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International Association for Soaps,
Detergents and Maintenance Products

# Enzyme Safety Management

## A series of web based training and Information Sessions developed and presented by the AISE Enzyme Safety Task Force

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# Session 2: RISK MANAGEMENT MEASURES

# Planning for a Safe Workplace: Preventing Exposure to Enzymes

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# Objectives of this Webinar

Following this webinar you will be able to:

- Understand the elements of developing a risk management plan for the Safe Handling of Enzymes as outlined by the AISE "Guidelines for the Safe Handling of Enzymes in Detergent Manufacturing"
- Explain each element of the risk management process and how it contributes to the prevention of exposure to enzymes.
- Fundamentally plan for safe operations as a leader of an organization or an individual working with enzymes.

# Hazard Recognition

- Enzymes are respiratory sensitizers.
- Over-exposure can result in development of occupational sensitization, allergy, or asthma.

It is important to prevent;

- Routine and repeated or persistent exposures by the inhalation (breathing) route of exposure.
- Incidental very high or peak exposures by inhalation.
- Each and Every Exposure Counts- Development of Sensitization, Allergy, and Asthma is progressive.

# Roles and Responsibilities

Employer

- to provide conditions which do not endanger health
  - Provide financial and organizational resources to control exposure and ensure adequate capability of the organization.
  - Ensure supervisors and their employees clearly understand safety and cleanliness expectations and those standards are reinforced consistently.
  - Provide for the preventative maintenance of all enzyme processing equipment.
- this covers employees, contractors, agency & temps, visitors, co-packers etc.

# Roles and Responsibilities (continued).

Technical Leaders

- Develop processes for handling enzymes which isolate the hazard and are easily maintained.
- Ensure enzyme handling processes are designed to reduce the risk of damaging the enzyme granulates and risk of generating airborne dusts or liquid aerosols.

# Roles and Responsibilities (continued).

Safety Leaders

- Develop training for the organization so that everyone working with enzymes or enzyme containing products understand the risks of exposure and at risk tasks, behaviours, and conditions.
- Build capability of supervisory leaders so they can deliver safe conditions and reinforce safe behaviours in a consistent way.
- Lead the management of change process when changes in products, processes, or equipment handling enzymes undergoes change.

# Roles and Responsibilities (continued).

Employee's responsibility

- to participate fully in the safety management system and in the delivery of all control measures
  - involvement in decisions
  - training
  - follow all procedures and practices

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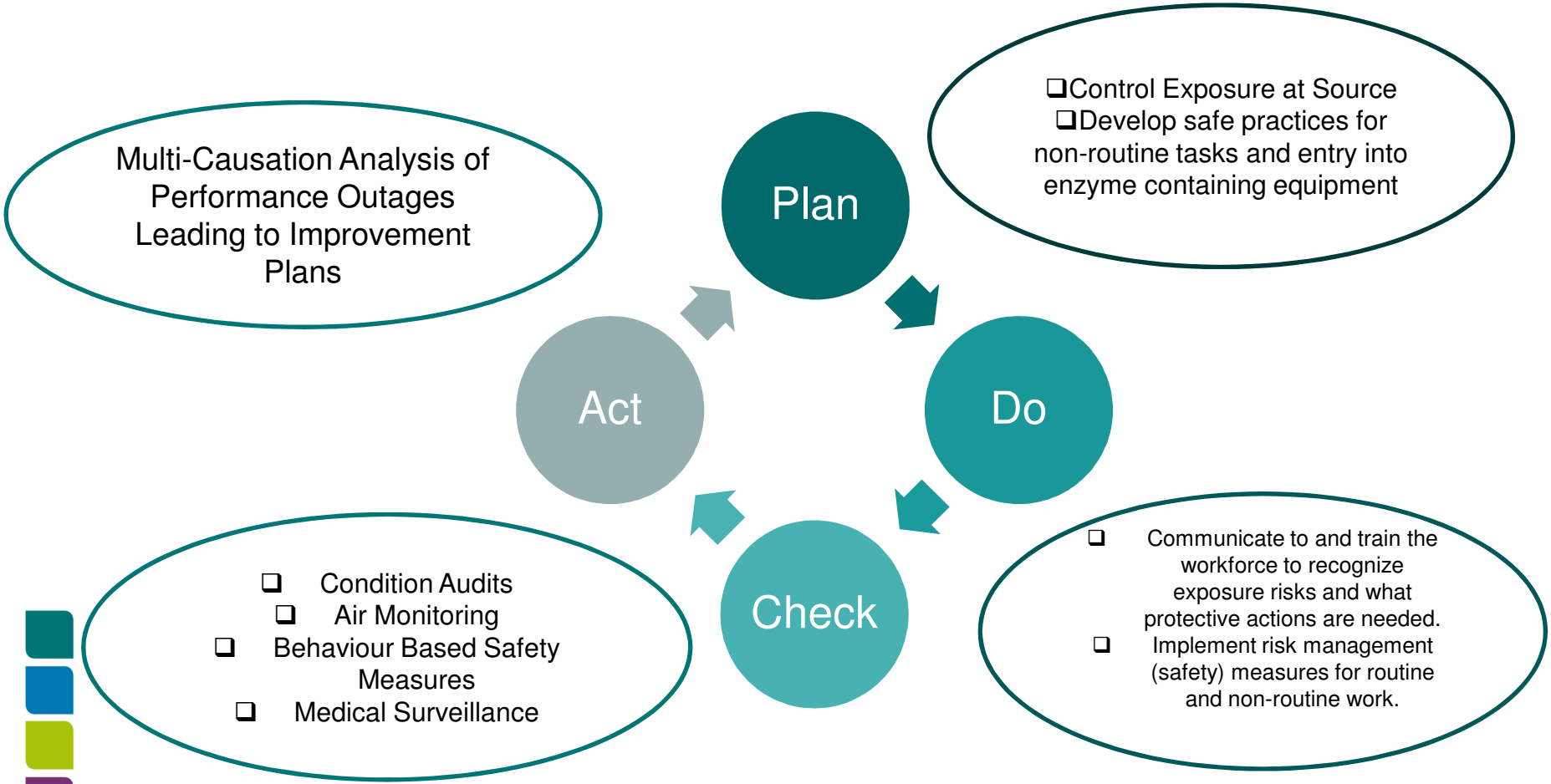
# Risk Management Process



# Risk Assessment

Risk = Hazard x Exposure

- Extent or magnitude/frequency/duration
- qualitative - evidence of spills or dried liquid
- quantitative - air sampling to detect & measure
- The objective is to determine tasks, processes, or operations that pose a risk of exposure so as to enable the workforce to avoid exposure.

# Risk Assessment steps

Identify all tasks - not just the routine

Rank hazard

- inhalation high, skin mild

Rank exposure

- yes/no/maybe/sometimes
- Predictability of the exposure situation

Suitable & sufficient

- greater the risk - greater the detail needed

# Risk Assessment through Risk Mapping

| | | CONSEQUENCE (MAGNITUDE OF EXPOSURE) | | |
|---|---|---|---|---|
| | | SEVERE | MODERATE | MILD |
| PROBABILITY OF THE EXPOSURE EVENT | HIGH | HIGH | HIGH | MEDIUM |
| | MEDIUM | HIGH | MEDIUM | LOW |
| | LOW | MEDIUM | LOW | NEAR ZERO |

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# Example Processes to be Assessed (Delivery of a liquid enzyme)


Receipt → Storage → Dispensing → Disposal of Container → Maintenance

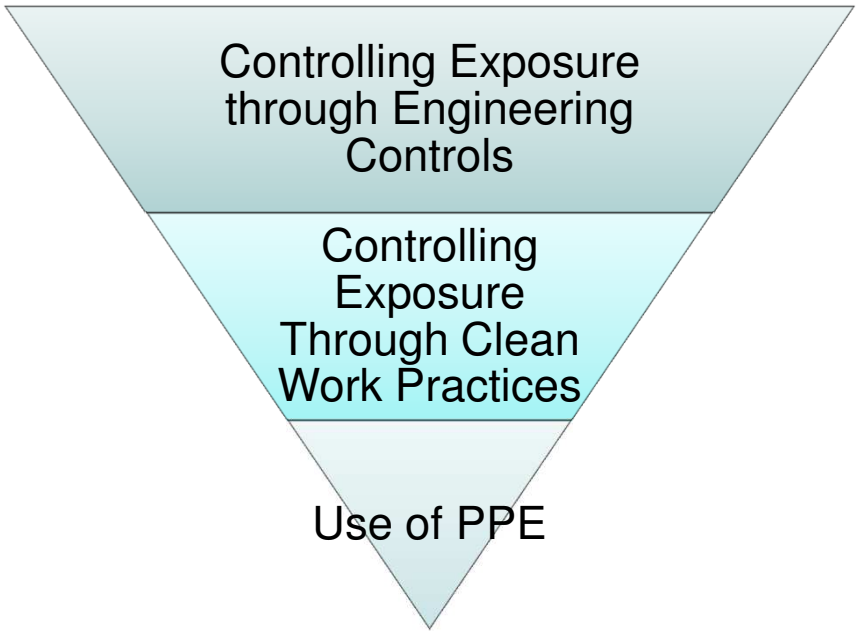

# Life Cycle Assessment: Trace the path of enzyme containing materials through the factory.

- what happens to it normally?
- what should happen?
- what could go wrong?
- how should normal or routine operations be dealt with?
- can problems be anticipated or do they occur without warning?
- How should non-routine or problems be managed?

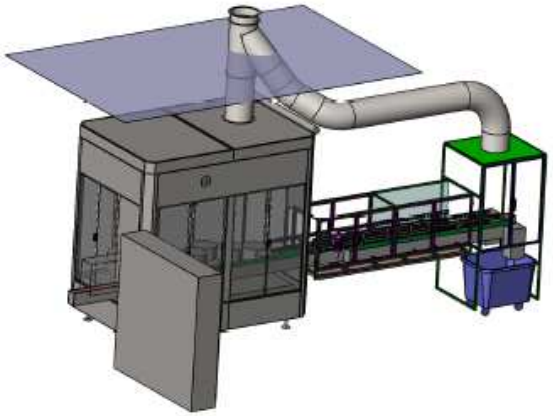
Avoiding Exposure is the KEY!

# The Hierarchy of Controls

1. Engineering Controls
2. Administrative Controls
3. Personal Protective Equipment



# Engineering Controls

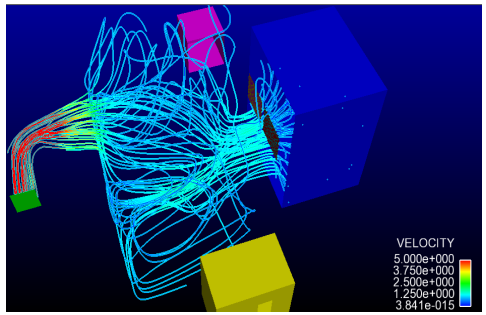


Is your equipment for handling enzymes or enzyme containing products;

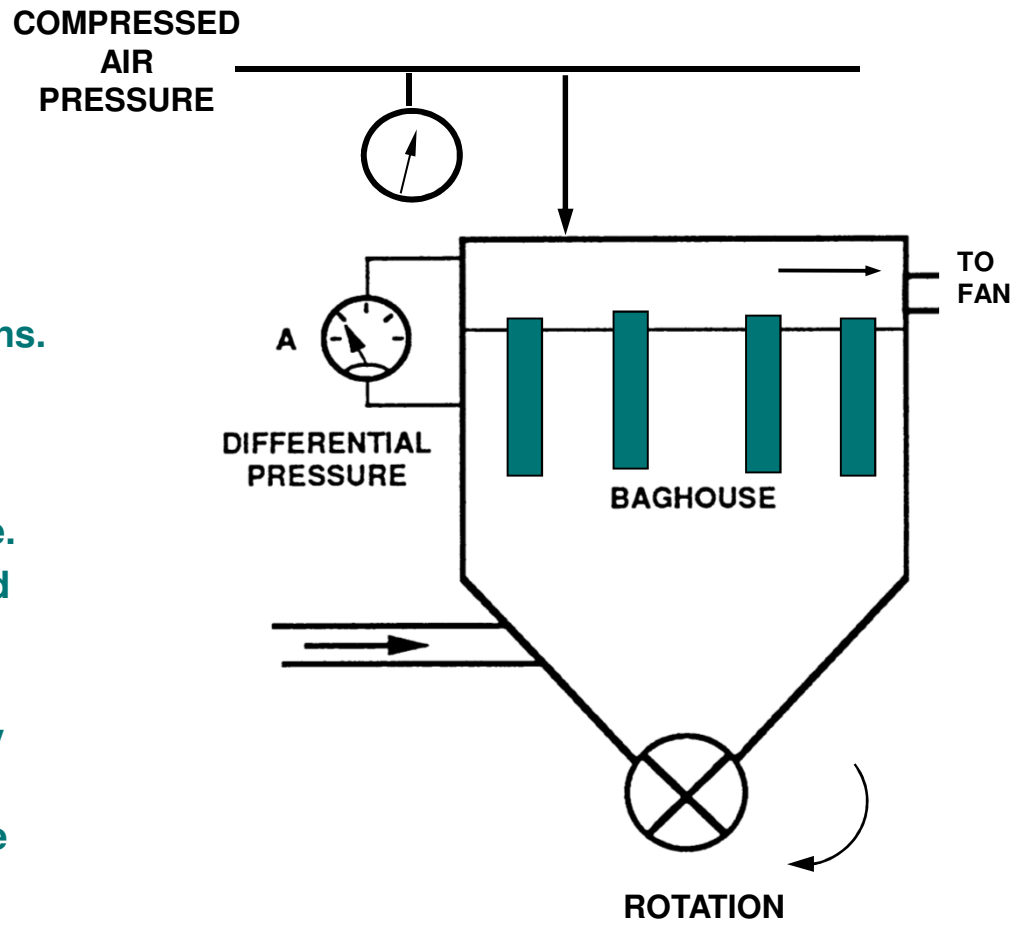
- designed to reduce exposure through use of local exhaust ventilation?
- intrinsic spill prevention systems? and
- designed to be leak free, reliable and minimize damage to raw materials and packaging?

Is your facility designed with general ventilation in the workplace to reduce the likelihood and duration of exposure during, cleaning, inspection, and maintenance activities?

Do you have a preventative maintenance program in place to ensure these systems are reliably performing?



# Example of Monitoring and Maintenance Plan




Each Shift or Daily

## Visual Inspection to verify or record:

- No visible stack emissions.
- Filter media differential pressure.
- Pulse cleaning system compressed air pressure.
- Access doors closed and leak free.
- Hopper empty.
- Proper rotation of Rotary Valve / Screw Conveyor.
- Dust fines flow in recycle system

# Training and Qualification

Recognition of exposure conditions is important!
Everyone working with enzymes must understand;

- The hazard
- The way that they can be exposed in both routine and non-routine situations and how to avoid exposure.
- Expectations for cleanliness standards and maintenance of the equipment.
- How and When to use, fit, and care for personal protective equipment.

# Training

- WHEN?
  - Train at induction - on first arrival at site
  - Repeat regularly & when changes are introduced
  - Document training
  - Check comprehension

- WHO?
  - For everyone potentially exposed
    - » i.e. everyone on site
  - include
    - » background information on hazards
    - » standard instructions
    - » contingency measures
  - Don’t forget Supervisors!

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# The value of Assessing Conditions in the workplace

What Conditions Can Cause Me To Be Exposed?

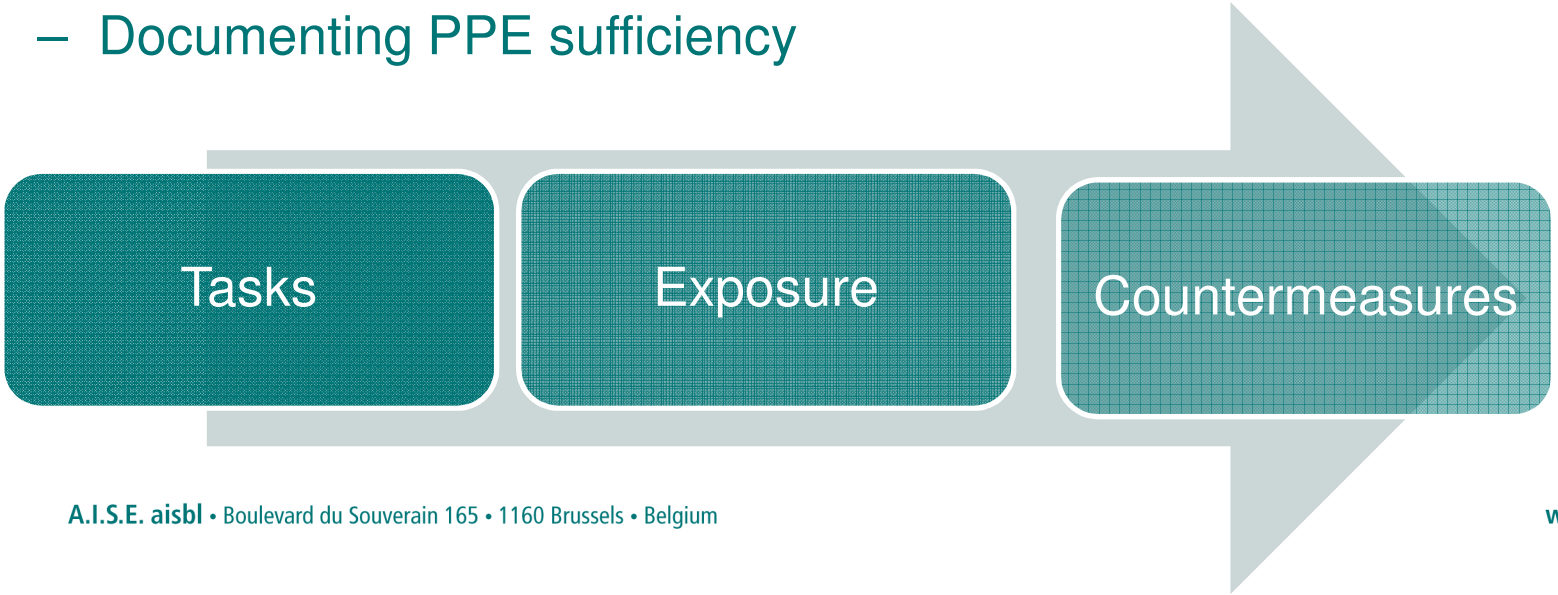
How Serious is the Exposure Potential?

What Countermeasures do I need to use and how quickly do I need to use them?

VS

# Development of Safety Practices

- Each task which results in entry into enzyme containing equipment or interaction with enzyme containing product should have a Safe Practice.
- Peak Exposure Assessment
  - Discrete Risk Definition
  - Documenting PPE sufficiency



# Criticality Index: A Prioritization Tool

- Using a control banding approach to determining criticality of exposure when tasks requiring intervention in equipment or product are required.
- Consideration are:
  - Potential Exposure level
  - Frequency of exposure
  - Number of people exposed
  - Ability to anticipate the exposure and PPE practices
- Objective- to document assumptions regarding safety practices and countermeasures used.

| | Rating | | | |
|---|---|---|---|---|
| Critical factor | 1 | 2 | 3 | 4 |
| Exposure level (R1) | No leaks or visible detergent outside of containment | Intermittent leak outside breaking zone | Intermittent spillage overhead/in breathing zone | Frequent leak/spill |
| No. Of Events (R2) | < 1/shift | 1-4/shift | 5-8/shift | ≥ 9/shift |
| Avg. No. Of people (R3) | 1 | 2 | 3 | 4 |
| Ability to anticipate (R4) | Scheduled maintenance | Schedule d task | Repetitive task | Immediate response |

$$CI = R1 \times R2 \times R3 \times R4$$

# Reinforcing Enzyme Safety Behaviors

## Measure critical behaviors – *How well does the organization demonstrate critical behaviors?*

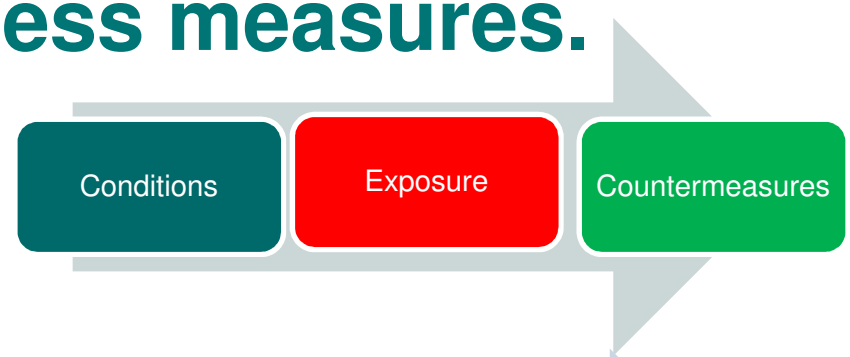
- Behavior Observation System
  - Everyone is involved
  - A few Critical Safety Behaviors are reviewed.
  - Feedback is given, in addition to measuring behaviors
- Safety Sampling System
  - Critical measures observed by a select group of skilled observers
  - Better observations, but not intended to give feedback

## Give and Collect Feedback

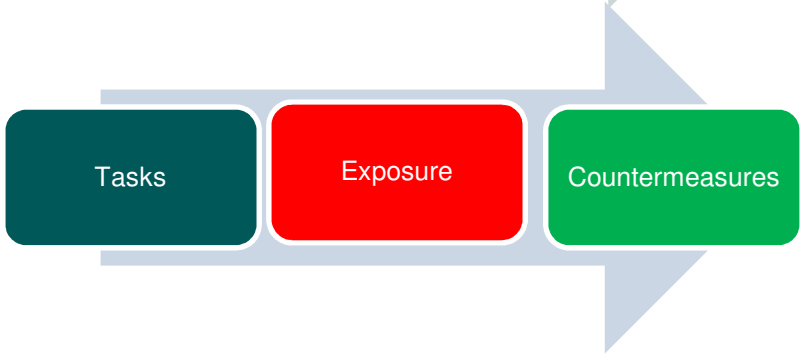
- On-going feedback systems
  - Everyone gives feedback daily, when appropriate with method for tracking the data
- Focused Feedback System
  - You target identify a specific person to observe and you coach and give them feedback during your observation
  - Provides a great opportunity for leadership to understand what prevents safe behaviors and provide coaching on safe behaviors.

# Reviewing in-process measures.

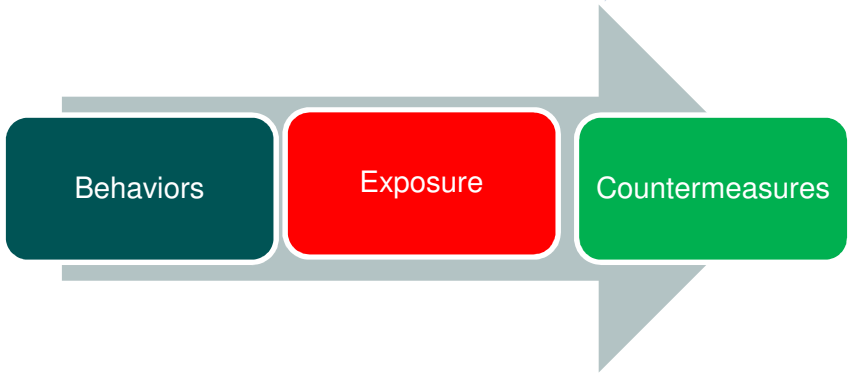
## (1) Operating Guidelines Compliance (OGC)




## (2) Peak Exposure Criticality Matrix




## (3)Behavior Based Feedback Systems



# Verifying that Control Measures Are Effective: Air Sampling

Engineering controls - design/function

- airborne dust/enzyme sampling
  - strategy/collection/analysis
  - procedure for exceedances
- maintenance schedule
  - systematic checks & planned maintenance
  - prevent failure

# Occupational Exposure Guidelines: Enzymes

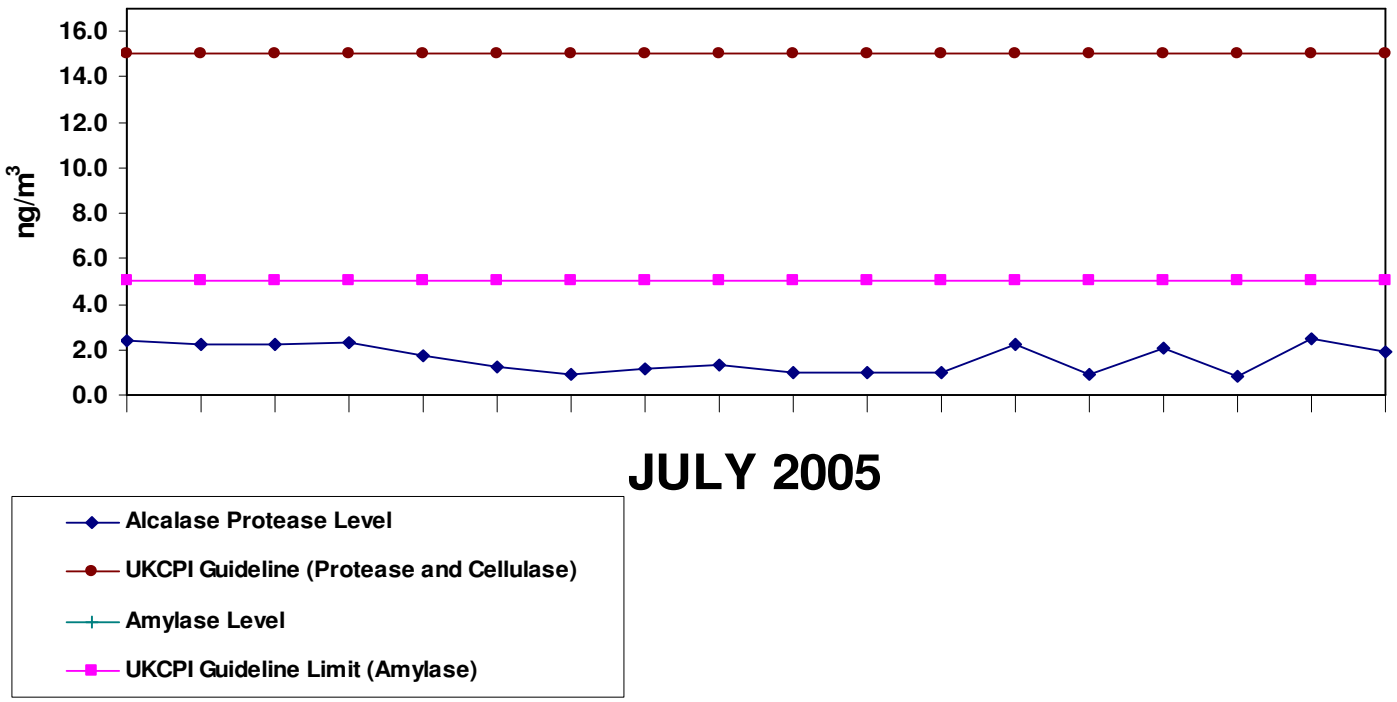
- Lower OEG for enzymes in detergents
  - 15 ng/m3 protease
  - 5 ng/m3 amylase
- Reflects influence of other ingredients in detergents.
- Indicate a level below which health effects should not be induced
- Measured as a time weighted average
  - average exposure spread over a working day
  - but also short term exposure limit not to be exceeded

- High Volume Sampling Necessary:
  - Low Occupational Exposure Limits
  - Analytical Limitations
    - Activity
    - ELISA
  - Generally 1-4 hour samples (varies by situation)
- Sampling Strategy
  - Randomized collection of fixed areas samples in relevant locations to **measure Aerosol Control Capability.**

**In process measures:**

1. **Exposure Limit Exceedances.**
2. **Action Limit Exceedances (Generally defined as ½ the OEG)**
3. **% of samples in a location which exceed the limit of detection. (P&G Criteria)**
4. **Discrete Statistics by Sampling Location**

# Enzyme Levels



# Occupational Exposure Guidelines: General

Used to compare against actual workplace levels

- Raw Material dusts 10 mg/m3 total, 4 mg/m3 respirable
- Detergent dust (irritant) 1 mg/m3

# Medical Surveillance

– final check that other measures have been effective

- Skin Prick Testing
- Immunological Testing (RAST)

# Auditing & Inspections

Objective is the confirmation of the effectiveness of the safety program

- internal or external but impartial
- priorities determined in advance
- look at totality of the available data
- process for feedback, action, & improvement
- non-compliances rectified as soon as possible
- evaluate sustainability of the program

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# Respiratory Protection

Clean

Clean Your Respirator Every Day!

Wear

Wear the Respirator When Needed!

Air Purifying Respirators

Care

Inspect all Valves and Elastics at Least Once Per Week.

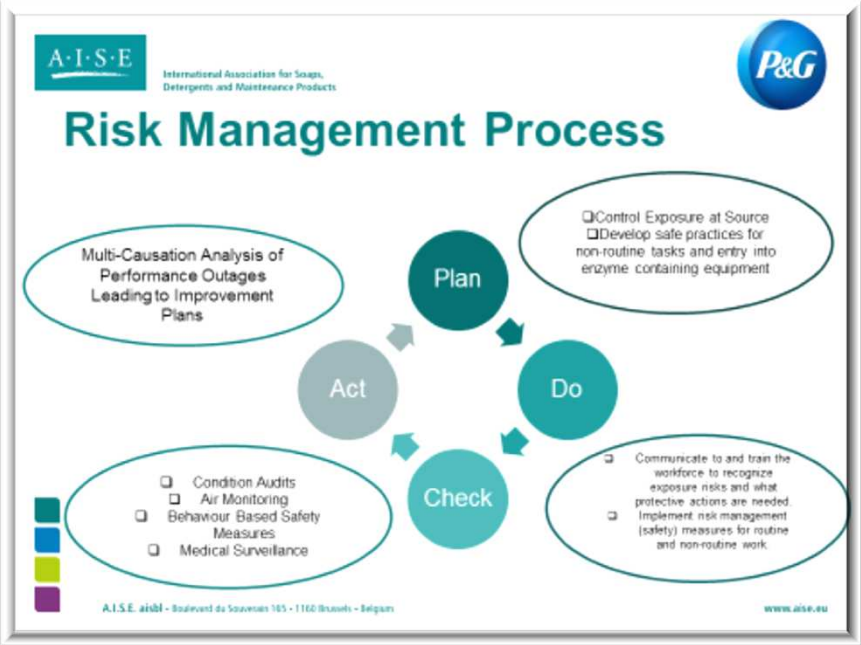
Fit

Do a Positive and Negative Fit Check Every Time You Wear the Respirator

If using a powered air purifying respirator battery management is very important!

# Conclusions

- Using enzymes does require special precautions
- Some require investment but many precautions are simple awareness, simple procedures, and checks that all good safety management systems include
- Full details are in the AISE Guidelines



# “You cannot get Sensitized, If you do not get exposed!”

# Any Questions ?

# What is next……Future Webinars

This webinar from the AISE Enzyme Safety Task Force has introduced you to the hazards and risks of enzymes used to manufacture detergent products.

Future webinars will focus in more detail on;

- Engineering Controls – For Safety and Engineering Teams
- Safe Work Practices – For Management, Leadership teams, Safety teams & Employees
- Exposure Monitoring – For Safety, Laboratory & Quality Managers, Laboratory staff
- Health Surveillance – For Site Management, Safety Managers, Occupational Health
- Performance Monitoring – For Site Management, Safety Managers, Occupational Health
- Laboratory Safety – For Safety, Laboratory & Quality Managers, Laboratory staff
- Consumer Safety – For Product Development, Product Safety, R&D

•On Behalf of the AISE Enzyme Safety Task Force

Thank You For Attending Today

We Will Appreciate Your Feedback or Further Questions to:

webinar@aise.eu