Deflagration during nightshift
and a short digression about safety culture

Alexander Thomas
Structure

- the administrative district Arnsberg from the major hazard point of view
- deflagration during nightshift
- safety culture (a very brief comparison)
- conclusion
the administrative district Arnsberg from the major hazard point of view

127 operating ranges under Seveso directive (637 in NRW)
- 69 lower-tier establishments
- 58 upper-tier establishments
  thereof: 40 surface planting and 10 in which explosives are dealt with

branches overview
- surface planting, staining
- chemical industries (pharmaceutical, varnishes, special chemistry,…)
- powerstations
- biogas facilities
- storage (petrochem., fl. gases, explosives, fertilizer,…)
- waste management facilities (chemical-physical treatment, storage..)
- miscellaneous
the administrative district Arnsberg from the major hazard point of view

Tasks of the major hazard team / Störfallteam
(2 senior service, 5 inspectors)

• participation on preliminary discussions on legal obligations
• „preliminary examination“ on behalf of article 15 Seveso-III-directive
• statement in approval procedures
• examination of notifications to Art. 7, Seveso-III-directive
• the „governmental duties“
  – assessment of safety reports
  – reporting duties to the EU
  – identification of domino effects
  – implementation a system of inspections
• accident investigation
• statement to safety distance issues
• if appropriate participation on IED inspections
• participation on national & international exchange of experiences
the „big bang theory“

• deflagration: subsonic combustion propagating through heat transfer and pressure
  → pressure resulting from emerging and expanding gas

• explosion: supersonic combustion with shock wave
Deflagration during nightshift - overview

Upper-tier establishment
Under umbrella of an authorization holder and several other companies
Deflagration during nightshift - event

- facility to produce solid fuel during the recondition of raw materials in a kneader (homogenization & desorption of water remains)
- rapid implementation/deflagration
- fire was under control after about one hour (about 80 men and women emergency personal, fire fighter, first responder etc.)

- 02:48 : UV-flame detector triggered signal towards fire alarm system activation of spray extinguishing system
- 02:56 : first fire engine in action
Deflagration during nightshift - effects

- destruction of operational infrastructure due to the deflagration (pressure wave)
- further destruction due to fires within the building (basement and lower outside) as a result of flame front and flame propagation
- one injured operator
- material damage is estimated at 150,000 € (at the time of the incident)
Deflagration during nightshift - analysis

• **preserved data**
  - performance data from drive motor of the kneader was stored
  - raising power consumption logged (16 instead of 15 kW) within an extreme short period before the incident

• **first indicator of a possible cause**

• **Ignition?**
Deflagration during nightshift - analysis

- BAM (federal institution of material testing) is appointed with incident investigation by the company (almost on the spot)
- material testing by a chair for material science of a nearby university
Deflagration during nightshift analysis

conclusion:
• breakaway at the edge of the kneader shaft lead to increased friction, because the fragment disabled the concentricity
• breakaway due to changed hardness courses and structural changes

measures taken:
• increase of production safety - primary measures
• increase of structural safety level- secondary measures
Deflagration during nightshift pictures

production unit before
Deflagration during nightshift pictures

production unit / box afterwards
Deflagration during nightshift pictures

neighboring boxes afterwards
Deflagration during nightshift pictures

exterior view from box to wall
Deflagration during nightshift pictures

inside view box, kneader and housing devastated
Deflagration during nightshift pictures

inside view kneader, housing devastated, corrosion due to spray
Deflagration during nightshift pictures

emergency exit

exterior view: access to basement

escape route
Deflagration during nightshift pictures

escape route

exterior view: access to basement
Deflagration during nightshift pictures

exterior view: access to basement
Deflagration during nightshift pictures

inside basement: result of flame front propagation squeeze water barrels filled
Deflagration during nightshift pictures

inside basement: result of flame front propagation remains of empty squeeze water barrels
Deflagration during nightshift pictures

kneader waves removed
Deflagration during nightshift pictures

„Corpus Delicti“?
a piece from the kneader, found during the examination
safety culture (a very brief comparison)

- Extreme short comparison with a catastrophic fire in a surface planting company
safety culture (a very brief comparison)

„When can we start again?“

„What can WE do to prevent such an incident under all circumstances in the future?“

Vgl. Vortrag: ErFa Berlin 2015, Sicherheitskultur
safety culture (a very brief comparison)

safety management reflects safety culture
Thank you for your attention!

Germany, North Rhine Westphalia
Bezirksregierung Arnsberg
Ruhrallee 1-3, Dortmund

Dezernat 53 (Immissionsschutz)
Anlagensicherheit (StörfallV)

Alexander Thomas
Dipl.-Ing. (FH)
Telefon: 02931/82-5436
Fax: 02931/82-47424
Email: alexander.thomas@bra.nrw.de

Team-Email: anlagensicherheit@bra.nrw.de

Internet: www.bezreg-arnsberg.nrw.de/themen/s/stoerfallrecht/index.php