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RISE Reaching Impact, Saturation, and Epidemic Control

Reaching Impact, Saturation, and Epidemic Control (RISE)

## Trainer's Handbook

# Quality Testing Protocols

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## Acronyms

| | |
|---|---|
| **ARDS** | Acute Respiratory Distress Syndrome |
| **ASU** | Air Separation Unit |
| **BIS** | Bureau of Indian Standards |
| **BPAP** | Bilevel Positive Airway Pressure |
| **CCOE** | Chief Controller of Explosive |
| **COVID- 19** | Corona Virus Disease-19 |
| **CO2** | Carbon Dioxide |
| **CPAP** | Continuous Positive Airway Pressure |
| **Cu M** | Cubic Metre |
| **$FiO_2$** | Fraction of Inspired Oxygen |
| **HAFOE** | High Air Flow with Oxygen Enrichment |
| **HDU** | High Dependency Units |
| **HFNC** | High Flow Nasal Cannula |
| **ICU** | Intensive Care Unit |
| **ISO** | International Organization for Standardization |
| **LMO** | Liquid Medical Oxygen |
| **LPM** | Litre Per Minute |
| **MGPS** | Medical Gas Pipeline System |
| **MT** | Metric Ton |
| **NIV** | Non-invasive Ventilation |
| **NRBM** | Non-Rebreather Mask |
| **$O_2$** | Oxygen |
| **OC** | Oxygen Concentrator |
| **PESO** | Petroleum and Explosives Safety Organization |

| | |
|---|---|
| **PISS** | Pin Index Safety System |
| **PPE** | Personal Protective Equipment |
| **PRV** | Pressure Relief Valve |
| **PSA** | Pressure Swing Adsorption |
| **SpO2** | Saturation of Peripheral Oxygen |
| **UN** | United Nations |

## Context

India experienced the worst of the COVID-19 pandemic. Reported daily new infections in India had crossed the 400,000 mark with daily reported deaths are more than 2,700. The demand for hospital beds, personnel, drugs, testing kits, and life-saving oxygen spiked to unprecedented levels. The demand for medical oxygen peaked to around 11,000 MT per day by the beginning of May from around 3,800 MT per day in the mid-May 2021, over four times the pre-second wave levels. Pushed to the limits of what it could achieve, given its current state, the healthcare supply chain snapped at many places.

Although medical oxygen is an essential medicine that is used in care for patients across the healthcare systems, the pandemic has accelerated its demand and made the delivery of oxygen supplies more urgent than ever. As part of its preparations for the third wave for COVID-19, the Government of India and its state counterparts are rapidly scaling up its oxygen systems – liquid medical oxygen (LMO), pressure swing adsorption (PSA) plants and oxygen concentrators – across government health facilities, in addition to improving availability of oxygen supply systems through medical gas pipeline systems (MGPS), manifold systems and oxygen cylinders.

One of the many critical actions the government has prioritized to improve health outcomes and save lives is augmentation of the public health system's capacity to reliably deliver oxygen. The public health systems in the country, with exception to the large teaching hospitals and tertiary healthcare facilities, had historically relied on oxygen cylinders to meet its medical oxygen demands. Recently LMO, PSA and oxygen concentrators are being used to cater the increased need for oxygen. As many states are rapidly setting up oxygen systems, there is a growing gap between the facilities with newly installed oxygen systems and the availability of accredited laboratories to test and certify the quality of oxygen produced from these devices and approve them for commissioning and use. This course provides training relevant to oxygen sample preparation that is critical for medical use.

## Purpose of the training

At the end of this course, participants are expected to effectively oversee/perform the sampling of gases for gas chromatography.

## Training objectives

By end of this training, the participants will be able to:

- Understand gas sampling and its purpose
- Gain knowledge about types of sampling
- Ensure reduction of sampling errors
- Undertake Tedler bag sampling procedure and sending the sample for analysis

The training module includes a package of standardized printed material, standardized PowerPoint slides, exercises and pre-test questions.

## Training methodologies

Training techniques that use participatory learning approaches have been used in this module. The training would be imparted through interactive presentations, group discussions by the trainers and the participants. This course is structured in such a way that each participant performs exercises and is encouraged to discuss with the facilitator, their problems, or questions, if any.

## Notes for the trainer

1. Familiarise yourself with gas chromatography sample preparation from IP 2018.

2. The training should be done as a full day, classroom training.

3. Ensure that you have prepared the PowerPoint slides, the notes on the flipcharts and Index Cards prepared well in advance.

4. As far as possible consider doing training with a co-facilitator. The trainers must discuss their individual roles for each session when preparing for the training and share the responsibility of facilitating and co-facilitating sessions.

5. Both the trainers need to participate in all sessions with equal enthusiasm, irrespective of who is leading the session. This will help the participants stay focused during the training.

6. Explain the difficult or less familiar words. Keep asking questions to participants to the session topic to whether or not they understand the contents of the session.

7. When you give group work to participants, keep moving among the groups and guide them in their group work. Try identifying shy participants, encourage them to participate in the discussions and provide input.

8. Keep an eye on the time all the time to ensure that you are aware of the time being consumed for each session and in each activity. Ensure that all activities are done in time.

9. Neither be very loud, nor be very low in your voice. Do not give participants more information than they need.

10. Do not interject when any of the participants is speaking but do encourage participants to speak to-the-point.

11. Ensure that all the background materials are available prior to trainings.

12. Standardize training slides.

13. Ensure that a communication of the trainings has gone well in advance to all trainees.

14. Always repeat the key points of the session at the end of each session, as a reminder and to conclude the session.

## Training Schedule

| No. | Sessions | Methods | Duration |
|---|---|---|---|
| | Tea and registration of participants | | |
| 1 | Session I: Introduction and pre-test | Group activity | 30 mins |
| 2 | Session II: Gas sampling | Presentation discussion | 60 mins |
| 3 | Session III: Sample collection with Tedlar bag | Presentation discussion | 45 mins |
| **4** | Session IV: Post-training assessment and transfer out | Group activity | 30 mins |
| | **End of training** | | |

## Session I Introduction

### Context

This is the first session of the training. Although most of the participants might be familiar with each other, the trademark "good start" to any training is when the trainer and the participants not only are familiar with each other, but also are able to connect their expectations with the objectives of the training. This will help the participants stay focused during the sessions.

**Activity 1.1** **15 mins**

**Introduction/ ice-breaking**

| Learning Objectives | Materials | Methodology |
|---|---|---|
| ➢ Get familiar with each other | - | Group work |

- Welcome all participants to the training, introduce yourself and briefly introduce the project and PATH's technical assistance for strengthening oxygen ecosystem.

  *NOTE: Please collect information about the project and PATH's technical assistance role from the project manager or the state lead.*

- Ask all participants to stand in a circle.

  *NOTE: If the training is being done with fixed seating and limited space, the participants can stand on their spot.*

- Inform the group that we will begin the training by getting introduced to one another.
- Ask the participants to pair up with one of the two people standing to either of their sides.
- Ask the participants to introduce themselves to their paired-up partner. During the introduction, ask the participants to share the following – **(1) their name, (2) their designation and department, (3) the numbers of years in service and (3) one thing about medical oxygen systems that they (the partner) are concerned about.**
- Start with the person standing first to your left-hand side so that you are the last person to complete the introduction.
- Ask the person to introduce his or her partner.
- Thank all participants for introducing themselves.

**Activity 1.2** **10 mins**

**Know the training flow and align expectations**

| Learning Objectives | Materials | Methodology |
|---|---|---|
| ➢ Get ready to work each other to enhance learning | Presentation slides | Presentation |

| | | |
|---|---|---|
| ➢ Be aware of objectives and flow of the training<br>➢ Express expectations from the training and apprehensions with the training | Flipcharts (at least 2)<br>Marker pens of different colors<br>Flipchart stands (2)<br>Scotch tapes/ magic tapes | Discussion |

- Using a PowerPoint presentation, introduce the participants to the purpose, objectives and schedule of the training.
- Inform the participants that the training is designed to help them familiarize them with the gas sampling and its purpose, sampling procedure, and that the training will also provide information on various aspects of reducing sampling errors.
- Use two flipcharts. Put title as “Expectations” on one flipchart and title the other flipchart as “Apprehensions” and put them on separate flipchart stands.
- Inform the participants that all of us have expectations as well as apprehensions when we come for training. By sharing their expectations and apprehensions before start of the training, they will be able to help the trainers customise the training to meet their expectations.
- Ask them to express their expectations and apprehensions related to this training.
- Record their expectations and apprehensions on respective flipcharts.
- Put the flipcharts of “Expectations” and “Apprehensions” on the walls in the training with the help of scotch tape.
- Assure the participants that you will try to meet their expectations and address their apprehensions during the training.

**Activity 1.3** **05 mins**

**Pre-training knowledge assessment**

| Learning Objectives | Materials | Methodology |
|---|---|---|
| ➢ Understand the existing level of knowledge on medical oxygen systems | Pre-test questionnaires | Self-assessment |

- Distribute pre-test questionnaire (Participant’s Handout 1.3.1) for gas sampling
- Give 05 minutes for them to write the answers
- Collect the response sheet.

*NOTE: Do not discuss the correct response. The co-facilitator reviews the responses while the lead facilitator initiates the next session.*

## Session II Gas Sampling

## Context

This is the first technical session of the training. The trainer, through this session, will provide foundational information to the participants. As participants to this training are oxygen program managers, biomedical engineers and technicians, who are involved in overseeing the operations of PSA plant, handling of gases otherwise, the session will focus on providing them fundamental, relevant, and actionable information on gas chromatography and types of gas sampling.

**Activity 2.1** **20 mins**

**Overview – purpose of sampling**

| Learning Objectives | Materials | Methodology |
|---|---|---|
| ➢ Know Gas Chromatograph<br>➢ Become familiar with versatility of technique<br>➢ State scope of application<br>➢ Understand handling of samples | Presentation slide deck | Presentation, and discussion |

- Distribute printouts of gas chromatography sample preparation notes from IP 2018
- Use PowerPoint slide titled OVERVIEW from Trainer's Handout to discuss the technique, its scope and need for special care during handling of medical gases.

**Notes for the facilitator**

- You may allow participants to ask questions in-between the presentation or you may also ask them to park their questions till you complete one section of the presentation before they ask you their questions related to that particular section.
- Repeat, in your own words, the question the participant has asked to ensure that you have correctly understood the query. This will also give you time to think through the response to the question.

**Activity 2.2** **25 mins**

**Types of gas sampling**

| Learning Objectives | Materials | Methodology |
|---|---|---|
| ➢ Become familiar with types of gas sampling<br>➢ Understand the functionality and specificities and | Presentation slide deck | Presentation, and discussion |

| | | |
|---|---|---|
| limitations of each type of sampling | | |

- Distribute printouts of gas chromatography sample preparation notes from IP 2018
- Use PowerPoint section "Types of Gas Sampling" from Trainer's Handout to discuss the three different types of gas sampling and the best fit for sampling oxygen gas for testing

**Notes for the facilitator**

- You may allow participants to ask questions in-between the presentation or you may also ask them to park their questions till you complete one section of the presentation before they ask you their questions related to that particular section.
- Repeat, in your own words, the question the participant has asked to ensure that you have correctly understood the query. This will also give you time to think through the response to the question.

**Activity 2.3** **15 mins**

**Types of gas sampling**

| Learning Objectives | Materials | Methodology |
|---|---|---|
| ➢ Understand key actions that will reduce errors when collecting, storing and transferring gas samples for testing | Presentation slide deck | Presentation, and discussion |

- Use the PowerPoint slide on "Tips to reduce sampling errors" from Trainer's Handout to discuss actions one should ensure to minimise risks in incorrect gas sampling.
- There are eight points on the slide. Explain each point clearly and allow the participants clarifying questions.
- Repeat, in your own words, the question the participant has asked to ensure that you have correctly understood the query. This will also give you time to think through the response to the question.

## Session III Sample Collection with Tedlar Bag

## Context

This is the penultimate session of the training module. During this session, the trainer shall provide the details about sample collection using Tedlar bag and precautions when collecting the samples.

**Activity 3.1** **30 mins**

**Tedlar bag sampling collection procedure**

| Learning Objectives | Materials | Methodology |
|---|---|---|
| ➢ Understand the considerations for Tedlar bag sampling<br>➢ Know the procedure for sending the sample for analysis to NABL accredited testing lab | Presentation slide deck<br>Tedlar bag | Presentation, and discussion |

- Use PowerPoint slides from Trainer's Handout to discuss key considerations for Tedlar bag sampling.
- Demonstrate, using the Tedlar bag, the sample collection procedure.

**Notes for the facilitator**

- If possible, take the participants to a PSA plant site and demonstrate the correct procedure of collecting gas sample.
- Another option is to use a video to demonstrate the key actions for collecting oxygen gas for sample testing.

**Activity 3.2** **15 mins**

**Tedlar gas sample bag precautions**

| Learning Objectives | Materials | Methodology |
|---|---|---|
| ➢ Know the key dos and don'ts when working with Tedlar bags | Presentation slide deck<br>Tedlar bag | Presentation, and discussion |

- Use PowerPoint slides from Trainer's Handout to discuss precautions when handling Tedlar gas sample bags.

- Encourage the participants to ask questions in-between the presentation or you may also ask them to park their questions till you complete one section of the presentation before they ask you their questions related to that particular section.

## Session IV Post-Training Assessment and Transfer Out

### Context

This is the final session of the training. During this session, the trainer shall facilitate a recall of key takeaways of various sessions and conduct a post-training assessment.

**Activity 4.1** **30 mins**

**Key takeaways**

| Learning Objectives | Materials | Methodology |
|---|---|---|
| ➢ Recall and refresh the key lessons from the previous sessions | Flipcharts (at least 2)<br>Marker pens of different colors<br>Flipchart stands (2)<br>Scotch tapes/ magic tapes | Group work |

- Divide the participants into five groups.
    - You can either make the participants count from 1 and 2, and group all participants counting '1' into one group, those counting '2' into another group
    - Allow participants to self-select into one of the four groups
- Announce the four technical sessions of the training and allocate one session name to each group, ensuring that each group gets only one session –
    - Collection of gas samples
    - Gas collection using Tedlar bag
- Ask the groups to record "What did we learn in this session?" on the flipchart.
- Instruct the groups to –
    - Put each lesson or take-away in bullets, with one bullet for each lesson
    - Identify a presenter from the group to present it back to the larger group
    - Complete the task in 05 (five) minutes
- Invite each group to present the key take-aways of their session. Give each group 2-3 minutes to present their take-aways.

**Notes for the facilitator**

- Time permitting, you may allow other groups to add more take-aways for the sessions.
- Encourage participants to contribute and be positive to input from other groups and avoid confrontations.

**Activity 4.2** **15 mins**

**Post-training assessment**

| Learning Objectives | Materials | Methodology |
|---|---|---|
| ➢ Assess the change in knowledge from the pre-training levels | Post-training questionnaire | Self-assessment |

- Distribute the post-training questionnaire (Participant's Handout 4.2.1) to all participants
- Ask participants to respond to the questions, and hand-over their responses to the co-facilitator.
- Discuss each question and its correct answer.

## Participant's Handouts

Please refer to the Participants handouts folder

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