



SASOL

Safe Handling of BHT

(Butylated Hydroxy Toluene)



Introduction

Butylated Hydroxy Toluene (BHT) is a manufactured antioxidant (preservative) commonly used in plastics, rubber, petroleum products, foods, pharmaceuticals, and cosmetics.

BHT was patented in 1947 and is effective and safe in a great variety of hydrocarbon products. It is the most prevalent and approved antioxidant in the world. BHT has been approved for use in foods and food packaging in low concentrations by the Food and Drug Administration (FDA) since 1954. As an antioxidant, BHT preserves organic materials by reducing the effects of time, heat and light.

Sasol BHT is used predominantly by other chemical manufacturers and industrial users that incorporate it into a multitude of products to extend the life of the materials being produced. This preservative effect benefits end consumers through longer lasting goods. The typical American uses countless products which involve BHT somewhere in their manufacture.

Despite BHT's many beneficial properties and end uses, it is classified as a hazardous chemical under the US Occupational Safety and Health Administration (OSHA) Hazard Communication Standard and can pose hazards and risks to people and the environment during handling, processing, and transporting.

Purpose & Scope

The purpose of this document is to provide information gathered through Sasol's long experience in the safe handling of BHT. It focuses on basic and practical information about working safely with this substance. Additional references are provided and it is strongly recommended that these and others be consulted prior to working with BHT. Sasol is globally committed to Responsible Care[®] principles and is a member of the American Chemistry Council. Please do not hesitate to contact your regional Sasol office if we can be of assistance in the safe storage, handling, processing and disposal of our products.

Hazards

Health Hazards

The primary danger posed in handling BHT is irritation. BHT is irritating to the eyes and may cause respiratory irritation. BHT may cause nausea, vomiting, gastro-intestinal distress, and narcotic effects if ingested in large doses well above the acceptable daily intake (ADI) of 0.3 mg/kg body weight (bw) /day. Liquid BHT can cause thermal burns like any hot liquid.

Exposure guidelines have been developed to protect workers from eye and respiratory irritation. The National Institute for Occupational Safety and Health (NIOSH) has established a time-weighted average (TWA) recommended exposure limit (REL) of 10 mg/m³ and the American Conference of Governmental Industrial Hygienists (ACGIH) has established a TWA Threshold Limit Value (TLV) of 2 mg/m³ as inhalable particulate and vapor.

BHT has been tested extensively for toxicity and used widely for many years. It does not contain any ingredient designated as a known, probable, or suspected human carcinogen by the International Agency for Research on Cancer (IARC), the National Toxicology program (NTP), ACGIH, or OSHA.

The levels of BHT that consumers are exposed to through food and contact with BHT containing products are not known to have any negative health effects.

Fire Hazards

BHT in solid form may burn but does not readily ignite. BHT dust may form an explosive mixture in air and measures must be taken to prevent dust buildup and electrostatic charges. BHT dust can be generated during handling and processing. If it is dispersed in air in sufficient concentrations and in the presence of an ignition source, it is a potential dust explosion hazard. Accumulation of dust on surfaces such as floors, ledges, and duct work, if dispersed in air from a primary explosion, can cause flame propagation and secondary explosions with greater consequences.

Fire will produce dense black smoke containing hazardous products of combustion such as carbon oxides, nitrogen oxides, and hazardous organic compounds.

Reactivity Hazards

In general, BHT is a stable compound. However, exposure of BHT to strong acids or bases or strong oxidizing or reducing agents can result in exothermic reactions, pressure and potentially hazardous and flammable by-products.

Environmental Hazards

BHT has been classified as “very toxic to aquatic life with long lasting effects” due to immobilization of water fleas at the limits of water solubility. BHT is not generally considered toxic to fish at the limits of water solubility. BHT is not readily degradable in the environment and may bio-accumulate in aquatic organisms, so care must be taken to prevent it from entering surface or ground waters. BHT should be disposed of in accordance with applicable federal, state, and local regulations as a non-hazardous waste.

BHT is directly incorporated into products at low levels and does not readily leach or evaporate from preserved materials. Therefore, BHT incorporated into products essentially has no environmental impact beyond those posed by the products themselves.

Physical and Chemical Characteristics

Chemical Identity

Butylated Hydroxy Toluene (BHT)

2,6-di-tert-butyl-p-cresol (DBPC)

2,6-di-tert-butyl-4-methyl-phenol

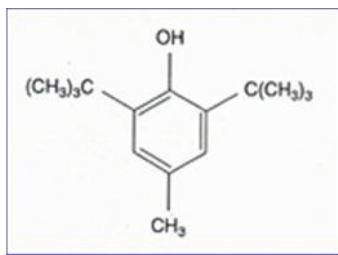
$C_6H_2(C_4H_9)_2(CH_3)OH$

$C_{15}H_{24}O$

Molecular Weight: 220.34

CAS# 128-37-0

EINECS (EU) 204-88-14





Sasol BHT is a solid at ambient temperatures and is produced in both crystal and pellet forms. It is white when produced but may discolor to yellow in the presence of heat and moisture. Molten BHT is a colorless liquid which is shipped at elevated temperature in bulk tank truck quantities.

BHT is practically insoluble in water and moderately soluble in organic solvents and oils (20-50%). Refer to the latest Safety Data Sheet (SDS) and Technical Data Sheet for more information on BHT physical/chemical properties.

Controls for Working with BHT

Safe storage, handling, processing and disposal of BHT begin long before it arrives on-site. Measures necessary to ensure the health and well-being of employees, customers, the community and the environment include the development of effective administrative and engineering controls designed to specifically address the hazards associated with BHT. Personal protective equipment (PPE) is integral to safe handling and should be viewed as the last line of defense against an accidental failure of the administrative and/or engineering controls.

Administrative Controls

Administrative controls are the foundation of any program designed for safely handling of BHT. Every company is unique in how they run their business and establish administrative controls. Those specifically developed for working with BHT should address comprehensive process planning, thorough communication of hazards to employees and extensive training of employees on the proper implementation of all safety measures.

Engineering Controls

Engineering controls for safely storing, transferring, processing and disposing of BHT should be developed around maintaining the physical integrity of the processing equipment from receipt to disposal. Selection of materials of construction and mechanical equipment should address both the physical and chemical properties of BHT. The appended Table A lists suggested materials for piping and tanks used for handling BHT, along with suggestions for compatible materials used in pumps, gaskets and seals. Special consideration must be given to providing adequate dust explosion mitigation equipment in areas where BHT dust may be produced in processing and handling. This equipment may include properly designed dust collection systems, grounding and bonding of process equipment, grounding confirmation systems, deflagration venting for processes, deflagration isolation systems, gas inerting systems, static dissipating systems, humidification, and fixed fire protection systems.

The National Fire Protection Association (NFPA) has several excellent references on dust explosion mitigation including NFPA 68 Standard on Explosion Protection by Deflagration Venting, NFPA 69 Standard on Explosion prevention Systems, and NFPA 654 Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids.

Personal Protective Equipment

All personnel who work with or near BHT must use adequate PPE. The extent of the potential exposure and consideration of established exposure guidelines (RELs/TLVs) should dictate the level of protection necessary. At a minimum, safety glasses with side shields, long-sleeved shirts and trousers, and leather or cloth work gloves are recommended. Workers should not wear contact lenses when handling BHT. If dust blow back is a concern, chemical goggles or a full-face respirator should be used to protect the eyes from irritation. For tasks that may cause inhalation exposure at or above inhalation exposure guidelines, a NIOSH certified negative pressure full-face respirator with a combination Organic Vapor/P95 cartridge is recommended. A sink, safety shower, and eyewash fountain should be maintained in the work area. If BHT is used in molten form, use

personal protective equipment, such as face shields and heat resistant gloves and outer garments to protect against thermal burns.

Handling

This section highlights some of the key points to consider when handling BHT.

Receipt & Unloading

Sasol delivers BHT in several different packages and by several different transportation modes. Packages include multi-wall paper bags, fiber drums, super sacks, and molten bulk liquid tank-trucks. Transportation modes include box trucks, ISO-box containers, and tank-trucks.

Bags, drums, and super sacks are shipped on shrink-wrapped pallets. Box containers should arrive sealed and/or locked to prevent tampering during transport. BHT should not be shipped with hazardous materials as it is a food-grade additive. Contact Sasol if tampering or contamination of product is known or suspected. Unloaders should open box trucks and containers carefully to make sure that packages have not shifted or fallen in transport. The unloaders should ensure that pallet lifting/moving devices including powered industrial trucks (forklifts) are weight rated to the loaded pallet weights at full lift extension. Be careful not to puncture packages during unloading to prevent releases of BHT.

Several safety factors should be considered when unloading molten BHT in tank trucks. Tank trucks should arrive with cable car-seals on all tank openings to prevent tampering during transport. Any suspected tampering or contamination should be reported to Sasol and the product should not be unloaded into the process. Typically, molten BHT should be bottom unloaded by applying nitrogen pressure to the vapor space of the tank container while regulating the pressure below the allowable working pressure and relief valve setting of the tank container. Please note that the BHT tank truck will be sent heated with a nitrogen blanket applied to the vapor space. Therefore, caution and proper ventilation should be used when opening the vapor space to prevent an asphyxiation hazard. Unloading hoses and connections should be made of compatible materials and rated for the product temperature and applied pressure (typically stainless steel). Ensure that the BHT in the tank truck has been heated to specified temperatures and is fully molten before attempting to unload the product. Unloading hoses must be heat-traced with steam or warmed with steam and tarped during unloading to prevent the molten BHT from solidifying during transfer. Transfer piping must be heat traced and insulated to keep the BHT in liquid form. The freeze point of BHT is 69.2°C minimum. Unloading personnel should don heat resistant chemical suits and gloves and face shields to prevent thermal burns while making connections and during the unloading process.

Transfer

If manually moving large quantities of bags or drums, lift-assist devices should be considered to reduce ergonomic concerns. When transferring solid BHT product in crystal or pellet forms, ensure that transfer equipment is grounded and bonded and designed to minimize dust formation and static electricity. Refer to the NFPA references listed under “Engineering Controls” above. Super sacks are very heavy when filled with BHT. Ensure that all lifting equipment such as forklifts, slings, and hangers are properly rated for filled weights. Follow proper lifting procedures as outlined on the super sacks. Keep all personnel away from super sacks when being transported or suspended. Only properly grounded electrostatically dissipative super sacks should be used with BHT to mitigate the risk of dust explosion.

Heat-traced 304 or 316 stainless steel piping is recommended for transferring liquid BHT within a facility at typical storage and transfer temperatures (80-90°C) to prevent discoloration. Aluminum piping may be acceptable for some applications, but copper and brass should be avoided. As a general rule, the piping system should be welded and flanged to minimize threaded connections. A standard ANSI-type chemical process

pump is recommended using a single rotating bellows seal with a carbon face running on a stationary silicon carbide seat. A steam quench is a good feature to have for a seal in this type of service.

Storage

Keep BHT sealed in its original container until ready for use. Avoid exposure to heat, moisture, light, nitrogen oxide (NO_x) gas from propane-powered forklift exhaust and/or other environmental factors that may cause premature product degradation and color development. The efficacy of the BHT (how it works) is not affected by color development.

If removed from its original packaging, store BHT in a cool, dry place, in tightly closed containers. Solid BHT may be stored in metal or fiberboard containers. A natural yellow discoloration that is not detrimental to BHT's effectiveness may result from uncovered storage. Molten BHT should be stored in stainless steel tanks at approximately 80-85°C. The use of an inert gas blanket will extend color stability substantially. Without it, color develops within 7 to 10 days at the temperatures indicated.

Polypropylene and polyethylene bottles or bags are suitable for storage of small, solid, lab-scale BHT samples. Glass or compatible metal containers are suitable for molten or solidified molten storage of lab-scale samples.

Processing

BHT processing equipment should typically be made of stainless steels or other materials compatible with BHT as noted in Table A. If dust is formed in processing, equipment must be designed to mitigate dust explosion risks (See "Engineering Controls"). Combustible dust clouds may be created where operations produce fine material (dust). Avoid significant deposits of material, especially on horizontal surfaces, which may become airborne, form combustible dust clouds and contribute to secondary explosions. Handling and processing operations should be conducted in accordance with 'best practices' (e.g. NFPA 654). It is recommended that all dust control equipment such as local exhaust ventilation and material transport systems involved in handling of this product contain explosion relief vents or an explosion suppression system or an oxygen deficient environment.

Ensure that dust-handling systems (such as exhaust ducts, dust collectors, vessels, and processing equipment) are designed in a manner to prevent the escape of dust into the work area (i.e., there is no leakage from the equipment). Ensure adequate ventilation, especially in confined areas. Provide adequate precautions, such as electrical grounding and bonding, or inert atmospheres. Use only appropriately classified electrical equipment and forklifts. Electrical equipment used in BHT processing areas should typically be rated for Class 2, Division 1, Group G or Class 2, Division 2, Group G following NFPA 499: Recommended Practice for the Classification of Combustible Dusts and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas.

Disposal

Ideally, all BHT should be consumed or recycled in processing. Any unused or residual BHT must be disposed of properly. Uncontaminated BHT is generally considered as a non-hazardous waste and can typically be land-filled for disposal. Ensure that disposal meets any federal, state or local regulations.

Emergency Procedures

Physical Exposure - External

If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists, consult a specialist.

If on skin: Wash off with soap and water. Get medical attention if irritation develops and persists. Wash contaminated clothing before reuse.

Physical Exposure – Internal

If inhaled: Remove to fresh air and keep at rest in a position comfortable for breathing. If symptoms persist, call a physician.

If swallowed: Do not induce vomiting. If conscious, give 2 glasses of water. Get immediate medical attention. Treat symptomatically. Ingestion is not an expected route of exposure.

Fire-Fighting

Fires involving BHT are best extinguished using water fog or foam. Do not use a water jet. Dry chemical and CO₂ media are also effective. Approved self-contained breathing apparatus and protective clothing should be employed as needed to avoid inhalation of vapors, smoke or run-off water while fighting the fire. Evacuate personnel to safe areas. Do not allow run-off from firefighting to enter drains or water courses.

Spill Containment & Clean-Up

Personal precautions: Evacuate personnel to safe areas. Use personal protective equipment. Prevent further leakage or spillage if safe to do so. Dust deposits should not be allowed to accumulate on surfaces, as these may form an explosive mixture if they are released into the atmosphere in sufficient concentration. Avoid dispersal of dust in the air (i.e., clearing dust surfaces with compressed air). Non-sparking tools should be used.

Environmental precautions: Prevent further leakage or spillage if safe to do so. Do not allow material to contaminate ground water system. Do not flush into surface water or sanitary sewer system. Keep out of waterways. If the product contaminates rivers and lakes or drains inform respective authorities.

Methods for cleaning up: Use personal protective equipment. Take precautionary measures against static discharges. Avoid dust formation. Take up mechanically and collect in suitable container for disposal. Non-sparking tools should be used. Clean contaminated surface thoroughly.

The composition and extent of any spill should be evaluated against local guidelines (ex. SARA Title III and RCRA in the U.S.) and reported to the proper agencies, if necessary. Any non-disposable clean-up equipment should be thoroughly decontaminated with soap and water after use.

Regulatory Information:

BHT is classified as hazardous for workers and by some modes of transport. It is regulated under a variety of local, state, federal and international laws requiring exposure and environmental controls, as well as various means of hazard communication such as labeling and Safety Data Sheets (SDS). BHT has been registered under the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) (CE) 1907/2006 regulation in the European Union.

Classification and labelling

Under the Global Harmonized System on Classification and Labelling of chemicals (GHS) regulations, substances are classified according to their physical, health, and environmental hazards. The hazards are communicated via specific labels and the SDS. GHS attempts to standardize hazard communication so that the intended audience (workers, consumers, transport workers, and emergency responders) can better understand the hazards of the chemicals in use. The following classification and labelling information is based on the US OSHA Hazard Communication Standard.

Classification

Serious eye damage/eye irritation Category 2B
 Specific target organ systemic toxicity (single exposure) Category 3
 Acute aquatic toxicity Category 1
 Chronic aquatic toxicity Category 1

Labelling

Signal word: Warning

Hazard pictograms:



Hazard statements:

H320: Causes eye irritation
 H335: May cause respiratory irritation
 H336: May cause drowsiness or dizziness
 H410: Very toxic to aquatic life with long lasting effects.
 May form combustible dust concentrations in air (during processing)

Precautionary statements:

P280 - Wear eye protection/face protection
 P264 - Wash face, hands and any exposed skin thoroughly after handling
 P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
 P337 + P313 - If eye irritation persists: Get medical advice/ attention
 P261 - Avoid breathing dust/ fume/ gas/ mist/ vapors/ spray
 P271 - Use only outdoors or in a well-ventilated area
 P304 + P340 - IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing
 P304 + P312 - IF INHALED: Call a POISON CENTER or doctor/ physician if you feel unwell
 P403 + P233 - Store in a well-ventilated place. Keep container tightly closed
 P273 - Avoid release to the environment.
 P391 - Collect spillage.
 P501 - Dispose of contents/ container to an approved waste disposal plant.

Combustible dust clouds may be created where operations produce fine material (dust). Avoid significant deposits of material, especially on horizontal surfaces, which may become airborne and form combustible dust clouds and may contribute to secondary explosions. Handling and processing operations should be conducted in accordance with 'best practices' (e.g. NFPA- 654)

For Further Information:

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References:

- Sasol BHT Brochure
- Sasol BHT Safety Data Sheet
- OECD SIDS BHT, March 2002
- Sasol Compatibility Matrices
- NFPA 68, NFPA 69, NFPA 499, NFPA 654

Disclaimer:

The information and recommendations contained herein are, to the best of Sasol's knowledge and belief, accurate and reliable as of the date issued. Sasol does not warrant or guarantee their accuracy or reliability, and Sasol shall not be liable for any loss or damage arising out of the use thereof. The information and recommendations are offered for the user's consideration and examination, and it is the user's responsibility to satisfy itself that they are suitable and complete for its particular use.

Nothing contained herein is to be construed as a recommendation to use any product, process, equipment or formulation in conflict with any patent, and Sasol makes no representation or warranty, express or implied, that the use thereof will not infringe any patent.

Table A: BHT Material Compatibility

Metal/Material	Rating
304L Stainless Steel	Acceptable
316L Stainless Steel	Acceptable
Carbon Steel	Not Recommended – Discolors Molten BHT
Cast Iron	Not Recommended – Discolors Molten BHT
Brass	Not Recommended – Discolors Molten BHT
Copper	Not Recommended – Discolors Molten BHT
Aluminum	Acceptable
Monel	Not Recommended – Discolors Molten BHT
PVC	Not Recommended
Polypropylene	Not Recommended
Teflon	Acceptable
Viton	Recommended
Neoprene	Unsuitable
Flexible Graphite	Acceptable