TABLE OF

CONTENT

|  |  |
| --- | --- |
| **Items** | **Page** |
| **Executive 1**   1. **Introduction** 2. **Objectives**    1. Main Objective    2. Specific Objectives 3. **Process Description** 4. **Methodology**    1. Instrumentation    2. Selection of Sampling Personal    3. Sampling Strategy    4. Sampling & Analysis Methodology    5. Monitoring Procedures 5. **Results**    1. Calibration Record    2. Environmental Factor    3. Job Descriptions    4. Results of Personal Chemical Exposure For 8 Hours Time Weighted Average    5. Results of Personal Exposure for Ceiling Level 6. **Discussion**    1. Permissible Exposure Limit    2. Ceiling Limit    3. Existing Control Measures 7. **Recommendation**    1. Information, Instruction and Training    2. Personal Protective Equipment    3. Record Keeping    4. Exposure Monitoring 8. **Conclusion**   **Appendixes** | iii  1  2  2  2  3  4  4  4  5  5  6  7  7  7  8  9  10  11  11  13  14  15  15  15  15  16  17 |

EXECUTIVE

SUMMARY

!@#$%Baseline Chemical Exposure Monitoring had been successfully conducted by Hygiene Technician I, **Hari Vicknes Nadarajan** **[JKKP HIE 127/171 – 3/1 (183)]** (refer to **Appendix III** for copy of certificate)at 1 **Schutz (Malaysia) Sdn Bhd** on **January 5, 2016 to January 7, 2016.**

The objectives of the assessment are as follows:

1. To determine exposure level of Welding Fumes at Production (Grid Welding).
2. To determine exposure level of Welding Fumes at Production (Pallet Welding).
3. To determine exposure level of Sodium Hydroxide and Ethyl Acetate at Maintenance.
4. To determine exposure level of Methyl Ethyl Ketone at Production.
5. To recommend suitable control measures where necessary.

The conclusion for chemical exposure monitoring are as follows:

1. Exposure of Welding Fumes at Production (Grid Welding) were found **below** PEL.
2. Exposure of Welding Fumes at Production (Pallet Welding) were found **below** PEL.
3. Exposure of Ethyl Acetate at Maintenance were found **below** PEL and MEL
4. Exposure of Methyl Ethyl Ketone at Production were found **below** PEL and MEL.
5. Exposure of Formaldehyde at Production were found **below** CL.
6. Exposure of Sodium Hydroxide at Maintenance were found **below** CL.

The management should take the recommended actions as follows:

1. Implement Administrative Control at Production Maintenance and Welding.
2. Supply suitable and approved type of respiratory protective equipment and other protective clothing to employees working at Production Maintenance and Welding and distribution records to kept in good order.
3. Consult a Professional Engineer to Design, Fabricate, Install & Commission suitable LEV systems at Production Maintenance and Welding.
4. Conduct training program which related to law and requirements, risk to health, precautions of exposure, safe work practices, chemical spill control, proper use of PPE, first aid and CPR, and other related topics for at least **once in 2 years**.
5. Refer back to CHRA Assessor and his report for the frequency of monitoring.
6. Employees working at Production Maintenance and Welding needs to undergo Medical Surveillance Program.
7. Suitable warning sign should be posted at suitable work areas or at a conspicuous place at every entrance of the area to warn person entering the area of the hazards.
8. Employee medical and exposure monitoring results need to kept in good condition for **thirty (30)** years.

The monitoring has fulfilled the entire objective set out in the exercise.

CHAPTER 1

INTRODUCTION

Chemical Exposure Monitoring is a monitoring conducted on exposure of employee for airborne vapors, mists, fumes, or dust particles in any workplace. Under Occupational Safety and Health (Use and Standard of Exposure of Chemicals Hazardous to Health) Regulations 2000, Part VIII, Regulation 26 it is stated as *“Where an assessment of risk to health indicates that monitoring of exposure is required or it is requisite for ensuring the maintenance of adequate control of the exposure of employees to chemicals hazardous to health, the employers shall ensure that the exposure of employees to chemicals hazardous to health is monitored in accordance with an approved method of monitoring and analysis.”* In compliance to this regulation and/or as per Recommendation of Chemical Health Assessor, Baseline **Chemical Exposure Monitoring** had been conducted in 1 **Schutz (Malaysia) Sdn Bhd** on **January 5, 2016 to January 7, 2016** at the factory / project site located at the address stated below:

**1 Schutz (Malaysia) Sdn Bhd**

2 Lot 27773, Jalan Nilai 3,

Taman Nilai,

71800 Nilai,

Negeri Sembilan, Malaysia

Tel: +60 (6) 798 0899

The Chemical Exposure Monitoring shall be conducted by Industrial Hygiene Technician 1 registered under Department of Occupational Safety and Health, Malaysia. In the regulation it is stated as *“The monitoring of exposure shall be conducted by a hygiene technician unless the monitoring is confined to checking the presence of toxic or flammable gases and the level of oxygen in a confined space before entry.”* Therefore, this monitoring was undertaken by **Mr. Hari Vicknes Nadarajan** **[JKKP HIE 127/171 – 3/1 (183)]**.

The information related to factory / site operations was given by 3**Mr. Abd Hafiz Bin Mastor** during the day of assessment. Therefore, we reasonably believe that the assessment represents the normal operational conditions.

CHAPTER 2

OBJECTIVES

As with any form of monitoring, objectives of monitoring are crucial to set even before the monitoring to be carried out to perform planning, preparation, selection, sampling, evaluation, and recommendation. Here, the objectives had been categorized in to two (2); (1) Main Objective which is the ultimate goal that we want to achieve by end of the study and (2) Specific Objectives that specify the smaller goals in order to achieve the main objective.

* 1. **MAIN OBJECTIVE**

To evaluate exposure level to Chemical Hazardous to Health as required under the Occupational Safety and Health (Use and Standards of Exposure of Chemicals Hazardous to Health) Regulations 2000.

* 1. **SPECIFIC OBJECTIVES**

1. To identify type of chemical hazardous to health to be monitored.
2. To identify and classify personnel to be monitored.
3. To determine the most suitable sampling strategy to be used.
4. To evaluate and document chemical exposure monitoring.
5. W1To determine exposure level of 5.3Welding Fumes, fORMALDEHYDE & Acetone at 5.2Production (Grid Welding).
6. W2To determine exposure level of Welding Fumes at Production (Pallet Welding).
7. W3To determine exposure level of Sodium Hydroxide and Ethyl Acetate at Maintenance.
8. To determine exposure level of Methyl Ethyl Ketone at Production.
9. To recommend suitable control measures where necessary.

CHAPTER 3

PROCESS DESCRIPTION

**1Schutz Malaysia Sdn Bhd** is an IBC Tank Manufacturing company. In the production there are process such as Welding, Molding and Assembly. Their operations begin from 8:00am till 5:00pm (shift 1) and 5:00pm till 2:00am (shift 2). There were total of 70 employees working in this facility.

For further details, kindly refer to Appendix VII for Process Flow Chart.

CHAPTER 4

METHODOLOGY

1. **SAMPLING & ANALYSIS METHODOLOGY**

There are three methods can be used for chemical exposure monitoring such as NIOSH Manual of Analytical Methods (NMAM), Occupational Safety and Health Administration, Sampling and Analytical Method (OSHA) and Environmental Protection Agency (EPA). Accessories and collecting media are chosen as according to the methodology requirement the chemical sampling and analysis expressed in any of the three methods. Collecting media were submitted for analysis at Envichem Consults Sdn Bhd, an ISO/IEC 17025 SAMM Accredited Laboratory (SAMM Reg. Num: 686). The reference methods used for chemical exposure monitoring are as follows:

Table 4.1: 1 of Reference Methods Used for This Project.

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Methodology** | **Sampling Media** | **Measurement Technique** |
| Formaldehyde | NIOSH 2016 | Cartridge  (Cartridge containing silica gel coated with  2,4-dinitrophenylhydrazine) | HPLC, UV Detection |
| Welding Fume | OSHA ID 125G | Filter  (0.8µm, MCE membrane) | Gravimetric (Filter Weight) |
| Methyl Ethyl Ketone | NIOSH 2500 | Solid Sorbent Tube  (beaded carbon,  150 mg/75 mg) | Gas Chromatography, FID |
| Sodium Hydroxide | NIOSH 7401 | Filter  (1μm PTFE membrane) | Acid – Base Titration |
| Ethyl Acetate | NIOSH 1457 | Solid Sorbent Tube  (coconut shell charcoal, 100 mg/50 mg) | Gas Chromatography, FID |

1. **MONITORING PROCEDURES**

Method of air sampling is according to NIOSH Manual of Analytical Methods (NMAM), Occupational Safety and Health Administration, Sampling and Analytical Method (OSHA) and Environmental Protection Agency (EPA). The sampling process summarized as follows:-

* 1. Blank sample is prepared - two samples which are subjected to exactly the same handling conditions except that no air is drawn through the collection media.
  2. Pre-Calibration of sampling pumps - the pumps were calibrated to specific flow rate as stated in related sampling methods. Each sampling pump was calibrated with representative collecting media in line.
  3. Briefing was given to personal in-charge on purpose of chemical exposure monitoring and also on “do and don’ts” during the sampling period.
  4. For personal monitoring the sampling pumps were fixed to the personal belt, and the sampling media were placed at breathing zone.
  5. For area monitoring the sampling pumps were fixed at region of contaminant sources.
  6. The work specification and job activities at the surrounding were recorded in monitoring worksheet.
  7. Workplace temperature and humidity were recorded in monitoring worksheet.
  8. Collected samples were firmly sealed with plugs at both the inlet and outlet point.
  9. Sample identities and all relevant sample data were recorded.
  10. The collected samples were transported in an air tight container to prevent contamination during transportation.
  11. Post Calibration of sampling pumps - the sampling pumps were again calibrated at the end of sampling. In case the flow fluctuation is more than 10% of the desired flow rate then re-sampling is required.

Diagram 4.1: Process Flow Chart for Chemical Exposure Monitoring

Start

Identify airborne contaminant & workers to sample

Determine Methods, Equipment, Sampling Media & Flow Rate

Pre-Calibration of Pump

Assemble Sampling Instrument

Assemble on Selected Workers and Record Their Particulars

Workers Briefing

Start Pump and Record the Start Time

Record Operating Temperature & Pressure

Observe Work Routine & Practices

Collect Samples and Seal with Blank Samples

Observe Existing Control Measures & Effectiveness

Post Calibration within 10% of Initial Flow Rate?

Transport Media to Laboratory

Laboratory Analysis

Stop Pump and Record the End Time

Blank Samples Contaminants is within 5%?

Report Preparation

Presentation

End

Sampling Pump & Media in Desired Condition?

Yes

Yes

Yes

No

No

No

1. **INSTRUMENTATION**

The chemical exposure monitoring were performed using the following equipment:-

1. Equipment : Air Sampling Pump

Brand : Sensidyne Gilian

Model : Gil-Air 3

Serial Number : S101 – 107

1. Equipment : Twin Port Sampler

Brand : MSA

Model : Gemini

Serial Number : TP01 – 03

1. Equipment : Air Flow Calibrator

Brand : Sensidyne Gilian

Model : Gillian Calibrator 2

Serial Number : 0710018-S

1. Equipment : Hot wire anemometer

Brand : TSI Incorporated

Model : Model 9555 – P

Serial Number : 9555P1112003

Sampling pumps was calibrated with a air flow calibrator prior and after the sampling, in accordance to the calibration procedure. External calibration records are attached in Appendix V.

1. **SELECTION OF SAMPLING PERSONAL**

The intention of chemical exposure monitoring is to determine the highest exposure from a group of workers doing a comparative job at the same work area. The highest exposed worker was identified from walk through survey/observation of the workplace. These components were considered while selecting highest risk worker:

1. Nearest to source.
2. Duration and frequency of exposure.
3. Nature of work or work practice.
4. Availability of control measure
5. **SAMPLING STRATEGY**

Generally there are four (4) types of sampling strategy. Each has their advantages and disadvantages. The sampling strategies are expressed in diagram and explanation below:

Diagram 4.2: Sampling Strategies for Chemical Exposure Monitoring

Type of samples

A

A

A

B

B

B

C

C

A

B

A

B

C

A

1 2 3 4 5 6 7 8

Hours after start of workshift

A

D

B

A

B

C

Full Period Single Sample (FPSS)

Full Period Consecutive Samples (FPCS)

Partial Period Consecutive Samples (PPCS)

Grab Samples (GS)

* 1. **Full Period Single Sample (FPSS)**

The sample is taken for full period of the standard, in other words 8 hours sampling for 8 hours operation and 15 minutes sampling for ceiling standard. Samples will be drawn into a single media covering the entire working hours. Normally, for a full working shift minimum sampling duration of 75% from the full working period is covered.

* 1. **Full Period Consecutive Samples (FPCS)**

The sample is taken for full period of the standard, in other words 8 hours sampling for 8 hours operation and 15 minutes sampling for ceiling standard. Samples will be drawn into multiple media covering the entire working hours. Normally, for a full working shift minimum sampling duration of 75% from the full working period is covered.

* 1. **Partial Period Consecutive Samples (FPCS)**

Sampling was performed for only a period of time within the full working shift. The samples was obtained single or multiple sampling media at equal or unequal time duration. Normally, for a full working shift the sampling duration are from 4 hours to less than 8 hours.

* 1. **Grab Samples (GS)**

Grab Samples is a sampling strategy where samples collected at a random intervals over a period of time for which the standard is defined. These sampling was done using direct reading meters or colorimetric detector tubes, to collect either a single samples or multiple samples at defined standard. Normally, the sampling duration is less than 1hour (generally minutes or seconds).

* 1. **Blank Samples**

Blank samples are used to detect any potential contamination during sampling, transportation, preparation and analysis. If both field blanks prepared had contamination at a level of less than 5% of the results, it would be assumed that all the samples contained this extra amount. The analysis data for the samples would then be blank-corrected by subtracting the blank results from the total amount of contaminant found on each of the samples. Blanks are good insurance to deal with contamination, but the best approach is to avoid sample contamination by being careful. Generally there are two (2) types of blank samples:

1. Field Blank

A field blank consists of sample media that are exposed to the same conditions as the media used for the actual sampling, but are not connected to a sampling pump. Field blanks measure the signal contribution from the collection media (e.g. impinger solution, filter, sorbent tube, et.). The recommended practice is two (2) field blanks for each 10 samples with a maximum of 10 field blanks for each sample set.

1. Reagent Blank

Reagent or laboratory blanks are sample media that are not sampled on, but are prepared and analyzed by the laboratory. Reagent blanks are also measure the signal contribution from solvents, acids or other reagents used by the laboratory in preparing samples for analysis. This is another quality control step that is taken to detect problems with preparation and analysis of the samples.

Table 4.2: 1 of the Sampling Strategies Used for This Project.

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Sampling Strategy** | **Blank Sample ID** |
| Formaldehyde | Full Period Single Sample | B1 & B2 |
| Welding Fume | Full Period Single Sample | B3 & B4 |
| Methyl Ethyl Ketone | Full Period Single Sample | B5 & B6 |
| Sodium Hydroxide | Full Period Single Sample | B7 & B8 |
| Ethyl Acetate | Full Period Single Sample | B9 & B10 |

CHAPTER 5

RESULTS

* 1. **CALIBRATION RECORD**

Table 5.1: External Calibration Records.

|  |  |  |
| --- | --- | --- |
| **Serial Number** | **External Calibration** | |
| **Factory Calibration Date** | **Factory Calibration Due Date** |
| 0710018 – S | *January 19, 2015* | *January 19, 2016* |

Table 5.2: Sampling Pump Pre and Post Calibration Records.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Date** | **Serial Number** | **Internal Calibration** | | |
| **Pre Sampling**  **Flow Rate (L/min)** | **Post Sampling**  **Flow rate (L/min)** | **Average**  **Flow Rate (L/min)** |
| January 5, 2017 | S101 | 1.00 | 1.00 | 1.00 |
| 2.00 | 2.00 | 2.00 |
| S102 | 2.00 | 2.00 | 2.00 |
| S103 | 2.00 | 2.00 | 2.00 |
| S104 | 0.02 | 0.02 | 0.02 |
| S105 | 0.02 | 0.02 | 0.02 |
| S106 | 3.00 | 3.00 | 3.00 |
| S107 | 0.02 | 0.02 | 0.02 |
| January 6, 2017 | S102 | 2.00 | 2.00 | 2.00 |
| January 7, 2017 | S103 | 2.00 | 2.00 | 2.00 |

* 1. **ENVIRONMENTAL FACTORS**

Table 5.3: Environmental Data Records.

|  |  |  |  |
| --- | --- | --- | --- |
| **Description** | **Temperature** | **Pressure** | **Relative Humidity** |
| Calibration – Lab | 24.5 oC | 760 mmHg | 63.2 % |
| Production  (Grid Welding) | 30.0 oC | 756 mmHg | 68.3 % |
| Production  (Pallet Welding) | 24.5 oC | 760 mmHg | 63.2 % |
| Maintenance | 30.0 oC | 756 mmHg | 68.3 % |
| Production | 24.5 oC | 760 mmHg | 63.2 % |

* 1. **JOB DESCRIPTIONS**

Table 5.4: Job Descriptions at Sampling Site.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Work Unit | **Work Specification** | Chemical | **Type of**  **Exposure** | **Total Exposed Personal** | **Total Monitored**  **Personal** |
| Production  (Grid Welding) | Operator | Welding Fumes | Inhalation | 4 | 1 |
| Production  (Pallet Welding) | Operator | Welding Fumes | Inhalation | 4 | 1 |
| Maintenance | Technician | Ethyl Acetate | Inhalation | 2 | 1 |
| Maintenance | Technician | Sodium Hydroxide | Inhalation | 2 | 1 |
| Production | Operator | MEK | Inhalation | 8 | 2 |

* 1. **RESULTS OF PERSONAL CHEMICAL EXPOSURE FOR 8 HOURS TIME WEIGHTED AVERAGE**

Table 5.5: Results of Personal Chemical Exposure Monitoring for 8 Hours Time Weighted Average.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sample**  **ID** | **Blank ID** | **Name** | **Work Unit** | **Work Specification** | **Chemical**  **Monitored** | **Duration (min)** | **Results**  **TWA – 8hours** | **PEL** | **Comment** |
| P2 | B3 & B4 | Ye Myint Aung  (MA 805812) | Production (Grid Welding) | Operator | Welding Fumes | 411 | 1.772 mg/m3 | 5 mg/m3 | Below PEL |
| P3 | B3 & B4 | Rishidev Dhilip  (8718121) | Production (Pallet Welding) | Operator | Welding Fumes | 415 | 1.073 mg/m3 | 5 mg/m3 | Below PEL |
| P4 | B5 & B6 | Basnet Mega Nata  (7424956) | Production | Operator | Methyl Ethyl Ketone (Butanone) | 407 | 4.615 ppm | 200 ppm | Below PEL |
| P5 | B5 & B6 | Mohamad Amirrul Ikhmal Bin Zulkifli  (970211-05-5325) | Production | Operator | Methyl Ethyl Ketone (Butanone) | 408 | 3.423 ppm | 200 ppm | Below PEL |
| P7 | B9 & B10 | Mohd Zaki Bin Abu Kasim  (731130-05-5261) | Maintenance | Technician | Ethyl Acetate | 424 | 6.894 ppm | 400 ppm | Below PEL |

Note: TWA means Time Weighted Average PEL means Permissible Exposure Limit ND means Not Detected

NA means Not Available

Comments - Above PEL, Above 50% of PEL, Below 50% of PEL, Not Detected

* 1. **RESULTS OF AREA CHEMICAL EXPOSURE FOR 8 HOURS TIME WEIGHTED AVERAGE**

Table 5.6: Results of Area Chemical Exposure Monitoring for 8 Hours Time Weighted Average.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Sample**  **ID** | **Blank ID** | **Work Unit** | **Chemical**  **Monitored** | **Duration (min)** | **Results**  **TWA – 8hours** | **PEL** | **Comment** |
| A2 | B3 & B4 | Production (Grid Welding) | Welding Fumes | 411 | 1.772 mg/m3 | 5 mg/m3 | Below PEL |
| A3 | B3 & B4 | Production (Pallet Welding) | Welding Fumes | 415 | 1.073 mg/m3 | 5 mg/m3 | Below PEL |
| A4 | B5 & B6 | Production | Methyl Ethyl Ketone (Butanone) | 407 | 4.615 ppm | 200 ppm | Below PEL |
| A5 | B5 & B6 | Production | Methyl Ethyl Ketone (Butanone) | 408 | 3.423 ppm | 200 ppm | Below PEL |
| A7 | B9 & B10 | Maintenance | Ethyl Acetate | 424 | 6.894 ppm | 400 ppm | Below PEL |

Note: TWA means Time Weighted Average PEL means Permissible Exposure Limit ND means Not Detected

NA means Not Available

* 1. **RESULTS OF PERSONAL CHEMICAL EXPOSURE FOR MAXIMUM EXPOSURE LEVEL**

Table 5.7: Results of Personal Chemical Exposure Monitoring for Maximum Exposure Level.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sample**  **ID** | **Blank ID** | **Name** | **Work Unit** | **Work Specification** | **Chemical**  **Monitored** | **Duration (min)** | **Results**  **MEL** | **MEL** | **Comment** |
| P5M | B5 & B6 | Mohamad Amirrul Ikhmal Bin Zulkifli  (970211-05-5325) | Production | Operator | Methyl Ethyl Ketone (Butanone) | 15 | 10.227 ppm | 600 ppm | Below MEL |
| P7M | B9 & B10 | Mohd Zaki Bin Abu Kasim  (731130-05-5261) | Maintenance | Technician | Ethyl Acetate | 15 | 20.135 ppm | 1200 ppm | Below MEL |

Note: MEL means Maximum Exposure Limit ND means Not Detected

Comments - Above MEL, Below MEL, Not Detected

* 1. **RESULTS OF PERSONAL CHEMICAL EXPOSURE FOR CEILING LEVEL**

Table 5.8: Results of Personal Chemical Exposure Monitoring for Ceiling Level.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sample**  **ID** | **Blank ID** | **Name** | **Work Unit** | **Work Specification** | **Chemical**  **Monitored** | **Duration (min)** | **Results**  **CL** | **CL** | **Comment** |
| PC1 | B1 & B2 | Aung Aung Soe  (M552457) | Production | Operator | Formaldehyde | 15 | 0.071 ppm | 0.3 ppm | Below CL |
| P6 | B7 & B8 | Mohd Zaki Bin Abu Kasim  (731130-05-5261) | Maintenance | Technician | Sodium Hydroxide | 30 | ND (<0.34 mg/m3) | 2 mg/m3 | Not Detected |

Note: CL means Ceiling Limit ND means Not Detected

Comments - Above CL, Below CL, Not Detected

CHAPTER 6

DISCUSSION

1. **PERMISSIBLE EXPOSURE LIMIT**

Formaldehyde, Welding Fumes, Methyl Ethyl Ketone, Sodium Hydroxide and Ethyl Acetate are listed as chemical hazardous to health in Occupational Safety and Health (Use and Standards of Exposure of Chemical Hazardous to Health) Regulations 2000 [USECHH reg.2000].

According to USECHH reg.2000, Part 1, under clause **“Duty of Employer”**, the employer should take necessary action to reduce and maintain the exposure level of employees to chemical hazardous to health to:

* The lowest practicable level
* Below the permissible exposure limits

Permissible Exposure Limit (PEL) is listed in Schedule I (Regulation 6 and 7), Occupational Safety and Health (Use and Standards of Exposure of Chemical Hazardous to Health) Regulations 2000. PEL means a permitted eight hour time weighted average airborne concentration. Eight hour time weighted average methodology is used if the exposure of chemical hazardous to health is continuous throughout the 8 hours working period. List of Permissible Exposure Limit (PEL) specified in schedule I for Hazardous Chemical monitored are as follows:-

|  |  |
| --- | --- |
| **Chemical Hazardous To Health** | **Permissible Exposure Limit** |
| Welding Fumes | 5 mg/m3 |
| Methyl Ethyl Ketone (Butanone) | 200 ppm |
| Methyl Ethyl Ketone (Butanone) | 200 ppm |
| Ethyl Acetate | 400 ppm |

The results can be grouped on to 3 different categories whereby: (1) Above PEL, (2) Above 50% of PEL and (3) Below 50% of PEL. By categorizing it will easier to make decisions in control measures. However, exposure results can only be used as indicative figures and to ensure the exposure is within the specified limits. Based on results:

1. the following are work units where exposure level are **above** the Permissible Exposure Limit for Time Weighted Average for 8 hours shift:

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Work Unit** | **Parameter** | **Results** |
| None |  |  |  |

1. the following are work units where exposure level are **exceeding** 50% of the Permissible Exposure Limit and **within** the Permissible Exposure Limit for Time Weighted Average for 8 hours shift:

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Work Unit** | **Parameter** | **Results** |
| None |  |  |  |

1. the following workers have been exposed to exposure level **below** 50% of the Permissible Exposure Limit for workers working at 8 hours shift:

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Work Unit** | **Parameter** | **Results** |
| Ye Myint Aung  (MA 805812) | Production  (Grid Welding) | Welding Fumes | 1.772 mg/m3 |
| Rishidev Dhilip  (8718121) | Production (Pallet Welding) | Welding Fumes | 1.073 mg/m3 |
| Basnet Mega Nata  (7424956) | Production | Methyl Ethyl Ketone (Butanone) | 4.615 ppm |
| Mohamad Amirrul Ikhmal Bin Zulkifli  (970211-05-5325) | Production | Methyl Ethyl Ketone (Butanone) | 3.423 ppm |
| Mohd Zaki Bin Abu Kasim  (731130-05-5261) | Maintenance | Ethyl Acetate | 6.894 ppm |

1. **MAXIMUM EXPOSURE LIMIT**

The Permissible Exposure Limit represent the average exposure in a throughout the whole working shift. However, acute health effect will occur due to sudden and severe exposure during short term operation. To identify this hazard, Maximum Exposure Limits (MEL) was tested. This monitoring is required at fluctuating operations. Sampling conducted during operation that generates highest exposure.

Maximum Exposure Limit (MEL) is 3 times the Permissible Exposure Limits (PEL) listed in Schedule I (Regulation 6 and 7), Occupational Safety and Health (Use and Standards of Exposure of Chemical Hazardous to Health) Regulation 2000. MEL means a permitted maximum average airborne concentration. Short term exposure methodology (15 to 30 minutes) is used at operation that generates the most contamination in the 8 hours working period.

List of Maximum Exposure Limit (MEL) are as follows:-

|  |  |
| --- | --- |
| **Chemical Hazardous To Health** | **Maximum Exposure Limit** |
| Methyl Ethyl Ketone (Butanone) | 600 ppm |
| Ethyl Acetate | 1200 ppm |

The results can be grouped into 2 categories as: (1) Above MEL, (2) Below MEL. Based on results:

1. the following are work units where level exposure **above** the Maximum Exposure Limit at peak operation activity:

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Work Unit** | **Parameter** | **Results** |
| None |  |  |  |

1. the following are work units where level exposure **below** the Maximum Exposure Limit at peak operation activity:

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Work Unit** | **Parameter** | **Results** |
| Mohamad Amirrul Ikhmal Bin Zulkifli  (970211-05-5325) | Production | Methyl Ethyl Ketone (Butanone) | ND (<0.002 ppm) |
| Mohd Zaki Bin Abu Kasim  (731130-05-5261) | Maintenance | Ethyl Acetate | ND (<0.159  ppm) |

1. **CEILING LIMIT**

Ceiling Limits (CL) are listed in Schedule I (Regulation 6 and 7), Occupational Safety and Health (Use and Standards of Exposure of Chemical Hazardous to Health) Regulations 2000.

As stated in the USECHH Regulation “An employer shall ensure that the exposure of any person to any chemical hazardous to health listed in Schedule I at no time exceeds the ceiling limit specified for that chemical in that Schedule. Sampling conducted during operation that generates highest exposure

List of Ceiling Limit (CL) are as follows:-

|  |  |
| --- | --- |
| **Chemical Hazardous To Health** | **Ceiling Limit** |
| Formaldehyde | 0.3 ppm |
| Sodium Hydroxide | 2 mg/m3 |

The results can be grouped into 2 categories as: (1) Above CL, (2) Below CL. Based on results:

1. the following are work units where level exposure **above** the Ceiling Limit at peak operation activity:

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Work Unit** | **Parameter** | **Results** |
| None |  |  |  |

1. the following are work units where level exposure below the Ceiling Limit at peak operation activity:

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Work Unit** | **Parameter** | **Results** |
| Aung Aung Soe  (M552457) | Production | Formaldehyde | 0.071 ppm |
| Mohd Zaki Bin Abu Kasim  (731130-05-5261) | Maintenance | Sodium Hydroxide | ND (<0.34 mg/m3) |

1. **EXISTING CONTROL MEASURES**

Based on observation during the sampling, we found that management had taken certain control measures in order to protect employees from overexposed to chemical hazardous to health. The control measures implemented are as follows:

1. Health Surveillance Program had been conducted by Dr. S. Nasir [HQ/08/DOC/00/222] on June 24 - July 1, 2015.
2. Medical Surveillance Program had been conducted by Dr. S. Nasir [HQ/08/DOC/00/222] on June 24 - July 1, 2015.
3. LEV systems had been installed in order to minimize the chemical exposure to workers. The descriptions are as follows:

|  |  |
| --- | --- |
| **Work Unit** | **Type of LEV System** |
| Production (Grid Welding) | Slot |
| Production (Pallet Welding) | Canopy |

Inspection, Examination and Testing been conducted by Hygiene Technician II on January 5, 2016 by Hari Vicknes Nadarajan [JKKP HIE 127/171 – 3/2 (190)].

1. Management had provided Respiratory Protectors to their employees. The summary of the Respiratory Protectors are as follows:

|  |  |  |
| --- | --- | --- |
| **Work Unit** | **Respiratory Protectors** | **Distribution List** |
| Production  (Grid Welding) | 3M N95 Face Mask | Available |
| Production  (Pallet Welding) | 3M N95 Face Mask | Not Available |
| Production | 3M N95 Face Mask | Available |
| Production | 3M N95 Face Mask | Available |
| Maintenance | 3M N95 Face Mask | Not Available |

1. Safe Handling of Chemicals Briefing Session had been conducted by Mr. Ling Tai Shyan on June 22, 2016.
2. Basic First Aid & CPR Training Program had been conducted by Mr. Ling Tai Shyan on June 22, 2015.
3. Warning signages had been installed at the Entrance and Production remind workers on the use of Personal Protective Equipment.

CHAPTER 7

RECOMMENDATION

**1Schutz (Malaysia) Sdn Bhd** is taking control actions in order to protect the workers from chemical exposure hazard. The management is recommended to keep up the current control measures and to continue on a regular basis as per Occupational Safety & Health (Use and Standards of Exposure of Chemicals Hazardous to Health) Regulations 2000:

* 1. **ADMINISTRATIVE CONTROL**

(*Please refer to OSH (USECHH) Reg. 2000, Part V, Regulation 15)*

Administrative Controls are changes in work procedures such as written safety policies, rules, supervision, schedules, and training with the goal of reducing the duration, frequency, and severity of exposure to hazardous chemicals or situations. Based on result, it is crucial to apply at Production, Maintenance and Welding since the exposure is above the regulatory limits. Methods of Administrative Control are as follows:-

* Giving workers longer rest periods, shorter work shifts or rotating workers through various job assignments to reduce exposure time.
* Minimizing the number of employees exposed to chemicals hazardous to health.
* Moving a hazardous work process to an area where fewer people will be exposed.
* Adoption of safe work systems and practice that eliminate or minimize the risk to health.
  1. **PERSONAL PROTECTIVE EQUIPMENT**

(*Please refer to OSH (USECHH) Reg. 2000, Part V, Regulation 16)*

Suitable and approved type of respiratory protective equipment and other protective clothing should be provided to the workers who are exposed to hazardous chemicals. This worker also needed to be fully instructed in the proper use of the protective equipment. Management should also establish and maintain proper distribution records of the PPE. Based on the exposure monitoring results, it is crucial for employees working at Production, Maintenance and Welding since the exposure is above the 50% of the regulatory limits.

* 1. **ENGINEERING CONTROL**

(*Please refer to OSH (USECHH) Reg. 2000, Part V, Regulation 17 & 18)*

Engineering Control are those methods that reduce the contaminants levels either at the source of emissions, along the path or at the receiver. Based on result, it is crucial to apply at Production, Maintenance and Welding since the exposure is above the regulatory limits. Methods of Engineering Control are as follows:-

* Total enclosure of process and handling systems.
* Isolation of the work to control the emission of chemical hazardous to health.
* Modification of the process parameters.
* Application of engineering control equipment; eg. Local exhaust ventilation systems.
  1. **INFORMATION, INSTRUCTION AND TRAINING**

(*Please refer to OSH (USECHH) Reg. 2000, Part VII, Regulation 22)*

Management should conduct training program at least **once in 2 years** for employees who are exposed and likely to be exposed to chemical hazardous to health. The training program should cover topics related to law and requirements, risk to health, precautions of exposure, safe work practices, chemical spill control, proper use of PPE, first aid and CPR, and other related topics to educate employee to prevent occupational diseases. All training documents shall be kept in proper order for inspection.

* 1. **EXPOSURE MONITORING**

(*Please refer to OSH (USECHH) Reg. 2000, Part VIII, Regulation 26)*

In general, the management is advised to keep up a good approach of annual chemical exposure monitoring. However, the management should consult the CHRA Assessor for the frequency of monitoring.

* 1. **MEDICAL SURVEILLANCE PROGRAM**

(*Please refer to OSH (USECHH) Reg. 2000, Part IX, Regulation 27)*

Employees who are exposed to chemical beyond Permissible Exposure Level must undergo a Medical Surveillance Program. Based on exposure results, employees who are necessary to undergo Medical Surveillance Program are as follows:

|  |  |
| --- | --- |
| **Work Units** | **Parameter** |
| Production | Manganese |
| Chromium |
| Maintenance | Crystalline Silica |
| Welding | Inhalable Dust |

* 1. **WARNING SIGN**

(*Please refer to OSH (USECHH) Reg. 2000, Part XI, Regulation 29)*

Suitable warning sign should be posted at suitable work areas or at a conspicuous place at every entrance of the area to warn person entering the area of the hazards.

* 1. **RECORD KEEPING**

(*Please refer to OSH (USECHH) Reg. 2000, Part XII, Regulation 30)*

Employee medical and exposure monitoring results need to be kept in good condition by the management. Record of compliance and report as per USECHH Reg. 2000:- The Employer shall maintain in good order the monitoring report and any record regards to the monitoring for **thirty (30)** years as mentioned in OSH Act 1994.

CHAPTER 8

CONCLUSION

Baseline Chemical Exposure monitoring had been successfully carried out 1**Schutz (Malaysia) Sdn Bhd** on **January 5, 2016** in accordance to Occupational Safety and Health (Use and Standard of Exposure of Chemicals Hazardous to Health) Regulations 2000.

Conclusion for monitoring results compared against the Permissible Exposure Limit (PEL) are as follows:

1. Exposure of Welding Fumes at Production (Grid Welding) were found **below** PEL.
2. Exposure of Welding Fumes at Production (Pallet Welding) were found **below** PEL.
3. Exposure of Ethyl Acetate at Maintenance were found **below** PEL.
4. Exposure of Methyl Ethyl Ketone at Production were found **below** PEL.

Conclusion for monitoring results compared against the Maximum Exposure Limit (MEL) are as follows:

1. Exposure of Ethyl Acetate at Maintenance were found **below** MEL.
2. Exposure of Methyl Ethyl Ketone at Production were found **below** MEL.

Conclusion for monitoring results compared against the Ceiling Limit (CL) are as follows:

1. Exposure of Formaldehyde at Production were found **below** CL.
2. Exposure of Sodium Hydroxide at Maintenance were found **below** CL.

The management should take the recommended actions in order to control and maintain the risk of exposure to workers below the permissible exposure limit or as low as reasonably practicable.

Monitoring was conducted in normal working environment.

The monitoring has fulfilled the entire objectives set out in the exercise.

Reported by,

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

***Hari Vicknes Nadarajan***

*Hygiene Technician 1*

*[JKKP HIE 127/171 – 3/1 (183)]*