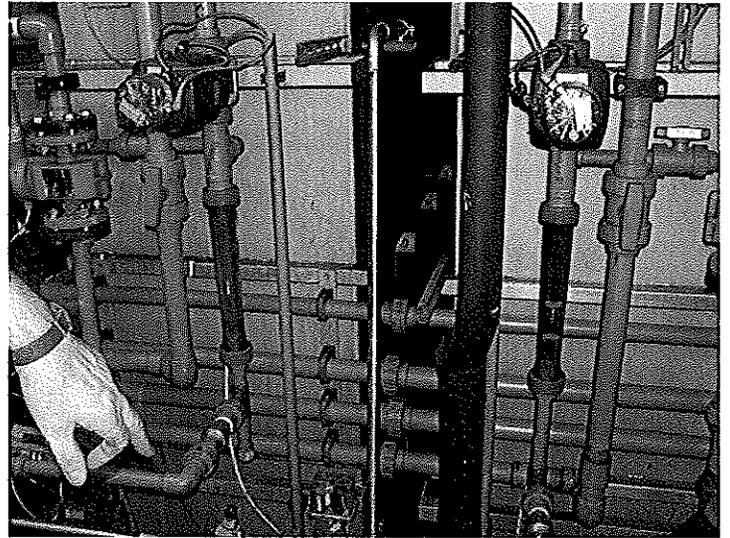


PHOTO #:22 DATE: AUGUST 14, 2011
TAKEN BY: AMY JANKOWIAK FILE No.: P8140036
DESCRIPTION: BLACKWATER ROCHEM SYSTEM

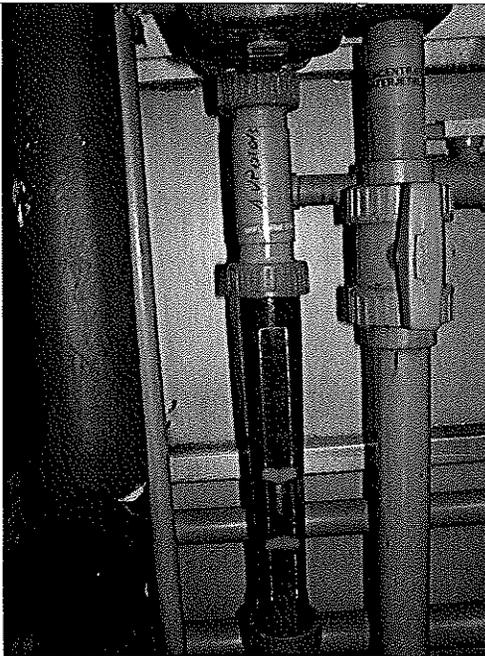


PHOTO #:23 DATE: AUGUST 14, 2011
TAKEN BY: AMY JANKOWIAK FILE No.: P8140037
DESCRIPTION: ROCHEM BLACKWATER

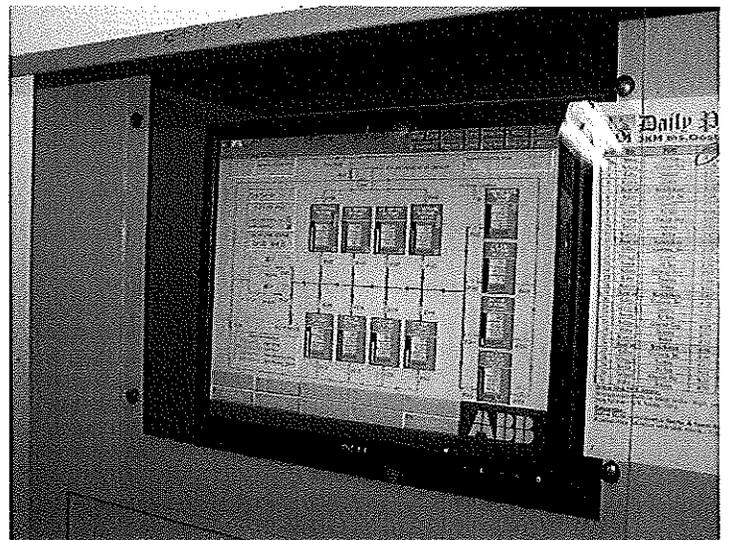


PHOTO #:24 DATE: AUGUST 14, 2011
TAKEN BY: AMY JANKOWIAK FILE No.: P8140038
DESCRIPTION: ROCHEM SYSTEM OPERATIONS

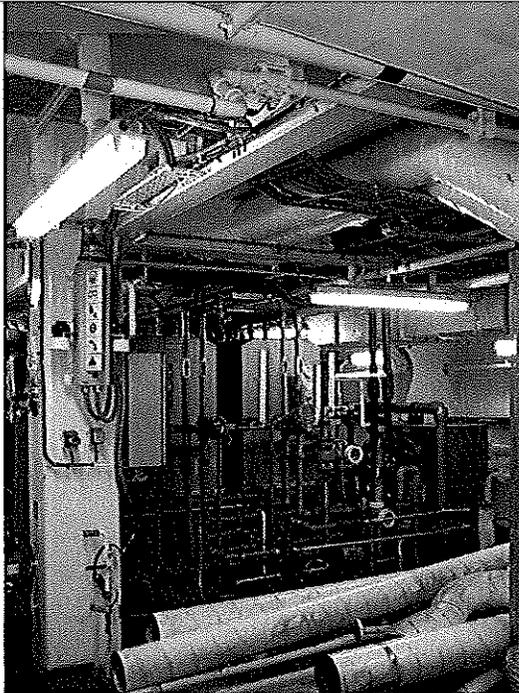


PHOTO #:25 DATE: AUGUST 14, 2011
TAKEN BY: AMY JANKOWIAK FILE No.:P8140039
DESCRIPTION: ROCHEM MBR TANKS

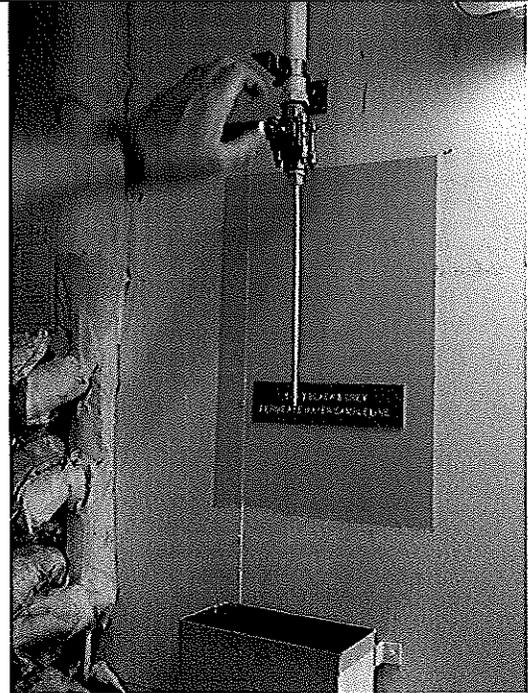


PHOTO #:26 DATE: AUGUST 14, 2011
TAKEN BY: AMY JANKOWIAK FILE No.: P8140040
DESCRIPTION: SAMPLE PORT FOR ROCHEM PERMEATE

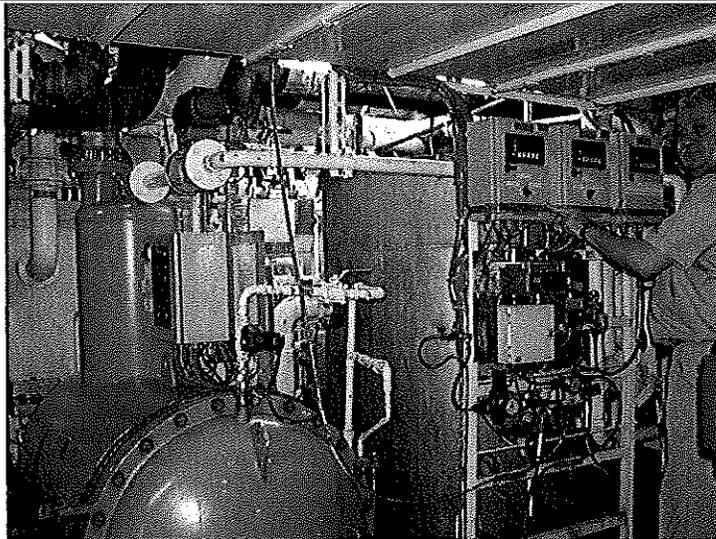


PHOTO #:27 DATE: AUGUST 14, 2011
TAKEN BY: AMY JANKOWIAK FILE No.: P8140041
DESCRIPTION: OILY WATER SEPARATOR SYSTEMS (FACET AND SERAP)

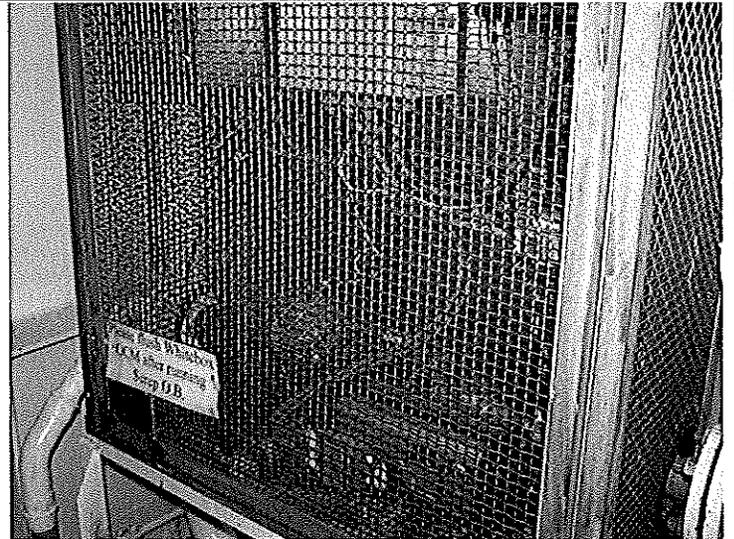


PHOTO #:28 DATE: AUGUST 14, 2011
TAKEN BY: AMY JANKOWIAK FILE No.: P8140042
DESCRIPTION: OILY BILGE WHITE BOX



PHOTO #:29 DATE: AUGUST 14, 2011
TAKEN BY: AMY JANKOWIAK FILE No.:P8140043
DESCRIPTION: OILY BILGE WATER DISCHARGE PORT