

HSE REX Feedback

High Learning Value Event - Learning from a Fluid Catalytic Cracking event

Ch. Kapp – Company Major Incident Investigation and Return on Experience

Introduction



Title: Antwerp FCCU2 jet fire on Main Fractionator
Reference: REK-RC-RBE-2023-056 **Date:** Aug. 6th, 2023
Business: Refining **Site:** TERA
Country: Belgium
Domains: Workplace safety Technological risk Transport Health Environment Security Societal
Causes key words: Loss of UPS, Air Breakthrough, reverse flow, internal combustion, crack
Consequences key words: FCC, LOPC, Fire, Asset damage



Incident description:
 On 6th of August 2023 at 22:00 a failure of electric Uninterruptible Power Supply (UPS) to several instruments across the refinery resulted in a refinery wide upset and a loss of process control on the Fluid Catalytic Cracking Unit (FCCU2) reaction zone.
 The instrumented safeguards installed on the FCCU2 initiated oil-out, but fully interrupted catalyst flow only after 36 minutes. Additional manual attempts were made to stabilize the unit. Around midnight a temperature rise in the Main Fractionator (MF) caused a crack and a hydrocarbon/steam release in the area of a 24" manhole flange in the middle section of the MF.
 The hydrocarbons ignited causing a jet fire. Emergency staff was mobilized. The fire was rather short (15' to 20') but intense and was extinguished by stopping the air blower and continuing feeding steam in the MF whilst the fire brigade cooled the surrounding equipment.

Consequences:

- Physical: no personnel injured
- Material or production-related: FCCU2 and downstream units' shutdown, MF Column damage, Reaction & Regeneration section impacted. Under further assessment but estimated 25 M\$ direct cost. Production losses estimated to be 1-2 M\$/day
- Environmental: heavy smokes
- Media-related: local TV

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- Prevention of or air emergency mandatory operation system, automatic control valve, low-level operation, air breakthrough:
 - Manual opening of spent slide valve (and hence overriding ESD) without proper risk analysis had grown to be considered as an acceptable practice over the different shift teams
 - Insufficient awareness of operational teams on main operational risks at hand during the event.

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Content

1. REX animation of the Fluid Catalytic Cracking event
2. A few thoughts on lessons learnt



VIDEO



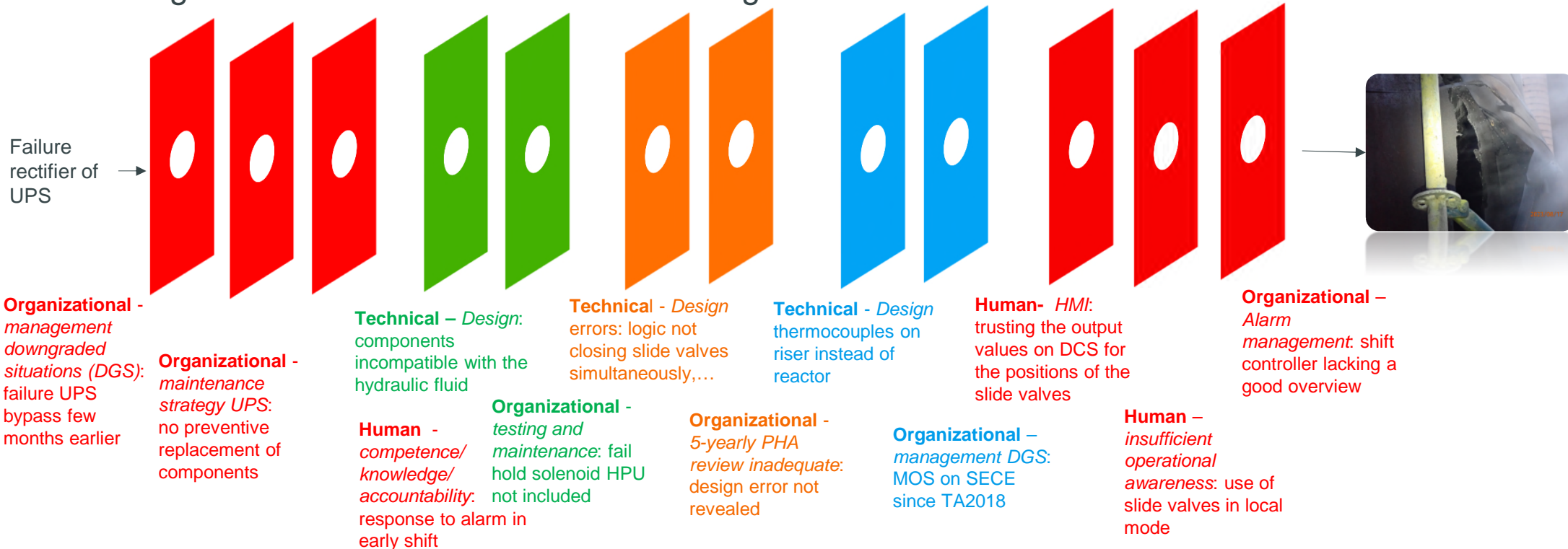
Edward A. Murphy never sleeps



- At first glance... an accident specific to Fluid Catalytic Cracking Units



- Looking into the details of this event... nothing is less true



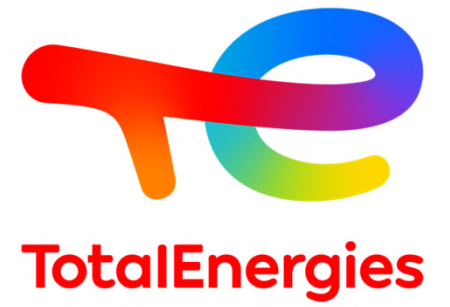
Everyone can learn from this event – one example



- **Design error:**
High temperature protection closing the regenerated catalyst slide valve (RCSV) installed on riser instead of reactor during TA2018
- **Result:**
Trip setpoint lower than normal operating temperature, caused trip during startup and would cause recurring trips during run
- **Response:**
Downgraded situation form initiated, risk analysis done and compensatory measures defined
- **How did it go wrong?**

Compensatory measure in the form
“upon high temperature alarm, give feed-out”

- **Compensatory measures were not specific:**
only feed out was not sufficient to achieve safe park
- **Compensatory measures were not realistic:**
alarm load as during the trip was too large for the compensatory measure to be effective (prio low alarm riser)
- **Initial compensatory measures were not sufficiently challenged during the approval process**
- **Timeline not sufficiently challenged:** there are always opportunities to do s-plc modifications in run



Thank you

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Christian Kapp

27th of June 1963, married and father of one son



Current Position

- General manager of the team that oversees (and does) all important investigations in TotalEnergies worldwide
- Technical authority of the HSE High Learning Value Event Process implemented within in TotalEnergies (The HSE REX Process)
- Recognized professor in accident investigations and High learning Value process. Professor Mines Paris Tech - Specialized Master in Industrial Risk Management - Post-accident investigation and HLVE (High Learning Value Event)
- Consulted many times by the French authorities and Worldwide professional associations (EPSC, GBG, Fabig, etc.)

Education

- Master Degree in Engineering
- Director of MSc-THESIS : master degree risk management, master degree international logistics
- TAPROOT Certified Accident Investigator (*a part of the role in my current position is to develop a robust process in incident investigation along my team, we have been certified to the TAPROOT causes analyses process*)

36 year of international experience

- **20 years of international experience in the oil and gas industry (operations, constructions and projects)**
 - Argentina, China, Korea, France, Benelux, etc.
 - Several senior management positions (plant manager, head of engineering, regional manager)
 - Inventor of Conceptual design of «first mounded spherical tanks » and realization (project leader for 3,500 m3 mounded sphere)
- **16 years of senior management positions in the field of HSE**
 - **Vice President HSE** for the European gas station network (2008 – 2011)
 - **Company Transport safety** (2011 – 2016)
 - **Company Major Incident Investigation and Return on Experience** (2016 -)