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## Denial, Delusions, and Bias

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# Agenda

- 1 Background
- 2 Cognitive dissonance: Root of human bias
- 3 Human bias in PHAs examples
- 4 Techniques to address human bias in PHA teams
- 5 Relationship between culture, human bias, and failure to learn
- 6 Summary and recommended reading

# Introduction

- ▶ “There are no new accidents; just different people making the same mistakes because of the failure to recognize the relevance to them of other people’s experiences, and therefore not learning.”
  - ▶ Dame Judith Hackitt, Hazards 32



Source: ioMosaic Stock Image

# Paper objectives

- ▶ Explore how human bias leads to failure to learn
  - ▶ Cognitive dissonance
  - ▶ Denials as a byproduct of cognitive dissonance
  - ▶ Delusions and confirmation bias
- ▶ Addressing denials, delusions, and confirmation bias
  - ▶ What works and what does not

# Human bias

Human bias arises from cognitive dissonance

- When a person holds two reasonings in conflict with each other

Reasonings forms from experience, relationships or culture

To make sense of conflicting ideas, the mind seeks to justify one of the ideas

With conflict reduced, the mind seeks confirmation of the “winning” idea

- Known as “confirmation bias”

# Highlighted examples

- ▶ Paper provides three examples
  - ▶ Reflects real experiences in PHA teams
- ▶ Highlighting two examples
  - ▶ Confirmation bias and credible sources (example 2 in paper)
  - ▶ Changing minds (example 3 in paper)



Source: ioMosaic Stock Image

# Confirmation bias and credible causes (Example #2)

- Site PHA Team denied that an earthquake could occur and cause a loss of containment
- Site team was convinced that an only a mild tremor could occur
- PHA Facilitator and Process Safety Manager presented scientific data
  - Past incidents involving external events such as earthquakes, tsunamis, and floods, and experience with glass equipment in the region
- Data from the government meteorological agency was discounted
- Site culture was very hierarchical
  - Plan developed to user hierarchy to address roadblock

# If I can see it, why can't you?

- ▶ Quote from Mistakes Were Made (but not by me):
  - ▶ “...People unintentionally blind themselves so that they fail to notice vital events and information that might make them question their behavior or their convictions.”
- ▶ Scenario reviewed with corporate process safety group and with Vice-President of Operations for the region
- ▶ With their support, site team did accept:
  - ▶ Cause (earthquake) and
  - ▶ Consequence (LOPC)



# Changing Minds (Example #3)

Same PHA as #2 but  
another scenario

High pressure N2 to  
glass distillation column  
without a safeguard

Site team: Excess  
pressure would be  
vented through Tee at  
the outlet of the  
pressure regulator  
through a vent line near  
the ventilation system  
intake (Figure 1)

In the event of excess  
flow, the nitrogen would  
vent into the room

No oxygen gas monitor  
in the room

# Figure 1: Sketch for example 3

Ventilation Intake

N2 to room

Glass Distillation Column

Glass Distillation Pot

Pre-Cut

Main Cut

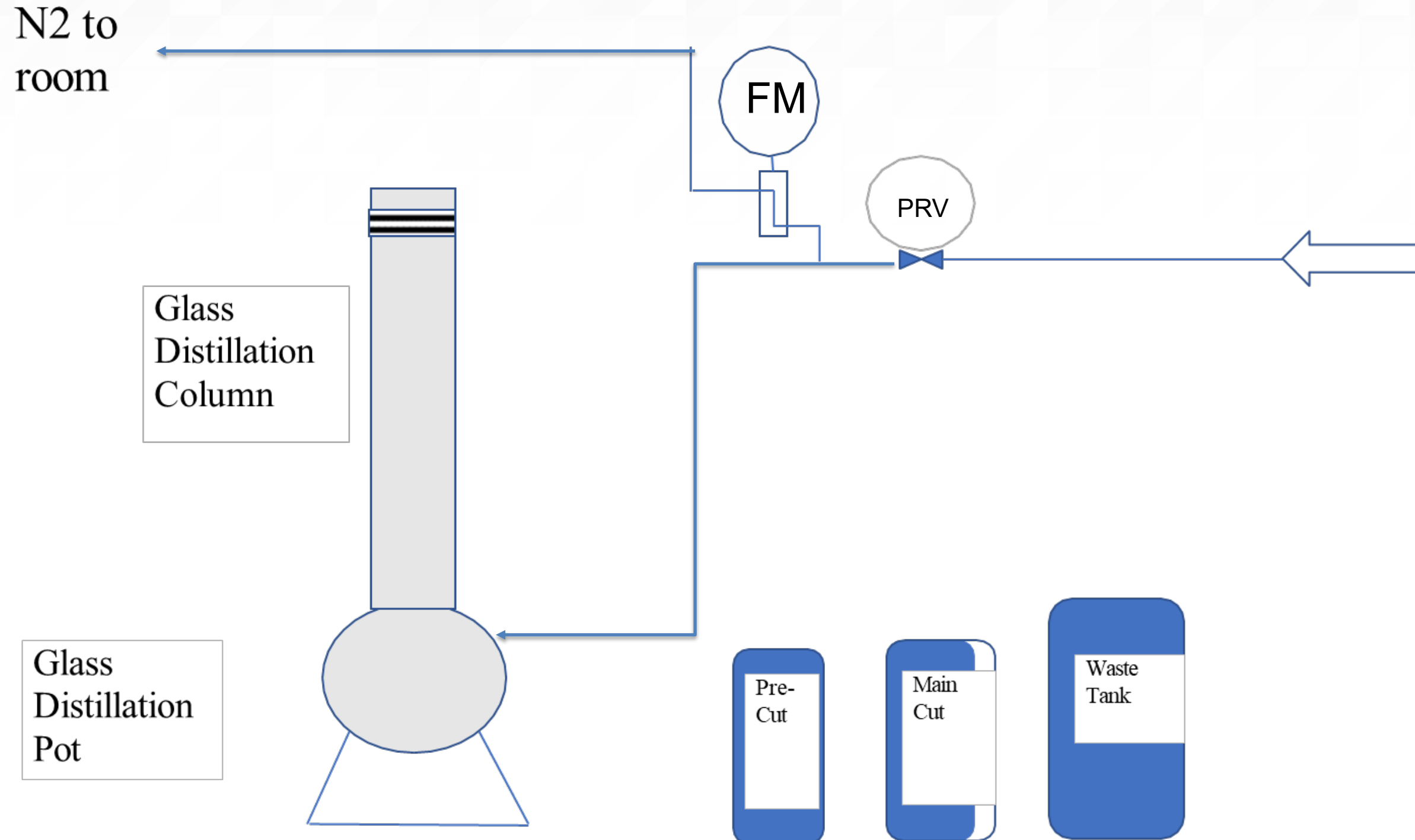
Waste Tank

FM

PRV

From N2 Vaporizer

Source: ioMosaic Corporation



# Addressing the “obvious” risk

- ▶ What seemed like such an obvious risk was not considered a risk by the site team
- ▶ Took a different approach
  - ▶ Asked the site to calculate the %O<sub>2</sub>
  - ▶ Site team accepted calculated the %oxygen with nitrogen vented into the room
- ▶ Changed their minds – Why?
  - ▶ Performing the calculations themselves displaced their delusion that there was no hazard (“I might be wrong”)
  - ▶ They put together the “why” and “how” and it made sense to them
  - ▶ They changed their minds

# Techniques used to address human bias

- ▶ Not effective
  - ▶ Arguments lead to both parties digging in their heels
  - ▶ Data flood is not effective as it will be discounted
- ▶ Effective
  - ▶ Calm and empathic
  - ▶ Encourage identification of “how” and “why” leading to “I may be wrong”
    - ▶ Focus on the “what” can lead to arguments

# Failure to learn

Failure to learn from incidents was included in each example

Lessons were not learned and did not affect their confirmation bias

*CCPS: Driving Continuous Process Safety Improvement from Investigated Incidents*

Common obstacles to learning were illustrated our paper's examples:

- *Normalization of deviance (venting nitrogen into a process area)*
- *Lack of understanding of hazards (earthquake potential)*
- *Difficulty seeing beyond one's own experiences (failure to recognize the universal human error)*
- *Loss of sense of vulnerability (all)*
- *Assessing blame rather than correcting root causes (prior N2 exposure incident)*

# REAL (Recalling Experiences and Applied Learning)

- ▶ Driving Continuous Process Safety Improvement from Investigated Incidents presents the REAL learning model
- ▶ Encourage use of this model
  - ▶ Embeds importance of learning into company culture
  - ▶ Strengthens commitment to process safety culture



Source: ioMosaic Stock Image

# Summary



Human bias originates from cognitive dissonance.



People develop justifications to reduce the conflict from their inconsistent reasonings

Justifications lead to denials and delusions



Delusions can lead to denying a potential cause of an incident or that a hazard exists



Leading people to identify “why” and “how” leads to a mind change



Connection of human bias and failure to learn is process safety culture



A strong process culture encourages and supports a learning and questioning environment to proactively address process safety concerns

# Recommended reading

Title	Author(s)
Mistakes Were Made (but not by <i>me</i> )	Carol Tavris and Elliot Aronson
Blind Spot	Mahzarin R. Banaji and Anthony G, Greenwald
How Minds Change: The Surprising Science of Belief, Opinion and Persuasion	David McRaney
Driving Continuous Process Safety Improvement From Investigated Incidents	Center for Chemical Process Safety



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# About ioMosaic Corporation

Through innovation and dedication to continual improvement, ioMosaic has become a leading provider of integrated process safety and risk management solutions. ioMosaic has expertise in a wide variety of areas, including pressure relief systems design, process safety management, expert litigation support, laboratory services, training, and software development.

ioMosaic offers integrated process safety and risk management services to help you manage and reduce episodic risk. Because when safety, efficiency, and compliance are improved, you can sleep better at night. Our extensive expertise allows us the flexibility, resources, and capabilities to determine what you need to reduce and manage episodic risk, maintain compliance, and prevent injuries and catastrophic incidents.

Our mission is to help you protect your people, plant, stakeholder value, and our planet.

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