



Benzene Exposure Risk Management

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1. Introduction

Benzene is commonly found in crude oil and gas operations, and in crude oil products such as condensate and gasoline.

Significant exposures should be expected either when process equipment is opened for service or when process fluids leak or spill.

Benzene is a volatile flammable liquid which has a flashpoint of -11°C.

Benzene and other hydrocarbon vapours (e.g. toluene, ethyl benzene, Xylene) are heavier than air and are able to travel along the ground towards ignition sources.

Benzene could cause adverse health effects following exposure by inhalation, ingestion or skin contact.

Acute exposure could result in narcotic effects. High exposures lead rapidly to deep anaesthesia. Symptoms of chronic exposure to low levels of benzene include: headaches, dizziness, fatigue, anorexia, shortness of breath, vertigo, pallor (unnatural paleness) and visual disturbances.

Benzene is a known carcinogen, affecting the blood-making tissues of the body.

Benzene absorption through the skin could contribute to total dose, but the effects of skin contact with benzene are likely to be limited to direct local effects such as skin irritation, de-fatting, dryness and cracking.

The risks from the hazards of benzene are directly related to the dose and exposure time. Monitoring needs to be carried out in order to evaluate where, or if, significant exposure exists for both routine and non-routine work (eg working in a confined space with potential exposure to any toxic substance must always be completed in accordance with Safe Systems of Work

WARNING: BENZENE IS A CARCINOGENIC SUBSTANCE WITH A WORKPLACE EXPOSURE LIMIT (WEL) WHICH MUST BE CONTROLLED TO AS LOW AS REASONABLY PRACTICABLE (ALARP) AND WHICH MUST NOT BE EXCEEDED UNDER ANY CIRCUMSTANCES.

2. Purpose

The purpose of this document is to provide instruction on safe management of benzene, including hazard identification, monitoring, control measures and the management of benzene exposure, within the onshore and offshore workplaces, and to detail the procedure for managing the risks from benzene exposure.

3. Scope

This document for the management of benzene applies to all AzSPU operational sites and is intended to be used by all of those directly or indirectly involved in processes that have a potential for benzene exposure.

3.1. Standards and Compliance

This document ensures full compliance with GRP 3.4-0004 Managing Industrial Hygiene

Standards which known as Occupational Exposure Limits (OELs) are used by Industrial Hygienists to inform decisions about safe levels of exposure to various chemical agents and physical hazards found in the workplace.

If there are no OELs in the local jurisdiction, Industrial Hygienists shall consider using American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs) or Workplace Exposure Limits (WELs) approved by UK Health and Safety Commission.

In comparison of the findings between ACGIH TLVs and WELs for exposure to any chemicals the more strict values shall be considered

Exposure monitoring for benzene is required, if the following applied:

- When failure or deterioration of the control measures could result in a serious health effect
- To ensure that WELs are not exceeded:
 - UK legislation gives a WEL 1 parts per million (ppm) for 8hr Time Weighted Average (TWA)
 - ACGIH TLV gives 0.5ppm
- To provide additional checks on the effectiveness of the existing controls
- When any significant change occurs in conditions affecting employees' exposure, e.g. system changes. Due to the potentially severe effects of uncontrolled benzene exposure BP has a duty to identify benzene as a hazard to its workforce and provide them with the information and training required to avoid exposure.

Note: Refer also to COSHH (Control of Substances Hazardous to Health)

4. Roles and Responsibilities

Refer to the Tier 2 AzSPU Chemical and Hazardous Material Management Procedure AzSPU-HSSE-DOC-00078-2, Appendix 1 COSHH.

5. Monitoring

Monitoring for benzene enables immediate changes to be carried out to work practices, or repetition of venting/purging procedures, where necessary to minimise exposure risk.

When to monitor:

- Monitor either if you are uncertain of the benzene levels or if they have never been measured previously
- Monitor to ensure that the WEL has not been exceeded during routine operations, until a reliable baseline level has been determined
- Measure during a shutdown to ensure that the controls are adequate
- Measure as an additional check on the effectiveness of the controls, or if the controls fail or deteriorate
- Monitor following any significant process or procedural change Spot/Area Monitoring

The preferred instruments for area or spot monitoring:

- Colorimetric measurement devices such as Drager
- Direct reading instruments with Photo Ionising Detector (PID) such as Ultra Rae Benzene Monitor and /or Mini Rae

Personal monitoring:

- Personal monitoring for Benzene and/or BTEX (Benzene, Ethylbenzene, Toluene and Xylene) must be considered if workplace exposure assessment indicates its presence is likely:
 - Baseline assessment shall be done for Similar Exposure Groups quarterly for 1 year
 - The frequency of follow-up monitoring to be established as per Industrial Hygiene judgment based on previous monitoring data and if exposure to benzene exceeds UK HSE WEL or ACGIH TLV
- Area or spot monitoring is not a substitute for personal monitoring.
- Personal benzene or BTEX exposure monitoring will be conducted by the industrial hygienist, industrial hygiene technician, or safety advisor using integrated sampling methods.
 - Workers will wear passive monitoring badges (3M) or personal air sampling pumps with charcoal tubes mounted to collect the sample in the breathing zone.
 - The industrial hygienist will report laboratory analytical results to the site management. BP approved laboratories shall be used for samples testing (e.g. Bureau Veritas, US)

Note: Samples should be taken within the breathing zone, to ensure that they are representative of exposure.

6. Control Measures

If it is not known what the exposure levels will be or if direct-reading samples indicate breathing zone concentrations of 0.25ppm or greater of benzene, control of exposure must be exercised. These controls should follow the following hierarchical approach.

- Eliminate – Consideration should be given to purging, venting and in-situ cleaning, to reduce the levels of benzene to acceptable levels (<0.25ppm).
- Control – Consider the installation of temporary local exhaust ventilation, to capture hydrocarbon vapours at the source before these can reach breathing zones of workers (eg laboratory fume cupboards, air movers etc).
- Procedural – Consider restricting access and exposure times.
- Protect – Consideration should be given to Respiratory Protection Equipment (RPE) and skin and eye protection

WARNING: ENSURE THAT ALL RPE WEARERS HAVE BEEN FACE-FIT TESTED.

Atmospheric Concentration (ppm)	Guidance
<0.25	No RPE required
0.25 to 2.5	Half facemask (type A1 or A2 filter) (Refer to Note)
2.5 to 5	Full facemask (type A1 or A2 filter) (Refer to Note)
5 to 200	Positive pressure Breathing Apparatus (BA)
>200	Stop work and re-assess
Note: The 'A Type Filter is designed for collection of organic gases and vapours (bp>65°C) as specified by the manufacturer.	

7. Health Surveillance

To date, monitoring has shown that benzene health surveillance is not appropriate for normal operations. However, if there is any possibility of people being exposed to levels above 1ppm, health surveillance should be considered. Please refer to Tier 2 AzSPU Fitness for Task and Health Surveillance Management programme AzSPU-HSSE-DOC-00007-2.

8. Records

Spot/area records of Benzene measurements have to be kept as per the COSHH recordkeeping requirements.

Revision/Review Log

Revision Date	Authority	Custodian	Revision Details
30.09.2010	Almaz Agazade	Hijran Jafarova	Initial issue