Respirator Types & Selection

Spring 2015 PAPTAC Bleaching Committee Meeting

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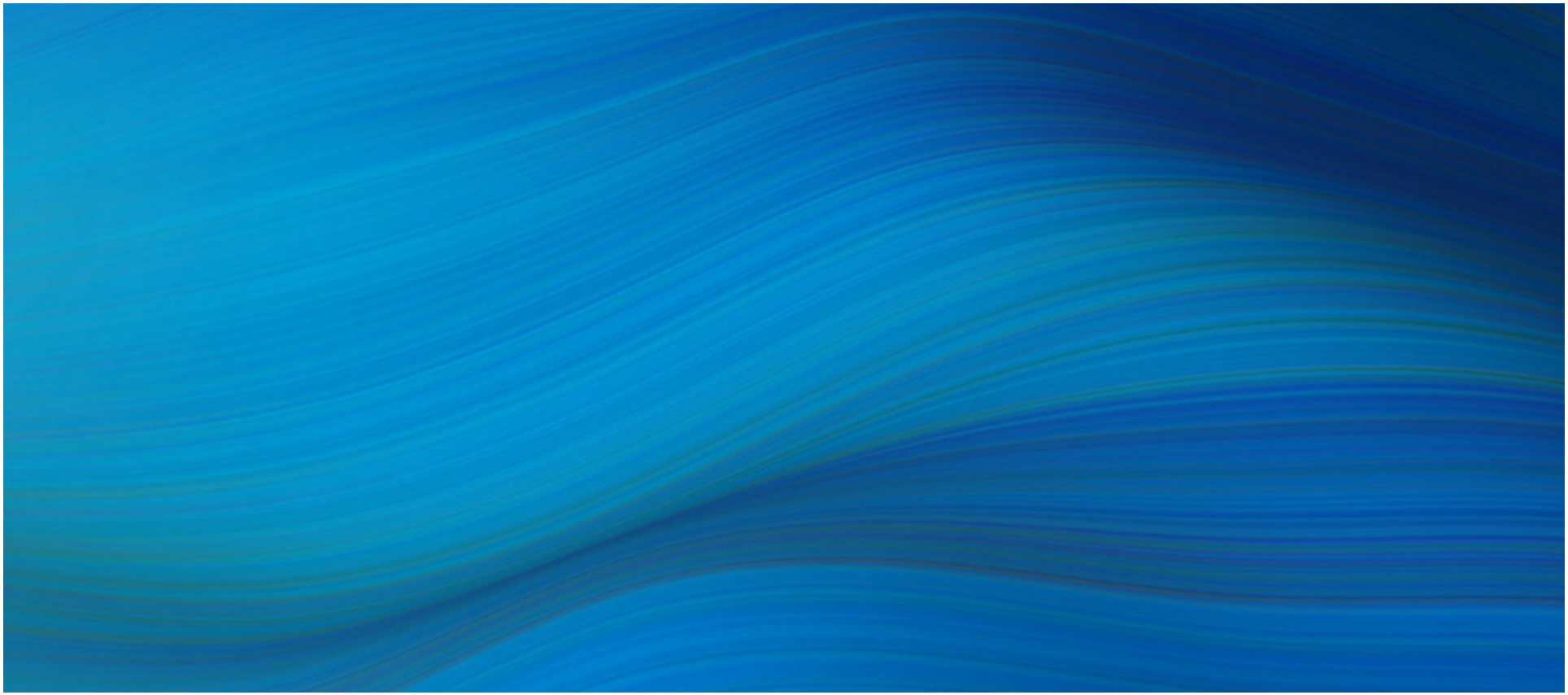

Introduction

- This presentation deals with protection from gases and mists associated with bleaching chemicals
  - Does not deal with oxygen-deficient atmospheres, confined spaces, protection from dust, particulates, asbestos, etc.

- Many types of respirators available

- Many agencies involved in:
  - Recommending (i.e. NIOSH)
  - Regulating (WCB / WorkSafe BC, OSHA)

- Always comply with all applicable local rules and regulations

APF Ratings

- Respirators are rated by their Assigned Protection Factor (APF)
  - Higher APF indicates better protection
  - Range from 5 to 10,000
  - APF rankings are generally similar across different regions

Types of Respirators

Cartridge Respirator (APF = 5-10)

- Normally used for escape purposes
- Purifies air using cartridges that are made to filter specific contaminants
- Be sure that the cartridge installed is made to remove the expected contaminants
- Effective for short exposures
- Cartridges should be replaced after use (i.e. exposure to the contaminant).

Types of Respirators

Full Facepiece Cartridge Respirator (APF = 50)

- Similar to cartridge respirators on previous slide but provides better respiratory protection.
- Also protects the eyes from irritating gases

Types of Respirators

Full Facepiece Canister Gas Mask (APF = 50)

- Essentially the same as a full face piece cartridge respirator
- Only difference is that the canister may be bigger than the cartridge therefore allowing for longer exposure before the filter medium is exhausted.

Types of Respirators

Powered Air Purifying Respirator (APF = 50)

- Seldom, if ever, used in pulp mills
- Use a motor to draw air past the filter media.
- Easier to breathe through than canister respirators
- BUT - more complicated, require batteries, and require more maintenance
- Be sure that the cartridge installed is made to remove the expected contaminants

Types of Respirators

Full Facepiece Type C Supplied Air Respirator (SAR)

(APF = 1,000 in pressure-demand or continuous flow mode)

- Also called an “airline” respirator
- Seldom, if ever, used in pulp mills
- Compressed air is supplied through a long hose to a mask worn by the worker
- Not suitable for emergencies, entry into unknown atmospheres, concentrations above IDLH (immediately dangerous to life or health), or firefighting
- APF falls to 50 if it is used in demand (negative pressure) mode because contaminants will leak into the mask

Types of Respirators

Full Facepiece Type C Supplied Air Respirator with Auxiliary SCBA (APF = 10,000 in pressure-demand or continuous flow modes)

- Seldom, if ever, used in pulp mills
- Combines a Type C SAR with a small air tank (SCBA) for escape
- Suitable for emergencies, entry into unknown atmospheres, and concentrations above IDLH (in pressure demand and continuous mode)
  - Not suitable for firefighting.

Types of Respirators

Self Contained Breathing Apparatus (SCBA)

(APF = 10,000 in pressure-demand or continuous flow modes)

- Commonly used in pulp mills when personnel respond to gas leaks
- Provide compressed air from a tank carried by the wearer
- Suitable for all situations including emergencies, entry into unknown atmospheres, concentrations above IDLH, and firefighting (in pressure-demand or continuous flow modes).

Table of APF's

Respirator Type	Protection Factor
Air-purifying Respirators	
Non-powered air-purifying	
Half-facepiece—filtering facepiece style (NIOSH TC-21C-XXX type)	5
Half-facepiece—filtering facepiece style (NIOSH TC-84A-XXX type)	10
Half-facepiece—elastomeric facepiece style	10
Full-facepiece	50
Powered air-purifying	
Loose-fitting facepiece PAPR	25
Half-facepiece PAPR	50
Full-facepiece PAPR equipped with "100" (HEPA) filters for exposure to asbestos	100
Full-facepiece PAPR or helmet/hood PAPR for exposure to contaminants other than asbestos	1,000
Air-supplying Respirators	
Airline-demand (negative-pressure)	
Half-facepiece	10
Full-facepiece	50
Airline-continuous flow	
Loose-fitting facepiece	25
Half-facepiece	50
Full-facepiece	1,000
Helmet / hood	1,000
Airline-pressure demand (positive-pressure)	
Half-facepiece	50
Full-facepiece	1,000
Full-facepiece with egress (escape) bottle	10,000
Self-contained breathing apparatus (SCBA)	
Demand (negative-pressure)	50
Pressure-demand (positive-pressure)	10,000

Note: Protection factors do not apply to escape respirators.

Four Situations That Require a Respirator

1. Emergency escape from a hazardous atmosphere

2. Firefighting in a hazardous atmosphere

3. Entering/working in a hazardous atmosphere:
   a) in an emergency OR
   b) when there are unknown concentrations of hazardous substances OR
   c) concentrations above IDLH (Immediately Dangerous to Life and Health)

4. Entering/working in a hazardous atmosphere when the concentration is known and below the IDLH

Emergency Escape

- Guidance leaves room for interpretation
- A typical statement comes from the Workers Compensation Board of British Columbia:

1. If the nature or quantity of an air contaminant and the nature of the work area could prevent a worker escaping from a contaminated area without assistance, the worker must carry an emergency escape respirator

2. The emergency escape respirator must be
   a) carried on the worker's person or be within arm's reach at all times, and
   b) sufficient to permit the worker to leave the contaminated area without assistance

- Most pulp mills have decided on a bite-block or half facepiece cartridge respirator.
  - Advantages: small size, ease of use, readily available cartridges, and low cost.
  - Full facepiece canister respirators offer eye protection and longer protection time, however, their size may make them impractical to carry at all times.

Firefighting in a Hazardous Atmosphere

- SCBA operated in positive pressure mode such as pressure-demand is required

Emergencies, Unknown Concentrations, or Concentrations Above IDLH

- SCBA or combination SAR/auxiliary SCBA is required
- Respirator must be operated in a positive pressure mode such as pressure-demand to keep hazardous material from entering the mask.
- In my experience, all pulp mills use SCBAs in these situations.

Hazardous Atmosphere With Known Concentrations Below IDLH

- Remember, this assumes there is sufficient oxygen in the atmosphere
  - If in doubt, check the oxygen level
  - In situations where the oxygen level is suspect, very near to, or below 19.5%, use a SCBA or combined SAR/escape SCBA

- Determine the Minimum Protection Factor (MPF) or Hazard Ratio.
- MPF = (airborne concentration of contaminant) / (8-hour TWA [time-weighted average] limit)
  - Example: Suppose the airborne ClO2 concentration is 2 ppm
    - 8-hour TWA limit for ClO2 is 0.1 ppm
    - Minimum Protection Factor is 2 ÷ 0.1 = 20.
    - Therefore, a respirator with an Assigned Protection Factor (APF) of 20 or higher will provide adequate protection for up to 8 hours.
  - Other TWA limits such as the 15 minute STEL (if available) may be used to calculate the MPF for different exposure times.







Additional Resources

- “Breathe Safer – How to Use Respirators Safely and Start a Respirator Program,” Worker’s Compensation Board of BC, 2005 http://www.worksafebc.com/publications/health_and_safety/by_topic/assets/pdf/breathe_safer.pdf

- “NIOSH Respirator Selection Logic,” NIOSH, 2004 http://www.cdc.gov/niosh/docs/2005-100/default.html

- The Bleaching of Pulp, 5th edition, edited by Hart & Rudie, Chapter 20.10, TAPPI Press, 2012 http://www.tappi.org/0101R331

Thank you for your attention