



SAFETY DATA SHEET(SDS)

Date of issue 2017.06.16

Revision date Not applicable

BUNKER-C(RCBC)

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1. IDENTIFICATION

A. Product name : BUNKER-C(RCBC)

B. Recommended use: Boiler and each heating furnace fuel oil
restriction on use: Not available

C. Manufacturer / Supplier / Distributor information:

1) Manufacturer information:

Company name	Hanwha Total Co.,Ltd		
A d d r e s s	103, Dokgot 2-ro, Daesan-Up, Seosan, Chungnam, Korea, 356-711		
Telephone number	+82-41-660-6441	F a x n u m b e r	+82-41-660-6447

2) Supplier/Distributer information:

Company name	Hanwha Total Co.,Ltd		
A d d r e s s	Energy Sales Team 3, Hanhwa Finance Plaza, Sejongdae-ro 92 (Taepyungro 2-ga), Jung-gu, Seoul, Korea		
Telephone number	+82-2-3415-9386	F a x n u m b e r	+82-2-3415-9390

3) Writer information:

D e p a r t m e n t	PSM Team		
Telephone number	+82-41-660-6382,	F a x n u m b e r	+82-41-660-6348

2. HAZARD IDENTIFICATION

A. GHS Classification

1) Physical hazards:

- Flammable liquids: Category4

2) Health hazards

- Acute toxicity (dermal): Category4

- Acute Toxicity (Inhalation: dust / mist): Category4

- Skin corrosion/irritation: Category3

- Serious eye damage/irritation: Category2B

- Carcinogenicity: Category1B

- Specific target organ toxicity(Single exposure): Category3(Respiratory tract irritation)

- Specific target organ toxicity(Repeated exposure): Category1

3) Environmental hazards:

- Acute aquatic toxicity: Category1

- Chronic aquatic toxicity: Category1

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B. GHS label elements

1) Hazard symbols:



2) Signal words: Danger

3) Hazard statements:

H227 Flammable liquids

H312 Harmful in contact with skin

H316 Cause mild skin irritation.

H320 Cause eye irritation.

H332 Harmful if inhaled

H335 May cause respiratory irritation

H350 May cause cancer

H372 Causes damage to organs through prolonged or repeated exposure (Refer Section SDS 11)

H400 Very toxic to aquatic life

H410 Very toxic to aquatic life with long lasting effects

4) Precautionary statements:

■ Prevention

P201 Obtain special instructions before use.

P202 Do not handle until all safety precautions have been read and understood.

P210 Keep away from heat/sparks/open flames/hot surfaces. No smoking.

P260 Do not breathe gas/mist/vapors/spray.

P261 Avoid breathing gas/mist/vapors/spray.

P264 Wash hands thoroughly after handling.

P270 Do not eat, drink or smoke when using this product.

P271 Use only outdoors or in a well-ventilated area.

P273 Avoid release to the environment.

P280 Wear protective gloves/protective clothing/eye protection/face protection.

P281 Use personal protective equipment as required.

■ Response

P302+P352 IF ON SKIN: Wash with plenty of soap and water.

P304+P340 IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.

P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

P308+P313 If exposed or concerned: Get medical advice/attention.



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P312 Call a POISON CENTER or doctor/physician if you feel unwell.

P314 Get medical advice/attention if you feel unwell.

P322 Specific measures

P332+P313 If skin irritation occurs: Get medical advice/attention.

P337+P313 If eye irritation persists: Get medical advice/attention.

P363 Wash contaminated clothing before reuse.

P370+P378 In case of fire: Use suitable extinguishing media for extinction (Refer Section SDS 5).

P391 Collect spillage.

■ Storage

P403+P233 Store in a well-ventilated place. Keep container tightly closed.

P403+P235 Store in a well-ventilated place. Keep cool.

P405 Store locked up.

■ Disposal

P501 Dispose of contents/container in accordance with local/regional/national/international Regulation.

C. Other hazards which do not result in classification : (NFPA Classification)

NFPA grade (0 ~ 4 level): Health: 1, Flammability: 2, Reactivity: 0

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	Trade names and Synonyms	CAS No.	Content (%)
Bunker C Fuel oil	Bunker Fuel Fuel oil, no. 6	68553-00-4	more than 99.7
Sulfur	Atomic sulfur	7704-34-9	below 0.3

4. FIRST AID MEASURES

A. Eye contact :

- Do not rub your eyes.
- Immediately flush eyes with plenty of water for at least 15minutes and call a doctor/physician.
- Get medical attention immediately.
- Go to the hospital immediately if symptoms(flare, irritate) occur.
- Remove contact lenses if worn.

B. Skin contact :

- Flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and



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shoes.

- Laundering enough contaminated clothing before reuse.
- Get medical attention immediately.
- Go to the hospital immediately if symptoms(flare, irritate) occur.
- Remove contaminated clothing, shoes and isolate.
- Wash thoroughly after handling.
- Wear gloves when washing the patient, and please avoid contact with contaminated clothing.

C. Inhalation contact :

- When exposed to large amounts of steam and mist, move to fresh air.
- Take specific treatment if needed.
- Get medical attention immediately.
- If breathing is stopped or irregular, give artificial respiration and supply oxygen.

D. Ingestion contact :

- About whether I should induce vomiting take the advice of a doctor.
- Rinse your mouth with water immediately.
- Get medical attention immediately.
- If swallowed, large amounts of water to drink and do not induce vomiting.

E. Delayed and immediate effects and also chronic effects from short and long term exposure:

- Not available

F. Notes to physician

- Notify medical personnel of contaminated situations and have them take appropriate protective measures.

5. FIREFIGHTING MEASURES

A. Suitable (Unsuitable) extinguishing media

- 1) Suitable extinguishing media: alcohol form, carbon dioxide, water spray, dry sand and earth.
- 2) Unsuitable extinguishing media: Avoid use of water jet for extinguishing.
- 3) In case of large fire: spraying, watering.

B. Specific hazards arising from the chemical

- Flammable liquid
- Polymerization may cause fire and explosion.
- Vapor may be released to the ignition source and ignited.
- May form explosive mixture above flash point.



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- Container may explode on heating.
- Leaks are a fire / explosion hazard.
- Vapors may explode indoors, outdoors, and in drains
- Vapors may cause dizziness or suffocation without awareness.
- May cause irritating, corrosive and toxic gases in case of fire.
- Inhalation and contact may irritate or burn the skin and eyes.

C. Special protective actions for firefighters :

- Remove all ignition sources if safe to do so.
- Fire fighters should wear appropriate protective equipment.
- Please digested outside the area by keeping a safe distance.
- Find and use appropriate evolutionary methods for your surroundings.
- Wear appropriate protective equipment if necessary.
- Move container from fire area if it is not hazardous.
- Vapors or gases may ignite at distant ignition sources and spread rapidly.
- Do not pour water directly into the exposure source or safety equipment as it may freeze in the event of a tank fire.
- In case of tank fire, extinguish at maximum distance or use unmanned firefighting equipment.
- Cool containers with large amounts of water even after tank fire has extinguished.
- In the event of a fire in the tank, if there is a high sound level on the pressure relief device or if the tank is discolored, immediately withdraw it.
- In case of tank fire, back off the flame tank.
- In the event of a large fire, use unmanned firefighting equipment and allow it to retreat if it is impossible.

6. ACCIDENTAL RELEASE MEASURES

A. Personal precautions, protective equipment and emergency procedures :

- Avoid breathing dust / fume / gas / mist / vapors / spray.
- Remove all ignition sources because very fine particles may cause fire or explosion.
- Wipe off any spills immediately and follow all protective precautions.
- Isolate contaminated areas.
- If you do not need to enter or do not have protective equipment, do not go in.
- If possible, turn the leak container to release it as a gas rather than a liquid.
- Do not pour into leak sources directly.
- Use water spray to reduce vapors or scatter vapor clouds and prevent water from coming into contact with spills.
- Always ground all equipment when handling materials.
- Keep the substance scattered.



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- Stop the leak if it is not dangerous.
- Some leave flammable residues after evaporation.
- Do not touch a damaged container or spill without adequate protection.

B. Environmental precautions :

- Prevent runoff and contact with waterways, drains or sewers.
- Do not allow vapors to escape through drains, ventilation, or enclosed spaces.
- If large amounts have been spilled, inform the relevant authorities.

C. Methods and materials for containment and cleaning up :

- Pile up the embankment and collect the water for digestion.
- Absorb spillage with inert materials (e.g. dry sand or earth) and place in a chemical waste container.
- Absorb liquid and rinse contaminated area with detergent and water.
- Notification to central government, local government. When emissions at least of the standard amount.

7. HANDLING AND STORAGE

A. Precautions for safe handling :

- Do not handle until all safety precautions have been read and understood.
- Handle it outdoors or in a well-ventilated area.
- Do not expose, cut, expose, weld, solder, bond, punch, grind or expose to heat, flames, sparks, static electricity or other sources of ignition
- Follow all SDS / warning label precautions, as product residues may remain even after emptying containers.
- Carefully open the cap before opening.
- Be sure to ground all equipment when handling material.

B. Conditions for safe storage, including any incompatibilities :

- Keep away from heat / sparks / open flames / hot surfaces. - no smoking
- Keep container tightly closed in a well-ventilated place.
- Avoid direct sunlight.
- The empty drum should be completely drained, properly blocked and immediately returned to the drum regulator or placed properly.
- The container may be pressurized if exposed to heat.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION



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A. Exposure limits

- 1) ACGIH TLV
 - Not available
- 2) OSHA PEL
 - Not available

B. Engineering controls :

- A system of local and/or general exhaust is recommended to keep employee exposures above the Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. The use of local exhaust ventilation is recommended to control emissions near the source.

C. Individual protection measures, such as personal protective equipment :

1) Respiratory protection :

- Under conditions of frequent use or heavy exposure, Respiratory protection may be needed.
- Respiratory protection is ranked in order from minimum to maximum.
- Consider warning properties before use
- Any chemical cartridge respirator with organic vapor cartridge(s).
- Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s).
- Any air-purifying respirator with a full facepiece and an organic vapor canister.
- For Unknown Concentration or Immediately Dangerous to Life or Health : Any supplied-air respirator with full facepiece and operated in a pressure-demand or other positive-pressure mode in combination with a separate escape supply. Any self-contained breathing apparatus with a full facepiece.

2) Eye protection

- Wear primary eye protection such as splash resistant safety goggles with a secondary protection face shield.
- Provide an emergency eye wash station and quick drench shower in the immediate work area.

3) Hand protection

- Wear appropriate chemical resistant glove.

4) Skin protection

- Wear appropriate chemical resistant protective clothing.

5) Others : Not available

9. PHYSICAL AND CHEMICAL PROPERTIES

- A. Appearance: Dark brown liquid (Viscous liquid)
- B. Odor: Petroleum odor
- C. Odor threshold: Not available



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- D. pH: Not available
- E. Melting point/Freezing point: Not available
- F. Initial Boiling Point/Boiling Ranges: Not available
- G. Flash point: 70 °C (ASTM D93)
- H. Evaporation rate: Not available
- I. Flammability (solid, gas): Not applicable
- J. Lower/Upper Flammability or explosive limits: Not available
- K. Vapor pressure: Not available
- L. Solubility: Insoluble (water)
- M. Vapor density (Air=1): Not available
- N. Specific gravity (Relative density): 0.91–0.94 (15°C)
- O. Partition coefficient of n-octanol/water: Not available
- P. Auto ignition temperature: Not available
- Q. Decomposition temperature: Not available
- R. Viscosity: Below 540 CST (50 °C)
- S. Molecular weight: Not available

10. STABILITY AND REACTIVITY

- A. Chemical Stability
 - This material is stable under recommended storage and handling conditions.
- B. Possibility of hazardous reactions
 - Cylinders exposed to fire may vent and release flammable gas.
- C. Conditions to avoid
 - Avoid contact with incompatible materials and condition.
 - Avoid contact with heat, sparks, flame or other ignition sources.
- D. Incompatible materials: Not available
- E. Hazardous decomposition products
 - May cause irritating, corrosive and toxic gases.

11. TOXICOLOGICAL INFORMATION

- A. Information on the likely routes of exposure
 - Respiratory tracts:
 - May cause respiratory irritation.



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○ Oral:

- Not available

○ Eye·Skin:

- Cause eye irritation.
- Cause mild skin irritation.

B. Delayed and immediate effects and also chronic effects from short and long term exposure

1) Acute toxicity:

- Oral: Not classified
 - [Bunker C Fuel oil]: LD50>5000 mg/kg Rat (OECD Guideline 401, GLP)
 - [Sulfur]: LD50>5000mg/kg Rat
- Dermal: Category4
 - [Bunker C Fuel oil]: LD50>1800 mg/kg Rabbit (OECD Guideline 402), GLP
 - [Sulfur]: LD50>2000mg/kg Rabbit
- Inhalation: Category4
 - [Bunker C Fuel oil]: LC50>3.6 mg/l 4 hr Rat (OECD Guideline 403, GLP)
 - [Sulfur]: LC50> 5.43 g/m3 (ECHA)

2) Skin corrosion/irritation: Category3

- [Bunker C Fuel oil]: Mild irritating to skin (500mg, rabbit)
- [Sulfur]: Contact can severely irritate and burn the skin (NLM, TOMES)

3) Serious eye damage/irritation: Category2B

- [Bunker C Fuel oil]: Mild irritating to eye (100ul, 24hr, rabbit)
- [Sulfur]: Contact can severely irritate the eyes with possible eye damage (NLM, TOMES)

4) Respiratory sensitization: Not available

5) Skin sensitization: Not classified

- [[Bunker C Fuel oil]: Not sensitising, Guinea pig (OECD Guideline 406, GLP)
- [Sulfur]: Not sensitising, Guinea pig (OECD Guideline 406, GLP) (ECHA)

6) Carcinogenicity: Category1B

- NTP: Not available
- IARC: Not available
- ACGIH: Not available
- OSHA: Not available
- EU CLP:
 - [Bunker C Fuel oil]: Carc.1B

7) Germ cell mutagenicity: Not classified

- [Bunker C Fuel oil]: in vitro genetic mutation test using mammalian cultured cells (OECD Guideline 476, GLP) – Negative, in vitro sister chromosome exchange using mammalian sperm cells(SCE) (OECD Guideline 479, GLP) – Positive, in vivo chromosome aberration test



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- using mammalian bone marrow cells (OECD Guideline 475, GLP) – Negative
- [Sulfur]: in vitro Bacterial Reverse Mutation Assay (OECD Guideline 471) – negative without metabolic activation all strains tested negative with metabolic activation all strains tested. Mammalian Erythrocyte Micronucleus Test (OECD Guideline 474) – Negative
- 8) Reproductive toxicity: Not classified
- [Bunker C Fuel oil]: No effect on reproductive toxicity test using rats. NOAEL=100mg/kg bw/day (EPA OTS 798.4900 (Prenatal Developmental Toxicity Study), GLP)
- 9) STOT–single exposure: Category3 (Respiratory tract irritation)
- [Bunker C Fuel oil]: In the acute respiratory toxicity test using the rat, dyspnea, runny nose, and fur discoloration appear.
- 10) STOT–repeated exposure: Category1
- [Bunker C Fuel oil]: Repeated dose toxicity studies on 28–day skin of New Zealand rabbits (female / male) resulted in death of all animals (female/male), skin and mucous membrane bleeding, necrosis.
 - [Sulfur]: repeated exposure can cause a skin rash (TOMES)
- 11) Aspiration hazard: Not available

12. ECOLOGICAL INFORMATION

A. Ecotoxicity

- Acute aquatic toxicity: Category1
 - Chronic aquatic toxicity: Category1
- 1) Fish:
 - [Bunker C Fuel oil]: LC50 48 mg/l 96 hr Brachydanio rerio (IUCLID)
 - [Sulfur]: LC50 866 mg/l 96 hr Brachydanio rerio (UBA, IUCLID)
 - 2) Crustaceans:
 - [Bunker C Fuel oil]: EL50 0.22 mg/l 48 hr Daphnia magna (ECHA)
 - [Sulfur]: EC50 \geq 5000 mg/l 48 hr Daphnia magna (ECOTOX)
 - 3) Algae:
 - [Bunker C Fuel oil]: EC50 160 mg/l 96 hr Skeletonema costatum (IUCLID)
 - [Sulfur]: NOEC $>$ 5 μ g/L 72 hr (OECD Guideline 201) (ECHA)

B. Persistence and degradability

- 1) Persistence:
 - [Bunker C Fuel oil]: Log Kow 2.7–6 (IUCLID)
 - [Sulfur]: Log Kow 0.23 (Estimate)
- 2) Degradability: Not available

C. Bioaccumulative potential



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- 1) Bioaccumulative potential: Not available
- 2) Biodegradation:
 - [Bunker C Fuel oil]: 11 (%) 28 day ((Aerobic, Industrial wastewater contaminated with oil, very slowly decomposes)) (IUCLID)

- D. Mobility in soil: Not available

- E. Other adverse effects:
 - [Bunker C Fuel oil]: Fish: NOEC(Brachydanio rerio) = 5.6 mg/L/96h

13. DISPOSAL CONSIDERATIONS

A. Disposal methods

- Since more than two kinds of designated waste is mixed, it is difficult to treat separately, then can be reduction or stabilization by incineration or similar process.
- If water separation is possible, pre-process with water separation process.
- Dispose by incineration.

B. Special precautions for disposal

- The user of this product must dispose by oneself or entrust to waste disposer or person who other's waste recycle and dispose or person who establish and operate waste disposal facilities.
- Dispose of waste in accordance with all applicable laws and regulations.

14. TRANSPORT INFORMATION

A. UN No. (IMDG): 3082

B. Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCES, LIQUID, N.O.S.

C. Hazard Class: 9

D. IMDG Packing group: III

E. Marine pollutant: Applicable

F. Special precautions for user related to transport or transportation measures

- 1) EmS FIRE SCHEDULE: F-A (General fire schedule)
- 2) EmS SPILLAGE SCHEDULE: S-F (Water-soluble marine pollutants)



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15. REGULATORY INFORMATION

A. National and/or international regulatory information

- 1) POPs Management Law: Not applicable
- 2) Information of EU Classification
 - Classification
 - [Bunker C Fuel oil]: Carc. Cat. 2; R45
 - Risk Phrases
 - [Bunker C Fuel oil]: R45
 - Safety Phrase
 - [Bunker C Fuel oil]: S53, S45
- 3) U.S. Federal regulations
 - OSHA PROCESS SAFETY (29CFR1910.119): Not applicable
 - CERCLA Section 103 (40CFR302.4): Not applicable
 - EPCRA Section 302 (40CFR355.30): Not applicable
 - EPCRA Section 304 (40CFR355.40): Not applicable
 - EPCRA Section 313 (40CFR372.65): Not applicable
- 4) Rotterdam Convention listed ingredients: Not applicable
- 5) Stockholm Convention listed ingredients: Not applicable
- 6) Montreal Protocol listed ingredients: Not applicable

16. OTHER INFORMATION

A. Reference

- EU Regulation 1272/2008
- TOMES; LOLI ; <http://csi.micromedex.com/fraMain.asp?Mnu=0>
- UN Recommendations on the transport of dangerous goods 17th
- IARC Monographs on the Evaluation of Carcinogenic Risks to Humans:
<http://monographs.iarc.fr>
- ECHA CHEM: <http://echa.europa.eu/web/guest/information-on-chemicals/registered-substances>
- OECD SIDS: <http://webnet.oecd.org/Hpv/UI/Search.aspx>
- HSDB: <http://toxnet.nlm.nih.gov/cgi-bin/sis/search2>

B. Key acronyms

- ACGIH(American Conference of Governmental Industrial Hygienists)
- ECHA(European Chemicals Agency)
- OECD(Organization for Economic Co-operation and Development)
- CERCLA(Comprehensive Environmental Response, Compensation, and Liability Act)



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- IARC(International Agency for Research on Cancer)
- OSHA(Occupational Safety and Health Administration)
- NTP(National Toxicology Program)
- NFPA(National Fire Protection Association)
- LC₅₀(Lethal Concentration 50% kill)
- LD₅₀(Lethal Dose 50% kill)
- EC₅₀(50% Effect Concentration)
- STEL(Short Term Exposure Limit)
- TWA(Time weight Average)
- TLV(Threshold Limit Value)

C. Issue date: 2017-06-16

D. Revision number and Last date revised: Not applicable

E. Other

- This SDS is prepared according to the Globally Harmonized System (GHS).