Institute of Refractories Engineers

What Happens When It Goes Wrong

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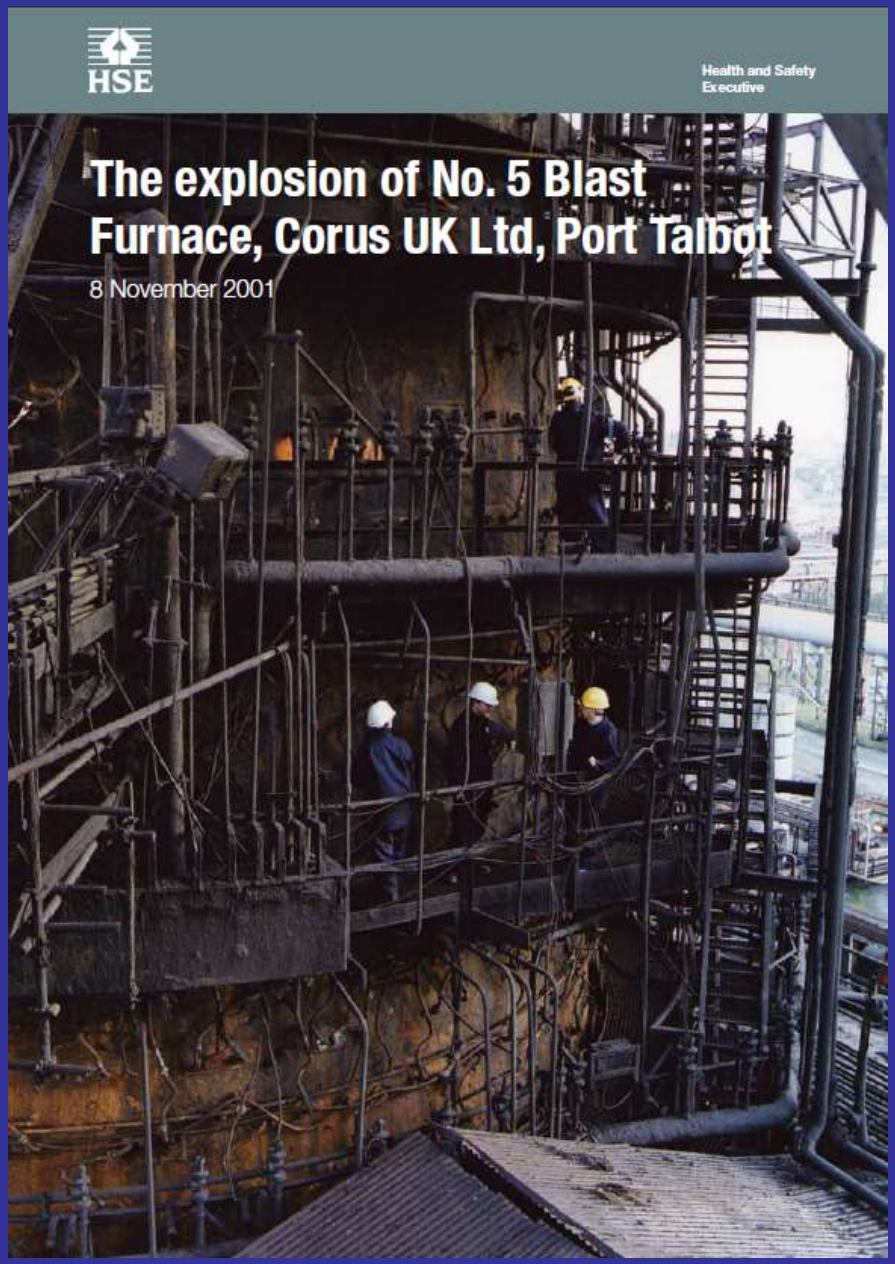
Consequences of Failure

Refractory Failure can lead to

- Loss of Containment of
  - Hot Gas, Liquid and Solid
  - Loss of Pressure Containment
  - Escape of Toxic Materials

- Loss of Production
- Damage to Capital Plant
- Environmental Damage
- Injury and Death



Root Cause Analysis

After the car crash, some damage to bodywork was found.

Was faulty bodywork the cause of the crash?

Just because it is the first thing to suffer does not mean it is the cause.

Mechanical Equipment

Progressive Damage to Taphole refractory

Gas Leakage,
Poor Tapping Stream,
Downstream Costs

Caused by….Change to Operation of
Mechanical Equipment

Solution – Change to Operation.
Costly repair

Material Fault

Pressing
- Lamination
- Density

Firing too fast
- Blackheart
- Cracks

Firing too hot
- Warpage
- Vitrification

Underfiring
- Low Strength
- High Shrinkage

Expansion Allowance

If the correct allowance is not made

- Large forces – damage to plant
- Open joints – leakage, collapse

Brick Sizing, Installation

Large joints,
Movement in rotary kiln
- Leaks
- Damage

Installation – Castable Mixing

Contamination of castable by old, set material

Flash set

Installation – Stop Boards

Stop Boards are needed to prevent shrinkage cracks
Must be removed

Standards

Few relevant standards specifying refractory materials

Compare to

- PD 5500 – Pressure Vessel Design
- EN345 – Safety Boots
- BS 6004 – Electrical Cable
- ASTM A36 – Structural Steel
- BS6102 – Bicycle Lights

Thank You For Your Attention