SAFETY DATA SHEET

Product Trade Name: BI-DI BOOSTER

Revision Date: 17-Jun-2015

1. Identification

1.1. Product Identifier
- Product Trade Name: BI-DI BOOSTER
- Synonyms: None
- Chemical Family: Explosive
- Internal ID Code: HM001498

1.2. Recommended use and restrictions on use
- Application: Explosive Charge
- Uses Advised Against: No information available

1.3. Manufacturer’s Name and Contact Details
- Manufacturer/Supplier: Halliburton Energy Services Inc.
  P.O. Box 1431
  Duncan, Oklahoma 73536-0431
  Emergency Telephone: (281) 575-5000

1.4. Emergency telephone number
- Emergency Telephone Number: (281) 575-5000

2. Hazard(s) Identification

2.1. Classification in accordance with paragraph (d) of §1910.1200

<table>
<thead>
<tr>
<th>Hazard Type</th>
<th>Category</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute Toxicity - Dermal</td>
<td>Category 3</td>
<td>H311</td>
</tr>
<tr>
<td>Specific Target Organ Toxicity - (Single Exposure)</td>
<td>Category 1</td>
<td>H370</td>
</tr>
<tr>
<td>Explosives</td>
<td>Division 1.4</td>
<td>H204</td>
</tr>
</tbody>
</table>

2.2. Label Elements

Hazard Pictograms
Signal Word: Danger

Hazard Statements:
- H204 - Fire or projection hazard
- H311 - Toxic in contact with skin
- H370 - Causes damage to organs

Precautionary Statements:

Prevention:
- P210 - Keep away from heat/sparks/open flames/hot surfaces. - No smoking
- P240 - Ground/Bond container and receiving equipment
- P250 - Do not subject to grinding/shock/friction
- P260 - Do not breathe dust/fume/gas/mist/vapors/spray
- P264 - Wash face, hands and any exposed skin thoroughly after handling
- P270 - Do not eat, drink or smoke when using this product
- P280 - Wear protective gloves/eye protection/face protection

Response:
- P302 + P352 - IF ON SKIN: Wash with plenty of soap and water
- P312 - Call a POISON CENTER or doctor/physician if you feel unwell
- P362 - Take off contaminated clothing and wash before reuse
- P307 + P311 - IF exposed: Call a POISON CENTER or doctor/physician
- P370 + P380 - In case of fire: Evacuate area
- P372 - Explosion risk in case of fire
- P373 - DO NOT fight fire when fire reaches explosives

Storage:
- P401 - Store in accordance with local/regional/national/international regulations
- P405 - Store locked up

Disposal:
- P501 - Dispose of contents/container in accordance with local/regional/national/international regulations

Contains:

<table>
<thead>
<tr>
<th>Substances</th>
<th>CAS Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hexanitrostilbene (HNS)</td>
<td>20062-22-0</td>
</tr>
<tr>
<td>2,6-Bis(picrylamino)-3,5-dinitro-pyridine (PYX)</td>
<td>38082-89-2</td>
</tr>
<tr>
<td>Cyclotetramethylene tetranitramine (HMX)</td>
<td>2691-41-0</td>
</tr>
</tbody>
</table>

2.3 Hazards not otherwise classified
None known

3. Composition/information on Ingredients
4. First-Aid Measures

4.1. Description of first aid measures

Inhalation
If inhaled, move victim to fresh air and seek medical attention.

Eyes
In case of contact, or suspected contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention immediately after flushing.

Skin
Wash with soap and water. Get medical attention if irritation persists.

Ingestion
Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

4.2 Most important symptoms/effects, acute and delayed
Toxic in contact with skin. May cause damage to internal organs.

4.3. Indication of any immediate medical attention and special treatment needed
Notes to Physician
Treat symptomatically.

5. Fire-fighting measures

5.1. Extinguishing media
Suitable Extinguishing Media
Do NOT fight fire. Isolate area and evacuate personnel to a safe area. Guard against intruders. Allow fire to burn itself out.

Extinguishing media which must not be used for safety reasons
None known.

5.2 Specific hazards arising from the substance or mixture
Special Exposure Hazards
May detonate with impact or on heating. May explode and throw fragments 1 mile or more in fire. Evacuate all persons, including emergency responders.

5.3 Special protective equipment and precautions for fire-fighters
Special Protective Equipment for Fire-Fighters
Not applicable.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
Use appropriate protective equipment. Use only competent persons for cleanup.
See Section 8 for additional information

6.2. Environmental precautions
Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up
Isolate area and remove sources of friction, impact, heat, low level electrical current, and RF energy. Remove ignition sources and work with non-sparking tools. Scoop up and remove.
7. Handling and storage

7.1. Precautions for Safe Handling

Handling Precautions
Do NOT consume food, drink, or tobacco in contaminated areas. Avoid contact with eyes, skin, or clothing. Wash hands after use. Launder contaminated clothing before reuse.

Hygiene Measures
Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information
Store only in ATF approved magazines. Keep away from friction, impact, and heat.

8. Exposure Controls/Personal Protection

8.1. Occupational Exposure Limits

<table>
<thead>
<tr>
<th>Substances</th>
<th>CAS Number</th>
<th>OSHA PEL-TWA</th>
<th>ACGIH TLV-TWA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hexanitrostilbene (HNS)</td>
<td>20062-22-0</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
<tr>
<td>2,6-Bis(picrylamino)-3,5-dinitro-</td>
<td>38082-89-2</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
<tr>
<td>pyridine (PYX)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cyclotetramethylene tetranitramine (HMX)</td>
<td>2691-41-0</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>

8.2 Appropriate engineering controls
Engineering Controls
Use in a well ventilated area.

8.3 Individual protection measures, such as personal protective equipment

Personal Protective Equipment
If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

Respiratory Protection
Dust/mist respirator. (N95, P2/P3)

Hand Protection
Cloth gloves.

Skin Protection
Cotton coveralls, undergarments, and socks. Conductive soled shoes.

Eye Protection
Wear safety glasses or goggles to protect against exposure.

Other Precautions
None known.

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical State</td>
<td>Solid</td>
</tr>
<tr>
<td>Odor</td>
<td>Odorless</td>
</tr>
<tr>
<td>Color</td>
<td>Metallic</td>
</tr>
<tr>
<td>Odor Threshold</td>
<td>No information available</td>
</tr>
<tr>
<td>pH</td>
<td>No data available</td>
</tr>
<tr>
<td>Freezing Point/Range</td>
<td>No data available</td>
</tr>
<tr>
<td>Melting Point/Range</td>
<td>No data available</td>
</tr>
<tr>
<td>Boiling Point/Range</td>
<td>No data available</td>
</tr>
<tr>
<td>Flash Point</td>
<td>No data available</td>
</tr>
<tr>
<td>Flammability (solid, gas)</td>
<td>No data available</td>
</tr>
<tr>
<td>upper flammability limit</td>
<td>No data available</td>
</tr>
</tbody>
</table>
10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.

10.2. Chemical Stability
Stable

10.3. Possibility of Hazardous Reactions
Will Not Occur

10.4. Conditions to Avoid
May detonate with friction, impact, heat, and low level electrical current.

10.5. Incompatible Materials
Strong acids. Strong alkalis.

10.6. Hazardous Decomposition Products

11. Toxicological Information

11.1 Information on likely routes of exposure
Principle Route of Exposure
Eye or skin contact, inhalation. Product does not present exposures health hazards during normal handling and use. However, this product is an explosive material and uncontrolled detonation may cause severe physical injury including death. All explosives are dangerous and must be handled carefully and used following approved safety procedures under the direction of competent, experience persons in accordance with all applicable regulations and ordinances.

11.2 Symptoms related to the physical, chemical and toxicological characteristics
Acute Toxicity
Inhalation
May cause effects to the blood and blood system. May cause central nervous system depression including headache, dizziness, drowsiness, incoordination, slowed reaction time, slurred speech, giddiness and unconsciousness.
May cause damage to the nervous, urinary, and reproductive systems. Nitrogen oxides generated during use are irritating to the respiratory system.

Eye Contact
May cause eye irritation.
### Skin Contact
Toxic in contact with skin. May be absorbed through the skin and contribute to the symptoms listed under ingestion. Nitrogen oxides generated during use are skin irritants.

### Ingestion
May cause abdominal pain, vomiting, nausea, and diarrhea.

### Chronic Effects/Carcinogenicity
No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

## 11.3 Toxicity data

### Toxicology data for the components

<table>
<thead>
<tr>
<th>Substances</th>
<th>CAS Number</th>
<th>LD50 Oral</th>
<th>LD50 Dermal</th>
<th>LC50 Inhalation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hexanitrostilbene (HNS)</td>
<td>20062-22-0</td>
<td>No data available</td>
<td>No data available</td>
<td>No data available</td>
</tr>
<tr>
<td>2,6-Bis(picrylamo)-3,5-dinitro-pyridine (PYX)</td>
<td>38082-89-2</td>
<td>&gt; 5000 mg/kg (Rat)</td>
<td>No data available</td>
<td>No data available</td>
</tr>
<tr>
<td>Cyclotetramethylene tetranitramine (HMX)</td>
<td>2691-41-0</td>
<td>6490 mg/kg (Rat)</td>
<td>2300 mg/kg (Rat)</td>
<td>5 g/kg (Rat)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>630 mg/kg (Rabbit)</td>
<td>982 mg/kg (Rabbit)</td>
<td>No data available</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Substances</th>
<th>CAS Number</th>
<th>Skin corrosion/irritation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hexanitrostilbene (HNS)</td>
<td>20062-22-0</td>
<td>No information available</td>
</tr>
<tr>
<td>2,6-Bis(picrylamo)-3,5-dinitro-pyridine (PYX)</td>
<td>38082-89-2</td>
<td>No information available</td>
</tr>
<tr>
<td>Cyclotetramethylene tetranitramine (HMX)</td>
<td>2691-41-0</td>
<td>Non-irritating to skin in rabbits</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Substances</th>
<th>CAS Number</th>
<th>Eye damage/irritation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hexanitrostilbene (HNS)</td>
<td>20062-22-0</td>
<td>No information available</td>
</tr>
<tr>
<td>2,6-Bis(picrylamo)-3,5-dinitro-pyridine (PYX)</td>
<td>38082-89-2</td>
<td>No information available</td>
</tr>
<tr>
<td>Cyclotetramethylene tetranitramine (HMX)</td>
<td>2691-41-0</td>
<td>Non-irritating to rabbit's eye</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Substances</th>
<th>CAS Number</th>
<th>Skin Sensitization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hexanitrostilbene (HNS)</td>
<td>20062-22-0</td>
<td>No information available</td>
</tr>
<tr>
<td>2,6-Bis(picrylamo)-3,5-dinitro-pyridine (PYX)</td>
<td>38082-89-2</td>
<td>No information available</td>
</tr>
<tr>
<td>Cyclotetramethylene tetranitramine (HMX)</td>
<td>2691-41-0</td>
<td>Did not cause sensitization on laboratory animals (guinea pig)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Substances</th>
<th>CAS Number</th>
<th>Respiratory Sensitization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hexanitrostilbene (HNS)</td>
<td>20062-22-0</td>
<td>No information available</td>
</tr>
<tr>
<td>2,6-Bis(picrylamo)-3,5-dinitro-pyridine (PYX)</td>
<td>38082-89-2</td>
<td>No information available</td>
</tr>
<tr>
<td>Cyclotetramethylene tetranitramine (HMX)</td>
<td>2691-41-0</td>
<td>No data of sufficient quality are available</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Substances</th>
<th>CAS Number</th>
<th>Mutagenic Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hexanitrostilbene (HNS)</td>
<td>20062-22-0</td>
<td>No information available</td>
</tr>
<tr>
<td>2,6-Bis(picrylamo)-3,5-dinitro-pyridine (PYX)</td>
<td>38082-89-2</td>
<td>No information available</td>
</tr>
<tr>
<td>Cyclotetramethylene tetranitramine (HMX)</td>
<td>2691-41-0</td>
<td>In vitro tests did not show mutagenic effects. In vivo tests did not show mutagenic effects. (similar substances)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Substances</th>
<th>CAS Number</th>
<th>Carcinogenic Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hexanitrostilbene (HNS)</td>
<td>20062-22-0</td>
<td>No information available</td>
</tr>
<tr>
<td>2,6-Bis(picrylamo)-3,5-dinitro-pyridine (PYX)</td>
<td>38082-89-2</td>
<td>No information available</td>
</tr>
<tr>
<td>Cyclotetramethylene tetranitramine (HMX)</td>
<td>2691-41-0</td>
<td>No information available</td>
</tr>
</tbody>
</table>
**12. Ecological Information**

### 12.1. Toxicity

**Ecotoxicity Effects**

**Product Ecotoxicity Data**

No data available

#### Substance Ecotoxicity Data

<table>
<thead>
<tr>
<th>Substances</th>
<th>CAS Number</th>
<th>Toxicity to Algae</th>
<th>Toxicity to Fish</th>
<th>Toxicity to Microorganisms</th>
<th>Toxicity to Invertebrates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hexanitrostilbene (HNS)</td>
<td>20062-22-0</td>
<td>No information available</td>
<td>No information available</td>
<td>No information available</td>
<td>No information available</td>
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<td>2,6-Bis(picrylamino)-3,5-dinitro-pyridine (PYX)</td>
<td>38082-89-2</td>
<td>No information available</td>
<td>No information available</td>
<td>No information available</td>
<td>No information available</td>
</tr>
<tr>
<td>Cyclotetramethylene tetranitramine (HMX)</td>
<td>2691-41-0</td>
<td>EC50 (96h) &gt; 22 umol/L (Scenedesmus capricornutum)</td>
<td>LC50 8.8-26 mg/L (Pimephales promelas)</td>
<td>LC50 (96h) &gt;15 mg/L (Pimephales promelas)</td>
<td>No information available</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>LC50 (96h) &gt;32 mg/L (Lepomis macrochirus)</td>
<td>NOEC (32d) &gt; 3.3 mg/L (Pimephales promelas)</td>
<td>EC50 (48h) &gt; 15 mg/L (Daphnia magna) NOEC (28d) &gt; 3.9 mg/L (Daphnia magna)</td>
</tr>
</tbody>
</table>

### 12.2. Persistence and degradability

<table>
<thead>
<tr>
<th>Substances</th>
<th>CAS Number</th>
<th>Persistence and Degradability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hexanitrostilbene (HNS)</td>
<td>20062-22-0</td>
<td>No information available</td>
</tr>
<tr>
<td>2,6-Bis(picrylamino)-3,5-dinitro-pyridine (PYX)</td>
<td>38082-89-2</td>
<td>No information available</td>
</tr>
<tr>
<td>Cyclotetramethylene tetranitramine (HMX)</td>
<td>2691-41-0</td>
<td>Not readily biodegradable (2% @ 29d)</td>
</tr>
</tbody>
</table>

### 12.3. Bioaccumulative potential

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### Substances

<table>
<thead>
<tr>
<th>Substances</th>
<th>CAS Number</th>
<th>Log Pow</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hexanitrostilbene (HNS)</td>
<td>20062-22-0</td>
<td>No information available</td>
</tr>
<tr>
<td>2,6-Bis(picrylamino)-3,5-dinitro-pyridine (PYX)</td>
<td>38082-89-2</td>
<td>No information available</td>
</tr>
<tr>
<td>Cyclotetramethylene tetryl (HMX)</td>
<td>2691-41-0</td>
<td>0.165</td>
</tr>
</tbody>
</table>

#### 12.4. Mobility in soil

<table>
<thead>
<tr>
<th>Substances</th>
<th>CAS Number</th>
<th>Mobility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hexanitrostilbene (HNS)</td>
<td>20062-22-0</td>
<td>No information available</td>
</tr>
<tr>
<td>2,6-Bis(picrylamino)-3,5-dinitro-pyridine (PYX)</td>
<td>38082-89-2</td>
<td>No information available</td>
</tr>
<tr>
<td>Cyclotetramethylene tetryl (HMX)</td>
<td>2691-41-0</td>
<td>No information available</td>
</tr>
</tbody>
</table>

#### 12.5 Other adverse effects

No information available

### 13. Disposal Considerations

#### 13.1. Waste treatment methods

**Disposal Method**

Disposal should be made in accordance with federal, state, and local regulations.

**Contaminated Packaging**

Do NOT reuse container. Store only in ATF approved magazines.

### 14. Transport Information

#### US DOT

- **UN Number:** UN0384
- **UN Proper Shipping Name:** Components, Explosive Train, N.O.S. (Bi-Directional Booster Containing HMX)
- **Transport Hazard Class(es):** 1.4S
- **Packing Group:** II
- **EX Number:** EX-9407302
- **Environmental Hazards:** Not applicable
- **NAERG:** NAERG 114

**DOT (Bulk)**

Not applicable

#### Canadian TDG

- **UN Number:** UN0384
- **UN Proper Shipping Name:** Components, Explosive Train, N.O.S. (Bi-Directional Booster Containing HMX)
- **Transport Hazard Class(es):** 1.4S
- **Packing Group:** II
- **EX Number:** EX-9407302
- **Environmental Hazards:** Not applicable

#### IMDG/IMO

- **UN Number:** UN0384
- **UN Proper Shipping Name:** Components, Explosive Train, N.O.S. (Bi-Directional Booster Containing HMX)
- **Transport Hazard Class(es):** 1.4S
- **Packing Group:** II
- **EX Number:** EX-9407302
- **Environmental Hazards:** Not applicable
- **EMS:** EmS F-B, S-X

#### IATA/ICAO

- **UN Number:** UN0384
BI-DI BOOSTER

Revision Date: 17-Jun-2015

UN Proper Shipping Name: Components, Explosive Train, N.O.S. (Bi-Directional Booster Containing HMX)
Transport Hazard Class(es): 1.4S
Packing Group: II
EX Number: EX-9407302
Environmental Hazards: Not applicable

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code: Not applicable
Special Precautions for User: None

15. Regulatory Information

US Regulations

US TSCA Inventory
All components listed on inventory or are exempt.

EPA SARA Title III Extremely Hazardous Substances
Not applicable

EPA SARA (311,312) Hazard Class
Acute Health Hazard
Fire Hazard
Sudden Release of Pressure Hazard

EPA SARA (313) Chemicals
This product contains toxic chemical(s) listed below which is(are) subject to the reporting requirements of Section 313 of Title III of SARA and 40 CFR Part 372:
Lead//7439-92-1
Copper//7440-50-8

EPA CERCLA/Superfund Reportable Spill Quantity
EPA Reportable Spill Quantity is 400 Pounds based on Lead (CAS: 7439-92-1).

EPA RCRA Hazardous Waste Classification
If product becomes a waste, it does meet the criteria of a hazardous waste as defined by the US EPA, because of:
Reactivity D003

California Proposition 65
All components listed do not apply to the California Proposition 65 Regulation.

MA Right-to-Know Law
Does not apply.

NJ Right-to-Know Law
One or more components listed.

PA Right-to-Know Law
Does not apply.

Canadian Regulations

Canadian DSL Inventory
Product contains one or more components not listed on the inventory.

16. Other information
Preparation Information
Prepared By
Chemical Stewardship
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

Revision Date: 17-Jun-2015

Reason for Revision
SDS sections updated:
2

Additional information
For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key or legend to abbreviations and acronyms
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
ErC50 – Effective Concentration growth rate 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NIOSH – National Institute for Occupational Safety and Health
NTP – National Toxicology Program
OEL – Occupational Exposure Limit
PEL – Permissible Exposure Limit
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
UN – United Nations
h - hour
mg/m³ – milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/

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End of Safety Data Sheet