Sodium Bisulphite ($NaHSO_3$)

Technical Bulletin

Responsible Care®
Our commitment to sustainability.

Gestion responsable™
Notre engagement envers le développement durable.

Table of Contents

Introduction

Sodium bisulphite, 38% solution is produced by neutralizing sulphur dioxide gas with sodium hydroxide.

$$NaOH_{(l)} + SO_{2(g)} \rightarrow NaHSO_{3(l)}$$

Sodium bisulphite is primarily used for water treatment, removing excess chlorine in drinking water. It is also used for bleaching pulp in the pulp and paper industry, to remove excess chlorine used in controlling zebra mussel growth in industrial cooling water systems, and to remove metals from industrial wastewater.

It is the objective of Sulco Chemicals Limited to maintain a high quality standard in the chemical industry. Meeting the service and product quality demands of our customers are the primary factors in determining our success. As a Responsible Care® member of the Chemistry Industry Association of Canada, Sulco Chemicals Limited is committed to taking every practical precaution towards ensuring that its products and operations do not present an unacceptable level of risk to its employees, customers, the public or the environment.

Sulco is registered under ISO 9001, ISO 14001, and ANSI/NSF/CAN 60 International Standards.

The purpose of this bulletin is to aid our customers in handling, transporting and storing sodium bisulphite. If further information is required, contact Sulco Chemicals Limited at (519) 669-1332 for assistance.

Physical Properties of Sodium Bisulphite

Physical Data

Sodium bisulphite is a light yellow liquid with a pungent sulphur dioxide odour. In general, sodium bisulphite is a moderately strong reducing agent, which yields sodium sulphate upon reaction with oxidizing agents. It has the potential of a violent exothermic reaction if mixed with strong oxidizing agents. If mixed with an acid, sulphur dioxide is liberated with the decreased pH.

Table 1
General Physical Data for Sodium Bisulphite, 38% Solution

Concentration	38% solution of $NaHSO_3$
Percent SO_2	23.4
pH	3.0 – 5.2
Specific gravity	1.313
Boiling point	104°C
Freezing point	6°C
Weight solution/US gallon	5.03 kg (11.1 lbs)
Weight $NaHSO_3$/US gallon	1.95 kg (4.33 lbs)
Weight SO_2/US gallon	1.21 (2.66 lbs)

Table 2
Viscosity of Sodium Bisulphite Solutions

Solution	Temperature °C (°F)	Viscosity (Centipoises)
30% $NaHSO_3$	5 (41)	3.8
30% $NaHSO_3$	25 (77)	1.9
40% $NaHSO_3$	5 (41)	6.7
40% $NaHSO_3$	25 (77)	2.8

Chart 1
Specific Gravity of Sodium Bisulphite Solutions

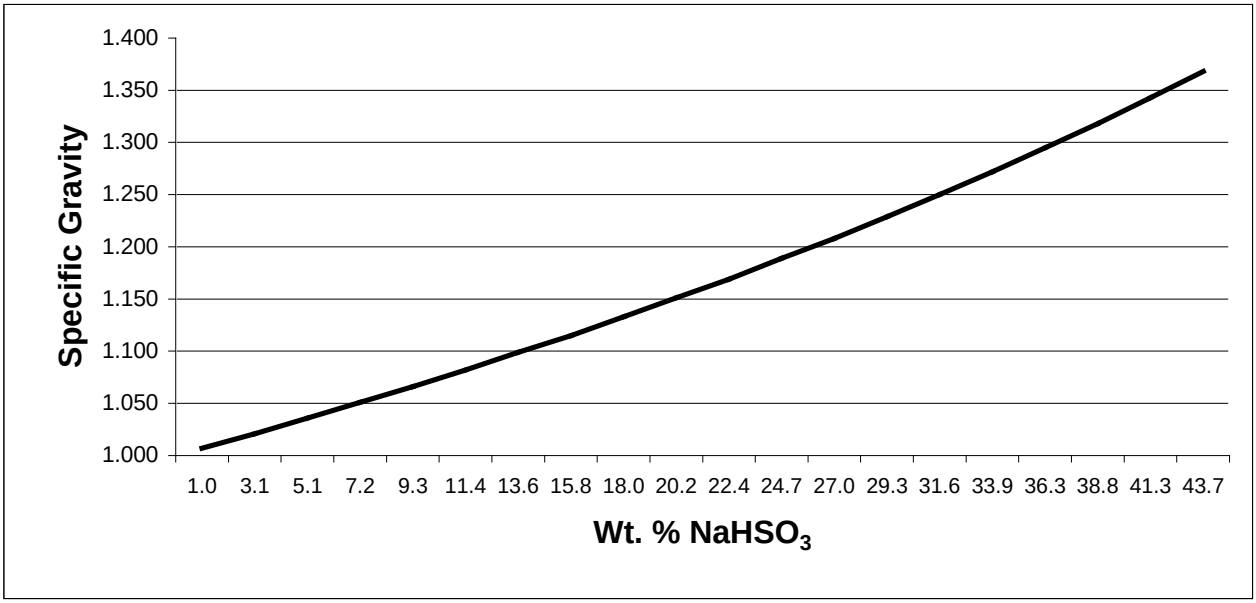
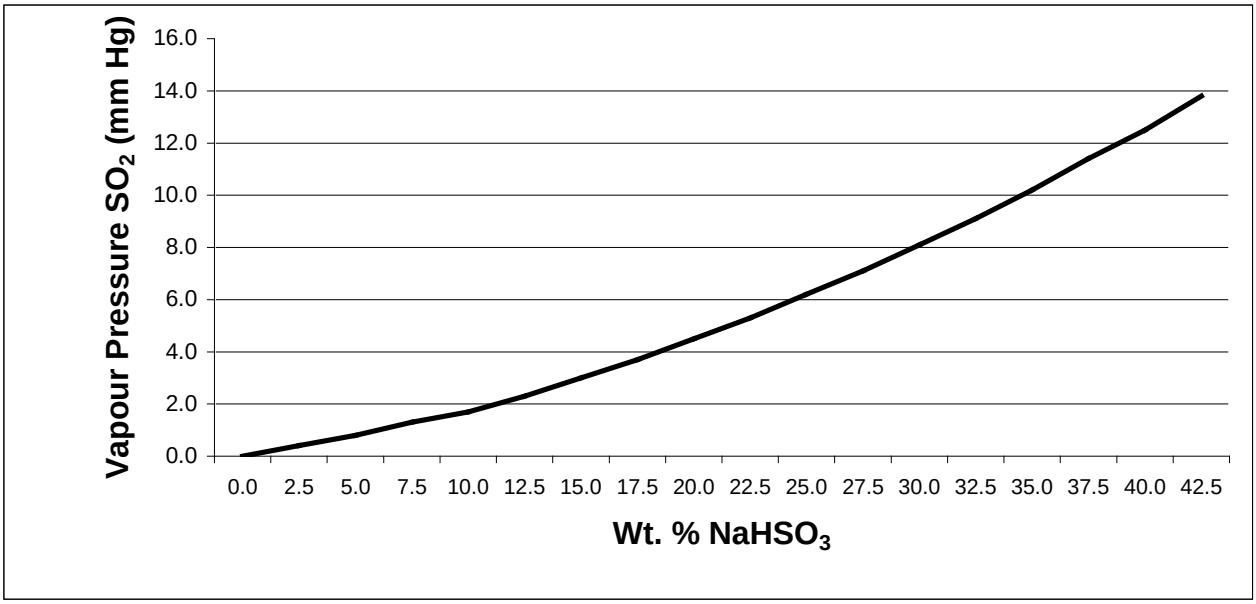


Chart 2
Vapour Pressure SO_2 (mm Hg) vs. Percent Sodium Bisulphite (25°C)



Bulk Storage of Sodium Bisulphite

The following information of bulk storage of sodium bisulphite is given as a guideline only since requirements will vary with the particular situation. Sulco Chemicals Limited will be pleased to offer technical advice regarding a particular installation.

Storage Tanks

1. Size and Design of Tanks

The normal practice is to size the storage tank to have 1½ times the capacity of the tank trailer to be received. Storage tank and delivery load size is also dependent on the customer usage rate and minimum inventory levels.

Maximum Trailer Size	Tank Size
35,000 kg	52,500 kg

This tank size (52,500 kg) corresponds to approximately 40,000 litres or 8,800 IGal. It is recommended that the maximum tank level be 90% for non-fuming products and 85% for fuming products. Both horizontal and vertical style tanks are used for sodium bisulphite storage.

2. Materials of Construction

Storage tanks for unpressurized sodium bisulphite are normally constructed of 316 stainless steel, fiberglass or HDPE.

3. Tank Location

Storage tanks should be located indoors to avoid freezing issues. The tank should be located such that tank trailers have free accessibility within 10 feet of the tank loading nozzle. Avoid catch basins and storm sewers in the truck unloading area.

4. Foundation and Diking

Storage tanks should be supported by reinforced concrete footings. It is also recommended that storage tanks should be surrounded by a dike, which is 125% times the capacity of the tank. Dike material should be of concrete or earth lined

with compacted clay or a synthetic liner. Both the local branch of the Ministry of the Environment and the Municipality concerned should be consulted for more specific guidelines regarding installation and diking.

5. Tank Fittings

All storage tanks should be equipped at minimum with the following:

- A 2" schedule 40, 316-stainless steel, CPVC, or PVDF unloading line (equipped with a camlock quick connector) brought down to waist level for easy accessibility. Depending upon the piping arrangement, it may be desirable to equip this line with a plug/ball valve adjacent to the main hook up connection to allow rapid shut off and containment of the SBS in the line in the event of the tank being over filled.

- A minimum 3" schedule 40 vent/overflow line piped down to ground level and away from the loading line within the dike. Ideally, the vent is directed through an alkaline absorption system.

- A 24" top manway with a 2" schedule 40 secondary outlet equipped with a blind flange to allow dipping of the tank. Installation of a level indicating system with a high level alarm is also recommended.

- A 2" schedule 40 flanged bottom/side outlet for connection to the process. This outlet should be equipped with a quarter turn plug/ball valve. The discharge valve should be located as close as possible to the tank outlet nozzle.

Piping, Valves, Fittings and Gaskets

Piping to the process should be of schedule 40 stainless steel with slip on welded flanges. Care should be taken at both the design and operation stages to avoid liquid full sections of pipe between closed valves. This will avoid pressure build-up during warm weather.

316 SS quarter turn plug/ball valves with PTFE seats have been found to give good service with SBS. Gasket material should be PTFE or neoprene.

Unloading Facilities – Air Supply

It is recommended that a compressed air supply be made available at the unloading area. All of Sulco Chemicals Limited tank trailers are equipped with

eduction pipes for unloading by pressurizing the tank trailer. The recommended pressure at the trailer is 25 psi but must be less than 35 psi. The air supply should be equipped with a shut off valve, a pressure reducing valve, a pressure gauge, a safety relief valve (set at a maximum of 40 psi), a quick opening manual relief valve, and 50 feet of 1" flexible air hose. The air supply valves should be freely accessible and located away from the storage tank and associated piping.

Trucks equipped with air compressors are available on request.

Tank Truck Unloading - Responsibilities

Sulco Chemicals Limited, as a Responsible Care® company, has a commitment to both carrier and customer for the safe handling of our products.

To better illustrate our concern, we have carefully reviewed the function of the truck driver and customers in the delivery of sodium bisulphite from tank-trucks. We have set up certain guidelines, which identify the responsibilities of the truck driver and the customer.

Customer Responsibilities

1. It is necessary to have safety showers and eye wash fountains in the unloading area such that they are easily accessible at the time of an emergency. Running water should be available at all times at the site. Both the truck driver and the customer's employee must be wearing protective clothing (during any chemical handling) such as a suit made of impervious material (PVC), safety goggles, face shield, rubber boots, and rubber gloves.

2. The customer must make sure that suitable equipment and facilities are in good working order and readily available to safely handle the material.

3. The customer must ensure, prior to off-loading, that there is sufficient capacity in the storage tank to accept the entire incoming quantity. The customer must also check the truck unloading connections to make sure that the material is being unloaded into the proper tank.

4. The customer must check the bill of lading for the incoming material to make sure that the proper material is being off loaded into the proper storage tank. A check should be made to make sure the bill of lading agrees with the customer's order and the placard on the truck.

5. The customer is responsible for the unloading of the entire shipment. The truck driver is available to assist but only under the supervision of the customer. Two people must be responsible for unloading. This will minimize the possibility of accidents and enable prompt assistance should any emergency arise.

6. The customer must make sure that the facility for unloading is designed to minimize the seriousness of any accident. Particular attention should be paid to the location of the overflow vent. If the tank is overfilled then the overflow vent should direct the liquid away from buildings, isolation valves and air shutoff valves and into the dike. Also, in the case of a ruptured unloading hose the air shutoff valve and liquid isolation valves should be far enough removed from the loading area so that the leak can be stopped quickly and safely.

Truck Driver Responsibilities

1. The truck driver must make sure that all equipment on his truck, including unloading hoses, is in good order. He must carry a set of protective clothing including safety goggles, PVC suit, face shield, gloves, boots and any other equipment as required by the customer.

2. The truck driver is responsible for all connections made at the truck. He/she will assist with connections to the customer's equipment but only at the customer's request and under their supervision.

It is important that both the customer and the truck driver be suitably trained so that they know the proper action to be taken in the case of a spill and what medical treatment would be necessary in the case of injuries.

This information is provided with the objective to prevent accidents. Should further assistance be required, please contact Sulco Chemicals Limited at (519) 669-1332.

General Trailer Unloading Procedures

Safety Precautions

1. PPE required: hard hat, safety goggles, face shield, steel-toed work boots, rubber gloves, acid resistant clothing (PVC jacket and pants).

2. Safety shower and eye wash sources: Locate in the event of a personal splash injury. Confirm operation.

3. Wheel chocks: Position to prevent movement of the trailer while offloading.

4. Trailer spotted: Check unloading setup (If unloading hose is stretched to the limit). If required, reposition the trailer before continuing.

5. Ignitions off: During the unloading process, unless tractor air is required for unloading.

6. Post any warning signs: Advise operators to route traffic away from offloading area.

7. Drains/catch basins: Insure all drains in the unloading area are covered or sealed for containment in event of a spill.

8. Regulated air supply: (Maximum 35 psi, normal 25 psi)

Unloading Steps

1. Instruct the driver where the trailer is to be parked for unloading.

2. Obtain the bill of lading and necessary quality documents from the driver (Certificate of Analysis, samples, weight ticket etc.).
   - Verify the product is correct.
   - Verify the amount of material on the trailer and confirm storage tank availability.
   - Sign the bill of lading if all is correct to acknowledge acceptance.

3. The unloading hose must be hooked up from the trailer to the unloading connection before any valves are opened. Note the location of any emergency shutoff valves equipped with the trailer.

4. Open the main valve on the trailer and any valves to the storage tank. This allows the SBS to begin flowing as soon as enough pressure is available in the trailer.

5. Connect the regulated air supply line **(Maximum 35 psi)** to the trailer and open all valves leading from the air compressor to the tank truck with the last valve opened at the tank truck. Confirm air pressure < 35 psi before opening last valve at the tank truck.

6. The SBS will begin to flow as the pressure builds up in the trailer. The SBS will continue to flow until the entire truckload is off loaded. The hose will jump and the sound of air rushing through will be evident when the trailer is empty. During the unloading period, the tank level must be continuously monitored.

7. Shut off the air supply at the trailer first and all the way back to the air compressor. Disconnect the air supply line from the trailer.

8. The main unloading valve on the trailer can be left partially open to blow any product free of the line for one minute.

9. The trailer can be vented slowly through the air supply valve to atmosphere.

10. Close the main valve on the trailer unloading line followed in succession by the valves leading to the storage tank.

11. The drain valve on the unloading line can be opened to drain any product from the unloading line. Once the line is confirmed to be free of product and any pressure, the unloading hose can then be disconnected at the trailer and the tank connection. Alternatively, permanent truck unloading hoses can just be capped and loaded back on the trailer.

12. Remove wheel chocks and warning signs before moving trailer.

Containment and Clean-up Procedures for Sodium Bisulphite

Personal Protective Equipment

The damage of human tissue is the most dangerous characteristic of sodium bisulphite. For that reason, protective equipment must be worn which is appropriate to the degree of risk such as safety goggles, face shield, hard hat, PVC jacket and pants, PVC gloves, and rubber boots.

Normally, no respiratory protection is required in handling SBS during loading/unloading operations. However, during emergency situations, approved sulphur dioxide gas respirators or self contained breathing apparatus may be required.

Containment of Spills

SBS leaking from tank, cars or tank trucks will usually have drained down the right-of-way embankment to the adjoining low ground. If there is not flowing water in that area, the SBS may form natural pools (except on porous, sandy soil) and no immediate containment action may be required.

If water is flowing through the area at a low rate, steps should be taken to construct earth dikes downstream to contain the SBS and water. A back-hoe or front-end loader is necessary if a dam of any significant size is needed, particularly in frozen ground. If there is a high rate of flow through the area, then damming in the immediate area may not be feasible. It may be possible to find a place farther downstream where the contaminated water can be contained for neutralization before it reaches a main water course.

Neutralization and Disposal

In the event of a leak, sodium bisulphite solution may be neutralized with alkali material such as soda ash, caustic soda, lime or limestone. The resulting solution of sodium sulphite must **not** be flushed to the sewer. It must be oxidized completely which will yield a solution of sodium sulphate. Dilute hydrogen peroxide is a good oxidizing agent for this purpose. If regulations permit, this solution may be discharged to the sewer, otherwise disposal of the solution may be required.

Transfer Procedures

The method selected for transferring SBS from derailed tank cars or damaged road trucks to other containers will depend on the condition of the tank, its orientation, and the accessibility of the tank fittings. SBS tanks are normally unloaded either by pumping or by the application of air pressure. If for some reason neither of these is possible, the use of a vacuum truck to remove the SBS to a disposal area should be considered.

Materials of Construction

Sodium bisulphite is normally handled in 316 stainless steel, fiberglass or HDPE piping and tanks. For components subject to wear such as pumps and valves, 316 SS and alloy 20 are used for prolonged life. Copper and brass fittings must be avoided. PTFE flexible pipe connections are preferable.

For gaskets, PTFE or neoprene is suitable.

Containers and Fittings

a. Tank Trucks

   Tank trucks in SBS service are variable in size. They are of 316 SS construction with maximum 42MT capacity and equipped with valves for bottom unloading or for top loading through an eduction pipe using air pressure or pump.

b. Small Containers

   Sodium bisulphite is packaged in carboys, 270 kg drums and 1300 kg totes.

Table 4
Sodium Bisulphite Transportation Information

Transportation of Dangerous Goods (TDG)
Of Bulk Product in Canada

1.	**Product name**	Sodium bisulphite		
2.	**Prescribed shipping name**	Bisulphites, aqueous solution, N.O.S. (Sodium Bisulphite)		
3.	**Product Identification No.**	UN 2693		
4.	**Shipping mode**	Tank Trucks		
5.	**Primary classification**	Class 8	Corrosive	
6.	**Packing group**	III		
7.	**Subsidiary classification**	n/a		
8.	**Placards required**	Class 8	Corrosive	UN 2693
9.	**ERAP Required**	No		

How to Request Emergency Response for Chemical Emergencies Involving Sulco Products

1. Gather information that will be needed by Sulco, as described on the following page.

2. Call the following 24-hour Emergency Response Number:

416-444-2112

3. When your call goes through, state that you have a chemical emergency involving a Sulco product, and that you need assistance. Provide the information requested, and ask for the aid you require. A qualified person will return your call to provide assistance.

Note:
For chemical emergencies involving products not supplied by Sulco, contact the supplier. If you don't have the number, or if you need immediate advice, call the following number:

For emergencies in Canada: Call collect to CANUTEC (613) 996-6666

Sulco Chemicals Limited

60 First Street, East
Elmira, Ontario
N3B 2Z5

Phone: (519) 669-5166
Fax: (519) 669-8340

Information Required by Sulco to Provide Assistance for Chemical Emergencies

Have as much of the following information available as possible:

For your initial call:

1. Your name, job title, and the phone number where you may be reached.
2. Name, location and office phone number of your company or agency.
3. Nature and location of the emergency.
4. Any injuries or needs for medical assistance?
5. Names of the Sulco products involved, UN numbers, if available.
6. What assistance do you require?
7. Any other pertinent information.

For the return call from Sulco:

1. Type and number of containers, and their condition.
2. Any leaks? Approximate rate of leakage?
3. When did the incident occur?
4. Who is the carrier? Are they on scene?
5. Who has been informed? Fire department? Police? Environment officials? Other?
6. Any other products on the scene? Have their shippers been called?
7. How to get to the scene – travel directions.
8. At the scene, who will be the main contact for Sulco representative? (Fire, police, company office, carrier office, other).