Material Safety Data Sheet

1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND COMPANY/UNDERTAKING

Material Name : **Benzene**
Product Code : Q9112, Q9169

Supplier : SHELL MARKETS (MIDDLE EAST) LIMITED
CHEMICALS
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JEBEL ALI, DUBAI
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2. COMPOSITION/INFORMATION ON INGREDIENTS

Material Formal Name : Benzene
CAS No. : 71-43-2
INDEX No. : 601-020-00-8

Hazardous Components

Chemical Name	CAS	EINECS	Symbol(s)	R-phrase(s)	Conc.
Benzene	71-43-2	200-753-7	F, T	R45; R46; R11; R36/38; R48/23/24/25; R65	100.00 %

Additional Information : Refer to chapter 16 for full text of EC R-phrases.

3. HAZARDS IDENTIFICATION

Health Hazards : Toxic: danger of serious damage to health by prolonged exposure through inhalation, in contact with skin and if swallowed. Slightly irritating to respiratory system. Vapours may cause drowsiness and dizziness. Irritating to skin. Irritating to eyes. Harmful: may cause lung damage if swallowed. Possibility of organ or organ system damage from prolonged exposure; see Chapter 11 for details. Target organ(s): Blood. Blood-forming organs. Immune system. May cause heritable genetic damage. May cause cancer. May cause leukaemia (AML - acute myelogenous leukaemia). May cause MDS (Myelodysplastic Syndrome).

Signs and Symptoms : Eye irritation signs and symptoms may include a burning sensation, redness, swelling, and/or blurred vision. Skin irritation

signs and symptoms may include a burning sensation, redness, swelling, and/or blisters. If material enters lungs, signs and symptoms may include coughing, choking, wheezing, difficulty in breathing, chest congestion, shortness of breath, and/or fever. The onset of respiratory symptoms may be delayed for several hours after exposure. Breathing of high vapour concentrations may cause central nervous system (CNS) depression resulting in dizziness, light-headedness, headache, nausea and loss of coordination. Continued inhalation may result in unconsciousness and death. Damage to blood-forming organs may be evidenced by: a) fatigue and anaemia (RBC), b) decreased resistance to infection, and/or excessive bruising and bleeding (platelet effect).

Aggravated Medical Condition : Pre-existing medical conditions of the following organ(s) or organ system(s) may be aggravated by exposure to this material: Blood. Blood-forming organs. Eyes. Skin. Cardiovascular system. Immune system.

Safety Hazards : Highly flammable. This material is a static accumulator. Even with proper grounding and bonding, this material can still accumulate an electrostatic charge. If sufficient charge is allowed to accumulate, electrostatic discharge and ignition of flammable air-vapour mixtures can occur.

Environmental Hazards : Not classified as dangerous under EC criteria.

4. FIRST AID MEASURES

General Information : Keep victim calm. Obtain medical treatment immediately.

Inhalation : DO NOT DELAY. Remove to fresh air. If rapid recovery does not occur, transport to nearest medical facility for additional treatment.

Skin Contact : Remove contaminated clothing. Immediately flush skin with large amounts of water for at least 15 minutes, and follow by washing with soap and water if available. If redness, swelling, pain and/or blisters occur, transport to the nearest medical facility for additional treatment.

Eye Contact : Immediately flush eyes with large amounts of water for at least 15 minutes while holding eyelids open. Transport to the nearest medical facility for additional treatment.

Ingestion : If swallowed, do not induce vomiting: transport to nearest medical facility for additional treatment. If vomiting occurs spontaneously, keep head below hips to prevent aspiration. If any of the following delayed signs and symptoms appear within the next 6 hours, transport to the nearest medical facility: fever greater than 101° F (38.3° C), shortness of breath, chest congestion or continued coughing or wheezing. Give nothing by mouth.

Advice to Physician : Potential for chemical pneumonitis. Potential for cardiac sensitisation, particularly in abuse situations. Hypoxia or negative inotropes may enhance these effects. Consider: oxygen therapy. Call a doctor or poison control center for guidance.

5. FIRE FIGHTING MEASURES

Clear fire area of all non-emergency personnel.

Specific Hazards	:	The vapour is heavier than air, spreads along the ground and distant ignition is possible. Will float and can be reignited on surface water. Carbon monoxide may be evolved if incomplete combustion occurs.
Extinguishing Media	:	Foam, water spray or fog. Dry chemical powder, carbon dioxide, sand or earth may be used for small fires only.
Unsuitable Extinguishing Media	:	Do not use water in a jet.
Protective Equipment for Firefighters	:	Proper protective equipment including chemical resistant gloves are to be worn; chemical resistant suit is indicated if large contact with spilled product is expected. Self-Contained Breathing Apparatus must be worn when approaching a fire in a confined space. Select fire fighter's clothing approved to relevant Standards (e.g. Europe: EN469).
Additional Advice	:	Keep adjacent containers cool by spraying with water.

6. ACCIDENTAL RELEASE MEASURES

Observe all relevant local and international regulations. Avoid contact with spilled or released material. For guidance on selection of personal protective equipment see Chapter 8 of this Material Safety Data Sheet. See Chapter 13 for information on disposal.

Protective measures	:	Isolate hazard area and deny entry to unnecessary or unprotected personnel. Stay upwind and keep out of low areas. Shut off leaks, if possible without personal risks. Remove all possible sources of ignition in the surrounding area. Use appropriate containment (of product and fire fighting water) to avoid environmental contamination. Prevent from spreading or entering drains, ditches or rivers by using sand, earth, or other appropriate barriers. Attempt to disperse the vapour or to direct its flow to a safe location for example by using fog sprays. Take precautionary measures against static discharge. Ensure electrical continuity by bonding and grounding (earthing) all equipment. Ventilate contaminated area thoroughly.
Clean Up Methods	:	For large liquid spills (> 1 drum), transfer by mechanical means such as vacuum truck to a salvage tank for recovery or safe disposal. Do not flush away residues with water. Retain as contaminated waste. Allow residues to evaporate or soak up with an appropriate absorbent material and dispose of safely. Remove contaminated soil and dispose of safely. For small liquid spills (< 1 drum), transfer by mechanical means to a labelled, sealable container for product recovery or safe disposal. Allow residues to evaporate or soak up with an appropriate absorbent material and dispose of safely. Remove contaminated soil and dispose of safely.
Additional Advice	:	Notify authorities if any exposure to the general public or the environment occurs or is likely to occur. Local authorities should be advised if significant spillages cannot be contained. The vapour is heavier than air, spreads along the ground and distant ignition is possible. Vapour may form an explosive mixture with air. For guidance on selection of personal protective equipment

see Chapter 8 of this Material Safety Data Sheet. For guidance on disposal of spilled material see Chapter 13 of this Material Safety Data Sheet. Fight fire with normal precautions from a reasonable distance.

7. HANDLING AND STORAGE

General Precautions	:	Avoid breathing vapours or contact with material. Only use in well ventilated areas. Wash thoroughly after handling. On guidance on selection of personal protective equipment see Chapter 8 of this Material Safety Data Sheet. Use the information in this data sheet as input to a risk assessment of local circumstances to help determine appropriate controls for safe handling, storage and disposal of this material.
Handling	:	Avoid inhaling vapour and/or mists. Avoid contact with skin, eyes and clothing. Avoid exposure. Obtain special instructions before use. Extinguish any naked flames. Do not smoke. Remove ignition sources. Avoid sparks. Even with proper grounding and bonding, this material can still accumulate an electrostatic charge. If sufficient charge is allowed to accumulate, electrostatic discharge and ignition of flammable air-vapour mixtures can occur. Be aware of handling operations that may give rise to additional hazards that result from the accumulation of static charges. These include but are not limited to pumping (especially turbulent flow), mixing, filtering, splash filling, cleaning and filling of tanks and containers, sampling, switch loading, gauging, vacuum truck operations, and mechanical movements. These activities may lead to static discharge e.g. spark formation. Restrict line velocity during pumping in order to avoid generation of electrostatic discharge (<= 1 m/s until fill pipe submerged to twice its diameter, then <= 7 m/s). Avoid splash filling. Do NOT use compressed air for filling, discharging, or handling operations. Use local exhaust ventilation if there is risk of inhalation of vapours, mists or aerosols. Avoid breathing vapours or contact with material. Only use in well ventilated areas. Wash thoroughly after handling. On guidance on selection of personal protective equipment see Chapter 8 of this Material Safety Data Sheet. Properly dispose of any contaminated rags or cleaning materials in order to prevent fires.
Storage	:	Electrostatic charges will be generated during pumping. Electrostatic discharge may cause fire. Ensure electrical continuity by bonding and grounding (earthing) all equipment to reduce the risk. The vapours in the head space of the storage vessel may lie in the flammable/explosive range and hence may be flammable.
Product Transfer	:	Refer to guidance under Handling section.
Recommended Materials	:	For containers, or container linings use mild steel, stainless steel.
Unsuitable Materials	:	Natural, butyl, neoprene or nitrile rubbers.
Container Advice	:	Data not available.
Additional Information	:	Ensure that all local regulations regarding handling and storage facilities are followed. See additional references that provide

safe handling practices for liquids that are determined to be static accumulators: American Petroleum Institute 2003 (Protection Against Ignitions Arising out of Static, Lightning and Stray Currents) or National Fire Protection Agency 77 (Recommended Practices on Static Electricity). CENELEC CLC/TR 50404 (Electrostatics – Code of practice for the avoidance of hazards due to static electricity).

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

If the American Conference of Governmental Industrial Hygienists (ACGIH) value is provided on this document, it is provided for information only.

Occupational Exposure Limits

Material	Source	Type	ppm	mg/m3	Notation
Benzene	SHELL IS	TWA (8 h)	0.5 ppm	1.6 mg/m3	
	SHELL IS	STEL	2.5 ppm	8 mg/m3	
	ACGIH	SKIN_DES			Can be absorbed through the skin.
	ACGIH	STEL	2.5 ppm		
	ACGIH	TWA	0.5 ppm		
	BH TLV	STEL	5 ppm	16 mg/m3	
	BH TLV	TWA	1 ppm	3 mg/m3	
	DB OEL	TWA	1 ppm		
	DB OEL	SKIN_DES			Can be absorbed through the skin.
	EG OEL	SKIN_DES			Can be absorbed through the skin.
	EG OEL	TWA	0.5 ppm	1.6 mg/m3	
	EG OEL	STEL	2.5 ppm	8 mg/m3	
	KW OEL	TWA	0.1 ppm		
	KW OEL	STEL	0.1 ppm		
	KW OEL	HCHL	500 ppm		
	KW OEL	SKIN_DES			Can be absorbed through the skin.
	UAE OEL	STEL	5 ppm	16 mg/m3	
	UAE OEL	TWA	1 ppm	3 mg/m3	

Biological Exposure Index (BEI)

Material	Determinant	Sampling time	BEI	Reference
Benzene	t,t-Muconic acid in Creatinine in urine	Sampling time: End of shift.	500 µg/g	ACGIH BEL (2011)
	S-Phenylmercapturic acid in Creatinine in urine	Sampling time: End of shift.	25 µg/g	ACGIH BEL (2011)
	S-Phenylmercapturic acid in Creatinine in urine	Sampling time: End of shift.	25 µg/g	KW BEL (2011)

Additional Information	:	Skin notation means that significant exposure can also occur by absorption of liquid through the skin and of vapour through the eyes or mucous membranes. Skin notation means that significant exposure can also occur by absorption of liquid through the skin and of vapour through the eyes or mucous membranes. SHELL IS is the Shell Internal Standard.
Exposure Controls	:	The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Select controls based on a risk assessment of local circumstances. Appropriate measures include: Use sealed systems as far as possible. Adequate explosion-proof ventilation to control airborne concentrations. Firewater monitors and deluge systems are recommended. Eye washes and showers for emergency use.
Personal Protective Equipment	:	Personal protective equipment (PPE) should meet recommended national standards. Check with PPE suppliers.
Respiratory Protection	:	If engineering controls do not maintain airborne concentrations to a level which is adequate to protect worker health, select respiratory protection equipment suitable for the specific conditions of use and meeting relevant legislation. Check with respiratory protective equipment suppliers. Where air-filtering respirators are suitable, select an appropriate combination of mask and filter. Select a filter suitable for organic gases and vapours [boiling point >65 °C (149 °F)] meeting EN14387. Where respiratory protective equipment is required, use a full-face mask. Where air-filtering respirators are unsuitable (e.g., airborne concentrations are high, risk of oxygen deficiency, confined space) use appropriate positive pressure breathing apparatus.
Hand Protection	:	Where hand contact with the product may occur the use of gloves approved to relevant standards (e.g. Europe: EN374, US: F739, AS/NZS:2161) made from the following materials may provide suitable chemical protection: Longer term protection: Viton. Incidental contact/Splash protection: Nitrile rubber. Suitability and durability of a glove is dependent on usage, e.g. frequency and duration of contact, chemical resistance of glove material, glove thickness, dexterity. Always seek advice from glove suppliers. Contaminated gloves should be replaced. Personal hygiene is a key element of effective hand care. Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturizer is recommended.
Eye Protection	:	Chemical splash goggles (chemical monogoggles). Chemical splash goggles (chemical monogoggles). Approved to EU Standard EN166, AS/NZS:1337.
Protective Clothing	:	Chemical resistant gloves/gauntlets, boots, and apron. Where risk of splashing or in spillage clean up, use chemical resistant one-piece overall with integral hood. Wear antistatic and flame retardant clothing.
Monitoring Methods	:	Monitoring of the concentration of substances in the breathing zone of workers or in the general workplace may be required to confirm compliance with an OEL and adequacy of exposure controls. For some substances biological monitoring may also be appropriate. Examples of sources of recommended exposure

measurement methods are given below or contact the supplier. Further national methods may be available. National Institute of Occupational Safety and Health (NIOSH), USA: Manual of Analytical Methods http://www.cdc.gov/niosh/ Occupational Safety and Health Administration (OSHA), USA: Sampling and Analytical Methods http://www.osha.gov/ Health and Safety Executive (HSE), UK: Methods for the Determination of Hazardous Substances, http://www.hse.gov.uk/ Institut für Arbeitsschutz Deutschen Gesetzlichen Unfallversicherung (IFA), Germany. http://www.dguv.de/inhalt/index.jsp L'Institut National de Recherche et de Securité, (INRS), France http://www.inrs.fr/accueil

Environmental Exposure Controls : Local guidelines on emission limits for volatile substances must be observed for the discharge of exhaust air containing vapour. Information on accidental release measures are to be found in section 6.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	:	Colourless Liquid.
Odour	:	Aromatic
Odour threshold	:	2.7 ppm
Boiling point	:	80.1 °C / 176.2 °F
Freezing Point	:	5.5 °C / 41.9 °F
Flash point	:	-11 °C / 12 °F(Abel)
Explosion / Flammability limits in air	:	1.4 - 7.1 %(V)
Auto-ignition temperature	:	498 °C / 928 °F
Vapour pressure	:	10 kPa at 20 °C / 68 °F
Specific gravity	:	0.8787 at 20 °C / 68 °F
Density	:	883 kg/m3 at 15 °C / 59 °F
Water solubility	:	1.8 kg/m3 at 25 °C / 77 °F
n-octanol/water partition coefficient (log Pow)	:	1.95 - 2.13
Kinematic viscosity	:	0.65 mm2/s at 20 °C / 68 °F
Vapour density (air=1)	:	2.7 at 15 °C / 59 °F
Electrical conductivity	:	Low conductivity: < 100 pS/m, The conductivity of this material makes it a static accumulator., A liquid is typically considered nonconductive if its conductivity is below 100 pS/m and is considered semi-conductive if its conductivity is below 10 000 pS/m., Whether a liquid is nonconductive or semi-conductive, the precautions are the same., A number of factors, for example liquid temperature, presence of contaminants, and anti-static additives can greatly influence the conductivity of a liquid.
Saturated Vapour concentration (in air)	:	320 g/m3 at 20 °C / 68 °F
Evaporation rate (nBuAc=1)	:	2.8
Surface tension	:	0.03 N/m
Molecular weight	:	78 g/mol

10. STABILITY AND REACTIVITY

Stability	:	No hazardous reaction is expected when handled and stored according to provisions.
Conditions to Avoid	:	Avoid heat, sparks, open flames and other ignition sources. Prevent vapour accumulation.
Materials to Avoid	:	Strong oxidising agents.
Hazardous Decomposition Products	:	Thermal decomposition is highly dependent on conditions. A complex mixture of airborne solids, liquids and gases, including carbon monoxide, carbon dioxide and other organic compounds will be evolved when this material undergoes combustion or thermal or oxidative degradation.
Hazardous Reactions	:	Stable under normal conditions of use.

11. TOXICOLOGICAL INFORMATION

Basis for Assessment	:	Unless indicated otherwise, the data presented is representative of the product as a whole, rather than for individual component(s).
Acute Oral Toxicity	:	Low toxicity: LD50 >2000 mg/kg , Rat Aspiration into the lungs when swallowed or vomited may cause chemical pneumonitis which can be fatal.
Acute Dermal Toxicity	:	Low toxicity: LD50 >2000 mg/kg , Rabbit
Acute Inhalation Toxicity	:	Low toxicity: LC50 >20 mg/l / 4 hours, Rat High concentrations may cause central nervous system depression resulting in headaches, dizziness and nausea; continued inhalation may result in unconsciousness and/or death.
Skin corrosion/irritation	:	Causes skin irritation.
Serious eye damage/irritation	:	Causes serious eye irritation.
Sensitisation	:	Not expected to be a sensitiser.
Repeated Dose Toxicity	:	Causes damage to organs through prolonged or repeated exposure. Blood-forming organs: repeated exposure affects the bone marrow. Blood: may cause haemolysis of red blood cells and/or anaemia. Immune System: animal studies on this material or its components have demonstrated immunotoxicity.
Germ cell mutagenicity	:	May cause heritable genetic damage.
Carcinogenicity	:	Known human carcinogen. May cause leukaemia (AML - acute myelogenous leukaemia).

Material	:	**Carcinogenicity Classification**
Benzene	:	ACGIH Group A1: Confirmed human carcinogen.
Benzene	:	NTP: Known To Be Human Carcinogen.
Benzene	:	IARC 1: Carcinogenic to humans.
Benzene	:	OSHA 29 CFR 1910.1028:
Benzene	:	GHS / CLP: Carcinogenicity Category 1A

Reproductive and Developmental Toxicity	:	Does not impair fertility. Not a developmental toxicant.

Causes foetotoxicity in animals at doses which are maternally toxic.

Additional Information : Exposure to very high concentrations of similar materials has been associated with irregular heart rhythms and cardiac arrest. May cause MDS (Myelodysplastic Syndrome).

12. ECOLOGICAL INFORMATION

Acute Toxicity

Fish	:	Toxic: LL/EL/IL50 >1 - <=10 mg/l
Aquatic crustacea	:	Harmful: LL/EL/IL50 >10 - <=100 mg/l
Algae/aquatic plants	:	Harmful: LL/EL/IL50 >10 - <=100 mg/l
Microorganisms	:	Harmful: LL/EL/IL50 >10 - <=100 mg/l
Mobility	:	Floats on water.
Persistence/degradability	:	Readily biodegradable.
Bioaccumulation	:	Does not bioaccumulate significantly.

Other Adverse Effects : In view of the high rate of loss from solution, the product is unlikely to pose a significant hazard to aquatic life.

13. DISPOSAL CONSIDERATIONS

Material Disposal : Recover or recycle if possible. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste classification and disposal methods in compliance with applicable regulations. Do not dispose into the environment, in drains or in water courses. Waste product should not be allowed to contaminate soil or water.

Container Disposal : Drain container thoroughly. After draining, vent in a safe place away from sparks and fire. Residues may cause an explosion hazard. Do not puncture, cut, or weld uncleaned drums. Send to drum recoverer or metal reclaimer.

Local Legislation : Disposal should be in accordance with applicable regional, national, and local laws and regulations.

14. TRANSPORT INFORMATION

Land (as per ADR classification): Regulated

Class	:	3
Packing group	:	II
Hazard identification no.	:	33
UN number	:	1114
Danger label (primary risk)	:	3
UN proper shipping name	:	BENZENE
Environmental hazards	:	No

IMDG

Identification number	UN 1114
UN proper shipping name	BENZENE
Class / Division	3

Packing group	II
Marine Pollutant:	No

IATA (Country variations may apply)

UN number	:	1114
UN proper shipping name	:	Benzene
Class / Division	:	3
Packing group	:	II

15. REGULATORY INFORMATION

The regulatory information is not intended to be comprehensive. Other regulations may apply to this material.

EC Label Name	:	BENZENE	
EC label/EC Number	:	200-753-7	
EC Classification	:	Highly flammable. Toxic. Carcinogenic, category 1. Mutagenic, category 2.	
EC Annex I Number	:	601-020-00-8	
Chemical Inventory Status			
AICS	:	Listed.	
DSL	:	Listed.	
INV (CN)	:	Listed.	
ENCS (JP)	:	Listed.	(3)-1
TSCA	:	Listed.	
EINECS	:	Listed.	200-753-7
KECI (KR)	:	Listed.	97-1-99
KECI (KR)	:	Listed.	KE-02150
PICCS (PH)	:	Listed.	
Other Information	:	Restricted to professional users.	

16. OTHER INFORMATION

R-phrase(s)

R11	Highly flammable.
R36/38	Irritating to eyes and skin.
R45	May cause cancer.
R46	May cause heritable genetic damage.
R48/23/24/25	Toxic: danger of serious damage to health by prolonged exposure through inhalation, in contact with skin and if swallowed.
R65	Harmful: May cause lung damage if swallowed.

SDS Version Number	:	3.4
SDS Effective Date	:	14.11.2012
SDS Revisions	:	A vertical bar (|) in the left margin indicates an amendment from the previous version.
SDS Regulation	:	The content and format of this safety data sheet is in accordance

		with Notification of Ministry of Industry, Subject: Hazard Classification andCommunication System of Hazardous Substances B.E.2555 (2012).
Uses and Restrictions	:	The substance/product is registered with strictly controlled conditions as defined in Article 18(4) of Regulation (EC) No. 1907/2006 (REACH Regulation) and must therefore be handled as such. Please refer to Ch16 for the registered uses under REACH.
SDS Distribution	:	The information in this document should be made available to all who may handle the product
Disclaimer	:	This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product.