File: F-333104

# Worker Exposed to Hydrogen Sulphide and Falls from the Top of the Truck

**Date of Incident:** 99 11 02
**Type of Incident:** Fatal

# SUMMARY

On 99 11 02 at approximately 16:30, a truck driver brought a truckload of produced sour emulsion from an oil production facility to an oil recycling plant. While the truck driver was waiting in the line to unload the product, he climbed on the top of the truck tank to collect a sample of the produced sour emulsion. After collecting a sample from the truck tank, he proceeded to the top of the pup tank to collect another sample. When the truck driver opened the pup hatch, he was exposed to hydrocarbon vapours and hydrogen sulphide released from the pup tank. After exposure, the truck driver fell approximately 3 metres to the ground and sustained fatal injuries.

The primary cause of the incident was that the truck driver was exposed to hydrocarbon vapours and hydrogen sulphide, and fell approximately 3 metres to the ground. The secondary cause was the truck driver was not protected from hydrocarbon vapours and hydrogen sulphide with respiratory protective equipment.

Workplace Health and Safety responded to the scene and commenced an investigation on 99 11 02. An order was issued requiring the trucking company and the oil recycling company to conduct an incident investigation and implement corrective measures to prevent reoccurrence. A site inspection was also completed at the oil production facility to ensure workers were adequately protected against exposure to hydrocarbon vapours and hydrogen sulphide.

The trucking company has voluntarily stopped transporting produced sour emulsion containing hydrocarbon vapours and hydrogen sulphide. The oil company that owned the production facility implemented a code of practice for the transportation of produced sour emulsion containing hydrocarbon vapours and hydrogen sulphide. The oil recycling company conducted an incident investigation and prepared the report. The oil recycling company developed and implemented a code of practice for cargoes containing hydrocarbon vapours and hydrogen sulphide. The oil company and the oil recycling company have complied with the provisions of the orders.

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**Section 1.0 FILE NUMBER**

1.1 F-333104

**Section 2.0 DATE AND TIME OF INCIDENT**

2.1 99 11 02, 16:30

**Section 3.0 DATE AND TIME OF INVESTIGATION**

3.1 99 11 02, 19:00

**Section 4.0 NAME OF INVESTIGATOR(S) (INTERNAL)**

4.1 Neil Looker, OHST, ROHT, Workplace Health and Safety Officer

**Section 5.0 INCIDENT REPORTED BY**

5.1 Medicine River Oil Recylers

**Section 6.0 DATE AND TIME INCIDENT WAS REPORTED**

6.1 99 11 02, 17:00

**Section 7.0 NAME AND ADDRESS OF PRINCIPAL STAKEHOLDER(S)**

7.1 **Owner(s)**

7.1.1 Randy Berdahl Trucking Ltd.
P.O. Box 184
Eckville, Alberta T0M 0X0

7.2 **Prime Contractor**

7.2.1 Samson Canada Ltd.
2200, 605 – 5th Avenue S.W.
Calgary, Alberta T2P 3H5

7.3 **Employer**

7.3.1 Randy Berdahl Trucking Ltd.
P.O. Box 184
Eckville, Alberta T0M 0X0

## Section 8.0 DESCRIPTION OF PRINCIPAL OWNER(S) OR EMPLOYER(S)

8.1 **Owner/Employer**

The truck driver was a self-employed truck operator and had two additional truck drivers in the company. The company was engaged in the transportation of sour water for the oil industry. The company owned three tank trucks and a pup tank.

8.2 **Employers**

Samson Canada Ltd. was an international oil company and operated oil and gas production facilities throughout the province of Alberta.

The battery site involved in the incident was located approximately ten kilometres south of Condor, Alberta (LSD 6-20-38-4 W5). The battery site collected oil/gas/water emulsions from seven well sites. The production fluid from the formation has an approximate concentration 7% of Hydrogen Sulphide.

The battery site had a produced sour water storage tank from where the produced sour emulsion loaded onto the tank truck and pup tank.

The Medicine Oil Recyclers was in the business of oil/water separation, water disposal, and contaminated soil wash and disposal.

## Section 9.0 LOCATION OF INCIDENT

9.1 The incident occurred at the Medicine River Oil Recyclers plant located south of Eckville, Alberta (LSD 1-29-39-3 W5).

## Section 10.0 EQUIPMENT AND MATERIAL INVOLVED

10.1 The equipment involved in the incident included a tank truck and a pup tank. The tank truck and pup tank had the Transport Canada designation of T306. The T306 designation included but not limited to a tank body that can transport regulated fluids and working pressure not more than three pounds per square inch gauge (Refer to Attachment A, Photographs 1 and 2).

10.1.2 The tank truck contained produced sour emulsion containing hydrocarbon vapours and hydrogen sulphide. The concentration of hydrogen sulphide was 326 ppm (ppm means parts of vapour or gas by volume per million parts of contaminated air by volume) in the tank truck and 279 ppm in the pup tank. The samples of sour water from the truck tank and pup tank were collected at approximately 22:00 on 99 11 02 (Refer to Attachment B, Laboratory Analysis).

10.1.3 The truck driver used an extraction tool to collect samples of produced sour emulsion from the tank truck and pup tank (Refer to Attachment A, Photograph 2).

## Section 11.0 NAMES OF OTHER INVESTIGATORS (EXTERNAL)

11.1 Alberta Transportation and Utilities

11.2 Alberta Energy Utilities Board

11.3 RCMP, Sylvan Lake Detachment

11.4 Medicine River Oil Recyclers

## Section 12.0 NARRATIVE DESCRIPTION OF INCIDENT

12.1 Samson Canada Ltd. had a failure on a produced water injection pump at the Condor Battery site. Samson Canada Ltd. contracted Randy Berdahl Trucking Ltd. to transport four loads of produced sour emulsion from their produced sour water storage tank to the Medicine River Oil Recyclers.

12.2 The truck driver, after emptying the produced sour emulsion storage tank, brought the fourth load to the Medicine River Oil Recyclers.

12.3 While the truck driver was waiting in the line to unload the product, he climbed on the top of the truck tank to collect a sample of the produced sour emulsion. After collecting a sample from the truck tank, he proceeded to the top of the pup tank to collect another sample.

12.4 When the truck driver opened the pup hatch, he was exposed to hydrocarbon vapours and hydrogen sulphide released from the pup tank. After exposure, the truck driver fell approximately 3 metres to the ground.

12.5 An employee of Medicine River Oil Recyclers who witnessed the truck driver falling attended the truck driver and started first aid. Medicine River Oil Recycler's dispatch called Emergency Medical Services (EMS).

12.6 EMS arrived at the scene at approximately 16:45 and transported the truck driver to the Regional Hospital.

12.7 The truck driver was air lifted to a Calgary Hospital where he was pronounced dead at 01:40 on 99 11 03.

## Section 13.0 CONCLUSIONS

13.1 The primary cause of the incident was that the truck driver was exposed to hydrocarbon vapours and hydrogen sulphide, and fell approximately 3 metres to the ground.

13.2 The secondary cause was the truck driver was not protected from hydrocarbon vapours and hydrogen sulphide with respiratory protective equipment.

## Section 14.0 FOLLOW-UP/ACTION TAKEN

14.1 **Industry**

14.1.1 Randy Berdahl Trucking

The trucking company has voluntarily stopped transporting produced sour emulsion containing hydrocarbon vapours and hydrogen sulphide. The trucking company complied with the order issued by Workplace Health and Safety.

14.1.2 Samson Canada Ltd.

Samson Canada Ltd. that owned the production facility implemented a code of practice for the transportation of oilfield fluids containing hydrogen sulphide. The company complied with the order issued by Workplace Health and Safety.

14.1.3 Medicine River Oil Recyclers

Medicine River Oil Recyclers conducted an incident investigation and prepared the report. Medicine River Oil Recyclers developed and implemented a code of practice for cargoes containing hydrogen sulphide. The company complied with the order issued by Workplace Health and Safety.

14.2 **Workplace Health and Safety**

14.2.1 Workplace Health and Safety responded to the scene and commenced an investigation on 99 11 02. An order was issued requiring the trucking company and the oil recycling company to conduct an incident investigation and implement corrective measures to prevent reoccurrence. A site inspection was also completed at the oil production facility to ensure workers were adequately protected against exposure to hydrocarbon vapours and hydrogen sulphide.

## Section 15.0 INJURY SEVERITY

15.1 Worker died from multiple blunt injuries.

## Section 16.0 SIGNATURES

[original signed]

## Section 17.0 ATTACHMENTS

Attachment A Photographs
Attachment B Laboratory Analysis

Photograph 1 Shows the tank truck and pup tank involved in the incident.

- Red arrow shows the location where the worker fell from the pup tank.

Photograph 2 Shows the top of the pup tank.

- Red arrow [left, upper] shows the hatch the truck driver opened to collect oilfield fluid sample.
- Blue arrow [centre] shows the oilfield fluid extraction tool.

# CHEMICAL ANALYSIS REPORT

AB TRANSPORTATION & UTILITIES
404 4920 51 ST
RED DEER AB T4N 6K8

DATE: November 19, 199

ATTN: AL CARLISLE

| | | | |
|---|---|---|---|
| Lab Work Order #: | E911315 | Sampled By: | AC |
| Project Reference: | NOT SUBMITTED | Date Received: | 11/05/99 |
| Project P.O.#: | NOT SUBMITTED | | |

Comments:

APPROVED BY:

Project Manager



ACCREDITATIONS: STANDARDS COUNCIL OF CANADA (SCC), IN COOPERATION WITH THE CANADIAN ASSOCIATION FOR ENVIRONMENTAL ANALYTICAL LABORATORIES (CAEAL): FOR SPECIFIC TESTS AS REGISTERED BY THE COUNCIL (EDMONTON, CALGARY, SASKATOON, WINNIPEG, THUNDER BAY)
AMERICAN INDUSTRIAL HYGIENE ASSOCIATION (AIHA) FOR INDUSTRIAL HYGIENE ANALYSIS (EDMONTON)
STANDARDS COUNCIL OF CANADA IN COOPERATION WITH THE CANADIAN FOOD INSPECTION AGENCY FOR FERTILIZER AND FEED TESTING (SASKATOON)

NORWEST LABS
14203 - 121 Avenue, Edmonton, Alberta T5L 4N9
Phone (780) 438-5522

E99-34561-01
Laboratory Report Number



Energy Resource Group | Enviro-Test Laboratories (Operator) | VIAL (Container Identity)

Location | Edmonton (Well Name) | KB Elev, m | GR Elev, m

Field/Area | Pool / Zone | Sampler | Company

Test Type | No
Multiple Recovery

Test Recovery:

Test Interval, m

Perforations, m

Sample ID E911315-01A, Truck (Sample Point) | Amount & Type of Cushion | Mud Resistivity @ 25°C

Type of Production: Pumping ____ Flowing ____ Gas Lift ____ Swab ____

Production Rates: Water ____ m³/d Oil ____ m³/d Gas ____ 10³ m³/d

Gauge Pressure, kPa

Temperature, °C

| Separator | Treater | Reservoir | Source | Sampled | Received |
|---|---|---|---|---|---|
| | | | | | |

Date Sampled (Y-M-D) | 1999-11-10 Date Received (Y-M-D) | 1999-11-16 Date Reported (Y-M-D) | Analyst | Other Information

Sample Description: Brown oil

## Oil Analysis

Hydrogen Sulphide as S, ppm mass/mass: 326

## METHODOLOGY

| Parameter | Brief Method Description | Reference |
|---|---|---|
| Hydrogen Sulphide in Oil | Potentiometric Titration with $AgNO_3$ | UOP 163-80 |

NORWEST LABS
14203 - 129 Avenue, Edmonton, Alberta T5L 4N9
Phone (780) 436-6522

E99-34561-02
Laboratory Report Number



Energy Resource Group

Enviro-Test Laboratories — Operator

VIAL — Container Identity

Location

Edmonton — Well Name

KB Elev. m | GR Elev. m

Field/Area | Pool / Zone | Sampler | Company

Test Type: RG
Multiple Recovery:

Test Recovery:

Test Interval, m

Perforations, m

Sample ID: E911315-02A, Pup — Sample Point

Amount & Type of Cushion

Mud Resistivity @ 25°C

Type of Production: Pumping ____ Flowing ____ Gas Lift ____ Swab ____

Production Rates: Water ____ m³/d Oil ____ m³/d Gas ____ 10³ m³/d

Gauge Pressure, kPa
Temperature, °C

| | Separator | Treater | Reservoir | Source | Sampled | Received |
|---|---|---|---|---|---|---|

Date Sampled (Y-M-D) | Date Received (Y-M-D): 1999-11-10 | Date Reported (Y-M-D): 1999-11-16 | Analyst | Other Information

Sample Description: Brown oil

## Oil Analysis

Hydrogen Sulphide as S, ppm mass/mass: 279

## METHODOLOGY

| Parameter | Brief Method Description | Reference |
|---|---|---|
| Hydrogen Sulphide in Oil | Potentiometric Titration with AgNO3 | COP 163-80 |

Supervisor: ____ Approved ____

Accredited by the Standards Council of Canada for specific services registered with the council

# ENVIRO-TEST CHEMICAL ANALYSIS REPORT

TEST: Flash Point METHOD:ASTM D-93

| SAMPLE DESCRIPTION | LAB ID | RESULT Degrees C | D.L. |
|---|---|---|---|
| TRUCK | E911315-01 | <-20 | |
| PUP | E911315-02 | <-20 | |

THIS IS THE LAST PAGE OF THE REPORT EXCLUDING APPENDICES

C1 - C12 CARBON RANGE SCAN
CLIENT I.D.: TRUCK
E911315-01

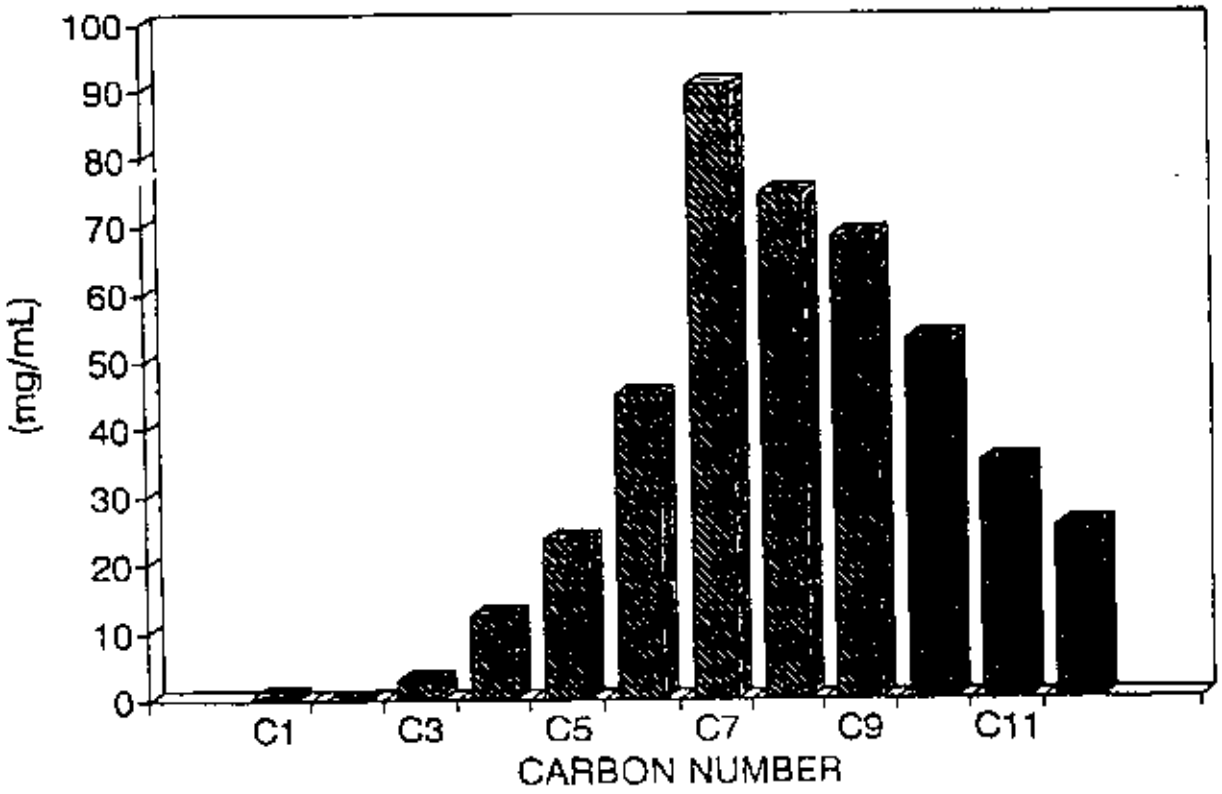
| Carbon Range | B.P. | Mass Fraction | Mole Fraction | Concentration (mg/mL) | M.W. |
|---|---|---|---|---|---|
| C1 | -161.5 | 0.00 | 0.01 | 0.6 | 16 |
| C2 | -88.5 | 0.00 | 0.00 | 0 | 30 |
| C3 | -42.1 | 0.01 | 0.02 | 2.9 | 44 |
| C4 | -0.5 | 0.03 | 0.06 | 12.5 | 58 |
| C5 | 36.1 | 0.06 | 0.08 | 23.6 | 72 |
| C6 | 68.7 | 0.11 | 0.13 | 45.2 | 86 |
| C7 | 98.4 | 0.19 | 0.21 | 91.0 | 100 |
| C8 | 125.7 | 0.18 | 0.17 | 74.9 | 114 |
| C9 | 150.8 | 0.16 | 0.14 | 68.5 | 128 |
| C10 | 174.2 | 0.12 | 0.09 | 53.3 | 142 |
| C11 | 196 | 0.08 | 0.06 | 35.1 | 156 |
| C12 | 216 | 0.06 | 0.04 | 25.2 | 170 |
| | TOTALS | 1.00 | 1.00 | 433 | |
| AVERAGE MOLECULAR WEIGHT | | | | | 108 |

DETECTION LIMIT-10PPM PER CARBON RANGE

| CARBON RANGES FOR B.T.E.X. | |
|---|---|
| Benzene | C6-C7 |
| Toluene | C8 |
| Ethylbenzene | C9 |
| Xylenes (o,m & p) | C9 |

# TEDLAR C1 TO C12 CARBON RANGE SCAN
## CLIENT I.D.:TRUCK

ETL LAB ID: E911315-01



C1 - C12 CARBON RANGE SCAN
CLIENT I.D.: PUP
E911315-02

| Carbon Range | B.P. | Mass Fraction | Mole Fraction | Concentration (mg/mL) | M.W. |
|---|---|---|---|---|---|
| C1 | -161.5 | 0.00 | 0.01 | 0.6 | 16 |
| C2 | -88.5 | 0.00 | 0.00 | 0 | 30 |
| C3 | -42.1 | 0.01 | 0.02 | 2.9 | 44 |
| C4 | -0.5 | 0.03 | 0.05 | 12.5 | 58 |
| C5 | 36.1 | 0.05 | 0.08 | 24.3 | 72 |
| C6 | 68.7 | 0.10 | 0.12 | 43.5 | 86 |
| C7 | 98.4 | 0.19 | 0.21 | 87.1 | 100 |
| C8 | 125.7 | 0.17 | 0.16 | 76.9 | 114 |
| C9 | 150.8 | 0.16 | 0.14 | 71.9 | 128 |
| C10 | 174.2 | 0.13 | 0.10 | 61.2 | 142 |
| C11 | 196 | 0.08 | 0.06 | 38.0 | 156 |
| C12 | 216 | 0.08 | 0.05 | 33.4 | 170 |
| | TOTALS | 1.00 | 1.00 | 452 | |
| AVERAGE MOLECULAR WEIGHT | | | | | 109 |

DETECTION LIMIT-10PPM PER CARBON RANGE

| CARBON RANGES FOR B.T.E.X. | |
|---|---|
| Benzene | C6-C7 |
| Toluene | C8 |
| Ethylbenzene | C9 |
| Xylenes (o,m & p) | C9 |

# TEDLAR C1 TO C12 CARBON RANGE SCAN
## CLIENT I.D.:PUP

ETL LAB ID: E911315-02