

CaCl₂ Brine Incident

#2313

M-I SWACO Broome
Western Australia

CaCl₂ Brine Incident #2313 Summary

- While conducting the standard operation of building Calcium Chloride (CaCl₂) Brine at the M-I SWACO Broome facility, a blockage occurred in the flexible hose between the 'Big Bag Hopper' and the entry into the hard piped fluid circuit.
- The flexible hose was disconnected in an attempt to release the blockage resulting in a quantity of CaCl₂ slurry being released onto the legs and to a lesser extent, the arms of the injured party.
- Cool running water was immediately applied to the affected areas and clothing removed.
- The injured party was then transported directly to the Broome District Hospital for emergency medical treatment.

CaCl₂ Brine Incident #2313
Summary – cont.

- Following six days of initial treatment at the Broome District Hospital the injured party was transported via the Royal Flying Doctor to the Royal Perth Hospital burns unit.
- The injured party received skin grafts to the tops and ankles of both feet and treatment for third degree burns to both arms, hands and lower legs.
- Secondary treatment was also required to fight infection resulting from the burns.

CaCl₂ Brine Incident #2313 Specifics

- Parties involved
 - M-I SWACO Broome operational personnel
- Location
 - M-I SWACO Broome Facility
6 De Castilla Street
Broome, Western Australia
- Operations
 - Calcium Chloride Brine building
- Time & Date
 - 1320 hours - Friday 30-Nov-07
- Notification of incident
 - Saturday 01-Dec-07

CaCl₂ Brine Incident #2313 Investigation

- Interviews were conducted at the M-I SWACO Broome facility on 3-Dec-07 with those parties present at the time of the incident.
- An analysis of the incident was commenced on-site at the Broome facility on 4-Dec-07 with those parties present at the time of the incident.
- Analysis of the incident was continued at the M-I SWACO Perth Offices.
- A preliminary report was issued on 6-Dec-07.
- The final report was issued on 18-Dec-07.

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Synopsis

- Monday 26-Nov-07 an email was sent to the M-I SWACO facility in Broome WA requesting 600bbls of 1.4SG CaCl₂ Brine be built.
- The request included quantities of 0.5Mt and 1Mt bags of CaCl₂ Flake and 1Mt bags CaCl₂ Powdered material to be used for the Brine.
- A follow up telephone call was made by the PE in which the requirements of the task were discussed and the need to complete a JSA was emphasized.

CaCl₂ Brine Incident #2313
Synopsis – cont.

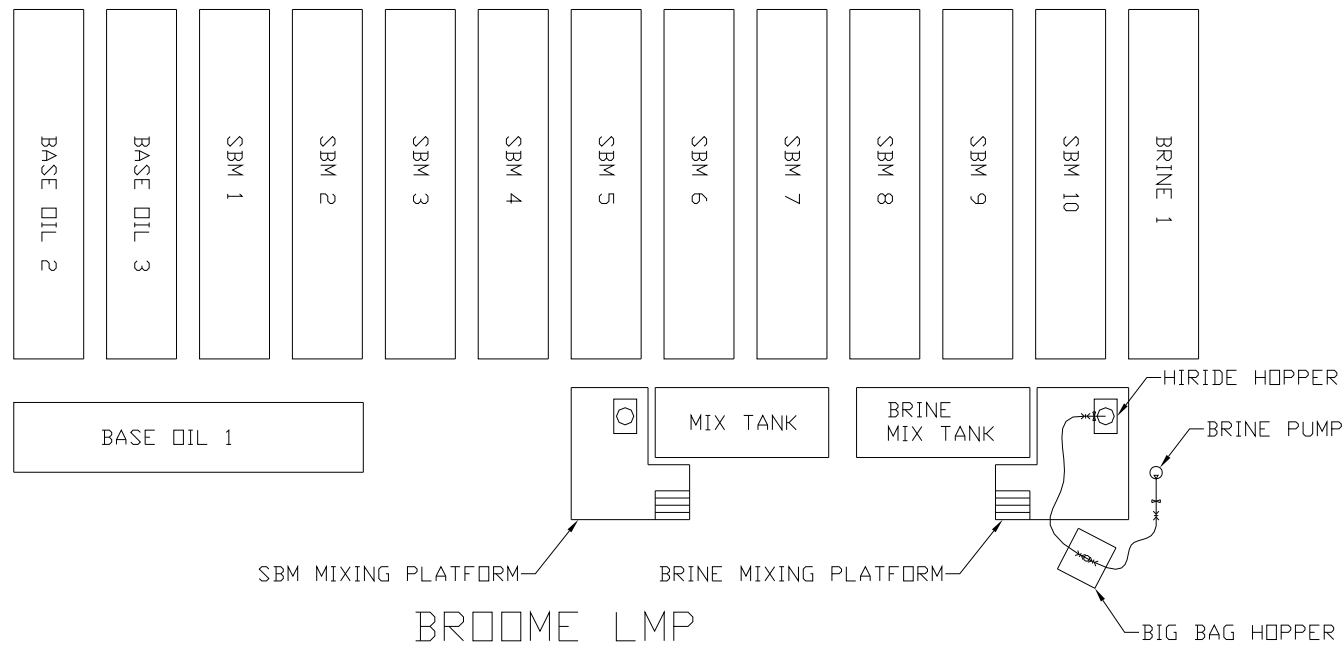
- On Tuesday 27-Nov-07 at approximately 13:00 the Broome facility operational personnel set up the 'Big Bag Hopper' (BBH) in preparation for the following days operations.



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Synopsis – cont.

- The BBH was located on the concrete loading bay in front of the Brine mixing platform with the BBH outlet approximately 5m from and 0.5m below the inlet connection on the base of the 'HIRIDE Hopper' (HRH).



CaCl₂ Brine Incident #2313 Synopsis – cont.

- A 4" 'Tee' piece was used to include the BBH in a fluid circuit from the pressure side of the Brine pump to the inlet connection on the base of the HRH.



CaCl₂ Brine Incident #2313
Synopsis – cont.

- Following the set up of equipment the system was operated and fluid flow was visually confirmed through the connection on the outlet of the BBH.
- At this time a JSA of the task to be undertaken was commenced and completed on the following morning.
- Personnel conducting the JSA received JSA and Risk Assessment training on 10-Sep-07.
- A single BBH is available to be positioned as required and connected into the system via flexible hoses.

CaCl₂ Brine Incident #2313
Synopsis – cont.

- Previous Brine building had been undertaken using the HRH as an initial attempt to use the BBH while training the Broome personnel in July 2007 had been unsuccessful.
- Configuration of the BHB at the time of the incident was based on previous experience of its use in adding Barite and Bentonite to SBM.
- The BBH was constructed locally based on an M-I SWACO design.
- Deviation from the original design includes additional plating to the internal corners to reduce caking of product, removal of the Bag Spike and the omission of the HIRIDE Eductor (Venturi) from the outlet.

CaCl₂ Brine Incident #2313
Synopsis – cont.

- No formal risk assessment of the Brine building process had been undertaken.
- No formal reports of operational issues related to the BBH had been received.
- On 28-Nov-07 a TBT was held and the JAS reviewed.
- Operations proceeded with the product moving very slowly into the system, water was introduced directly into the BBH to assist.
- Personnel noted during the investigation; that the flexible hose connecting the BBH into the system had melted due to the exothermic reaction and had to be replaced, this was not reported.

CaCl₂ Brine Incident #2313
Synopsis – cont.

- On 29-Nov-07 a TBT was held, the JAS reviewed and operational issues from the previous day were discussed.
- Operations proceeded as they had the previous day although some blockages occurred, which were not reported.

CaCl₂ Brine Incident #2313
Synopsis – cont.

- On 30-Nov-07 a TBT was held, the JAS reviewed and operational issues from the previous days were discussed.
- Operations proceeded without incident.
- At 13:10 with four bags remaining to be cut a system blockage occurred.
- The system was shut down and all valves closed.

CaCl₂ Brine Incident #2313
Synopsis – cont.

- Operational personnel had an informal discussion regarding the situation and how to proceed.
- The coupling was disconnected at the inlet connection on the base of the HRH and a length of 19mm Rigid PVC tube was inserted into the flexible hose in an unsuccessful attempt to dislodge the blockage.
- A fire hose was then used unsuccessfully to flush the blockage from the system.

CaCl₂ Brine Incident #2313 Synopsis – cont.

- The IP moved into position crouching under the BBH and removed the wire that had been used to ‘mouse’ the ‘Cam-Lok’ coupling.
- A fire hose was used to cool the general area around the IP.



CaCl₂ Brine Incident #2313
Synopsis – cont.

- The IP released the 'Cam-Lok' fitting and manipulated the hose to get it to the coupling to separate.
- As the coupling separated a quantity of fluid was released, some of which spilled onto the lower legs and feet of the IP, fluid also splashed onto his forearms and hands.



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Causal factors

- The resulting incident analysis identified four causal factors:
 - CF1 - System blockage
 - CF2 - Coupling disconnected
 - CF3 - Valve on BBH U/S
 - CF4 - PPE insufficient for task

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Root causes

- Analysis of the four causal factors found:
 - 7 root causes for CF1 - System blockage
 - 9 root causes for CF2 - Coupling disconnected
 - 2 root causes for CF3 - Valve on BBH U/S
 - 6 root causes for CF4 - PPE insufficient for task
- The root causes identified include:
 - Implementation and effectiveness of the Management System
 - Communication of Standards, Policies or Administrative Controls
 - Employer/Employee relations
 - Task analysis
 - Procedures
 - Understanding

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Corrective actions

- Immediate corrective actions:
 - Advise Broome personnel that the 'Big Bag Hopper' is not to be used in the Brine building process until such time as the incident analysis is complete and corrective actions completed.
 - Advise operational facilities that no Brine is to be built until all personnel have viewed safe handling video.
 - Advise operational facilities that no Brine is to be built until PPE review is conducted and suitable PPE is available onsite.

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Corrective actions

- Corrective actions:
 - Conduct Risk Assessment on Broome Brine mixing plant.
 - Review configuration of Broome Brine mixing plant based on Risk Assessment.
 - Review Job Safety Analysis, Risk Assessment, Standard Operating Procedure & Standard Work Instruction for Broome Brine mixing operations.
 - Provide Personal Protective Equipment training to Broome personnel.
 - Provide hazard identification training to Broome personnel.
 - Provide hazard and incident reporting training to Broome personnel.

CaCl₂ Brine Incident #2313 Update

- A global alert was issued on 17-Dec-07.
- Two corrective actions are yet to be closed out.
 - Modifications to the plant and the associated documentation
- The IP was given a medical clearance to return to full duties on 17-Jan-08.



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Questions

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