



HAZARD AND OPERABILITY STUDY FOR SEWERAGE WORKS

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- How to Control Incidents/Accidents?
- What is HAZOP?
- What is HAZOP in Sewerage Works?
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A Scenario...



- You and your family are on a road trip by using a car in the middle of the night. You were replying a text message while driving at 100 km/h and it was raining heavily. The car hits a deep hole and one of your tire blows. You hit the brake, but due to slippery road and your car tire thread was thin, the car skidded and was thrown off the road.

Points to ponder

What is the cause of the accident?

What is the consequence of the event?

What can we do to prevent all those things to happen in the first place?



FLAT TIRE



What other possible accidents might happen on the road trip?

Can we be prepared before the accident occurs?

How to Control Incidents/Accidents?



Three approaches to control of hazards and operability issues:



Wait for incidents to happen, then take remedial action

Enforce strict regulations to prevent recurrence of incidents


Ensure exercises effective control over its hazards

WHAT IS HAZOP ?




HAZARD VS OPERABILITY

HAZARD



Any operation or action that could result in injury to personnel

OPERABILITY



Operational activities inside the design envelope that would cause a shutdown or malfunction of the treatment process leading to violation of environmental, health and safety regulations or negative impact on profitability

HAZOP study looks into both of these issues

WHAT IS HAZOP

A risk assessment tool, HAZOP is often described as:

- A brainstorming technique
- A qualitative risk assessment tool
- An inductive risk assessment tool, meaning that it is a “bottom-up” risk identification approach, where success relies on the ability of subject matter experts (SMEs) to predict deviations based on past experiences and general subject matter expertise

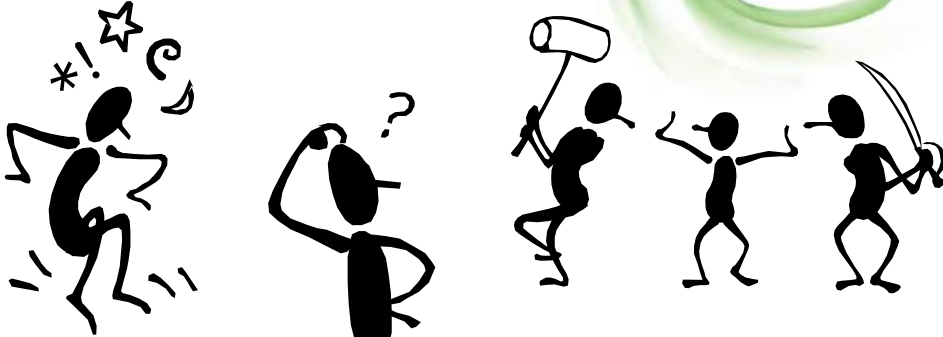
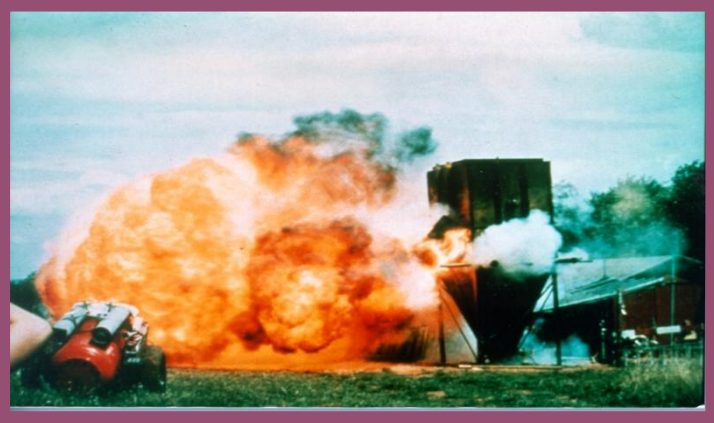


Guide words + Deviation = Consequence

HAZOP Study



I suppose that I should have done that HAZOP Study!



Without HAZOP
How will you focus all members of a team on the key issues in a systematic manner?

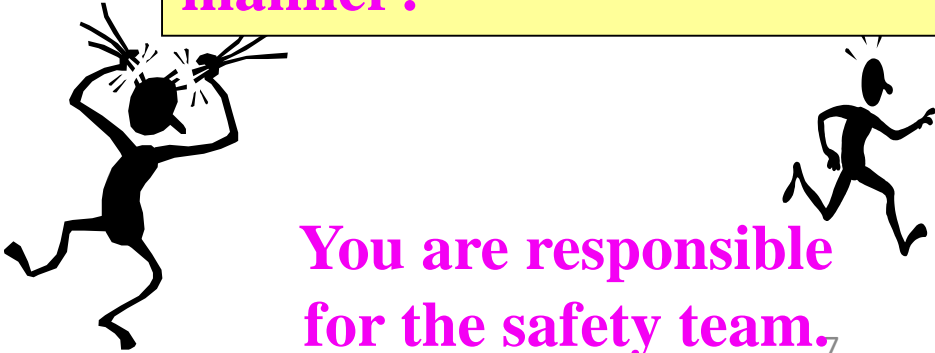
ATTITUDE CHECK

All of these terms! This stupid table!
Why HAZOPS. We are engineers,
We know how to design & construct?

Nodes
Parameters

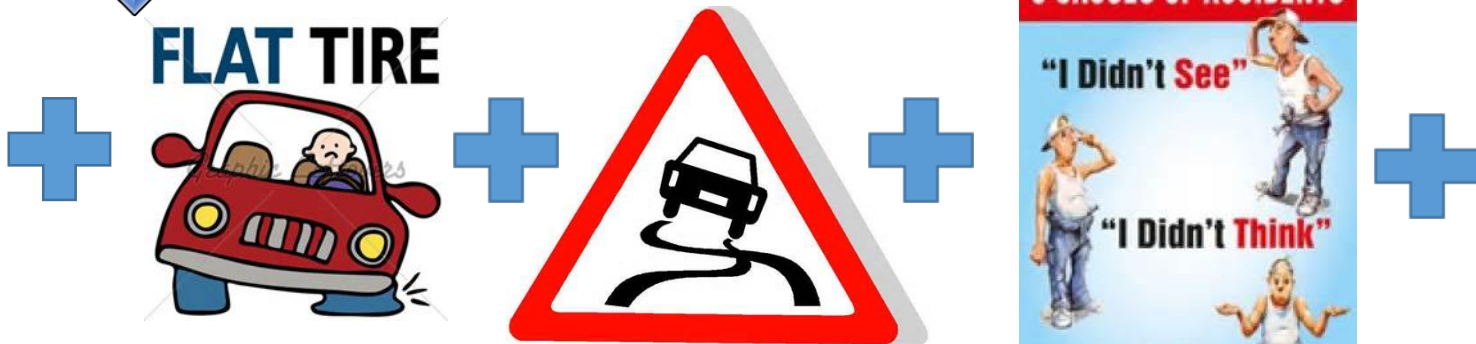
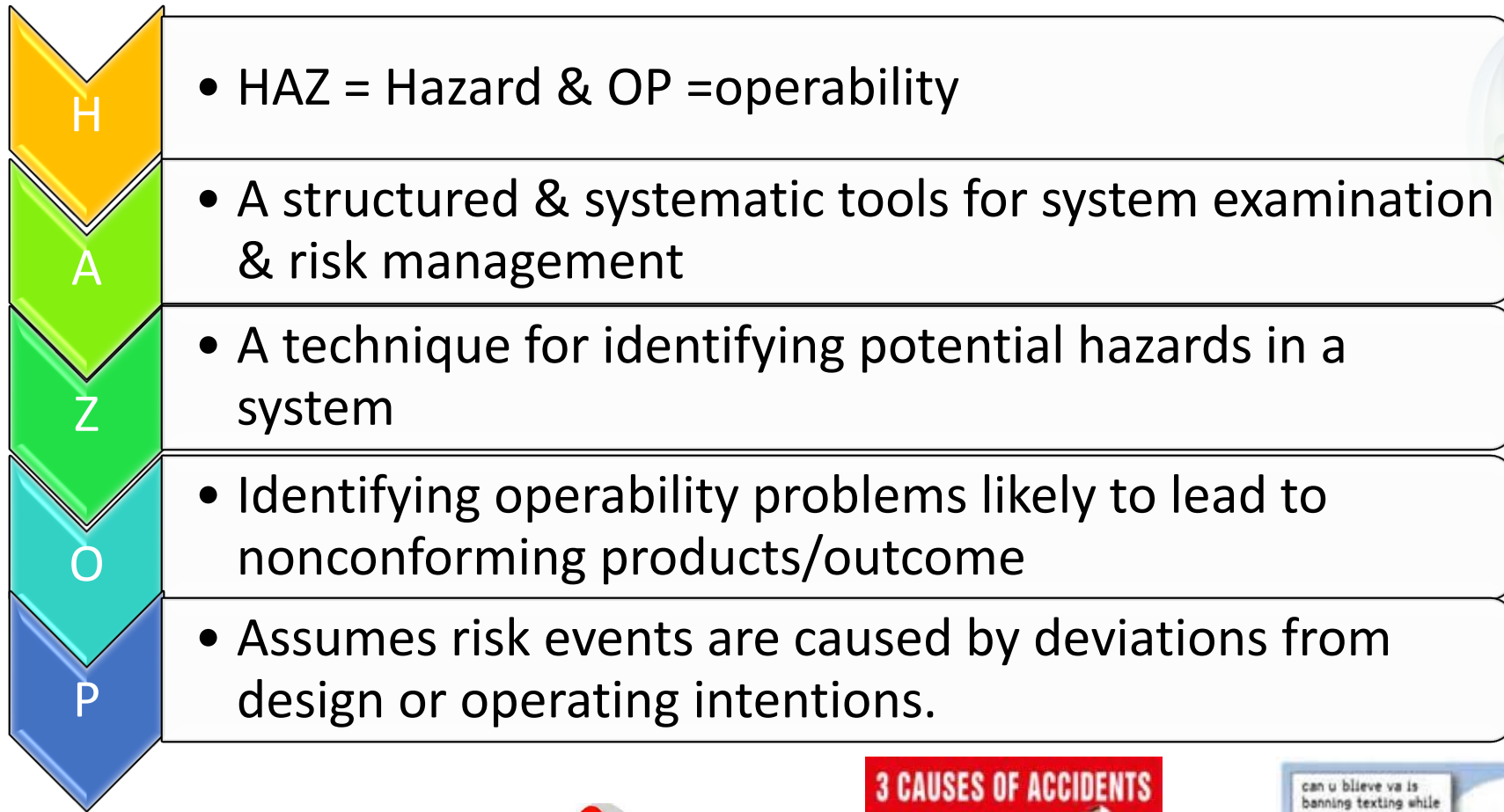


Consequence
Guide words
Deviation



You are responsible for the safety team.

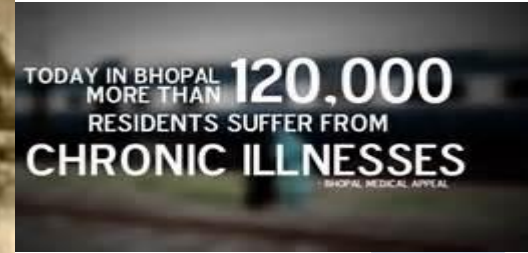
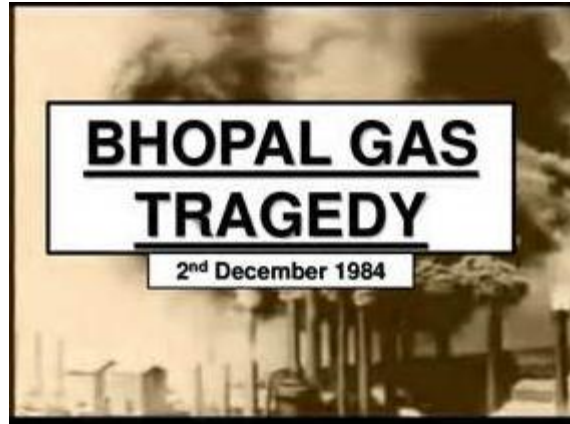
HAZOP Study



EVOLUTION OF HAZOP



**Flixborough (Nypro UK)
Explosion 1st June 1974**



• Early 60's ICI
Chemical
Industries

• 70's to 80's
more
chemical
industries

• Used in oil & gas
industries,
petrochemical
industries,
pharmaceutical
industries etc.

Mid 90's HAZOP in
sewerage sector

HAZOP STUDY FOR SEWERAGE WORKS



Short for HAZard and OPerability Study

Procedural tools designed to identify the safety and operability deficiencies in the design and operation of a treatment plant

Technique to identify potential hazards for both new and existing treatment plants

Qualitative risk assessment technique

A study which involves a multi-disciplinary team (inclusive subject matter experts)

A brainstorming exercise

HAZOP REQUIREMENTS & EXPERIENCE IN SEWERAGE WORKS

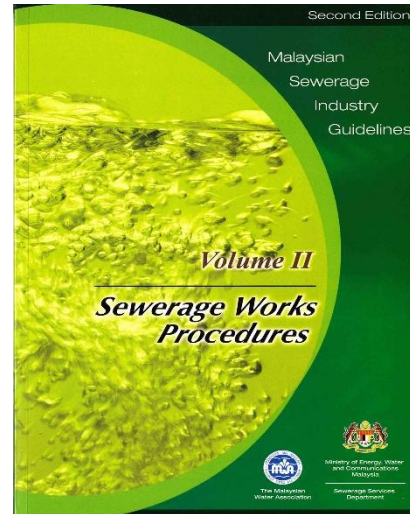


1998



HAZOP requirement under Section 4.2.4 in Reference to Vol 2

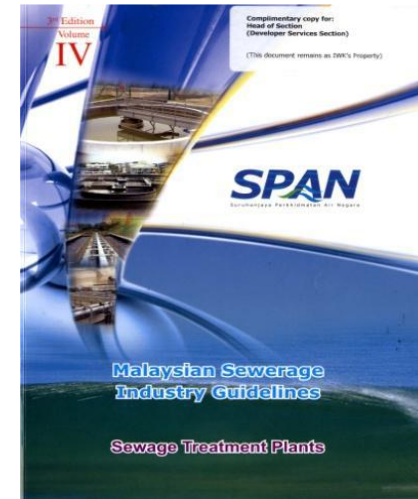
2006



HAZOP requirements Section 4.1.2

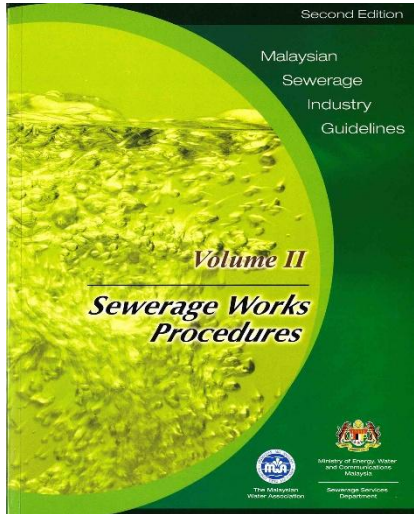
- <20,000 PE checklist
- >20,000 HAZOP Study

2008



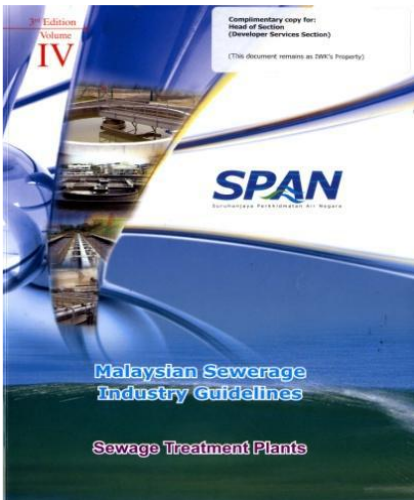
HAZOP requirements under Section 1.4 and to comply with Existing Vol 2

REQUIREMENTS OF HAZOP STUDY



MSIG Volume II (2nd Ed 2006):

- -For PE <20,000: HAZOP checklist (as attached in Appendix H) to be completed and submitted together with form SSA/PDC/2
- -For PE>20,000: HAZOP study shall be carried out prior to submission for detailed design approval



MSIG Volume IV (3rd Ed 2009):

- Clause 7.2: HAZOP Study for treatment plant located within building
- -Sub clause 7.2.2 (f): “The design of the treatment plant shall be subject to a Hazard and Operability Review (HAZOP) ...”
- -Sub clause 7.3.2 (iv): “The guidelines given for treatment plants located within buildings in Section 7.2 shall be followed”.

EXAMPLES OF HAZARD & OPERABILITY?



OPERABILITY

HAZARD ??



OPERABILITY

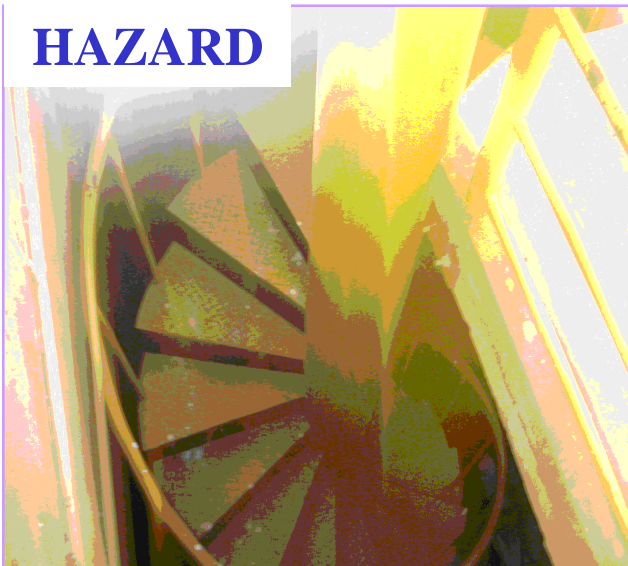


HAZARD



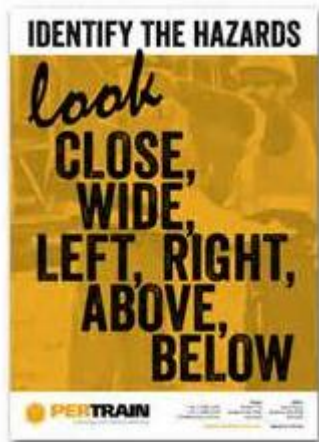
OPERABILITY

OPERABILITY ??



HAZARD

BENEFITS OF HAZOP STUDY



Allows for identification of hazards and operability problems at early stage

Reduce losses brought about by hazard and operability problems



Opportunity to correct errors and oversights during design stage

Ensures that all legislative requirements are consistently met

COMPLIANCE



Encourage brainstorming of team from various functions or disciplines

Cost saving exercise by minimising potential remedial and modifications



HAZOP Findings - Highlighted



Conclusion

- HAZOP is necessary tool to examine system and risk management
- HAZOP in sewerage works in not new and required based on SPAN Guidelines
- HAZOP studies predict shortcoming of facilities by subject matter experts
- HAZOP studies manage to identify and reduce hazard and operability issues at early stage



