

Human factors in incident investigations

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- Huntsman Holland bv
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Agenda

1. Intro Huntsman
2. What is HFACS ?
3. Example incidents
4. Questions

Huntsman Holland makes sustainable products!

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17 May 2023

See and experience our chemistry

Key Milestones of Huntsman's History

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Jon M. Huntsman
Founder, 1937-2018



1970

Founded the Huntsman Container Company and goes on to create “clamshell” container for McDonald’s Big Mac.

1982

Formed Huntsman Chemical Corporation and led the Company through constant, rapid growth with a myriad of well-timed acquisitions.

1999

Huntsman Corporation nearly doubles in size with the acquisition of Imperial Chemical Industries' polyurethanes, titanium dioxide, and petrochemical global businesses.

2005

Huntsman successfully launches an Initial Public Offering of Huntsman shares (HUN) on the New York Stock Exchange.

2021

2021 revenues ~\$8 billion
70 manufacturing, R&D, operations facilities in ~30 countries
9,000 associates within our four business divisions

- Polyurethanes
- Performance Products
- Advanced Materials
- Textile Effects

Our history

- Site built in 1961
- Situated on municipal reclaimed land in the Botlek area (Blankenburg)
- Located at the centre of the Dutch & European chemical cluster
- We produce methylene diphenyl diisocyanate (MDI)-based polyurethane products & services
- Size of the facility: 210 acres
- 350 associates, 150 contractors working for Huntsman



Our facilities & Processes

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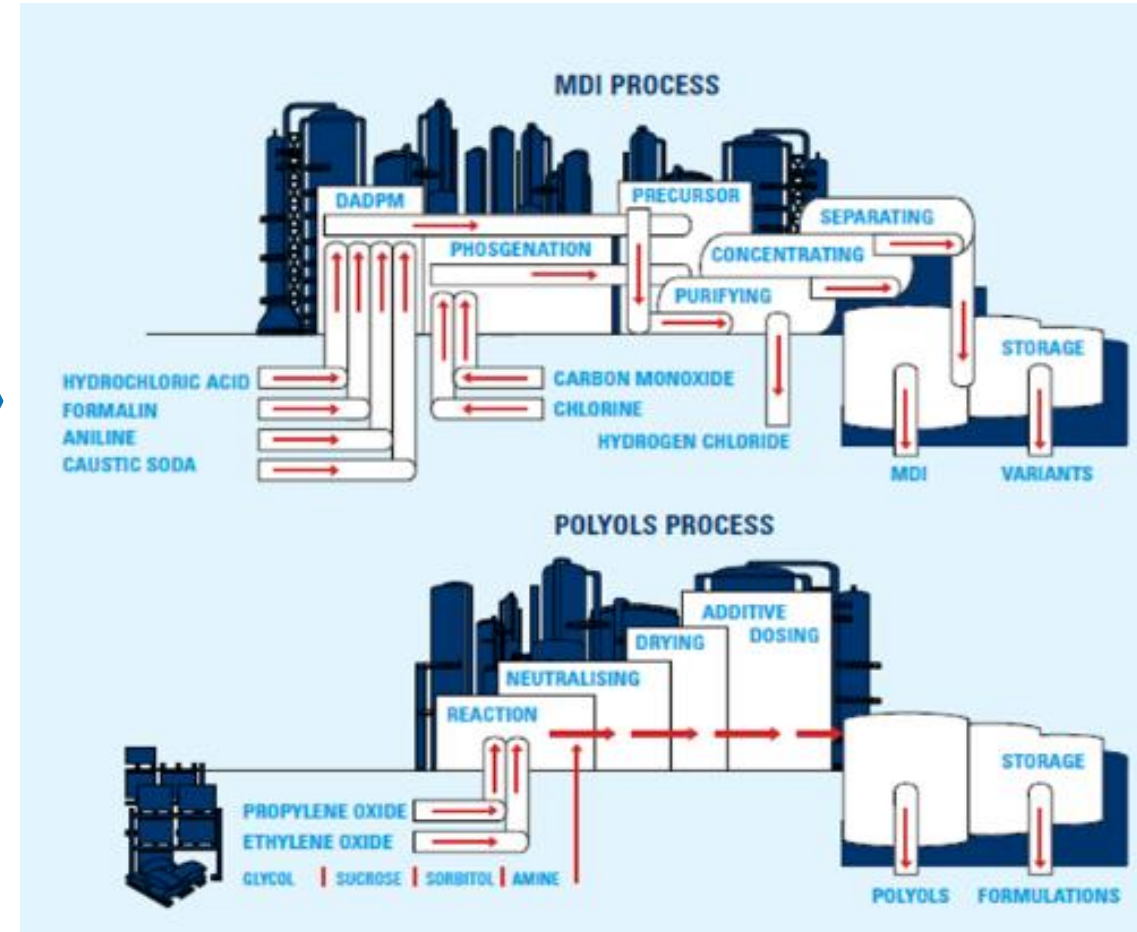
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Downstream

- Polyols production plant (1972)
- Formulations facility (1971)
- Variants production plant (1997)
- MDI splitter (2013)
- Polyols plant expansion (2014)
- Blending facility (2015)

Upstream

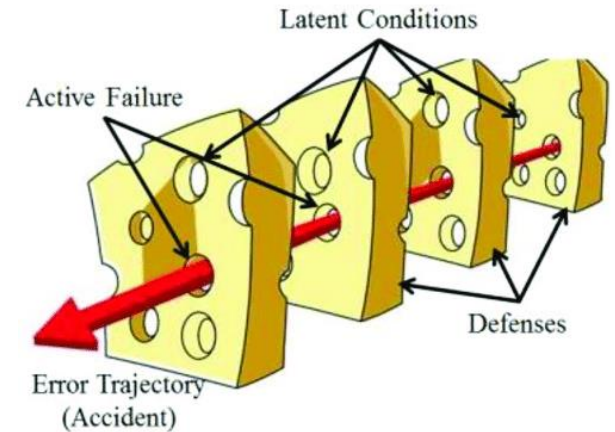
- MDI 1 (1973)
- MDI 2 (1997)
- Crystallizer 5 (2021)



80% of all incidents & accidents involve Human Factors

- Everyday activities occur in a chemical plant that can lead to an incident

- Huntsman has used HFACS for more than 5 yrs to analyse incidents on its plants, but what is HFACS ?
 - The analysis of Human related failures to the incident investigation additional to the equipment failures.
- Example: An operator fails to respond correctly to an alarm.
 - The operator is encouraged to report the incident so that all the factors contributing to the failure can be analyzed, since it may not be their fault.
- What factors could contribute to this failure ?
 - Culture of ignoring alarms – organization/culture
 - Alarm was missed as there are too many, no sound, etc.. – work environment
 - No clear instruction available to follow or no training - supervisory
 - Operator distracted or confused due to other activities on the plant – work environment.
 - Alarm did not come in due to known failure not being followed up – organization/culture.
 - Operator ignored the alarm or did not follow the instruction – active failure
- A combination of these factors likely leads to the incident (cheese model).

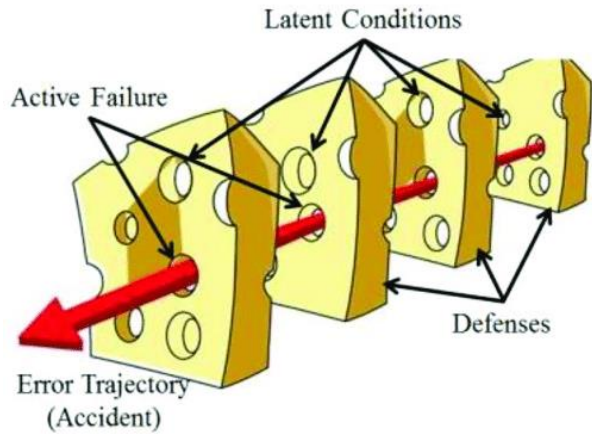


Latent conditions can also be Human Factors:

- Organisation/culture
- Supervisory
- Work environment

Active failures can be a human error.

What were the latent conditions & the active failure ?



Hydrogen Jet Fire

What Happened?

Following maintenance to a 6" non return valve (NRV), hydrogen leaked on restart which self-ignited and damaged cabling. It burned for approximately 10 minutes before being extinguished, from the Control Room, by isolation of the plant hydrogen supply.

Following the incident the reactor was offline for 13 days while the NRV installation was modified and repairs to damaged cabling were made.

Basic causes

- The bolted NRV installation was not leak tight (gasket was poorly centralised).
- A defensive layer to leak test disturbed joints on H2 service, before commissioning, was not carried out.

Immediate Lessons Learned

Under close supervision, the original 1979 installation could not be re-assembled reliably and has therefore been redesigned. Other human and environmental factors contributed to the defective assembly and a policy for mechanical fitters to report difficulties to an engineer has been reinvigorated.

The operating procedures did not make leak testing requirements sufficiently clear and have now been updated to include 100% nitrogen leak testing of all disturbed joints on hydrogen duty.

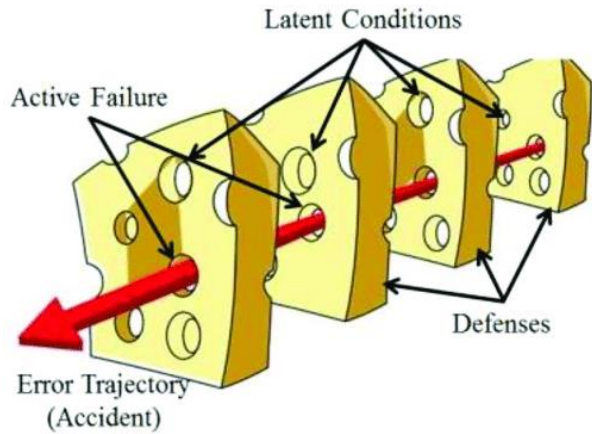
Gaskets fit here



Gasket not sufficiently compressed in this location



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Latent conditions:

Very difficult assembly process
Unclear escalation procedure
Unclear Leak test procedure

Active failure:

NRV gasket leaked

What were the latent conditions & the active failure ?

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Rotterdam Orange Flyer

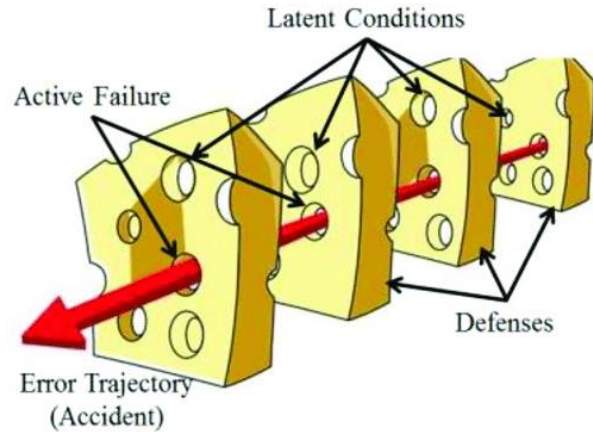
Cut in finger associate QC lab

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Date:

30 December 2019



What happened?

On Monday morning, December 30, an associate in the QC lab tried to open a jar containing MDI prepolymer. When pouring the Variants out of the jar, it can drip onto the glass threads around the mouth. As a result the cap can stick to the threads so that it cannot be opened by hand. The associate tried to open the jar with a wrench. He held the jar tightly with his right hand and used the wrench as extra leverage on the cap. The jar broke and the glass cut his right finger. Associate went directly to the Medical Center. The +/- 8 cm long cut was treated with 12 stitches. The associate wore the standard blue gloves prescribed for work in the QC lab.



What can we learn?

- Sharing Best practice between sites leads to safer work.
- Talk to each other about safe behaviour and address possible risks.
- Assess the risks before you take any abnormal actions (eg rush jobs).

What actions have been taken ?

- Best practice for this activity will be agreed across the PU Sites (inc Everberg), led from Rotterdam.
- Safety Cross has been implemented in the QC Lab and further Risk Tolerance workshops planned for 2020.
- Manning levels for the Foam lab on Mondays has been changed on a trial basis. The effect of this change will be reviewed in 3 months.

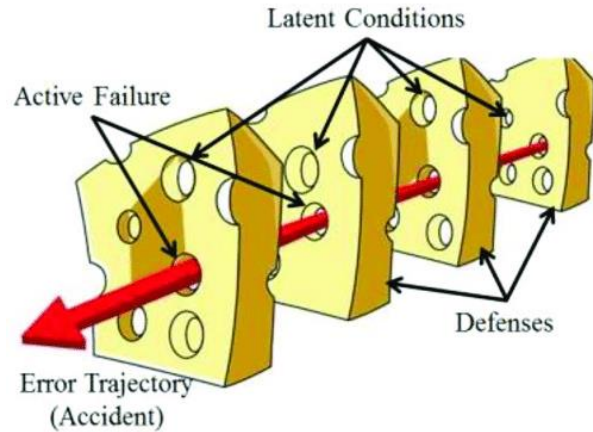


For more information over this incident please contact: [Laurence Thring](#)

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Latent conditions:

- Perceived work time pressure
- Colleague did not say 'stop'
- Other sites avoided the scenario
- LMRA not consciously done

Active failure:

Incorrect tool used to open bottle

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Questions?

