CHEMISTRY THAT MATTERS™

SAFEGUARDING THE FUTURE
AS-BUILT HAZOP

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INTRODUCTION

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SABIC UK Petrochemicals

Joined ICI on Teesside in 1991 with roles in process engineering, operations, customer technical service, product stewardship, EHSS management system.
For the past 10 years, led on process safety, with oversight of the Process Hazard Analysis programme.

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CONTENT

Background

- SABIC on Teesside
- Olefins6 Plant – History & Reconfiguration Project

Process Safety Information

- Learning from previous Ethane project
- Why an ‘As-Built’ HAZOP?
- As-Built project
- Recommendations

SABIC OLEFINS6 PLANT – OVERVIEW

History

- Commissioned 1980
- Ethane feedstock commissioned 2017
- 2020TA postponed
- 2022 construction commenced on reconfiguration project

OLEFINS6 RECONFIGURATION PROJECT – SCOPE

- Multi-million pound investment
- Deep cut and carve
- 260 redundant equipment items
- 11 main equipment items modified

OLEFINS6 RECONFIGURATION PROJECT – SCOPE

Complexity / Scope of Project

- Significant impact on much of the plant
  - New equipment
  - Repurposed equipment
  - Redundant equipment – tie-outs
  - Physically unchanged but process changes
  - Impact on safety systems

- Very broad scope – most P&IDs have changes on them
- Adequacy checks on equipment affected by the changes

APPENDIX DIVIDER SUBTITLE (20PT LIGHT)

PROCESS SAFETY INFORMATION

PROCESS SAFETY INFORMATION – HAZARD TABLES

SABIC UK Hazard Tables

- Developed through Process Hazard Review revalidation programme
- Similar to Hazard Identification study – HAZID
- Line-of-sight from hazardous event to safeguards
- Hazard Tables and PSM Checklists are the basis of PHR studies
- Underpin COMAH representative set (Seveso compliance)
- Key input for projects
- Assessment of risks identified through risk discovery processes
- Improvements to quality of Hazard Tables ongoing via PHR and a separate project with TUV

WHY AN AS-BUILT HAZOP?

Learning from Ethane Project

Concerns with Ethane project raised at subsequent PHR studies:

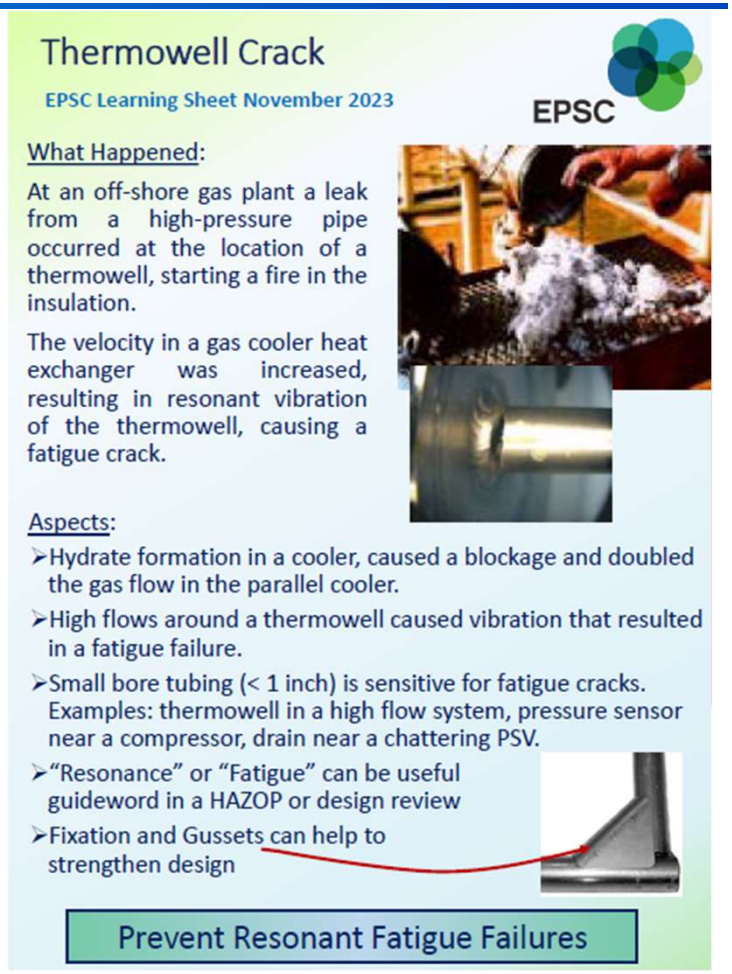
- Scenarios difficult to understand
- Scenarios removed by design
- Supporting documentation missing
- Deviations (causes) and LOPA inconsistent
- Duplication / overlap with existing hazard table scenarios

HAZOP action closure was not reflected in the Hazard Tables.

WHY AN AS-BUILT HAZOP?

Why is this Important?

- Excess flow through a heat exchanger creating high vibration during transient conditions
- Vibration leads to tube failure with low temperature embrittlement and overpressure risks
- HAZOP actions raised to address risk
- As-built HAZOP improved clarity of safeguards to ensure correct operator action



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WHY AN AS-BUILT HAZOP?

Purpose

Prior to re-start, the project can demonstrate that the risks associated with the project are mitigated.

Enabler for subsequent update of the Hazard Tables.

- Verify closure of HAZOP actions, update HAZOP record with outcome
- Identify any ‘gaps’
- Risk associated with these gaps is understood and being managed
- Quality of process safety information meets expectations

AS-BUILT HAZOP – TERMS OF REFERENCE

HAZOP	Desired Standard
Cause: Failure of level controller	Failure closed of level controller LCV2345 on Condensate Keg FA1773 (this valve is air-fail closed)
Cause: Operator error	Operator carrying out task FUR-B09-01 closes valve V-012 before opening valve V-018
Consequence: Failure of pipe due to 2-phase flow	Two-phase slug flow in E1720 overheads pipework 10”-17405-A1B. This pipe section has been assessed for 2-phase flow as per the Pipe Stress Critical Line List, and the pipework has been designed for this scenario. No Hazard. Ref: 3510-8230-26-000-0003 – Pipe Stress Critical Line List – Existing

AS-BUILT HAZOP – OVERALL PROJECT RISK

	L7	L6	L5	L4	L3	L2	L1
C1						1	
C2	36	35	55	7	7	2	
C3	1	6	37	52	7	5	
C4	2	4	12	33	22	14	4
C5			5	8	8	10	10

Project HAZOP

- 47 unacceptable risks
- HAZOP and LOPA studies raised 1115 actions
- 94 open actions

As-Built HAZOP

- Remaining unacceptable risks identified
- Ensured actions to address these

	L7	L6	L5	L4	L3	L2	L1
C1							
C2	43	40	76	1	1	2	
C3	9	5	42	58			
C4	1	5	13	30	27		
C5	1		5	18	16	30	14

AS-BUILT HAZOP - RECOMMENDATIONS

HAZOP

- Consider how to incorporate information into existing process safety information when structuring the HAZOP
- Develop TOR to define standards for documentation
- Ensure actions are clearly defined – be precise with the required outcome

‘As-built’ HAZOP

- Working version of the HAZOP to be updated as the project progresses and actions are closed
- Verify that action closure has addressed the original concern and update risk ranking
- Ensure supporting documentation clearly referenced

AS-BUILT HAZOP - RECOMMENDATIONS

Project Planning

- Reconfiguration projects likely to be more complex
- Many plant systems may be affected by changes even if they are not physically modified
- HAZOP structure can have a significant impact on updating process safety information
- Include periodic review of ‘as-built’ HAZOP
- Provide resource for updating process safety information


THANK YOU