

Explosion at Battery Site
Date of Incident: 99 07 26
Type of Incident: Fatal

SUMMARY

On 99 07 26 a relief operator and site consultant were assisting a flush-by crew at an oil well located about 200 meters west of the battery site. At approximately 11:45, they noticed a cloud of vapours, steam and smoke rising out of the group treater area at the battery site. The relief operator drove to the battery site to investigate the situation and entered the group treater building. The group treater vessel located beside the group treater building exploded and an ensuing fire occurred. The relief operator was fatally injured in the explosion and fire.

The primary cause of the incident was that the group treater vessel exploded due to high pressure. The exact cause for build-up of high pressure could not be determined as the group treater vessel and process equipment were severely damaged during the explosion and fire. The secondary cause of the incident was that the workers were not adequately trained on emergency procedures.

Workplace Health and Safety responded to the incident and commenced investigation on 99 07 26. An order was issued requiring the company to conduct an incident investigation and implement corrective measures to prevent recurrence. A follow up Client Contact Report was issued requiring the company to consider the recommended practices outlined in the American Petroleum Institute (API) RP 750 [Standard] in the redesign of the battery site.

The company conducted an incident investigation and prepared the report. The company's insurance adjuster retained an engineering consultant to conduct an incident investigation. The engineering consulting company redesigned the battery site. Several safety features, including gas detection system, ventilation system in the process and equipment buildings, and controls for fluid level and temperature have been incorporated in the installation of the battery site. A remote emergency shutdown has been located in the battery site office. The company revised the Emergency Procedures Manual and Safety Manual and implemented the changes.

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Section 1.0 FILE NUMBER

1.1 F-390357

Section 2.0 DATE AND TIME OF INCIDENT

2.1 99 07 26 at approximately 11:45

Section 3.0 DATE AND TIME OF INVESTIGATION

3.1 99 07 26 at approximately 17:00

Section 4.0 NAME OF INVESTIGATOR(S) (INTERNAL)

4.1 Craig Michaels, Workplace Health and Safety Officer

4.2 Ashok Khurana, Workplace Health and Safety Officer

Section 5.0 INCIDENT REPORTED BY

5.1 Energy North, Owner of battery site

Section 6.0 DATE AND TIME INCIDENT WAS REPORTED

6.1 99 07 26 at approximately 13:30

Section 7.0 NAME & ADDRESS OF PRINCIPAL STAKEHOLDER(S)

7.1 Owner (company)

7.1.1 Energy North Inc.
903, 55-4 Avenue, SW
Calgary, AB T2P 2V6

7.2 Prime Contractor (site consultant)

7.2.1 Mergin Ltd.
Box 909,
Provost, Alberta, T0B 3S0

7.3 Employer (plant operator)

7.3.1 Ken Flemmer Contracting Ltd.
P.O. Box 41
AcadiaValley, AB

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

8.1 Energy North is an oil and gas exploration company. Energy North Inc. retained Mergin Ltd. as the site consultant to represent the company. The company also retained Ken Flemmer Contracting Ltd. as the plant operator.

Section 9.0 LOCATION OF INCIDENT

9.1 The incident occurred at the Sibbald Battery site of Energy North Inc, Oyen, Alberta. L.S.D. 8-22-272-2W4M (Refer to Attachment A, Plot Plan).

Section 10.0 EQUIPMENT AND MATERIAL INVOLVED

10.1 The company serviced eight oil wells at the Sibbald Battery site. The oil wells produced about 90 percent water, 10 percent heavy oil and a small amount of natural gas. The oil, water and gas were separated at the battery site. Produced water was injected back into the ground formation and oil was pumped into storage tanks (Refer to Attachment B, Photograph 1).

10.2 The group treater building was located beside the group treater vessel. The building contained process piping, equipment and valves to control the flow of production fluids (Refer to Attachment B, photographs 1 and 2).

10.3 The company purchased the group treater as a reconditioned unit in October 1997. Maffat Tank Company, Edmonton, Alberta, manufactured the group treater in 1966. The group treater was a vertical vessel approximately 3 metres in diameter and 7.3 metres in height. The maximum working pressure of the group treater was 345 kilopascals with a maximum operating temperature of 94° C. The group treater separated oil from water (Refer to Attachment B, photographs 2 & 3).

During explosion, the group treater vessel was lifted and landed about 15 metres from its original location. The failure analysis of the fire tube heater's neck weld, revealed that the group treater exploded.

10.4 The group treater was equipped with a U-shaped fire tube heater. The fire tube heater was fitted with a fire box flame arrester to prevent the flame from exiting outside the burner assembly. The fire tube heater heated the production fluids during the process (Refer Attachment B, photograph 4).

10.5 The group treater was originally fitted with a reconditioned 102mm (4 inch) “Enardo” pressure relief valve. The pressure relief valve allowed excessive vapour pressure to be released from the group treater.

During a regular contract inspection carried out on May 31, 1998, the 102mm (4 inch) pressure relief valve was replaced with a 51mm (2 inch) “Mercer” pressure relief valve. According to the company’s calculation, the smaller size 102mm (2 inch) pressure relief valve had adequate capacity for the protection of the group treater.

Section 11.0 NAMES OF OTHER INVESTIGATORS (EXTERNAL)

11.1 Alberta Boiler Safety Association (ABSA).

11.2 Anderson Associates Consulting Engineers Inc. contracted by Kendal Adjusters Inc.

11.3 Energy North Inc.

Section 12.0 NARRATIVE DESCRIPTION OF INCIDENT

12.1 On 99 07 26 at approximately 10:30 a relief operator, and a site consultant were assisting a flush-by crew at an oil well located about 200 metres west of the battery site.

12.2 At approximately 11:45, they noticed a cloud of vapours, steam and smoke rising out of the group treater area at the battery site.

12.3 The relief operator drove his truck to the battery site to investigate the situation. The site consultant followed the relief operator in his truck to the battery site.

12.4 When the relief operator entered the group treater building, the group treater vessel located beside the building exploded and an ensuing fire occurred. The group treater building was destroyed.

12.5 The site consultant was forced to retreat as a fireball was shooting towards him.

12.6 The site consultant called Emergency Medical Services (EMS). EMS and a fire truck

were dispatched from Oyen and arrived at the site at about 12:10. It took approximately 20 minutes to contain the fire.

- 12.7 The relief operator received severe burn injuries and was pronounced dead at the scene.

Section 13.0 CONCLUSIONS

- 13.1 The primary cause of the incident was that the group treater vessel exploded due to high pressure. The exact cause for build-up of high pressure could not be determined as the group treater vessel and process equipment were severely damaged during the explosion and fire.

Anderson Associates Consulting Engineers Inc, concluded that the most likely scenario was that fluid level went down in the group treater. The lower level of fluid exposed the fire tube heater and allowed it to become overheated. Subsequent contact of emulsion oil and/or water with the fire tube heater, created steam and increased pressure in the group treater to cause failure.

- 13.2 The secondary cause of the incident was that the workers were not adequately trained in emergency procedures. The company's Emergency Procedures Manual was not specifically developed for the battery site. The relief operator entered the group treater building where a potential life-threatening situation existed.

- 13.3 To prevent this type of incident from recurring, the company had an engineering consultant redesign the battery site. Several safety features, including gas detection system, ventilation system in the process and equipment buildings, and controls for fluid level and temperature have been incorporated in the installation of the battery site.

Section 14.0 FOLLOW-UP/ACTION TAKEN

- 14.1 **Industry**

- 14.1.1 The company conducted an incident investigation and prepared the report. The company's insurance adjuster retained an engineering consultant to conduct an incident investigation. An engineering consulting company redesigned the battery site. Several safety features, including gas detection system, ventilation system in the process and equipment buildings, and controls for fluid level and temperature have been incorporated in the installation of the battery site. A remote emergency shutdown has been located in the battery site office. The company revised the

Emergency Procedures Manual and implemented the changes to ensure the contractors and workers are trained in the new safe work procedures.

14.1.2 The company has agreed to implement necessary upgrades to other battery sites.

14.2 **Alberta Human Resources & Employment**

14.2.1 Workplace Health and Safety responded to the incident and commenced investigation on 99 07 26. An order was issued requiring the company to conduct an incident investigation and implement corrective measures to prevent recurrence. A follow up Client Contact Report was issued requiring the company to consider the recommended practices outlined in the American Petroleum Institute (API) [Standard] RP 750 in the redesign of the battery site.

14.2.1 Workplace Health and Safety inspected the rebuilt battery site on 99 11 23. A Client Contact Report indicating deficiencies was issued.

14.2.2 The company complied with the provisions of all orders issued and the site was released on 99 11 30.

4.3 **Additional Measures**

14.3.1 ABSA distributed an Information Bulletin No. IB99-003, outlining the requirements for safe operation of pressure vessels, to industry

14.3.2 Workplace Health and Safety are reviewing the present legislation to include process safety.

Section 15.0 INJURY SEVERITY

15.1 The relief operator received fatal burn injuries.

Section 16.0 SIGNATURES

(original signed) _____
Investigator **Date**

(original signed) _____
Investigator **Date**

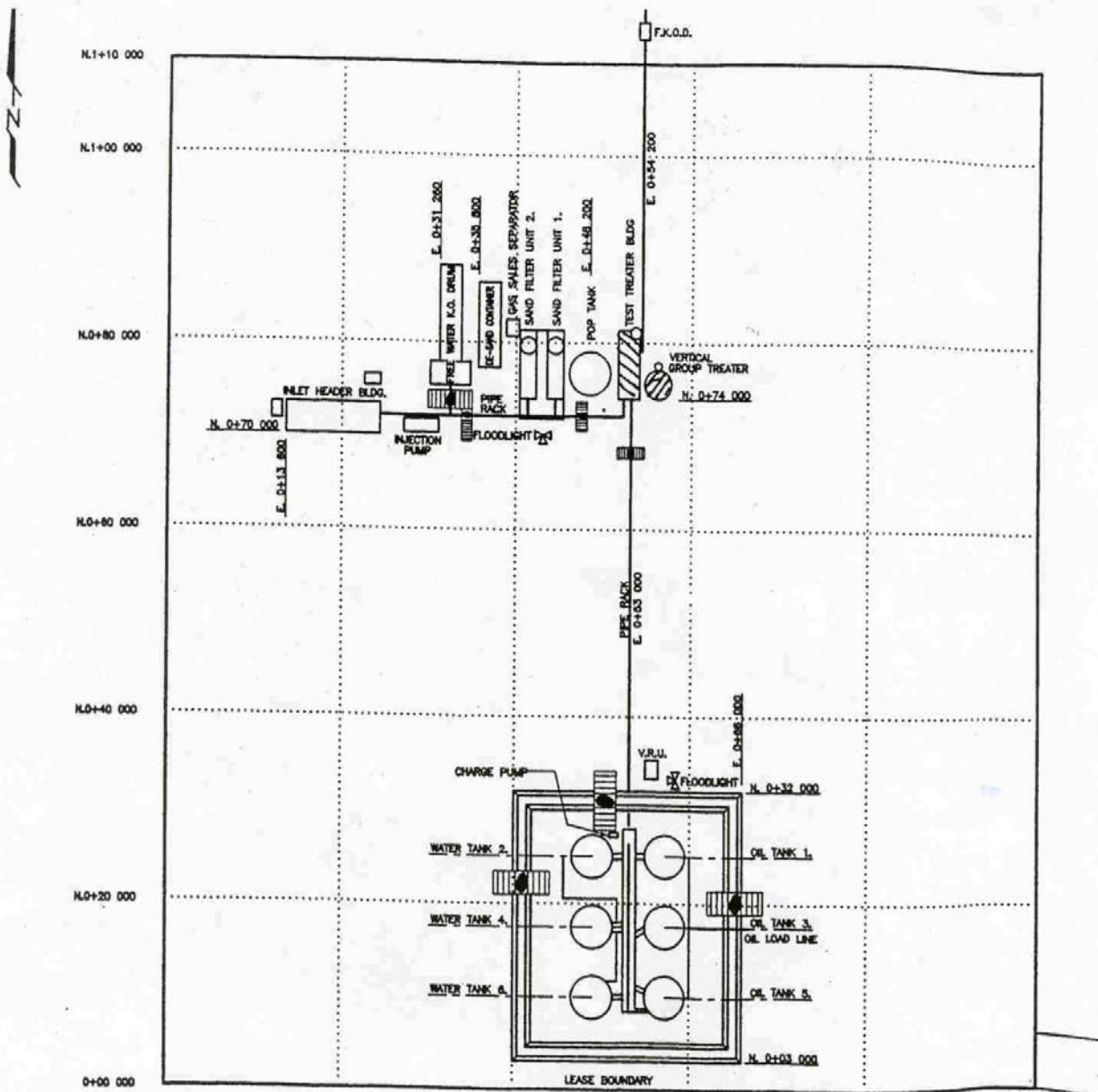
(original signed) _____
Reviewer **Date**

(original signed) _____
Reviewer **Date**

(original signed) _____
Manager, North **Date**

Section 17.0 ATTACHMENTS

Attachment "A" Sketch
Attachment "B" Photographs



PLOT PLAN
 SCALE: 1:300



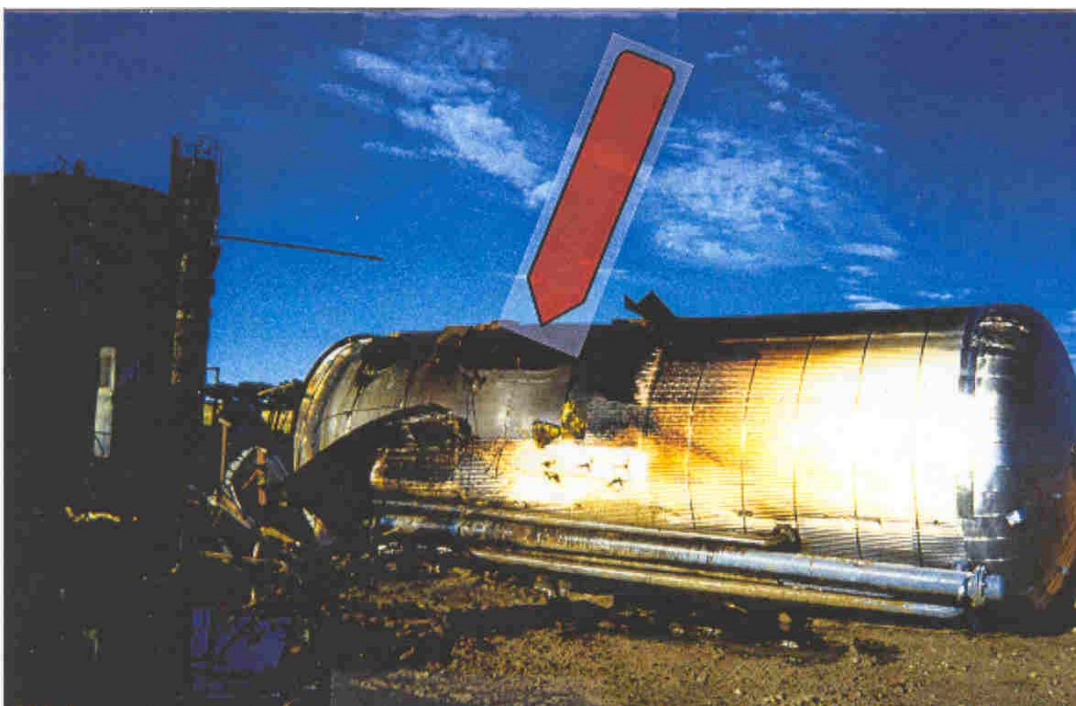
Photograph #1:

Shows process and equipment buildings. Red arrow [top, right] shows the group treater vessel. Blue arrow [bottom, right] shows test treater building. The photograph was taken prior to the incident.



Photograph #2:

Shows the extensive damage to the test treater building. Blue arrow [top, right] shows the damaged process pipes and control valves in the test treater building. The green arrow [centre] shows the test treater building's shell. The yellow arrow [bottom, centre] shows the relief operator's truck. The red arrow [left] shows the group treater vessel that was lifted from its original location beside the test treater building.



Photograph #3:
Red arrow shows an opening where fire tube heater separated from group treater.



Photograph #4:

Shows fire tube heater blown off the group treater. The red arrow shows the flange that separated from the group treater vessel.