

DOT US Department of Transportation
PHMSA Pipeline and Hazardous Materials Safety Administration
OPS Office of Pipeline Safety
Southwest Region

Principal Investigator Jon Manning
Region Director R.M. Seeley
Date of Report 10/20/2011
Subject Failure Investigation Report – Enterprise Offshore Gas Platform Fire

Operator, Location, & Consequences

Date of Failure 8/4/2009
Commodity Released Natural Gas
City/County & State Gulf of Mexico – Offshore
OpID & Operator Name 31618 Enterprise Products Operating, LLC
Unit # & Unit Name 12174 High Island Pipeline System Offshore Gas
SMART Activity # 125757
Milepost / Location High Island Off-Shore Platform 264B
Type of Failure Platform fire caused by Incorrect Operation
Fatalities 0
Injuries 0
Description of area impacted Offshore gas transportation platform
Property Damage \$7,061

Failure Investigation Report – Enterprise Offshore Gas Platform Fire

8/4/2009

Executive Summary

On August 4, 2009, Enterprise Products Operating, LLC (Enterprise, the Operator) reported to the NRC (No. 913841) a fire and explosion on their High Island Off-Shore (HIOS) 264B platform in the Gulf of Mexico (GOM). There were no reported injuries but the incident required the platform to be evacuated.

The fire occurred just after Enterprise and contract personnel started a turbine/compressor set designated as the Number 2 Unit. This unit had been overhauled in March 2009 but operational conditions had not required the unit to be operated since that time. Several unsuccessful attempts were made to start the unit and personnel bypassed some of the interlocks during this process. Enterprise personnel reported that the sixth attempt to start the Number 2 unit was successful.

Just after the Number 2 Unit was started, Enterprise personnel noted a gas smell in the control room and observed that the hydrocarbon detectors were indicating readings of approximately 34% of the Lower Explosive Limit (LEL) in the engine room. An Enterprise operations employee on the upper deck of the platform observed the 6-inch lubrication oil vent on the roof was discharging a stream of hydrocarbon vapors. The employee then went to the control room and ordered the Number 2 Unit shut down.

Heat from the exhaust stack is believed to have been the ignition source for the hydrocarbon vapors coming from the lubrication oil vent. Enterprise personnel reported that they attempted to extinguish the fire but migrating hydrocarbon vapors ignited and flames quickly engulfed the upper deck of the platform. Personnel were ordered to activate the Emergency Shutdown (ESD) system and evacuate the platform.

The next series of events are not as certain, but the most probable scenario is that when the ESD system was activated high pressure gas back-flowed into the Number 1 Unit starter turbine through a malfunctioning check valve. The check valve was intended to isolate piping and equipment with a lower pressure rating from the high pressure ESD gas. The high pressure gas ruptured the starter case allowing gas to flow into the engine room. An explosion and second fire then occurred on the main deck. The explosion and fires on the main and upper decks resulted in extensive damage to the equipment and piping on the platform.

Enterprise has decided to neither repair nor replace the damaged pipeline facilities. The reported \$7,061 property damage represents only the cost of lost gas since the pipeline facilities were fully depreciated and had no value.

System Details

The Enterprise High Island pipeline system consists of approximately 233 miles of offshore natural gas pipelines and eight platforms in the Gulf of Mexico (GOM) that include PHMSA regulated equipment. The incident occurred on the Enterprise High Island Off-Shore (HIOS) 264B platform. The HIOS 264 facility is located in approximately 150 feet of water approximately 87 miles off the coast of Sabine Pass, TX, and consists of three platforms designated as A, B, and C, interconnected with bridges. The 264A platform receives gas and separates liquids from three upstream HIOS pipelines at approximately 800 psig. The gas then flows to the 264B platform where it can be compressed to approximately 950 psig when operational conditions warrant. The compressed gas then is returned to the 264A platform where the liquids are re-injected into the stream and transported downstream to the West Cameron 167 platform through a single 42-inch pipeline. The 264B platform includes two engine room buildings, metering facilities, a warehouse, a control room, a communications shed, and a clerk's office. The 264C platform includes living quarters, a helicopter landing deck, and a survival craft. A partial map of the HIOS system is included in Appendix A.

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The HIOS 264B platform includes two compressor buildings. One compressor building houses unit Numbers 1 and 2, the second houses unit Number 3. Numbers 1 and 2 are identical General Electric 22,000 horsepower Frame 3 units, and Number 3 is a 33,000 horsepower General Electric Frame 5. Each unit consists of the basic components of a starter turbine, centrifugal compressor, and power turbine. The incident involved unit Number 2.

The incident occurred on the HIOS 264B platform located at Latitude 28.4115 degrees; Longitude 93.7393 degrees. Photographs showing the HIOS 264 platforms and incident damage on the HIOS 264B platform are included in Appendix A.

Events Leading up to the Failure

Enterprise personnel report that the platform was operating normally prior to the incident. The platform normally receives approximately 250,000 – 300,000 Mcfd from three upstream pipelines and operates in a pressure range of approximately 800 psig – 950 psig. Accounts from Enterprise personnel indicate that Enterprise personnel and technicians from NAES Turbine Services had just started the Number 2 turbine unit when the incident occurred.

Emergency Response

On August 4, 2009, Enterprise Products Operating, LLC (Enterprise, the Operator) reported to the NRC (No. 913841) a fire and explosion on their High Island Off-Shore (HIOS) 264B platform in the Gulf of Mexico (GOM) at approximately 11:00 PM (Appendix B). There were no reported injuries but the incident required the platform to be evacuated. A copy of the Enterprise incident report to PHMSA is Appendix C.

The fire occurred just after Enterprise and contract personnel from NAES Turbine Services started a turbine/compressor set designated as the Number 2 Unit. This unit had been overhauled in March 2009 but the unit had not operated since that time. Several unsuccessful attempts were made to start the unit and personnel bypassed some of the interlocks during this process. Enterprise personnel reported that the sixth attempt to start the Number 2 unit was successful.

Just after the Number 2 Unit was started, Enterprise personnel noted a gas smell in the control room and observed that the hydrocarbon detectors were indicating readings of approximately 34% of the Lower Explosive Limit (LEL) in the engine room. An Enterprise operations employee on the upper deck of the platform observed the 6-inch lubrication oil vent on the roof was discharging a stream of hydrocarbon vapors. The employee then went to the control room and ordered the Number 2 Unit shut down.

The venting hydrocarbon vapors ignited and the fire quickly spread over the upper deck of the platform. Enterprise operations personnel attempted to fight the fire using a wheeled fire extinguisher but were not successful. There was initially no fire water pressure as the pump failed to start in automatic mode. The fire quickly engulfed the upper deck and Enterprise operations personnel activated the ESD system and ordered the platform to be evacuated. The ESD system is designed to shut down the compressor units and vent the gas to the flare located on a structure off of Platform B. Failure of a check valve after the ESD system was activated is believed to have allowed high pressure gas to backflow into the low pressure starter turbine piping and ruptured the starter turbine case. The escaping gas resulted in an explosion and second fire on the main deck of the platform. The fire water pump did not initially start in automatic mode and had to be manually started. Enterprise personnel initially mustered on Platform C, but were not able to start the escape craft. The personnel then moved to Platform A and were evacuated by a nearby work boat, the Gulf Endeavor.

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Summary of Return-to-Service

Enterprise has decided to neither repair nor replace the damaged pipeline facilities. The reported \$7,061 property damage represents only the cost of lost gas since the pipeline facilities were fully depreciated and had no value.

Investigation Details

According to responses provided by Enterprise personnel and the incident investigation performed by BakerRisk, a compressor drain valve was found to be in the open position. Enterprise personnel and contractor accounts of the actions taken during the startup attempts for unit Number 2 indicate liquid was drained from the compressor case using the drain valve. The open compressor case drain valve allowed high pressure gas to enter the condensate drain piping. The condensate drain piping is interconnected with the lubrication oil/seal vent piping that terminates above the turbine exhaust stacks. It is likely that gas flowed through the interconnected piping to the vent above the turbine exhaust stack and was ignited, resulting in the fire on the upper deck.

The next series of events are not as certain and the determination is made more difficult as the piping associated with various systems on the platform is complex, interconnected, and has several potential flow-paths depending on the specific operational mode. Based on the investigation performed by BakerRisk and responses provided by Enterprise personnel, the most probable scenario is that when personnel activated the ESD system high pressure gas (>800 psig – 950 psig) from the discharge piping back-flowed into the Number 1 Unit starter turbine through a failed check valve. The starter gas piping is vented into the ESD flare system and a check valve designed to prevent the high pressure ESD gas from back-flowing into the lower pressure starter gas piping on unit Number 1 was determined to have failed. The case of the starter turbine, which was rated for an operating pressure of 125 psig, was ruptured by the high pressure ESD gas, causing gas to flow into the engine room. Ignition of this gas resulted in an explosion and second fire on the main deck of the platform.

BakerRisk performed a forensic analysis of the major components that are suspected to have been involved in the failure, including the unit Number 2 case drain valve unit, the unit Number 1 pressure safety valve (PSV, M838), and the Wheatley ANSI 600 check valve (M805). The unit Number 2 case drain valve was found to be in the open position during the post incident investigation allowing high pressure gas to discharge through the lubrication oil vent piping that terminates above the turbine exhaust stack on the upper deck. The pressure relief valve PSV M838 was determined to have been functional but was apparently not sized adequately to relieve the unintended backflow of gas due to activation of the ESD system. The Wheatley check valve M805 was determined to have failed, allowing high pressure gas to backflow into lower pressure starter turbine piping, rupturing the case. A photograph of the case drain valve, photographs of the pressure relief valve, and photographs of the Wheatley check valve are included in Appendix D, E, and F respectively. A copy of the PHMSA question matrix submitted to Enterprise is included in Appendix G, and a complete copy of the BakerRisk Incident Investigation Report is included in Appendix H.

The forensic analysis concluded that rupture of the starter turbine case was caused by internal pressure rather than an external explosion. The starter piping is protected by a relief valve (PSV M838) that was tested and torn down after the incident. BakerRisk determined the relief valve was functioning properly. Analysis of the check valve (M805) found the check valve clapper had dislodged from its normal operating position and that the retainer pin had failed. The BakerRisk analysis determined that

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the retainer pin was partially cracked prior to the incident and the sudden high pressure gas surge resulting from the ESD caused the remaining ligament to fail.

According to accounts from Enterprise personnel and the BakerRisk report, Enterprise personnel gathered at the designated muster location on Platform C to evacuate the platform using the escape watercraft but could not start the engine. Personnel abandoned the escape craft and mustered on Platform A where they were evacuated by a nearby workboat, the Gulf Endeavor. A copy of the operator's PHMSA 7100.2 Report is included in Appendix C.

Findings and Contributing Factors

The incident was likely initiated when Enterprise and NAES Turbine Services personnel left a turbine casing drain valve open during repeated restart attempts. This allowed gas to be vented through the lubricating oil vent on the roof. The initial fire on the top deck of the platform resulted from ignition of the vented gas. The probable cause of the explosion and fire that occurred on the main deck of the platform was failure of a check valve designed to prevent the backflow of high pressure ESD gas into low pressure starter turbine piping. High pressure gas is believed to have ruptured the starter turbine case allowing gas to enter the engine room.

Contributing Factors include

1. Tests performed by BakerRisk determined that the check valve clapper retaining pin was cracked prior to the incident and that the ESD event caused the remaining ligament to fail.
2. The fire water pump did not automatically start as designed so there was no fire water pressure on the upper deck during the initial fire.

Appendices

- A System Map 
- B NRC Report # 913841
- C Enterprise Incident Report to PHMSA
- D Case Drain Valve Photographs
- E Pressure Relief Valve Photographs
- F Check Valve Photographs
-  
- H BakerRisk Report

Appendix A System Map

This document is on file at PHMSA

NATIONAL RESPONSE CENTER 1-800-424-8802
 *** For Public Use ***
 Information released to a third party shall comply with any applicable federal and/or state Freedom of Information and Privacy Laws

Incident Report # 913841

INCIDENT DESCRIPTION

**** THIS IS A POTENTIAL RELEASE ****
 *Report taken at 00:20 on 05-AUG-09
 Incident Type: PLATFORM
 Incident Cause: EXPLOSION
 Affected Area:
 The incident occurred on 04-AUG-09 at 22:30 local time.
 Affected Medium: NON-RELEASE (N/A) PLATFORM FIRE

SUSPECTED RESPONSIBLE PARTY

Organization: HIGH ISLAND SYSTEMS
 HOUMA, LA 70301
 Type of Organization: PRIVATE ENTERPRISE

INCIDENT LOCATION

BLOCK: 264 County: HIGH ISLAND
 PLATFORM: B
 State: LA
 Latitude: 28° 28' 16" N
 Longitude: 093° 44' 21" W
 PLATFORM INCIDENT

POTENTIALLY RELEASED MATERIAL(S)

CHRIS Code: OIL Official Material Name: OIL: CRUDE
 Also Known As:
 Qty Released: 0 UNKNOWN AMOUNT

DESCRIPTION OF INCIDENT

CALLER IS REPORTING A FIRE ON A PLATFORM DUE TO UNKNOWN CAUSES.

INCIDENT DETAILS

Platform Rig Name:
 Platform Letter: B
 Location Area ID: HIGH ISLAND
 Location Block ID: 264
 OCSG Number: 03302
 OCSF Number:
 State Lease Number:
 Pier Dock Number:
 Berth Slip Number:

DAMAGES

Fire Involved: YES Fire Extinguished: NO
 INJURIES: NO Hospitalized: Empl/Crew: Passenger:
 FATALITIES: NO Empl/Crew: Passenger: Occupant:
 EVACUATIONS: YES Who Evacuated: EMPLOYEES Radius/Area:
 Damages: YES \$

<u>Closure Type</u>	<u>Description of Closure</u>	<u>Length of Closure</u>	<u>Direction of Closure</u>
Air:	N		
Road:	N		Major Artery: N

Waterway:

Track: N

Passengers Transferred: NO

Environmental Impact: UNKNOWN

Media Interest: NONE Community Impact due to Material:

REMEDIAL ACTIONS

ALL PERSONNEL WERE EVACUATED AND ACCOUNTED FOR, EMERGENCY SYSTEM ACTIVATED.

Release Secured: UNKNOWN

Release Rate:

Estimated Release Duration:

WEATHER

Weather: CLEAR, °F Wind speed: 15 MPH Wind direction: SW

ADDITIONAL AGENCIES NOTIFIED

Federal: USCG, MMS

State/Local: NONE

State/Local On Scene: NONE

State Agency Number: NONE

NOTIFICATIONS BY NRC

USCG HSOC AT DHS (USCG HSOC DESK)

05-AUG-09 00:29

USCG ICC (ICC ONI)

05-AUG-09 00:29

DOT CRISIS MANAGEMENT CENTER (MAIN OFFICE)

05-AUG-09 00:29

FBI LOUISIANA ATN: HILLARY ROSSMAN (MAIN OFFICE)

05-AUG-09 00:29

FBI NEW ORLEANS FIELD OFC (MAIN OFFICE)

05-AUG-09 00:29

FBI STRATEGIC INFO OPERATIONS CNTR (MAIN OFFICE)

05-AUG-09 00:33

FLD INTEL SUPPORT TEAM NEW ORLEANS (SUPERVISOR, FIST NEW ORLEANS)

05-AUG-09 00:29

USCG COMMAND CENTER (MAIN OFFICE)

05-AUG-09 00:33

JFO-LA (COMMAND CENTER)

05-AUG-09 00:29

JFO-LA (FEMA JFO LA)

05-AUG-09 00:29

LA DEPT OF ENV QUAL (MAIN OFFICE)

05-AUG-09 00:29

LA DEPT OF WILDLIFE AND FISHERIES (ATTN: VAUGHAN MCDONALD)

05-AUG-09 00:29

LA OFFICE OF EMERGENCY PREPAREDNESS (MAIN OFFICE)

05-AUG-09 00:29

LA OFFICE OF GOV (MAIN OFFICE)

05-AUG-09 00:29

LA OFFICE OF PUBLIC HEALTH (MAIN OFFICE)

05-AUG-09 00:29

NATIONAL INFRASTRUCTURE COORD CTR (MAIN OFFICE)

05-AUG-09 00:29

NOAA RPTS FOR LA (MAIN OFFICE)

05-AUG-09 00:29

NATIONAL RESPONSE CENTER HQ (MAIN OFFICE)

05-AUG-09 00:33

NTSB PIPELINE (MAIN OFFICE)

05-AUG-09 00:29

HOMELAND SEC COORDINATION CENTER (MAIN OFFICE)

05-AUG-09 00:29

MSU PORT ARTHUR (MAIN OFFICE)

05-AUG-09 00:35
PIPELINE & HAZMAT SAFETY ADMIN (OFFICE OF PIPELINE SAFETY (AUTO))
05-AUG-09 00:29
PIPELINE & HAZMAT SAFETY ADMIN (OFFICE OF PIPELINE SAFETY WEEKDAYS (VERBAL))
05-AUG-09 00:36
LA STATE POLICE (MAIN OFFICE)
05-AUG-09 00:29

ADDITIONAL INFORMATION

CALLER HAD NO ADDITIONAL INFORMATION.

*** END INCIDENT REPORT # 913841 ***



**INCIDENT REPORT –
GAS TRANSMISSION AND
GATHERING SYSTEMS**

Report Date September 8, 2009

U.S Department of Transportation
Pipeline and Hazardous Materials
Safety Administration

Report format corresponds to
Form PHMSA F 7100.2 (01-2002)

No. 20090097 - 8541

PART A – GENERAL INFORMATION					
N	Original Report	Y	Supplemental Report	Y	Final Report
1. Operator Name and Address					
a. Operator's 5-digit Identification Number			31618		
b. If Operator does not own the pipeline, enter Owner's 5-digit Identification Number (when known)					
c. Name of Operator			ENTERPRISE PRODUCTS OPERATING LLC		
d. Operator street address			1100 LOUISIANA		
e. Operator address	City		HOUSTON		
	County or Parish		HARRIS		
	State		TX		
	Zip code		77002		
2. Time and date of the incident					
	Hour		22:00		
	Date of the incident		8/4/2009		
3. Location of incident					
a. Street or nearest street or road					
b. City					
	County or Parish				
c. State					
	Zip Code				
d. Mile Post/Valve Station					
e. Survey Station No					
f. Latitude			28.4115		
	Longitude		93.7393		
g. Class location description					
	Onshore (Class Location)				
	Offshore		Y		
	Area		HIGH ISLAND		
	Block #		264B		
	State				
	Outer Continental Shelf		Y		
h. Accident on Federal Land other than Outer Continental Shelf			N		
i. Is pipeline Interstate			Y		
4. Type of leak or rupture					
Leak or Rupture			OTHER		
Type of Leak					
	- Puncture, diameter	(inches)			
Type of Rupture					
	- Tear/Crack, length	(inches)			
	- Propagation Length, total, both sides	(feet)			
	Other (specify)		PLATFORM EXPLOSION AND FIRE		
5. Consequences					
a. Fatality			No		
	Total number of people		0		
	Employees		0		
	General Public		0		
	Non-employee Contractors		0		
b. Injury requiring inpatient hospitalization			No		
	Total number of people		0		
	Employees		0		

General Public	0
Non-employee Contractors	0
c. Property damage/loss (estimated)	Yes
Total	\$ 7,061
Gas loss	\$ 7,061
Operator damage	\$ 0
Public/private property damage	\$ 0
d. Release Occurred in a 'High Consequence Area'	N
e. Gas Ignited / Gas did not ignite	Gas did not Ignite
f. Explosion / No Explosion	EXPLOSION
g. Evacuation (<i>general public only</i>)	Y
Number of people	39
Evacuation Reason	COMPANY POLICY
6. Elapsed time until area was made safe	
Hours	38
Minutes	50
7. Telephone Report	
NRC Report Number	913841
Date	8/4/2009
8. Pressure	
a. Estimated pressure at point and time of incident (PSIG)	0.00
b. Max. allowable operating pressure (MAOP) (PSIG)	
c. MAOP established by 49 CFR section	
d. Did an over pressurization occur relating to the incident?	N
PART B – PREPARER AND AUTHORIZED SIGNATURE	
Preparer's Name	JOEL E. KOHLER
Preparer's Title	
Area Code and Telephone Number	7133814830
Preparer's E-mail Address	JKOHLER@EPROD.COM
Area Code and Facsimile Number	7133816660
PART C – ORIGIN OF THE INCIDENT	
1. Incident occurred on	GATHERING
2. Failure occurred on	OTHER
Other (specify)	PLATFORM
3. Material involved (<i>pipe, fitting, or other component</i>)	STEEL
Plastic failure was	
a. ductile	N
b. brittle	N
c. joint failure	N
Material other than plastic or steel	
4. Part of the system involved in incident	COMPRESSOR
Other (specify)	
5. Year the pipe or component which failed was installed	1978
PART D – MATERIAL SPECIFICATION	
1. Nominal pipe size (NPS) (inches)	
2. Wall thickness inches	
3. Specification	SMYS
4. Seam type	
5. Valve type	
6. Pipe or valve manufactured by	
	in year
PART E - ENVIRONMENT	
1. Area of incident	INSIDE/UNDER BUILDING
Other (specify)	
Depth of cover (inches)	

PART F – APPARENT CAUSE						
F1 – CORROSION						
1. External Corrosion						
2. Internal Corrosion						
Complete items a-e where applicable						
a. Pipe Coating						
b. Visual Examination						
Other (specify)						
c. Cause of Corrosion						
Other (specify)						
d. Was corroded part of pipeline considered to be under cathodic protection prior to discovering incident?						
Year Protection Started						
e. Was pipe previously damaged in the area of corrosion?						
How long prior to incident?					Years	
					Months	
F2 – NATURAL FORCES						
3. Earth Movement						
Description						
Other (specify)						
4. Lightning						
5. Heavy Rains/Floods						
Description						
Other (specify)						
6. Temperature						
Description						
Other (specify)						
7. High Winds						
F3 - EXCAVATION						
8. Operator Excavation Damage (including their contractors) / Not Third Party						
9. Third Party Excavation Damage						
a. Excavator group						
b. Type						
Other (specify)						
c. Did operator get prior notification of excavation activity?						
Date received					mo.	
					day	
					yr.	
Notification received from						
d. Was pipeline marked?						
Temporary markings						
Permanent markings						
Marks were						
Were marks made within required time?						
F4 – OTHER OUTSIDE FORCE DAMAGE						
10. Fire/Explosion as primary cause of failure						
Description						
11. Car, truck or other vehicle not relating to excavation activity damaging pipe						
12. Rupture of Previously Damaged Pipe						
13. Vandalism						
F5 – MATERIAL AND WELDS						
Material						
14. Body of Pipe						
Description						
Other (specify)						
15. Component						
Description						
Other (specify)						
16. Joint						

Description	
Other (specify)	
Weld	
17. Butt	
Description	
Other (specify)	
18. Fillet	
Description	
Other (specify)	
19. Pipe Seam	
Description	
Other (specify)	
Complete a-g if you indicate any cause in part F5	
a. Type of failure	
Construction Defect	NO DATA
Description	
Material Defect	NO DATA
b. Was failure due to pipe damage sustained in transportation to the construction or fabrication site?	
c. Was part which leaked pressure tested before incident occurred?	
d. Date of test	
	Month
	Day
	Year
e. Test medium	
Other (specify)	
f. Time held at test pressure	hr
g. Estimated test pressure at point of incident	(PSIG)
F6 – EQUIPMENT AND OPERATIONS	
20. Malfunction of Control/Relief Equipment	
Description	
Other (specify)	
21. Threads Stripped, Broken Pipe Coupling	
Description	
Other (specify)	
22. Ruptured or Leaking Seal/Pump Packing	
23. Incorrect Operation	Yes
a. Type	FAILURE TO FOLLOW PROPER PROCEDURES
Other (specify)	
b. Number of employees involved who failed post-incident test	
Drug test	0
Alcohol test	0
c. Were most senior employee(s) involved qualified?	Y
d. Hours on duty	14
F7 – OTHER	
24. Miscellaneous	
Description	
25. Unknown	
Description	
PART G – NARRATIVE DESCRIPTION OF FACTORS CONTRIBUTING TO THE EVENT	
<p>AN EXPLOSION AND FIRE OCCURRED ON HIGH ISLAND BLOCK 264 PLATFORM B (HI 264B) IN AND AROUND THE COMPRESSOR BUILDING. ACCORDING TO THE RECENTLY RECEIVED BAKERRISK REPORT, THE CAUSE OF THE INCIDENT IS AS FOLLOWS: A) THE MOST PROBABLE SCENARIO SUGGESTS THE INITIAL FIRE RESULTED FROM A GAS RELEASE WHILE ATTEMPTING TO START THE NO. 2 TURBINE/COMPRESSOR SET. B) THE NO. 2 COMPRESSOR OUTBOARD CASE DRAIN WAS LEFT OPEN DURING STARTUP AND EVENTUAL LOADING OF THE COMPRESSOR. REPLACEMENT COST FOR THE COMPRESSOR PLATFORM AND EQUIPMENT IS ESTIMATED TO BE IN THE RANGE OF \$35 - \$70 MILLION, HOWEVER ENTERPRISE HAS ELECTED TO NOT REPAIR OR</p>	

REPLACE AT THIS TIME.

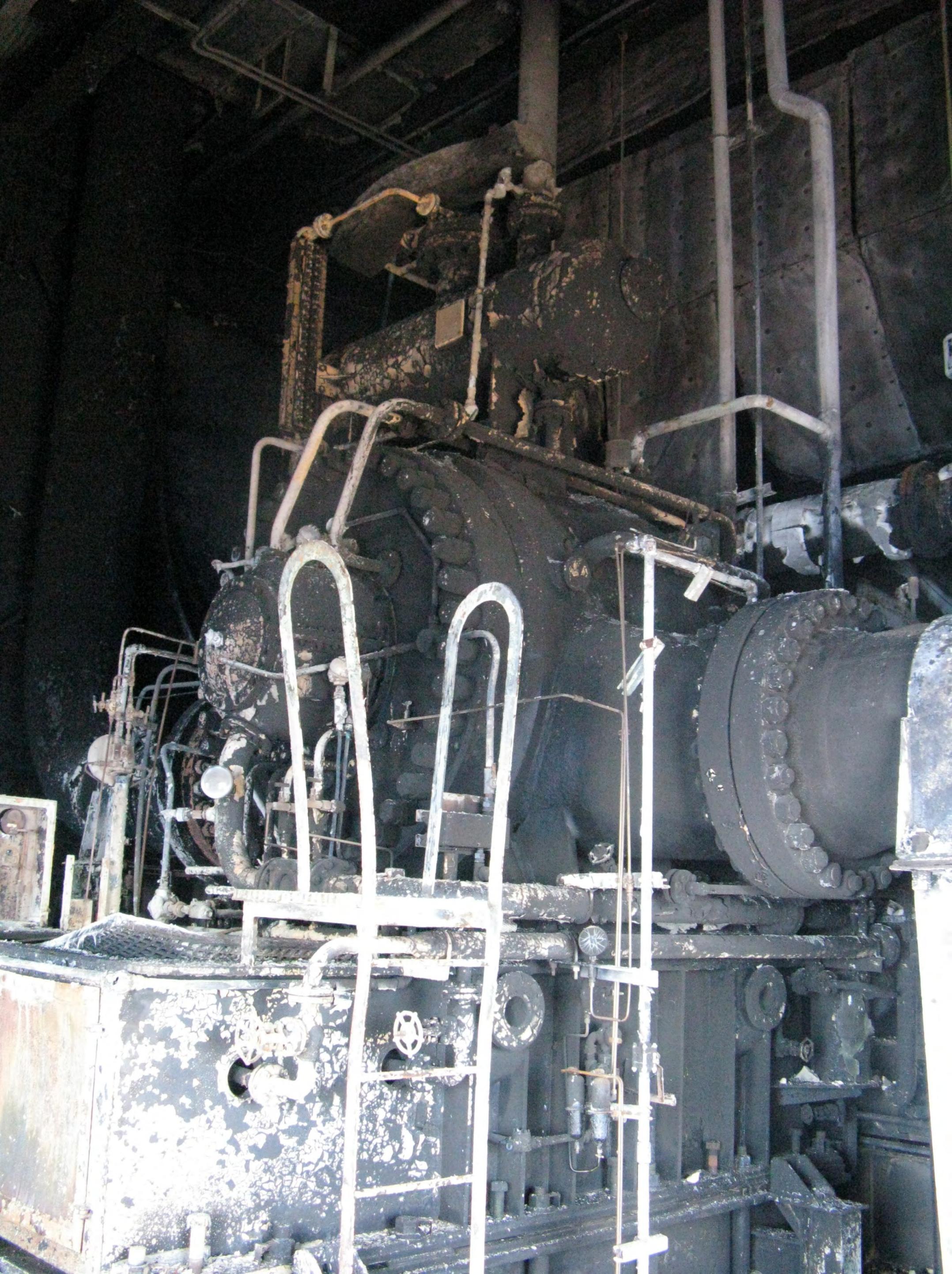
Appendix D - HIOS 264 Platform Photographs













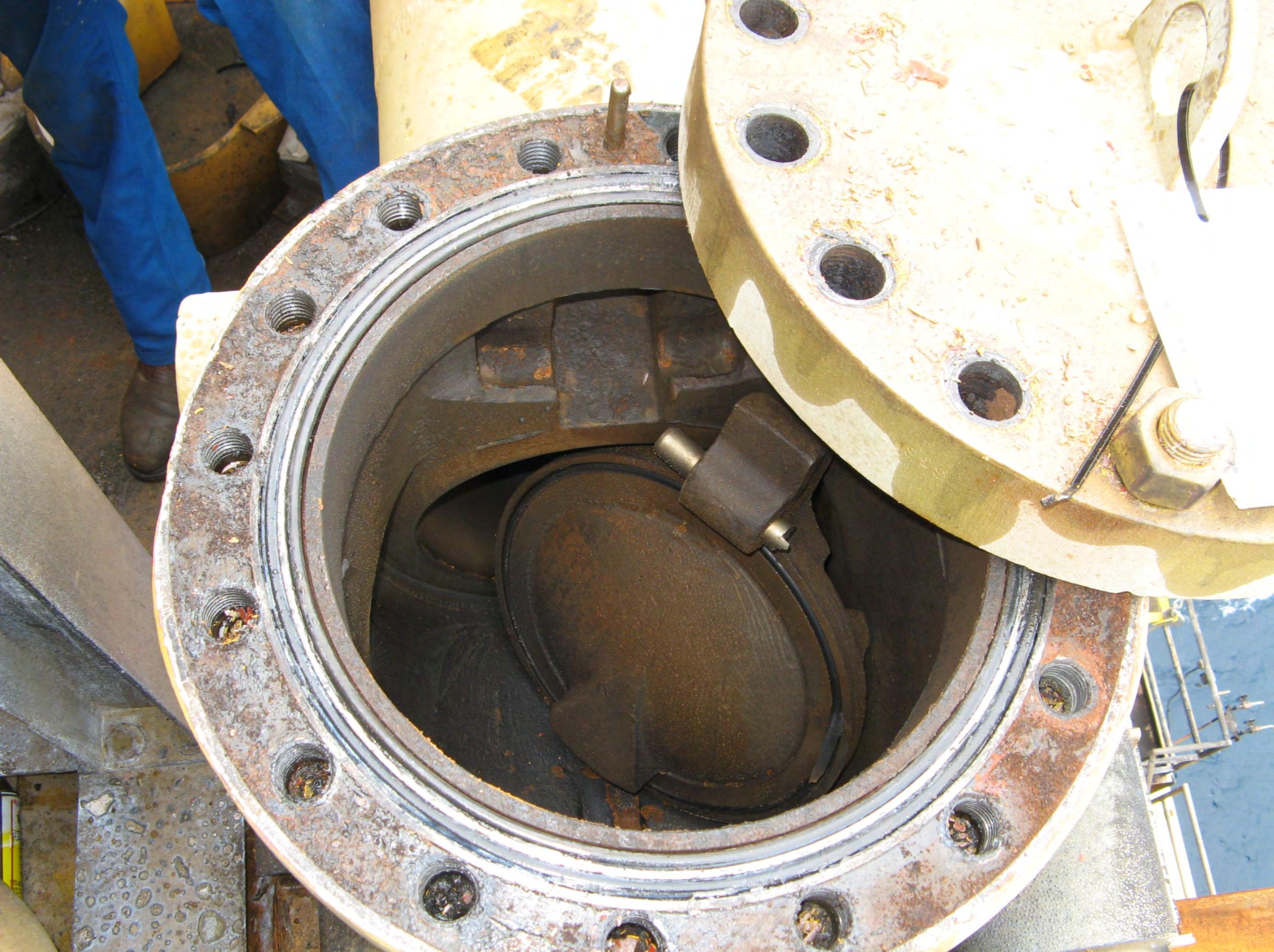


Appendix F – Check Valve Photographs

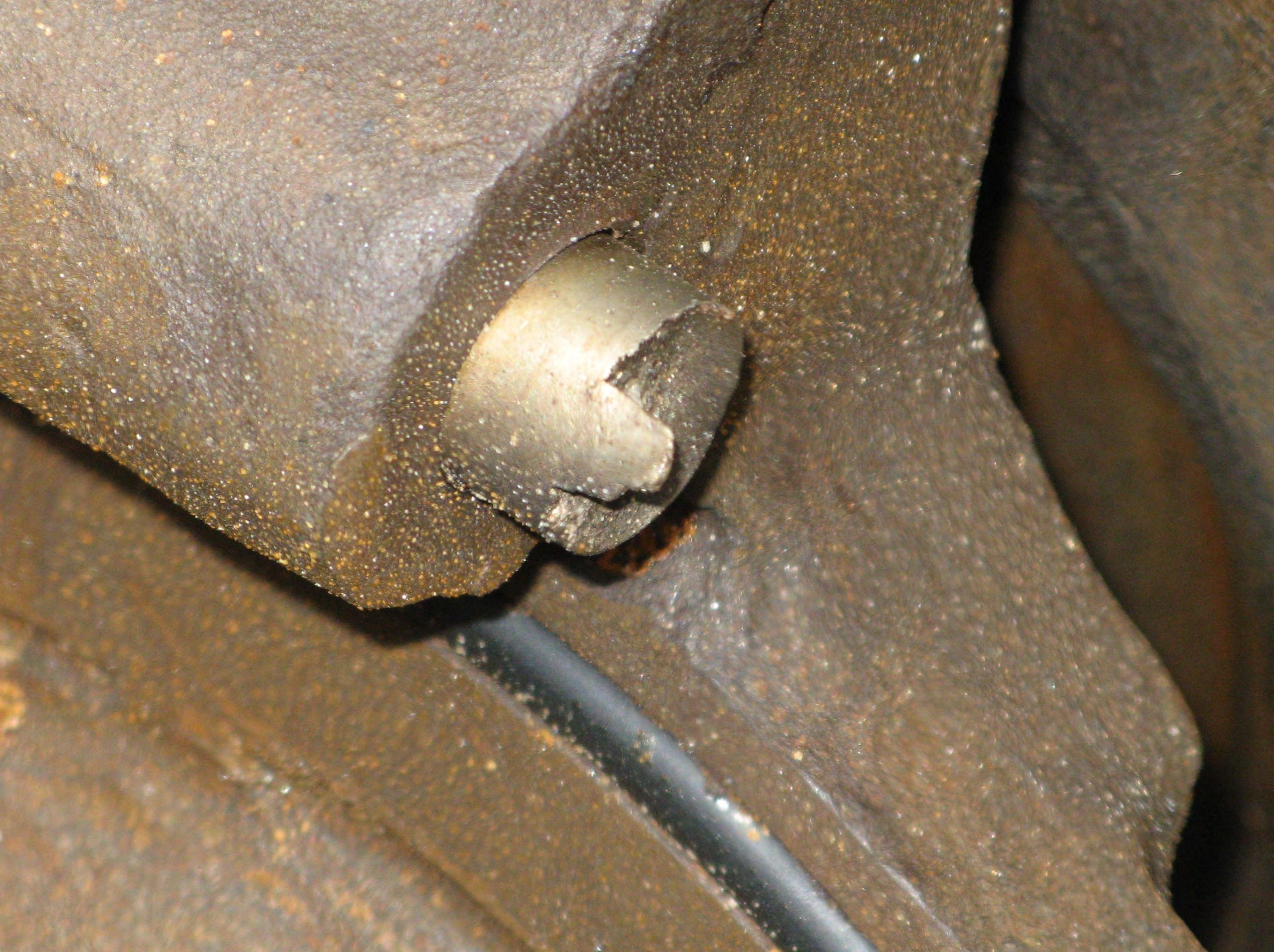
BakerRisk Identification Tag

Site # 2634 Item # E014
Description + Location *Stator turbine part*
check valve - welded in place for 12" dia
on west side of raft at wall west of G654
Name/Date/Time *TJA*
08/08/16/09/11:55 am

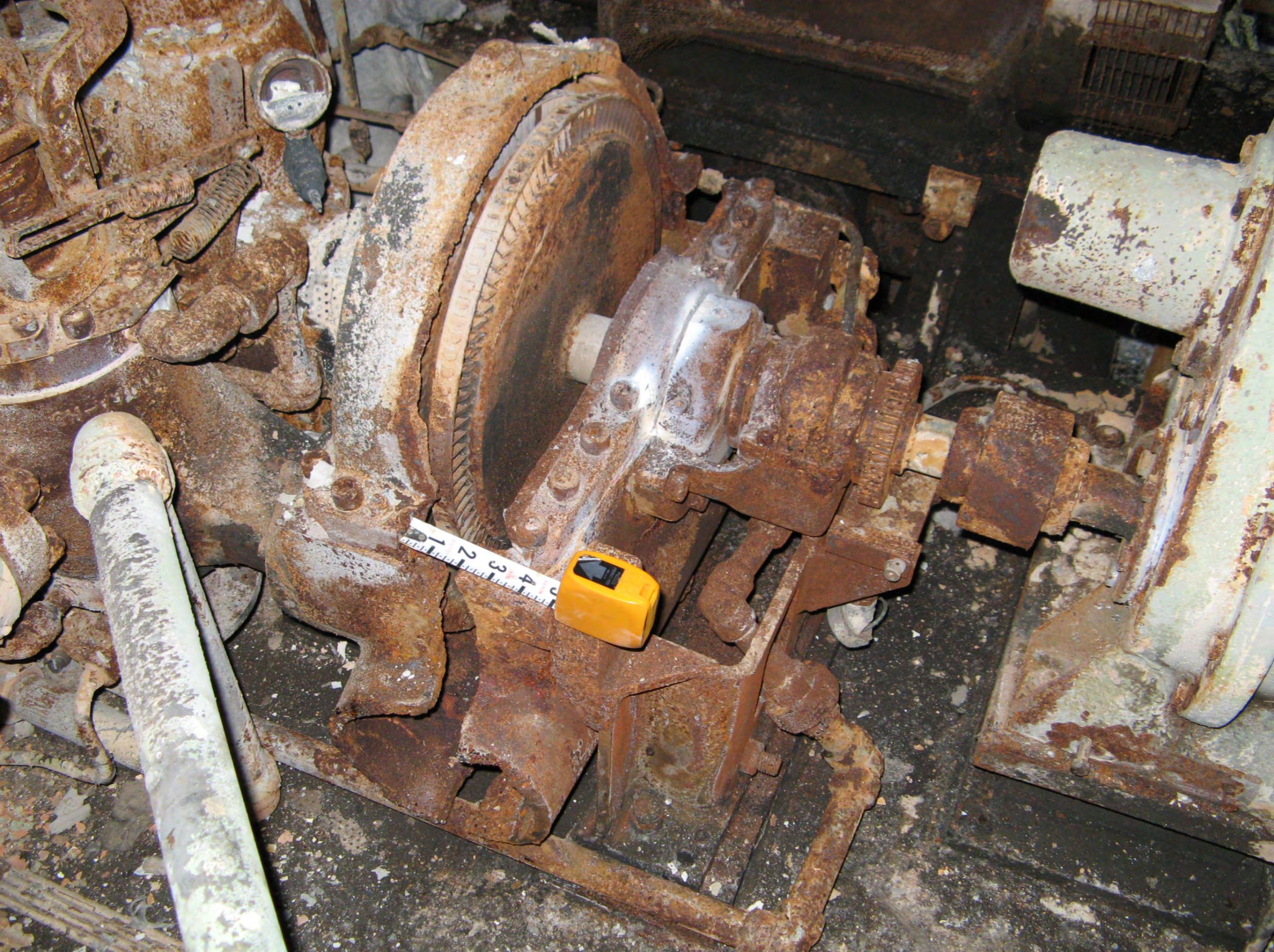








Appendix G – Starter Turbine, Piping, and Pressure Relief Valve Photos





4

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EMERGENCY THE EXPANDED
TYPICAL DESCRIPTION

Amstar S-235



BakerRisk Identification Tag

Site # 2634 Item # E-015
Description + Location *Shroud turbine work*
on Dist side of root seal
of GE Set # 1
on 2/20/09 11:40 AM

Name/Date/Time
RSV M838 on 2/20/09

Appendix H BakerRisk Report

This document is on file at PHMSA