QUALITY MAINTENANCE SERVICES
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Compressed Air Audit Services

Compressed Air Receivers Explode, Kill People and Damage Facilities!
What should you know about Air Receivers and Governing O.S.H.A Regulations and Incident Details

Quality Maintenance services is concerned with the fact that much of the industrial community is unaware off the actual vitally important information surrounding the installation and operation of compressed air receivers and the need to be fully aware of the potential for injury, death and business disruption these vessels can create if not properly configured.

We are committed to bringing new opportunities for education and improvement to American industry.

This information is presented for your use in making your facility a safer and more reliable place to work.

Quality Maintenance Services would appreciate receiving any other information readers feel should be included so this document can be updated as appropriate.

Also, should the reader need assistance in evaluating their compressed air operations for safety issues, Quality Maintenance Services is available to assist their continuous improvement efforts.

COMPRESSED AIR RECEIVERS-GOVERNING O.S.H.A. REGS AND DESCRIPTIONS OF RECEIVER FAILURES

This document is in no way meant to be an exhaustive list of pertinent items. This is a selection of material geared to raise awareness of the serious issues surrounding the installation and operation of compressed air receivers.

It is also intended to reinforce the fact that it is imperative that only the highest level of efficiency and excellence in ensuring that compressed air condensate drainage is in place at all times.

Refer to

API 510
National Boiler Safety Code Section 8

GOVERNING OSHA REGULATIONS:
29 CFR

• Part Number:	1910
• Part Title:	Occupational Safety and Health Standards
• Subpart:	M
• Subpart Title:	Compressed Gas and Compressed Air Equipment
• Standard Number:	1910.169
• Title:	Air receivers.

1910.169(a)

General requirements -

1910.169(a)(1)

Application. This section applies to compressed air receivers, and other equipment used in providing and utilizing compressed air for performing operations such as cleaning, drilling, hoisting, and chipping. On the other hand, however, this section does not deal with the special problems created by using compressed air to convey materials nor the problems created when men work in compressed air as in tunnels and caissons. This section is not intended to apply to compressed air machinery and equipment used on transportation vehicles such as steam railroad cars, electric railway cars, and automotive equipment.

1910.169(a)(2)

New and existing equipment.

1910.169(a)(2)(i)

All new air receivers installed after the effective date of these regulations shall be constructed in accordance with the 1968 edition of the A.S.M.E. Boiler and Pressure Vessel Code Section VIII, which is incorporated by reference as specified in Sec. 1910.6.

..1910.169(a)(2)(ii)

1910.169(a)(2)(ii)

All safety valves used shall be constructed, installed, and maintained in accordance with the A.S.M.E. Boiler and Pressure Vessel Code, Section VIII Edition 1968.

1910.169(b)

Installation and equipment requirements -

1910.169(b)(1)

Installation. Air receivers shall be so installed that all drains, hand holes, and manholes therein are easily accessible. Under easily accessible. Under no circumstances shall an air receiver be buried underground or located in an inaccessiblle place.

OSHA Instruction STD 1-10.2 OCT 30, 1978

OSHA PROGRAM DIRECTIVE #100-69

TO: REGIONAL ADMINISTRATORS/OSHA

THRU: DONALD E MACKENZIE Acting Field Coordinator

SUBJECT: Drains on Air Receivers; 29 CFR 1910.169(a) (2)(i) and (b)(2)

1. Purpose

To provide guidelines for issuance of citations for violation of drain requirements for air receivers.

2. Documentation-Affected

None.

3. Background

a. An inquiry has been received regarding Occupational Safety and Health Administration (OSHA) enforcement of 29 CFR 1910.169(b)(2) which requires a bottom drain at the lowest point of every air receiver. It states, relevantly, that: A drain pipe and valve shall be installed at the lowest point of every air receiver to provide for the removal of accumulated oil and water b. This inquiry notes the problem of an apparent inconsistency with 29 CFR 1910.169(a)(2)(i) which requires either a bottom drain or, alternatively, a side drain; that is, a pipe extending inward from any location to within 1/4 inch of the lowest point, in accordance with the 1968 edition of the American Society of Mechanical Engineers (A.S.M.E.) Boiler and Pressure Vessel Code, Section VIII. Specifically, it requires that: All new air receivers installed after the effective date of these regulations shall be constructed in accordance with the 1968 edition of the A.S.M.E. Boiler and Pressure Vessel Code, Section VIII.

OSHA Instruction STD 1-10.2 OCT 30, 1978

c. This problem arises only with regard to air receivers covered by Paragraph U-1 Scope, A.S.M.E. Boiler and Pressure Vessel Code, Section VIII, 1968, which excludes vessels having an internal or external operating pressure not exceeding 15 psi. and vessels having an inside diameter not exceeding 6 inches, and 29 CFR 1910.169(a)(1), which specifies the applicability of the standard. d. This problem also arises only with regard to air receivers subject to corrosion since, apparently, 29 CFR 1910.169(b)(2) originally was intended to apply only to an air receiver subject to corrosion. See Rule 7.3 of the source standard for 29 CFR 1910.169(b)(2), ANSI B-19, 1938, Safety Code for Compressed Air Machinery. Note that the 1968 edition of the A.S.M.E. Boiler and Pressure Vessel Code, Section VIII,

paragraph UG-25(e) limits the drain construction requirements to pressure vessels subject to corrosion.

4. Action

a. It is apparent that, despite the limited requirement of 29 CFR 1910.169(b)(2) regarding a "lowest point" drain, 29 CFR 1910.169(a)(2)(i) provides for an alternative to this; namely, a side drain. Thus, where side drains are present on air receivers, citations for violation of the (b)(2) requirement are not appropriate, even if the air receiver was constructed prior to April 28, 1971, since this is allowed for in 29 CFR 1910.169(a)(2)(i). (Note, however, that (b)(2) may be appropriately cited where there are violations of the other requirement that: The drain valve on the air receiver shall be opened and the receiver completely drained frequently and at such intervals as to prevent the accumulation of excessive amounts of liquid in the receiver.) b. A citation for violation of 29 CFR 1910.169(a)(2) (i) is appropriate where the air receiver has no bottom or side drain and is subject to corrosion and is covered by Paragraphs U-1 Scope and 29 CFR 1910.169(a)(1) Application.

OSHA Instruction STD 1-10.2 OCT 30, 1978 -3-

5. Effective Date

This directive is effective immediately and shall be retained until further notice.

Richard P. Wilson Deputy Director, Federal Compliance and State Programs

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(Originator

Description, Abstract, Keyword	SIC	Date Range
Keyword: "Air Receiver"	All	All

Sort By: | Date | Office |]

Results 1 - 10 of 10

By Date

		Summary Nr	Event Date	Report ID	Fat	SIC	Event Description
	1	202288940	08/13/2008	0950411	X	1711	Employee Is Stuck In Air Return.

							Suffocates And Is Killed
☐	2	202362570	07/17/2006	0352450		7349	Explosion Results In Employee Leg Amputation
☐	3	200072809	02/15/2006	0453720		2421	Employee Is Burned Fighting Fire After Air Tank Explosion
☐	4	202317335	10/01/2001	0420600	X	4789	Employee Killed When Caught Between Crane Structure And Beam
☐	5	200001030	08/09/2000	0728500	X	1796,1629,1731,1711,1799,1541,1791,1794	Employee Killed In Fall While Working On Air Handling Unit
☐	6	000674853	09/07/1994	0454510		3496	Employees Lacerated By Pieces Of Exploding Air Receiver
☐	7	000772491	09/19/1990	0627700	X	2875	Employee Killed When Head Struck By Flying End Plate
☐	8	014400600	01/09/1986	0626300	X	7623	Air Receiver Exploded, Killing Employee

☐	9	014198238	06/29/1985	0352410	X	5511	Air Receiver Ruptured; End Piece Struck And Killed Worker
☐	10	014550008	08/09/1984	0454711		2431	Compressed Air Tank Exploded

OSHA

Accident: 202362570 - Explosion Results In Employee Leg Amputation

Accident: 202362570 -- Report ID: 0352450 -- Event Date: 07/17/2006			
Inspection	Open Date	SIC	Establishment Name
310078282	07/17/2006	7349	J. & J., Incorporated

Employee #1 was injured when the 300-gallon air receiver of an air compressor unit ruptured resulting in severe injuries to both his legs The accident was caused by rust inside the receiver that weakened the steel due to the receiver not been drained. The safety valve was inoperative due to corrosion from not being tested. The pressure gauge was stuck on 90 psi. Employee #1 was transported to the hospital where his left leg had to be amputated below the knee and the right leg required several pins. Employee #1 was hospitalized.

Keywords: amputated, leg, explosion, equipment failure, air receiver, compressed air, compressor

	Inspection	Age	Sex	Degree	Nature	Occupation
1	310078282			Hospitalized injury	Amputation	Specified mechanics and repairers

OSHA

Accident: 674853 - Employees Lacerated By Pieces Of Exploding Air Receiver

Accident: 674853 -- Report ID: 0454510 -- Event Date: 09/07/1994			
Inspection	Open Date	SIC	Establishment Name
124656109	09/08/1994	3496	Woven Electronics Llc

A shop-made pressure vessel (air receiver) was overpressurized and exploded. Due to the explosion, two pieces of metal were sent flying. Employee #1 was struck by a piece of metal on the forehead and sustained lacerations. Employee #2 was struck on the hand by another piece and sustained lacerations and broken fingers. The air receiver was being

used in conjunction with a glue gun and had no pop-off valve or air gauge.
Keywords: struck by, explosion, flying object, head, hand, high pressure, laceration, air receiver, safety relief valve, pressure vessel

OSHA

Accident: 772491 - Employee Killed When Head Struck By Flying End Plate

Accident: 772491 -- Report ID: 0627700 -- Event Date: 09/19/1990			
Inspection	Open Date	SIC	Establishment Name
107503591	09/19/1990	2875	Blue Ribbon Organics, Inc.
Plant employees had just completed bagging compost products and the bagging line was shut down to refill material dispensing bins. Employee #1, the office manager, came into the plant to collect time cards. While he and a coworker were standing inside a doorway conversing, a non-ASME code air receiver ruptured; its south end plate flew off in an upward trajectory. The plate struck Employee #1's head, nearly severing the skull and removing part of the brain. The plate continued on, striking and breaking a roof joist. The coworker was impacted by Employee #1's propelled body and knocked into the building wall; he was apparently uninjured although he later complained of a sore back and psychological problems.			
Keywords: head, severed, struck by, flying object, rupture, air receiver, brain, skull, ejected			

OSHA

Accident: 14400600 - Air Receiver Exploded, Killing Employee

Accident: 14400600 -- Report ID: 0626300 -- Event Date: 01/09/1986			
Inspection	Open Date	SIC	Establishment Name
101803260	01/15/1986	7623	Tidewater Compression Service
EMPLOYEE #1 WAS ASSIGNED THE TASK OF REPAIRING A 16 HORSEPOWER GASOLINE ENGINE, POWERING A WORTHINGTON AIR COMPRESSOR, AT A GAS WELL SITE. THE ENGINE WAS BACKFIRING EXCESSIVELY AND BLOWING APART AN INJECTOR GAS COUPLING. THE ENGINE AND COMPRESSOR WERE MOUNTED ON TOP OF A ROY E. HANSON JR. AIR RECEIVER, SER. #186730. ALTHOUGH THERE WERE NO WITNESSES TO THE ACCIDENT, IT APPEARS THAT THE ENDS (WELDS) OF THE RECEIVER BLEW OUT. THE FORCE OF THE EXPLOSION DROVE EMPLOYEE #1 INTO A GAS COMPRESSOR, THEN UP AND BEHIND THE COMPRESSOR. EMPLOYEE #1 WAS PROBABLY KILLED INSTANTLY.			
Keywords: air receiver, explosion, high pressure, repair, gas well, compressed air			

Safety Info Posts - General Safety Topics

Written by Bryan Haywood

Thursday, 16 August 2012 23:06

The 2012 Memorial Day explosion and fire at a Minnesota paper mill that killed an employee and injured several more was caused by an overheated air compressor that ignited oil vapors in the compressor and an air receiver. The report states the cooling water supply to the compressor was severely reduced in the hour before the explosion and that two other compressors had already shut off because of overheating. The report indicated that a maintenance issue or a mechanical failure possibly caused the one compressor to exceed its thermal protection shutdown controls. The MN State Fire Marshal lead investigator estimated the damage from the explosion and resulting fire at $50 million.

The mill had been shut down earlier in the day to repair a leaking water pipe and that the mill was just being brought back online when the explosion happened. The shutdown caused the mill to switch its source of cooling water for its air compressors and the report indicated that cooling water flow to the air compressors had dropped from about 215 gallons per minute at 7:54 a.m. that day to a fluctuating rate of between 19 and 3 gallons per minute between 10:05 a.m. and 10:14 a.m. until the time of the incident at 11:17 a.m.

If you have never read a fatality report from a Fire Marshal, here is your chance. The detail in these reports really describes the scene to a level where many can visualize it like we are standing there. I do CAUTION everyone though, this was a fatality and it may be upsetting to some to read how a fatality investigation takes place. Pay particular attention to the "little things" the investigator(s) pick up on when surveying the scene.

> *"At the north end of the compressor room (with mezzanine above) is the location of two (2) vertical 7,500-gallon receiver tanks, one for mill air and the other instrument air. The mill air receiver tank is along the west wall of the compressor room and the instrument air receiver tank is along the east wall of the compressor room. The mill air receiver tank is 84" in diameter and has exploded and/or ruptured. The ½" thick steel receiver tank is ripped apart, and the welded dome and base of the tank have blown off. The ruptured tank is lying atop compressor #1, which has been displaced from its elevated concrete pad to the south. The interior of the ruptured mill air receiver tank is coated with a thick layer of oil and black soot. In a bottom section of the receiver tank I observed a large pool of oil. Examination of the dislocated 6" in diameter stainless steel compressed air piping from the ruptured receiver tank also revealed heavy black oily soot deposits within the piping."*

Lastly, OSHA's Air Receiver standard 1910.169 is often overlooked, yet almost every industrial facility will have an air compressor and reciever. Do you recall reading that their was a lot of oil present at the scene (after a fire that burned for a couple of days!) and burned oil inside the receiver that catastrophically failed? This is NOT suppose to be the case if we are strictly compling with 1910.169(b)(2), which states...

> *1910.169(b)(2) Drains and traps. A drain pipe and valve shall be installed at the lowest point of every air receiver to provide for the removal of accumulated oil and water. Adequate automatic traps may be installed in addition to drain valves.* ***The drain valve on the air receiver shall be opened and the receiver completely drained frequently and at such intervals as to prevent the accumulation of excessive amounts of liquid in the receiver.***

These days many receivers are equipped with automatic drain valves that do the required draining for us, but this is an after market addition and must be installed by the user. I would say that less than half of the receivers we come across in our audits have these auto-drains and when we ask if the receiver is on

any type of maintenance schedule we tend to get the deer in the headlight look!

Allowing the oil to build up inside this pressure vessel and being exposed to the kinds of temperatures this compressor was running basically vaporized the oil inside the receiver and when flames entered the piping and then into the receiver it was like a bomb going off!

> *Examination of thermal patterns to the compressor room clearly show the fire originated at compressor #3. Compressor #3 overheated internally and igniting compressor oil vapors on fire, which communicated through compressed air piping to the mill air receiver tank where explosive compressor oil vapors were ignited, causing the mill air receiver tank to explode. Flames from the mill air tank explosion communicated to the southwest quadrant of the paper warehouse, igniting rolls of stored paper on fire. The explanation for why compressor #3 didn't shut down due to overheating is unknown, but possible scenarios are failure of a thermal protection device and/or devices at the compressor and/or in-house maintenance issues. In my opinion, severe reduction of the water flow to compressors for cooling the morning of the incident is a contributing factor to compressor #3 overheating, which resulted in a fire and explosion occurring at the mill air receiver tank.*

So although the FM report does not determine the root cause of this explosion, I encourage you to read the report carefully and let's discuss what we think the root cause and the contributing factors of this fatal explosion are.

Case Number
2012-171
Lead Investigator
John W. Steinbach
State Fire Marshal Division
Department of Public Safety
444 Cedar Street, Suite 145
St. Paul, MN 55101-5145
Investigation Report
Confidentiality: Juvenile: Homicide: Confidential:
Property
Name: Verso Paper Corporation
Address: 100 East Sartell Street
City: Sartell County: Benton State: MN Zip: 56377-
Phone: 320-240-7510 Contact Name: Mike Gunderson Contact Phone: 320-250-7597
Property Use Code: 700
Building Name: Use Code: Alarm Type: Choose Sprinkler: Choose
Section Name: Use code: Alarm Type: Choose Sprinkler: Choose
Incident Detail
Date: 05/28/2012 Time: 1121 Fire Type: Explosion Fire Cause: Appliance Overheated # Injuries: 3
Fire Dept.: Sartell FDID: 73121 Req. Agency: Sartell Fire Department Coop. Agency: Sartell Police Department
Type of Occupancy: Paper Manufacturing Pre Fire Value: $ Loss: 50,000,000
Smoke Detector Performance: Unknown Sprinkler System Performance: Not Operating Properly
Occupied: Yes: No:
Disposition
Open: Closed: Referred to other agency: Referral Info:
Note: All fields underlined are required upon initial submission of this report.
Synopsis

Employees at a paper mill discovered smoke and flames shooting from the top of an air compressor in an air compressor room at the east end of the plant. Employees notified the plant's fire brigade and began exiting the area, when a receiver tank at the north end of the compressor room exploded, causing severe structural damage and fire to occur within the plant's compressor room and paper warehouse. The resulting explosion caused injuries to several employees, including one fatality. Multiple fire departments arrived on scene and battled the flames for days using multiple fire apparatus. Investigation determined a severe reduction of cooling water flow to operating compressors prior to the incident contributed to a compressor overheating,

which resulted in a fire and explosion to occur.

Owner 1 Check if Occupant:

Last First Middle Fatality DOB Gender

Verso Paper Corporation / / Choose

Address: 6775 Lenox Center Court, Suite 400 CO: % BAC: Drugs:

City: Memphis State: TN Zip: 38115-

Phone: - - Contact Name: Robert P. Mundy Contact Phone: 901-369-4128

E-mail: School District #: Country:

Blue indicates required fatality information. DOB is optional unless a fatality.

Owner 2 Check if Occupant:

Last First Middle Fatality DOB Gender

/ / Choose

Address: CO: % BAC: Drugs:

City: State: Zip: -

Phone: - - Contact Name: Contact Phone: - -

E-mail: Country:

Blue indicates required fatality information. DOB is optional unless a fatality.

Occupants

Last First Middle DOB Fatality Gender CO BAC Drugs

/ / Choose %

/ / Choose %

/ / Choose %

/ / Choose %

/ / Choose %

/ / Choose %

/ / Choose %

/ / Choose %

/ / Choose %

/ / Choose %

Blue indicates required fatality information. DOB is optional unless a fatality.

Other Fatalities – Fire Fighters and Others

Last First Middle DOB Gender FF/Other CO BAC Drugs

/ / Choose Choose %

/ / Choose Choose %

/ / Choose Choose %

/ / Choose Choose %

/ / Choose Choose %

CO, BAC and Drugs only required if fatality is not a Fire Fighter

Insurance Record

Insurance Agency: AON Risk Solutions Agent: Phone: 415-486-7000 City:

Insurance Co: FM Global Policy Number: XG935 Inception Date: 8/1/2011 Expiration Date: 8/1/2012

Amount of Policy: Blanket Coverage 5,900,000,000 Building: Contents: Other: Deductible

1,000,000
Claim Number: 411404 Payable to: Adjuster: David Hess Phone: 763-732-4239
Remarks:

Narrative Report

People

Sartell Fire Department – Fire Chief Ken Heim & Fire Marshal James Rieland; 320-253-2171

Sartell Police Department – Detective Tim Broda, Officer Jason Thompson & Officer Rob Lyon; 320-251-8186

Owner – Verso Paper Corporation; 6775 Lenox Center Court, Suite 400, Memphis, TN 38115

Senior Vice President and Chief Financial Officer Robert P. Mundy; 901-369-4128

Verso Paper employee/fatality – Jon Michael Maus, DOB 7/26/1961; 19839 390th Street, Albany, MN 56307

Verso Paper employee/injured – David Sylvester Popp, DOB 10/4/1951; 5599 398th Street, Rice, MN 56367;
320-259-1434 (h), 320-469-8301 (cell)

Verso Paper employee/injured – Dennis Daniel Schneider, DOB 1/8/1967; 3305 12th Avenue North, Sartell, MN
56377; 320-333-7206 (h), 320-241-0331 (cell)

Verso Paper Pulp & Utilities Manager – Robert Edward Bridges, DOB 4/19/1951; 4700 4th Street Loop NE,
St. Cloud, MN; 320-761-1047

Verso Paper Utilities Area Manager – Mark James Wichman, DOB 4/11/1960; 3612 South Oak Circle,
St. Cloud, MN; 320-241-1482

Verso Paper Water Treatment Operator – Randy Donald Roeder, DOB 5/23/1957; 20457 Elmwood Road,
Clearwater, MN 55320; 320-558-6662

Verso Paper Safety Supervisor – Caleb Voigt; 320-309-8145

Verso Boiler Operator – Joseph Edward David, DOB 6/14/1955; 4615 Mink Loop NW, Sauk Rapids, MN
56379; 320-293-8010

Verso Employee Lead Hourly Tech – Eugene Joseph Yasgar, DOB 7/17/1953; 2416 6th Street South, Sartell:
320-492-0463

Verso employees – Glen Schellinger; 320-255-1460
John Haus; 320-260-8325
Bob Heins; 320-252-9157
Marvin Koshiol; 320-493-3394
Paul Plafcan; 320-333-2644
Dale Dirks; 320-333-3181
Byron Birr; 320-363-1215
Duane Albrecht; 320-260-4019

Verso employees – Pete Haus; 320-253-8798
Jerry Schubert; 320-240-7248
John Knese; 320-252-7452
Jerry Bloch; 320-249-6422
Ray Cordie; 320-363-4864

Securitas Security employee – Matt Yager; 320-492-5313

Whitemore Fire Consultants – Bob Whitemore & Brian Haag; 952-461-7000

Background

At 1216 hours on May 28, 2012, I received a phone call from the State Duty Officer informing me the Sartell Fire Department was requesting my assistance for a commercial business fire and explosion involving one fatality at Verso Paper Corporation in Sartell. En-route to the fire scene, I contacted Deputy State Fire Marshal-Investigator Casey Stotts and requested his assistance with this fatal commercial business fire and explosion.

I arrived on scene at 1342 hours and observed many firefighters and fire apparatus battling flames to a fire damaged structural steel building used to manufacture paper. I was met by Sartell Fire Chief Ken Heim and Sartell Police Department Detective Tim Broda, Officer Jason Thompson and Officer Rob Lyon, who provided me with the following background information:

• The fire and explosion was reported by numerous 911 callers at 1121 hours.

• Upon fire department arrival, heavy black smoke was venting from the south end of the paper warehouse; and smoke and flames were shooting through a large gaping hole in the roof above the compressor room.

• Portions of the paper mill's sprinkler system were compromised during the explosion, displacing water lines.

• Exterior steel sheeting along the east wall of the paper warehouse had blown out onto the railroad tracks alongside the building.

• Fire suppression was focused from the south, north and east sides of the building.

• Many aerial fire apparatus were utilized to apply hose streams to the roof of the building, with a large gaping hole along the west side of the warehouse in the area of the plant's air compressor room.

• Firefighters discovered the body of deceased Verso Paper employee Jon Maus at the southern end of the roll wrap room, which is south of an employee break room and air compressor room.

• In addition to the employee fatality, two additional employees, David Popp and Dennis Schneider, were injured during the explosion.

• Prior to the explosion, employees heard a hissing noise and discovered a fire in the air compressor room.

• The plant's Fire Brigade was notified about the smoke and fire in the compressor room.

• Employee Jon Maus attempted to use a portable fire extinguisher on the fire in the compressor room and then he and employee Dennis Schneider decided to retreat. The explosion occurred as Maus and Schneider retreated.

• A water leak had occurred in the plant the morning prior to the explosion.

• The plant was scheduled to shut down at about 10:40 AM to repair the water leak.

• Employees repaired the water leak.

• As employees were bringing the plant back up to operation at approximately 11:00 AM, smoke was discovered in the roll wrap room.

Deputy State Fire Marshal Casey Stotts, Police Detective Broda, Benton County Assistant Medical Examiners and I photographed and documented the location of fire and explosion fatality Jon Maus. The victim's body was then removed from the scene and transported to the Midwest Medical Examiner's Office in Ramsey, MN for an autopsy. According to the Medical Examiner's Office, the victim died as a result of blunt force trauma sustained during the explosion.

I then proceeded to take some initial photographs of the scene and document the fire and explosion damage to the structure. Due to continuing fire suppression activities of burning rolls of paper in the plant's warehouse and severe structural damage, investigation into the origin and cause of the fire and explosion was suspended until extinguishment of the fire and shoring up of the structure was completed for safe entry. I conducted digitally recorded interviews with Verso employees Robert Bridges, Mark Wichman, Randy Roeder and Dave Popp (see Interviews).

On May 30, 2012, I returned to the fire scene where fire suppression activities were continuing to extinguish burning rolls of paper in the paper warehouse. I met with and interviewed Matt Yager from Securitas Security Company, who provides security at Verso Paper. At 0520 hours the morning of the fire, Stearns County

Dispatch received a 911 call from a Sartell resident regarding loud banging noises coming from the mill. Yager stated he was doing his rounds in the morning when he heard loud popping noises coming from the North Power Plant. The Power Plant operator told him they were dealing with a leaking steam valve and there was no danger. Yager stated a Sartell Police Officer then arrived on scene to inquire about the noise. Yager informed the officer about the incident and that there was no danger to the public.

On May 31, 2012, I was present for a meeting with the following Verso Paper employees: Electrical Engineer Dave Zimmer, Maintenance Supervisor for Utilities Jerry Schubert, Mechanical Engineer Bob Barr, and Utilities Manager Mark Wichman. Also present for the meeting was Bob Whitemore from Whitemore Fire Consultants, who was retained by FM Global Insurance to investigate the loss. During the meeting, I learned the following:

• Compressors #1 through #4 were installed in 1981. Compressor #5 was installed in 1996.

• The compressors are Gardner Denver rotary screw compressors, 400 horsepower.

• Each compressor has its own heat exchanger to cool compressor oil and air.

• Two times a shift, a water treatment employee records the oil temperature, oil level and operating temperature of each compressor operating. The logs are stored at the South Power Plant.

• The South Power Plant control room contains computer equipment that records the following compressor data: oil temperature, mode of operation, KW usage, air pressure and air pressure for each air tank vessel approximately 18’ in height and 84” in diameter.

• One of the air tanks is for instrument air and the other mill air.

• Alarms for compressor high air temperature and low oil are monitored at the South Power Plant.

• Compressor overhauls are completed by an outside vendor.

• Approximately two years ago, the company received a grant to convert the compressors from aircooled to water-cooled. Several outside vendors were involved with the installation project.

• Approximately three to six months ago, #4 compressor was switched out with a rebuilt air compressor.

• #4 compressor had an oil leak and oil consumption issue. The compressor also had a vibration issue. Verso addressed a filter problem and made changes. #4 compressor was then installed in the #1 compressor position, and #1 compressor was taken out and used as a spare compressor.

• There are no vibration alarms for compressors.

On June 1, 2012, I returned to the fire scene to supervise the removal of charred rolls of paper from the southwest corner of the warehouse adjacent to the compressor room where the fire and explosion occurred.

Rolls of paper were removed to access the blast area along the west wall of the warehouse. Through a laser imagining process, engineers from Clark Engineering, retained by Whitemore Fire Consultants, digitally photographed the compressor room and north end of the roll wrap room directly south of the computer room.

The roll wrap room and area east of the compressor room into the paper warehouse were secured with orange snow fence and/or fire line tape and traffic cones.

On June 4, 2012, I returned to the fire scene to resume debris removal from the southwest quadrant of the warehouse and north end of the roll wrap room. During debris removal, potential artifacts were discovered among debris. The artifacts were collected and secured in a secured area. Prior to debris removal, Verso Paper Corporation Senior Vice President of Manufacturing Lyle Fellows signed a consent form for this fire investigation (see attachment).

On June 5, 2012, I returned to the fire scene, where I observed heavy equipment contractors install steel I beams beneath the mezzanine above the north end of the compressor room in order to shore-up unstable steel and the poured concrete floor of the mezzanine above the compressor room. I also traveled to the

residence of injured Verso employee Dennis Schneider to possibly interview Schneider. There was no response at the residence. I left phone messages on both Schneider's cell and home phone for him to contact me. I then traveled to the work place of Schneider’s’ wife, Kim Schneider, and left my business card with Kim Schneider instructing her to have Dennis contact me.

On June 6, 2012, I returned to the fire scene, where I observed heavy equipment contractors resume operations to shore up the unstable mezzanine area above the north end of compressor room. I also met with and conducted a digitally recorded interview with Verso employee Dennis Schneider (see Interviews). Also present during the interview were Bob Darling from Minnesota Department of OSHA, Brian Haag from Whitemore Fire Consultants, and legal counsel from Verso Paper.

Deputy State Fire Marshal Casey Stotts turned the fire scene over to Bob Whitemore from Whitemore Fire Consultants on Friday June 8, 2012. Whitemore Fire Consultants represents FM Global, who insures Verso Paper.

On June 11, 2012, I returned to the fire scene for a scheduled inspection of the scene with Bob Whitemore from Whitemore Fire Consultants and involved parties (see sign-in sheet). During the inspection, I noted the ruptured receiver tank at the north end of the compressor room had been removed from the compressor room and placed inside the paper warehouse for inspection purposes. The top and base sections of the affected receiver tank were also removed from the compressor room and placed alongside the ruptured receiver tank.

Involved parties photographed and documented the fire and explosion scene.

On June 12, 2012, I returned to the fire scene, where I was present for debris removal from the north end of the compressor room. Artifacts discovered among debris were collected and placed in a secure area. I also conducted a digitally recorded interview with Verso employee Lead Hourly Tech Eugene Yasgar (see Interviews).

On June 13, 2012, I returned to the fire scene, where I was present for debris removal from the compressor room. Artifacts discovered among debris were collected and placed in a secure area. I also received a 4-GB jump drive from Verso Legal Counsel containing proprietary information pertaining to mill operations and instrumentation data for compressor data, i.e. air compressor oil temperature, electrical power usage, air pressure and on/off operation (see signed confidentiality agreement Deputy State Fire Marshal James Iammatteo signed for the MN State Fire Marshal Division).

On June 14, 2012, I returned to the fire scene, where I was present for debris removal from the compressor room and north end of roll wrap room. Artifacts discovered among debris were collected and placed in a secure area.

On June 15, 2012, I returned to the fire scene, where I was present for debris removal from the employee break room inside the roll wrap room. Artifacts discovered among debris were collected and placed in a secure area.

On June 18, 2012, I returned to the fire scene, where I was present for debris removal along the west wall of the compressor room. Artifacts discovered among debris were collected and placed in a secure area. The west wall of the compressor room was shored-up to stabilize the precast concrete walls above.

On June 19, 2012, I returned to the fire scene, where I was present for a tour of the raw water pump house at the north end of the mill. Mill water to the plant was shut-off in the pump house at a shut-off valve the morning of the incident to repair a leaking water valve beneath paper machine #3. The tour, escorted by Verso Paper employees and Verso Legal Counsel, continued to the leaking water valve beneath paper machine #3 that was replaced the morning of the incident. The tour then continued to a corridor immediately adjacent to the compressor room, where the mill water shut-off valve for cooling compressors is located. The mill water shutoff valve is in the closed position. Also located in this corridor outside the compressor room is a well water shut-off valve also used for cooling compressors. The well water shut-off valve is in the open position. The tour then continued to the South Power Plant control room, where I observed a series of control panels that monitor various plant operations. During the tour, I approached a Verso employee sitting at a control panel

and began asking questions regarding monitoring operations. Verso legal counsel present terminated any further questions.

On June 21, 2012, I returned to Verso Paper in Sartell, where Bob Whitemore and I conducted digitally recorded interviews with the following Verso employees: Glen Schellinger, John Haus, Bob Heins, Marvin Koshiol, Paul Plafcan, Dale Dirks and Byron Birr (see Interviews). Also present during employee interviews were mill union representatives and legal counsel for Verso Paper.

On July 9, 2012, I returned to Verso Paper in Sartell, where Bob Whitemore and I conducted digitally recorded interviews with the following Verso employees: Duane Albrecht, Pete Haus, Jerry Schubert, Mark Wichman, John Knese, Jerry Bloch and Ray Cordie (see Interviews). Also present during employee interviews were mill union representatives and legal counsel for Verso Paper.

Property Description

This structure was originally built in 1905 and has several additions. It varies in height from one to six stories and is a masonry and structural steel building used to manufacture various types of coated paper from raw materials. The paper mill, which employs approximately 260 employees, includes two separate electrical generating power plants. The paper mill produces rolls of coated paper weighing approximately one to four each and measuring approximately three to four feet in diameter and approximately four to six feet in height. The mill is a fully sprinkled building with its own in-house fire brigade that responds to emergencies at the plant. The paper mill is located along the banks of the Mississippi River in the city of Sartell in central Minnesota.

The portion of the building involved in the fire and explosion is a structural steel building with metal clad exterior walls and flat rubber membrane roof. The interior walls are metal clad, which includes concrete block walls and poured concrete fire walls. This affected area of the building at the east end of the plant is occupied by the mill's warehouse, roll wrap room, compressor room, and portion of the plant's electrical distribution center.

Scene Examination

I began my investigation in the roll wrap room where firefighters discovered the deceased body of mill employee Jon Maus. The roll wrap room with conveyor system is used to wrap rolls of finished paper for transport to the warehouse. There are fractured pieces of concrete blocks and debris scattered throughout the roll wrap room. Many damaged and/or overturned steel dumpsters are lying about the roll wrap room.

The victim's body is lying on the concrete floor at the southern end of the roll wrap room. The victim is lying on

his left side, with his upper back against a steel pipe. There is blood on the floor in the area of the victim's head, and the body is lying partially inside an overturned steel dumpster. The body has sustained numerous blunt force injuries. The victim's body was photographed, documented and transported to the Midwest Medical Examiner's Office in Ramsey for an autopsy. According to the Medical Examiner, the victim died of blunt force trauma injuries sustained during the fire and explosion.

At the northwest corner of the roll wrap room is an employee break room with concrete block walls. North and east of the employee break room is a compressor room which houses five (5) 400-horsepower air compressors and two (2) 7,500-gallon receiver air tanks. The south concrete block walls of the compressor room and the employee break room have blown out into the roll wrap room. There are fractured pieces of concrete blocks and debris scattered about the floors of the employee break room and roll wrap room. Explosion damage to the roll wrap room clearly reveals the blast originated from the north end of the compressor room.

Inside the compressor room are concrete blocks and debris littering the floors. Overhead mechanical and electrical distribution systems, including water lines originally suspended from steel I-beams above in the compressor room, have partially collapsed, obstructing a clear path to the north end of the compressor room.

There are five (5) 400-horsepower rotary screw air compressors along the west wall of the compressor room, beginning with #5 compressor at the south end and #1 compressor at the north end. Compressors #1 through #4 are Gardner Denver, installed in approximately 1981. Compressor #5, also a Gardner Denver, was installed in approximately 1996. The compressors contain two heat exchangers, one for cooling air and the other for cooling compressor oil. In 2010, through a federal grant, Verso converted compressors from air cooled to water cooled, which significantly reduced compressors from tripping out on hi air temperature.

Compressors are cooled primarily by mill water also know as (river water). Compressors can also be cooled by well water and/or by city water. Water-cooled air compressors supply compressed air to operate various types of valves and instruments throughout the plant.

At the north end of the compressor room (with mezzanine above) is the location of two (2) vertical 7,500-gallon receiver tanks, one for mill air and the other instrument air. The mill air receiver tank is along the west wall of the compressor room and the instrument air receiver tank is along the east wall of the compressor room. The mill air receiver tank is 84" in diameter and has exploded and/or ruptured. The ½" thick steel receiver tank is ripped apart, and the welded dome and base of the tank have blown off. The ruptured tank is lying atop compressor #1, which has been displaced from its elevated concrete pad to the south. The interior of the ruptured mill air receiver tank is coated with a thick layer of oil and black soot. In a bottom section of the receiver tank I observed a large pool of oil. Examination of the dislocated 6" in diameter stainless steel compressed air piping from the ruptured receiver tank also revealed heavy black oily soot deposits within the piping.

The second receiver tank, although intact, is lying on its side along the north blown out wall of the compressor room. The west concrete block wall of the compressor room has blown out, causing precast concrete walls above to partially collapse downward. The north and east concrete block walls at the north end of the compressor room have also blown out. Steel I-beams supporting the concrete floor above are hanging down.

Stainless steel pipes for air and water supply have been displaced and hang precariously above. The east concrete block wall of the compressor room has blown out into the paper warehouse, and shattered pieces of cinder block are lying all over the southwest corner of the warehouse among charred rolls of paper. The structural steel roof assembly of the southwest quadrant of the paper warehouse is partially collapsed and resting on charred rolls of paper. The fire in the warehouse and explosion at the mill air receiver tank in the compressor room ensued due to a fire that occurred at compressor #3, based on eye-witness observations and heat patterns observed at #3 air compressor.

A cable tray is suspended from the compressor room ceiling routed directly above air compressors in a north south direction. The cable tray supports various electrical conduits and electrical cables for electrical equipment in the plant. Wiring insulation on the electrical cables directly above compressor #3 are blackened and/or charred due to external heating from compressor #3 below. Painted steel enclosure panels for compressor #3 are heavily discolored due to thermal heating from within the compressor unit. Electrical control panels at the front and/or east side of the compressor are severely compromised due to the explosion damage.

I observed the compressor's relief valve at the top southeast corner of the compressor cabinet. I observed plumbers wire used to secure the relief valves manual release handle to the relief valve body. Examination of relief valves on compressors #1, #2, #4 and #5 revealed no plumbers wire securing the manual release handles to the relief valve bodies. According to compressor experts present, the plumbers wire securing the handle to the relief valve does not affect the operation of the relief valve.

I then examined the interior of the compressor unit, where I observed significant fire damage. The interior steel enclosure of the compressor unit is blackened and covered with soot. Air filters at the backside of the compressor unit for air intake are consumed by fire. Six-inch rubber couplings between the steel air intake cabinet and the compressors air intake heads are destroyed by fire. There is extensive thermal damage to the compressor unit itself. The painted cast iron compressor, oil separator and 100-gallon oil tank below the oil separator are blackened and discolored due to internal heating from the compressor. The compressor oil used in the compressors is Aeon 2000 or 4000 Rotary Screw Compressor, Petroleum Based Lubricant. According to MSDS Sheets, the flash point for Aeon 4000 is 410 degrees F. and the flash point for Aeon 2000 is 388 degrees F. A warning label affixed to either the Aeon 2000 or 4000 oil drums reads Attention: Empty containers may contain product residue, including flammable or explosive vapors. Do not cut, puncture or weld on or near container.

According to pi data retrieved from the south power plant control room, the compressor oil temperature at compressor #3 at the time of the explosion (11:17 AM) was 308 degrees F. The normal operating temperature for compressor oil is approximately 150 degrees F., according to pi data.

Compressor #3 operated at or above 300 degrees F. from approximately 10:30 AM until the time of the explosion at 11:17 AM. Compressor instrumentation used for measuring oil temperate measures from 50 degrees F. minimum to 300 degrees F. maximum. Review of a computer-generated pi graph of time and temperature for compressor #3 at the time of the incident was potentially approximately 484 degrees F.

Also according to pi data, compressor #4 stopped running at 10:06 hours with an oil temperature of 200 degrees F. Compressor #5 stopped running at 10:07 AM with an oil temperature of 205 degrees F. The compressors are designed to shut off when the compressor air temperature reaches approximately 230 degrees F. The compressors are also designed to shut off due to low oil pressure. When compressors #4 and #5 shut off due to high air temperature, compressors #1 and #2 were started by a Verso employee.

Compressor #1, only to be used in an emergency, was started at 10:16 AM and compressor #2 was started at 10:07 AM. Also, according to pi data on the day of the incident, compressor cooling water flow was approximately 215 gallons per minute until 7:54 AM, when cooling water flow dropped to an average of approximately 78 gallons per minute. Also according to pi data, from approximately 10:05 AM until about 10:14 AM, cooling water flow fluctuated between 19 gallons of water per minute to as low as 3 gallons of water per minute. Severe reduction of compressor cooling water flow continued up until the time of the incident at 11:17 AM.

Compressor cooling water is normally supplied by mill water from the plant's raw water pump house. At approximately 7:00 AM the morning of the incident, a mill water leak was detected beneath paper machine #3, which required mill water at the plant to be shut off in order to make repairs. Prior to shutting off mill water at the plant well, water to the compressor room for compressor cooling was turned on by opening a gate valve in a corridor west of the compressor room. During my scene examination, I noted the mill water shut-off valve to the compressor room for cooling water was closed and the well water shut-off valve open. As cooling water supply to the compressor room was significantly reduced, compressor oil temperatures at compressors #3, #4

and #5 continued to elevate until compressors #4 and #5 tripped out due to high temperature. Compressor #3 continued operating with an elevated oil temperature until the time of the incident. Compressors #1 and #2 also operated until the time of the incident, with oil temperatures at the time of the incident for #1 compressor at 158 degrees F. and #2 compressor at 178 degrees F.

Examination of thermal patterns to the compressor room clearly show the fire originated at compressor #3.

Compressor #3 overheated internally and igniting compressor oil vapors on fire, which communicated through compressed air piping to the mill air receiver tank where explosive compressor oil vapors were ignited, causing the mill air receiver tank to explode. Flames from the mill air tank explosion communicated to the southwest quadrant of the paper warehouse, igniting rolls of stored paper on fire. The explanation for why compressor #3 didn't shut down due to overheating is unknown, but possible scenarios are failure of a thermal protection device and/or devices at the compressor and/or in-house maintenance issues. In my opinion, severe reduction of the water flow to compressors for cooling the morning of the incident is a contributing factor to compressor #3 overheating, which resulted in a fire and explosion occurring at the mill air receiver tank.

Evidence

I collected no evidence from the scene.

Photographs & Diagrams

A photo log and a scene sketch are attached to this report.

Interviews & Investigation Activity

I interviewed Verso Pulp & Utilities Manager **ROBERT BRIDGES**, who told me the following:

- Approximately 100 employees were working the day shift that day.
- He wasn't at the plant today; he was up north fishing when he received word about the fire.
- On the weekends, there is a two-man maintenance crew per shift.
- Four or five compressors are in the compressor room; only two or three run at a time.
- The compressors are 200-horsepower Gardner Denver, installed in the 1980s. The compressors operate at about 80 PSI.

• There is an oil cooler for each compressor; the compressors are cooled by water.

• There was a leak in a water line at the mill the morning before the fire. The plant shut the mill water off and switched to well water to cool the compressors.

• He's not aware of any problems and/or recent service work to the compressors.

• Most of the maintenance work is done in-house.

I interviewed Verso Utilities Area Manager **MARK WICHMAN**, who told me the following:

• He has been with the mill for 30 years. He is in charge of the operation of air compressors, chillers, steam systems, power generation and waste treatment.

• The plant is open 24 hours a day, 7 days a week. Employees work 12-hour shifts, 6:00 am to 6:00 pm and 6:00 pm to 6:00 am.

• He got to work at 6:30 AM and there were approximately 8 employees in his area.

• Paper machine #3 coordinator Mike Gunderson called him at about 7:00 AM about a mill water leak in the basement of the plant. A 3" water line off the water main below paper machine #3 was leaking.

• Air compressors in the compressor room are cooled by either mill water or well water.

• At about 8:15 AM, the mill water valve to the compressor room was closed and the well water valve to the compressor room was opened. Well water is on most of the time.

• Mill water is treated water from the river. The plant flows approximately 7,000 gallons of mill water per minute.

• He had a meeting about 8:30 AM to discuss a plan to repair the water leak. They also turned on city water to cool equipment in the south power plant.

• The water leak in the basement completely failed and came apart.

• At about 9:50 AM, #3 paper machine was shut down.

• At about 10:00 AM, he heard over the radios that two of the air compressors had tripped out due to overheating. When #3 paper machine was shut down, well water to the air compressors got shut-off.

• At about 9:50 10:00 AM, Randy Roeder went to the compressor room and tried to re-start the compressors, but the compressors wouldn't start, overheated.

• Once well water started re-flowing again to cool oil in the air compressors, the compressors were restarted. He made sure the well water was running fine.

• They waited for the pulp mill to shut-down before shutting the mill water main off in the raw water pump house.

• At about 10:30 to 10:40 AM, the pulp mill was shut-down. He radioed to shut the mill water off.

• Pipe fitters made the repair to the leaking water line.

• At about 11:00 AM, they started re-opening the mill water main valve slowly.

• He heard about the fire brigade call to the roll wrap room.

• On his way to the roll wrap room, he heard a thump and percussion noise.

• He came outside and saw smoke coming from the roof of the building.

• The compressors used to be air cooled and switched to water cooled about 2 years ago.

• When the compressors were air cooled, they would trip out due to oil overheating.

• He's not aware of any recent service work to the compressors; most of the maintenance is done in house.

• The compressors used to have oil leak problems.

• The compressors were installed in the 1980s and are 400-horsepower. The oil temperature is approximately 180 degrees.

• There are 100 gallons of oil per compressor, and the oil is cooled through a heat exchanger. The operating air pressure is about 100 PSI.

• Three of the five air compressors were running at the time of the incident; two of the three chilled water pumps were running; and one of the glycol pumps in the compressor room was running at the time of the incident.

I interviewed Verso Water Treatment Operator **RANDY ROEDER**, who told me the following:

• He arrived at work at 6:00 AM and did his boiler water tests.

• At 7:00 AM, he went into the compressor room to check the compressors. Compressors #3, #4, and #5 were running fine.

• At about 10:30 AM, he got a call from the south power plant for a low air pressure problem.

• He and employee Gene Yasgar went back to the compressor room to check out the problem.

• Compressors #4 and 5 were in default, shut down because of high oil temperature. Compressor #3 was the only compressor running.

• He went up to compressor #2. Compressor #2 is set on auto and was supposed to be running, but wasn't. He turned the on-off switch for compressor #2 to off and then back to auto; the compressor started running.

• He also started compressor #1 up.

• Compressor #1 has vibration issues and is only supposed to be used in an emergency. Compressor #1 was vibrating and the vibration alarm for compressor #1 went off.

• The compressor room was fine when they left.

• He's not aware of any recent service work or problems with the compressors, other than the vibration issue with compressor #1, which is directly alongside the two vertical air storage tanks.

• He got a call from the power plant about an instrument air issue above the compressor room where air dryer equipment is located. He went up to the air dryer room.

• He then got a call about low water for the scrubber pump in the South Power Plant. He and Gene left the compressor room and went to the South Power Plant.

• He then heard about the fire alarm call.

I interviewed Verso Car Loader **DAVE POPP**, who told me the following:

• He started work at 5:45 AM Monday morning.

• He loaded rolls of paper into the warehouse until about 10:40 AM. Then he went to the car loaders office at the south end of the paper warehouse to take a safety course.

• He heard the page for the fire brigade and could see a smoke haze in the warehouse.

• He walked north in the warehouse to the area of the northeast roll wrap overhead garage door. The smoke level in the roll wrap room was about 5' above his head.

• He walked up to the garage door opening of the roll wrap room and the compressor room sliding door was open.

• He saw flames at floor level at the first compressor in the compressor room, south end.

• It looked like you could put the fire out with an extinguisher. The flames were about 2' to 3' high.

• He could see an orange glow coming from the compressor room.

• He saw Dennis and Jon across the roll wrap room near the compressor room sliding door.

• Jon was standing in front of the sliding door holding and pointing a fire extinguisher inside the compressor room.

• Then he saw the flames get brighter.

• He saw Dennis and Jon turn around and start walking away from the compressor room.

• Dennis was about in the middle of the roll wrap room when the explosion occurred.

• The explosion blew him back, injuring his shoulder.

• The roll wrap room got black with smoke.

• Fire Brigade employee John Wollak helped him up.

• He could hear water running from the sprinkler system.

• He and Fire Brigade person Dale Dires could see flames in a southwest corner of the warehouse adjacent to the compressor room. I interviewed Verso employee/Fire Brigade member **JOHN WOLLAK**, who told me the following:

• At about 11:00 AM, prior to the Fire Brigade page, he was in the core room when he noticed a haze in the room. He walked out in the warehouse and saw a haze in the warehouse.

• Then he heard the page out for the Fire Brigade to respond to the roll wrap room.

• He saw Dave Popp when he was in the warehouse east of the northeast roll wrap overhead garage door.

• Then the explosion occurred.

I interviewed Verso Boiler Operator of the North Plant **JOSEPH DAVID**, who told me the following:

• At about 4:30 AM on Monday morning, before the fire, they were bringing a boiler on line at the north power plant.

• There was a problem with a pressure relief steam valve. The safety valve kept popping, which made a booming noise.

• He took care of the problem and it went away.

• At about 5:45 AM, he got a call from security about the banging noises and told them everything was fine.

I interviewed injured Verso employee **DENNIS SCHNEIDER**, who told me the following:

• He has worked at the mill for 21 years. He's a trucker/operator in the roll wrap room.

• He started working in the roll warp room this past February.

• He arrived at work at 5:40 AM the morning of the explosion.

• He was working with Jon Maus in the roll wrap room.

• Approximately an hour prior to the fire, he and Jon went into the break room. There were no more rolls of paper to wrap. He and Jon were in the break room for an hour.

• Sometime prior to the fire, he saw employee Randy Roeder walk into the compressor room and then walk back out.

• Approximately five minutes prior to the explosion, he heard a loud hissing noise coming from the compressor room. He's never heard that noise before. The noise lasted about three seconds and then quit.

• He and Jon came out of the lunch room and walked up to the compressor room sliding doors. He could see a haze of smoke in the compressor room.

• He (Dennis) went to the phone and called the Fire Brigade and came back to the sliding doors. Jon had retrieved a fire extinguisher. He doesn't know where Jon got the extinguisher from.

• They were both standing at the compressor room sliding door looking into the compressor room.

• He saw a puff of smoke come off the top of the middle air compressor, #3. Then he saw a 3' to 6' tall orange flame shoot out the top of the #3 compressor.

• He turned around and started running away.

• He doesn't know if Jon sprayed the fire extinguisher or not.

• Then the place blew up and he was thrown to the ground. He didn't know what happened to Jon.

• He saw the exit light in the roll wrap room and got out.

• He never heard any type of fire alarms prior to the explosion.

• He has no knowledge about the equipment in the compressor room.

I interviewed Verso employee Lead Hourly Tech **EUGENE YASGAR**, who told me the following:

• He's worked at the paper mill for 30 years. He makes rounds at the mill checking equipment, pumps, air compressors and writes up work orders if equipment needs repairs.

• The day of the explosion, he was called into work at 8:00 AM to take care of a mill water leak under paper machine #3. They had to shut down the mill water to the plant. The well water was turned on.

• The #3 paper machine was shut down. TMP was shut down and the turbine for the power plant was shut down. City water was also turned on.

• He shut down all mill water at the raw water pump house in order to repair the leaking 3" mill water line under paper machine #3.

• He walked over to #3 paper machine and heard over his radio about the compressors getting warm and alarms going off.

• The Power Plant Operator that day was Randy Cordie.

• He walked over to the compressor room and met Randy Roeder as he was walking out.

• He went into the compressor room and checked the water bleed off on #5 compressor. Water was flowing to the compressor.

• He doesn't remember if compressor #5 was running or not. He doesn't remember what compressors were running.

• He walked down the line of compressors and noted compressor temperatures were less than 200 degrees. Everything seemed fine in the compressor room.

• There was no smoke odor and he didn't see any smoke.

• He walked through the compressor room twice that day; he doesn't remember what time it was.

• He left the compressor room and went to the south power plant.

• After the 3" water line beneath #3 paper machine was repaired, he went back to the raw water pump house and started opening the mill water valve slowly.

• When he had the mill water valve about halfway open, he heard the explosion.

• Air tank receivers have automatic blow down valves to displace water and oil. Each shift, the shut-off valves at the bottom of each air tank receiver are opened and closed to check for water and oil.

• He's not aware of any problems with the compressors, other than #1 air compressor was switched out about 6 months ago because of a housing oil leak.

• PM Specialists monitor and fill compressors with oil.

I interviewed Verso employee Pipefitter **GLEN SCHELLINGER**, who told me the following:

• He has worked at the mill for 33 years.

• He started work at 7:00 AM the day of the incident. They were getting ready to shut down the power plant to repair a water leak beneath paper machine #3.

• They had a meeting at 8:30 AM to discuss how to repair the water leak. They needed to shut down the mill water to the entire plant, with the exception of the south power plant.

• The mill water in the pump house was shut off at about 10:40-10:45 AM. At about 10:50 AM, they started repairing the water leak and replaced a 3" water valve and two pipe clamps. The repair took about 11 minutes.

• The mill water valve in the pump house was opened up slowly.

• He heard the Fire Brigade get paged to the roll wrap room. Then he heard the explosion.

• He used to work in the compressor room until this past December when #1 and #2 paper machines were shut-down. He used to replace dresser couplings in the compressor room and used to change out oil separator filters in the compressors.

• He was a pipefitter. He never worked on wiring and/or controls on the compressors.

• He also checked relief valves on the receiver tanks receiver.

• The power plant and production people maintain the compressors.

• When compressors were air cooled, they would trip out often in the summer due to high temperatures.

I interviewed Verso employee Tour Millwright **JOHN HAUS**, who told me the following:

• He has worked at the mill since 1978 and takes care of maintenance issues in the mechanical area of the plant.

• He started work at 6:00 AM on the day of the incident. There was a water leak beneath paper machine #3.

• At about 8:30 AM, Mark Wichman had the compressors switched from mill water cooling to well water

cooling.

• At about 10:30 AM, the mill water to the plant was shut down to repair a water leak below paper machine #3. He assisted with repairing the water leak and it took about 11 minutes.

• He heard the Fire Brigade call to the roll wrap room and then he heard the explosion.

• He does maintenance work on the compressors, changes oil separator filters and air intake filters.

• The last time he was in the compressor room was about two weeks ago. He changed air intake filters on one of the compressors, thinks it was #3 or #2.

• When he was in the compressor room, he noticed a green lock-out tag on he thinks it was #4 compressor, but he's not sure.

• The lock-out tag said, "Do not operate, runs hot, use only in an emergency, has high vibration."

• Tour Millwrights and E&I Techs use a computer program to go online to Verso's web site called Sar-Net to document maintenance issues at the plant.

• His brother Pete Haus is an oiler for the power plant and compressor room.

I interviewed Verso employee Environmental Health & Safety Coordinator **BOB HEINS**, who told me the following:

• He has worked at the mill for 40 years. He took the Health & Safety job this past December. He used to be an electrician at the plant.

• He got to work at 7:00 AM on the day of the incident. There was a leaking water issue at the plant.

• He was in his office doing his monthly audit.

• He's on the Fire Brigade at the mill.

• He heard the call for the Fire Brigade to the roll wrap room. Parts of the plant were dark, no lights.

• He responded to the roll wrap room for search and rescue.

• They discovered Jon Maus's body at the southern end of the roll wrap room; he had no pulse.

• He inspects the compressor room for housekeeping.

• There used to be oil pads on the floor, but there were no housekeeping issues with the compressor room since he took over.

I interviewed Verso employee Core Room Operator **MARVIN KOSHIOL**, who told me the following:

• He has worked at the mill for 30 years. He cuts cores for rolls of paper.

• He was at work at 5:30 AM and was cutting 6" cores in the core room until about 11:00 AM.

• John Wollak walked in the core room and asked him why it was so smoky in there. You could see a blue haze around the ceiling lights in the core room. There was also a different kind of odor in the air.

• He and John walked out into the warehouse and saw a train engine outside.

• They thought the smoke was from the train engine and went back to the core room.

• He heard the call for the Fire Brigade to the roll wrap room.

• He went into the east side of the roll wrap room and saw Jon Maus and Dennis Schneider standing near the break room. Then the explosion happened. It threw him to the ground.

• He hasn't been in the compressor room for years;

I interviewed Verso employee Pipefitter **PAUL PLAFCAN**, who told me the following:

• He has worked at the mill as a pipefitter for 40 years.

• He got to work at 7:00 AM and assisted with the repair of the leaking water line below paper machine #3. They changed out a shut-off valve and two clamp fittings.

• The water line came completely apart prior to the repair of the leak. The water line is about 90 PSI.

• The repair took 11 minutes and 30 seconds.

• After the repair, the mill water in the pumphouse was turned back on.

• He heard the call for the Fire Brigade to the roll wrap room and started walking toward the roll wrap room when he heard the explosion.

• The lights were out by the roll wrap room.

• He put his firefighter gear on and then he and Fire Brigade member Scott Beierman went into the roll wrap room to rescue missing employees.

• He looked in the employee break room and could see flames at the north end of the compressor room.

• They searched the roll wrap room and left the area.

• It wasn't real smoky in the roll wrap room; they could see with a flashlight.

• The last time he was in the compressor room was about 10 years ago. When he did work in the compressor room, he did pipefitting work.

I interviewed Verso employee E&I Tech **DALE DIRKS**, who told me the following:

• He has worked at the mill for 33 years.

• He got to work at 7:00 AM and there was a water leak below paper machine #3. The water was leaking

on an electric motor.

• He grabbed a sheet of plywood and diverted the water away from the electric motor.

• The water line was repaired and he went to the E&I lunch room.

• He heard the call for the Fire Brigade to the roll wrap room. Then he heard the explosion.
• He headed toward the roll wrap room and ran into Dave Popp and John Haus in the paper warehouse.
• He saw an orange glow coming from the southwest corner of the paper warehouse.
• There was some water flowing from sprinkler heads in the warehouse.
• He's been called to the compressor room in the past to shut down compressors for repairs.

I interviewed Verso employee Millwright Mechanical Maintenance **BYRON BIRR**, who told me the following:

• He has worked at the mill for 32 years. He repairs mechanical equipment at the mill.
• He got to work at 7:00 AM and there was a water leak beneath paper machine #3.
• He assisted with the water leak repairs.
• The power plant was shut down.
• He heard a call for the Fire Brigade to the roll wrap room.
• He saw black smoke coming from the south end of the plant.

I interviewed Verso employee Millwright Mechanical Maintenance **DUANE ALBRECHT**, who told me that:

• He has worked at the mill for 40 years and repairs equipment and plans repairs of equipment.
• The last time he was in the compressor room was this past April to change out oil separator filters in one of the compressors.
• There used to be oil consumption issues with the compressors.
• The oil separators used to have two basket filters. About a year ago, they switched to one basket because it was cheaper.
• They also installed plugs in the oil separator head about a year ago to reduce oil consumption.
• They switched from Aeon Compressor Oil 2000 to Aeon Compressor Oil 4000 because it cools the compressor oil better.

I interviewed Verso employee Maintenance Oiler **PETE HAUS**, who told me the following:

• He has worked at the mill for 24 years. He greases and oils equipment at the mill.
• The last time he was in the compressor room was the Friday before the explosion, May 25.
• He checked the oil level in the compressors and the oil level was good.
• He changed out two oil pads lying on the floor between compressors #3 and #4.
• Compressors #3, #4, and #5 were running when he checked the oil in the compressors.
• He checks the compressors every day.
• About a year ago, the compressors were switched from Aeon 2000 oil to Aeon 4000 oil.
• The #1 compressor still uses Aeon 2000.
• He's never known the compressors to shut off due to high temperatures.
• He's never worked on either of the receiver tanks.

I interviewed Verso employee Assistant Maintenance Supervisor **JERRY SCHUBERT**, who told me that:

• He just started as Assistant Maintenance Supervisor this past January. Prior to that he was an E&I Technician.
• He has worked at the mill since November of 1981. He in charge of scheduling maintenance and scheduling outages.
• Inlet valves on the compressors were rebuilt by Air Concepts within the last year.
• He schedules routine oil changes on the compressors.
• Compressor #4 used to have oil consumption issues. Since the rebuilding of the inlet valves and installing a plug in the separator head, oil consumption went away.
• Compressor #1 has a vibration issue.
• Prior to the compressors being switched over from air cooled to oil cooled, they would trip out often on high temperature.
• Since the mill shut down two of its three paper machines in December of 2011, they only need three air compressors running to operate the plant.

• He's not aware of any thermal couple failures at any of the compressors.

I interviewed Verso employee Utilities Manager **MARK WICHMAN**, who told me the following:

• He has been at the mill for 30 years.

• On the day of the incident, he was made aware of a mill water leak beneath paper machine #3 that required shutting off the plant's mill water supply.

• At about 8:00 AM, he instructed Verso employees Ron Determan and Randy Roeder to switch the compressor cooling water from mill water to well water.

• Determan and Roeder went to the corridor alongside the west wall of the compressor room and closed the mill water shut-off valve and opened the well water shut-off valve for cooling compressors.

• He later physically walked over to the corridor and visually confirmed the mill water valve was off and the well water valve was open.

• Well water is on most of the time at the plant.

• Well water is capable of pumping 450 gallons of water a minute.

I interviewed Verso employee E&I Technician **JOHN KNESE**, who told me the following:

• He has worked at the mill for 25 years. He performs preventative maintenance and trouble shooting on electrical equipment and instrumentation equipment at the mill.

• The last time he was in the compressor room was two years ago to support Al's Electric during the Department of Energy switch over of air compressors from air cooled to water cooled.

• He has never replaced any thermal couples on the compressors. He has replaced oil pressure relays on air compressors in the past.

I interviewed Verso employee E&I Technician **JERRY BLOCH**, who told me the following:

• He has been at the mill for 36 years. He repairs electrical and instrumentation equipment at the mill.

• The last time he was in the compressor room was this past fall to replace a red line meter for air temperature on compressor #4. The digital temperature display went out.

• He's not aware of any problems with the compressors.

I interviewed Verso employee South Power Plant Operator **RAY CORDIE**, who told me the following:

• He has been head power plant operator for 2 years. He was the assistant power plant operator for 7 years. He has been at the mill for 30 years total.

• He works in the control room at the south power plant.

• He got to work at 6:00 AM the day of the incident.

• He monitors mill operations, primarily pertaining to steam and hydro, from computer screens in the control room. He can also monitor compressor room operations at a computer screen.

• The screen for compressors has audible alarms for low air pressure and low oil pressure. The screen shows if an air compressor has stopped. There's no alarm for high oil temperatures for compressors.

• At about 10:10 AM, he had a low air pressure alarm go off. Compressor #5 had kicked out.

• He called Randy Roeder to check out the problem.

• When Randy got to the compressor room, #4 compressor was also kicked out. The compressors shut off due to high temperatures.

• He told Randy to start compressors #2 and #1. Compressor #1 has vibration issues.

• Mark Wichman called him and asked if the well water was on; the well water was shut-off and he turned the well water back on.

• He called #3 paper machine operator and told him not to shut the well water off.

• Gene Yasgar had also gone to the compressor room to make sure cooling water was flowing to the air compressors.

• At about 11:00 AM, he went up to the third floor of the south power plant and turned on an air compressor for additional air.

• He went back to the control room.

• Low water alarms were going off at scrubbers in the south power plant.

• Byron Cigkelski is the operator of the north power plant. Byron monitors raw water at the mill and air compressors. Byron didn't see any issues with the compressors.

• He (Ray) was away from the control room from about 10:16 AM to 10:26 AM. When he came back to the control room, he was working on getting recycling water pumps back on line.

• There were a lot of alarms going off that day.

• The north power plant controls all the water usage.

• Air pressure started coming back up.

• He was watching ash build-up in the stack.

• They had major water issues that day. He never experienced that many water issues in the past.

• There were no alarms going off just prior to the explosion, as he recalls.

• He doesn't normally monitor oil temperatures for the air compressors.

• In the past, it was common for the compressors to trip out on high temperature during the summer.

Conclusion

Based on my experience and training and the scene examination, it is my opinion this paper mill fire and explosion involving an employee fatality originated at compressor #3 in the mill's air compressor room.

Compressor #3 overheated, igniting combustible oil vapors within the compressor on fire. The internal compressor fire communicated to the mill air receiver tank through compressed air piping, and explosive oil vapors in the receiver tank were ignited, causing an explosion and catastrophic rupture of the receiver tank.

The resulting receiver tank explosion and fire caused concrete walls to be blown out, igniting rolls of stored paper in the southwest quadrant of the paper warehouse on fire. Review of computer-monitored data for the air compressors prior to the incident revealed a severe reduction in cooling water supply to operating compressors. Approximately an hour prior to the incident, compressors #4 and #5 shut-off due to overheating.

Compressor #3 continued to operate, exceeding the compressor's thermal protection shut down controls and/or devices, possibly caused by a mechanical failure and/or maintenance issue. This case shall be closed.

Respectfully submitted,
John W. Steinbach CFI
Deputy State Fire Marshal – Investigator
Date Submitted: 7/12/2012

Attachments

1. Photo Log
2. Consent Form
3. Sketch
4. Sketch prepared by Onsite Engineering
5. Confidentiality Agreement
6. Midwest Medical Examiner's Office Preliminary and Final Summaries for Jon Maus (Confidential)
7. Sartell Police Department CAD report
8. Sartell Police Department incident report
9. Sartell Police Department statement from David Popp
10. Whitemore Fire Consultants interviews
11. Site Examination/Sign-In Sheets (10)

ANOTHER INCIDENT

Alert WorkSafe VICTORIA

Air receiver on a compressor explodes

This Alert highlights the need to maintain compressor equipment to prevent explosive rupture of the air receiver tank.

Recently an air receiver of a compact air compressor unit exploded in a panel-beating workshop, narrowly missing an employee and causing material damage.

Compressors of this type are commonly used in smaller businesses, like automotive repairers, for spray painting, vehicle hoisting and other applications.

Although there was corrosion on the inside surface of the cylinder, the explosion was probably due to poor maintenance of the air supply line.

How can an air receiver tank explode?

During operation, deposits of lubricating oil tend to build up in the line supplying compressed air from the compressor cylinder to the air receiver. As the diameter of the supply line decreases, the already high temperature of the compressed air rises further to a point where it is possible for the contaminant to ignite.

Sparks are then carried into the air receiver where oil from the compressor, which is often present as a mixture with air in the air receiver, burns explosively. As the pressure relief valve is not designed for such an event, rupture of the air receiver vessel is likely to occur. In other air compressor accidents, static electricity sparks have also been identified as a source of fires and explosions.

Prevention measures

To avoid such incidents and damage, all air compressor equipment should be maintained in a safe operational condition and be regularly inspected. To prevent excessive fouling of compressed air supply lines, only the grade of oil recommended by the manufacturer/supplier should be used in the compressor.

Maintenance

A good maintenance program for compressor equipment should include checking the condition and operation of the following parts:

- compressor pump and motor:

    - Pump and other seals
    - Exhaust valve
    - Belt guard (if applicable)
    - Drive belt
    - Oil separator/filter, and
    - Discharge pipe
- receiver:
    - Physical internal condition. This may require a general clean out and a hydraulic test (as specified in Australian Standard *AS/NZS 3788 – 2001: Pressure equipment – In-service inspection*) or Magnetic Particle Testing if applicable
    - Checking and maintenance of relief and drain valves and pressure gauges
- electrics (to be performed by an electrician or person competent in electrical testing):
    - Earth connection and adequacy of insulation
    - Contacts in the pressure switch
    - Electronic controller, if applicable. Newer compressors are fitted with electronic controllers that include pressure switches in them

Note: The above list is by no means exhaustive and may need to include other items according to the particular type, brand and model of the compressor unit.

Inspection

AS/NZS 3788 should be used for guidance on conducting an inspection of air-receivers. In general, the extent of the inspection and how often inspections should occur should be sufficient to assure proper functioning of the pressure equipment. A good inspection program will include:

- Using supportive testing and examination methods; e.g. owners of air compressors should follow maintenance and testing recommendations of the manufacturer or supplier of the compressor and ancillary equipment
- Keeping maintenance and inspection records of all registered plant
- Making use of experience gained personally and from other sources

- Checking supplied test results or previous inspections

AS/NZS 3788 also provides guidance on the assessment and repair of defects.

Legal requirements

The *Occupational Health and Safety (Plant) Regulations 1995* require employers to maintain and inspect plant to ensure that health and safety risks associated with the use of that plant are eliminated or reduced as far as practicable (refer Regulation 708 for details).

February 14, 2011 Alert 02-11
Washington, DC

Air Receivers and Relief Valves

A reminder that shouldn't be necessary!

This Safety Alert addresses safety issues relating to air receivers on Uninspected Towing Vessels
(UTV), but may apply to air receivers on any vessel. Air receivers, regardless of specific use onboard
a UTV, contain extreme amounts of potential energy; an uncontrolled release of this energy may lead

to serious injury, death and catastrophic vessel damage. Although this issue involves basic safety
and good marine practice, too many related problems have been recently discovered. Not long ago, an air receiver unexpectedly ruptured with terrible results onboard an UTV on the Upper Mississippi River. A crewmember was seriously injured and paralyzed. Several causal factors were noted during the casualty investigation; the lack of a relief valve to protect the system and significant corrosion within the receiver. It's important to note that on unprotected systems, all it takes for the system to be over-pressurized is for the compressor's pressure switch/contactor or unloader to fail and not shut off the machine. Further, internal corrosion on aged tanks present a latent unsafe condition and may go unnoticed if not inspected. **(**Parted air receiver.**)**

As a result of this casualty and other similar incidents, the U. S. Coast Guard **strongly recommends** that UTV Owner/Operators, vessel engineers, insurance surveyors and other inspectors **ensure** that:

 A proper sized pressure relief device is installed on all air receivers. The pressure relief device
should not be rated higher than the Maximum Allowed Working Pressure (MAWP) stamped on
the air receiver's data plate;

 A data plate is attached to the receiver and pressure relief devices. If missing or damaged the UTV representative should provide evidence to prove the components were constructed to an approved standard. Otherwise this equipment should be taken out of service or replaced;

 The data plate associated with the receiver and pressure relief device remain unpainted and legible. Take care to minimize damage to the plates if paint needs to be removed. Pressure relief devices should not be painted as paint can interfere with the lifting of the valve. Those that are painted should be lift tested to ensure proper operation;

2

 Pressure relief devices are not capable of being isolated or their operation prevented by being
wired or secured in a position that prevents the valve from opening;

RELIEF VALVES MUST NEVER BE SECURED IN THE CLOSED POSITION

 Each receiver is equipped with a drain valve to remove condensate and all crewmembers
making rounds in the machinery space are instructed to drain the condensate as part of their
regular machinery space duties;

 All repairs and alterations to air receivers and pressure relief devices are conducted by

companies holding the National Board of Boiler and Pressure Vessel “R” Certificate for air
receivers and the “VR” Certificate for pressure relief devices; and
 Owner/Operators establish maintenance programs based on the manufacturer’s recommendations for such equipment that includes routine internal and external receiver
inspections. External inspections should include surface examinations for evidence of deterioration such as cracks, blisters, corrosion erosion, dents, etc., with particular attention to
the support attachments and welds.
Owner/Operators should be aware of these potential safety hazards and take proper action as
needed. Failure to address these concerns could result in a hazardous condition, and the Coast
Guard determining Operational Controls are necessary. If in doubt, contact your local Coast Guard
office or the Towing Vessel National Center of Expertise at (270) 444-7715.
This safety alert is provided for informational purposes only and does not relieve any domestic or
international safety, operational or material requirement. Developed by the Towing Vessel National
Center of Expertise. Distributed by the U.S.C.G. Headquarters Office of Investigations and Analysis,
Washington, DC. Questions may be addressed to HQS-PF-fldr-G-PCA@uscg.mil.
Office of Investigations and Analysis: http://marineinvestigations.us

SAFETY RECALL

Please be aware that

Ingersoll-Rand has recalled portable air compressorS. If you have purchased an item listed below, please follow the instructions given in the body of the letter. This is a safety recall notice issued from the manufacturer.

Please give widespread distribution. If you do not have this item or have not recently purchased same, please disregard this notice.

NOTICE

Woodcliff Lake, NJ (Safety Alerts) -Ingersoll-Rand Company has recalled about 458,000 portable air compressors sold between 1983 and 1991. Internal corrosion to the inner wall of the air receiver tank can cause the air tank to unexpectedly rupture allowing pressurized air to suddenly and forcefully escape, posing risk of injury to consumers.

Ingersoll-Rand has received 11 reports of sudden tank failure in these portable air compressors. No injuries have been reported.

The recalled portable compressors have single-phase electric motors up to 3hp or gasoline engines up to 8hp with tank sizes up to 30 gallons. The compressors were marketed under various brand names, including Ajax, Charge Air Pro, Energair, Guardian Power, MacTool, Power Force, Rallye, Rand 4000, and Steel Driver. The compressors have seria numbers beginning with the prefix "C" or "DC". The model numbers begin with the following prefixes - 1B, 1D, 1E, 1I, 2B, 2D, 2E, 3B, 3D, 3E, 4B, 4E, 5E, 5G, 15E, 23HP, 75, 75E, 250E, AB, AIR, AJ, C, CAP, CB, CL, CO, CP, CR, CS, CT, EA, GC, GP, HP, HPC, IR, IRC, LTD, MT, OI, PF, RA, RL, RP, RY, SC, SDS, SE, THP, and WB. Model and serial numbers are located on a plate or sticker attached to the outside housing of the air compressor. On some oil-less models, the model and serial numbers are affixed to an internal floor baffle beneath a removable plastic cabinet.

Hardware and construction supply stores nationwide sold the air compressors from 1983 through 1991 for between $150 and $400.

Air compressor receiver tanks do not have an infinite life. Tank life is dependent upon several factors, some of which include operating conditions, ambient conditions, proper installations, field modifications, and the level of maintenance. The exact effect of these factors on air receiver life is difficult to predict. Due to the current age of these products, Ingersoll-Rand is voluntarily undertaking this action to take these products out of service.

Consumers should stop using the air compressors immediately and contact Ingersoll-Rand for instructions on returning the compressor, freight paid. Consumers will have the option of being sent a check for $100.00 or receiving a $200.00 credit towards the purchase of a new DD2T2 air compressor. For more information, consumers can contact Ingersoll-Rand at (877) 552-2952 between 8 a.m. and 5 p.m. ET Monday through Friday or visit the firm's web site at www.air.ingersoll-rand.com.