PROCESS SAFETY AND RELIABILITY ANALYSIS FOR FERTILIZER INDUSTRY

AmmoniaKnowHow.com
NH₃, HNO₃, CH₃OH, NPK, (NH₄)₂(NO₃)₂

owned by Fertilizer Industrial Services Ltd
www.fertilizer.services
AmmoniaKnowHow.com (AKH) comprises a team of ammonia technology specialists and process safety engineers with experience of developing Safety Cases and associated studies for a number of operating organisations in fertilizer industry to ensure compliance with local and international legislative requirements.

For urea technology, we team up with UreaKnowHow.com (UKH) specialists who bring a wealth of knowledge and expertise from urea plants worldwide.

We offer a flexible package of services, providing cost effective solutions to our client's needs acting as ongoing support for process safety team during project development or independent consultants for specific project deliverables.

**Engineering Services**

AKH engineers work within projects to design and engineer the required safety systems for an ammonia and urea installation to meet the intent of codes, standards and legislation and can provide support for all stages of a project from Concept through to Turnover and ongoing support during Operation.

AKH offers process safety engineering and management services for both project development from concept through to operations, and independent case specific engineering consultancy.
Services provided, as described in the later sections, include:

- HAZID, HAZOP, LOPA and SIMOPS workshop facilitation
- Specific ammonia and urea hazard registers development
- Inherent Safety and Design Optimisation
- Regulatory and standards review and assistance for fertilizer manufacturers
- Development of project safety related engineering deliverables
- Assistance in engineering project development for ammonia and urea plants
- Inclusion of safety legislation requirements for the operational facility
- Development of additional process safety and reliability studies and technical notes
- Development and maintenance of Safety Case

### Qualitative risk assessment

Qualitative risk assessment can be based on informed judgement and reference to appropriate guidance.

- Hazard Identification (HAZID) Study
- Hazard and Operability (HAZOP) Study

### Consequence Assessment

Calculation or estimation of numerical values or graphical representations that describe the physical outcomes of hazardous events associated to flammable, explosive and toxic materials with respect to potential impact on human, asset and the environment.

AKH offers the following consequence modelling:

- Flare / Vent Radiation & Dispersion Modelling
- Gas Dispersion Modelling
- Fire / Explosion Consequence Modelling
- Vessel Fire Survivability Analysis
Formal Safety Assessment (FSA) focuses on major accident hazards specific to ammonia and urea technologies. Providing a well-considered, detailed description of a suitable and sufficient FSA within safety case will enable operators to provide evidence of:

- an understanding of the risk and the controls that are critical to managing risk;
- the magnitude and severity of the consequences arising from potential major accidents;
- the likelihood of potential major accidents;
- clear linkages between hazards, the major accidents, control measures and the associated consequences and risk; and
- a prioritised list of actions that reduce risks to a level that is ALARP.

Depending upon the facility the FSA may consist of a number of separate studies including, but not limited to, the following:

- Fire & Explosion Analysis (FEA)
- Quantitative Risk Analysis (QRA)
- Non-Flammable Hazard Analysis (NFHA)
- Temporary Refuge Integrity Analysis (TRIA)
- Emergency System Survivability Analysis (ESSA)
- Escape, Muster, Evacuation & Rescue Analysis (EMERA)
- Bowtie & Safety Critical Element Development
- Performance Standard Development
- ALARP Demonstration Study.
Probabilistic Risk Assessment

Probabilistic risk assessment involves obtaining numerical estimate of the risk from a quantitative consideration of event likelihoods and consequence effects. Specific quantitative tools and techniques are used to estimate the severity of the consequences and the likelihood of realisation of the hazardous effects. AKH offers the following quantitative risk assessments:

- Fault Tree Analysis (FTA)
- Event Tree Analysis (ETA)
- Risk Based Cost Benefit Analysis (CBA)
- Quantitative Risk Analysis (QRA)
- Safety Integrity Level (SIL) Study / Layers of Protection Analysis (LOPA)
- High Level SIL Verification

Safety and Reliability services

AKH offers the following safety and reliability services.

- Hazard Register Implementation
- Reliability, Availability and Maintainability (RAM) Modelling
AmmoniaKnowHow.com developed Fertilizer Industry Operational Risks Database - FIORDA (www.fiorda.eu) - the first global risk register specialised in Ammonia, Urea, Nitric Acid and Methanol technologies. Currently hosting over 1500 incidents and case studies from the fertilizer industry our database grows every day. All cases are documented, assessed and risk ranked. Protective barriers and mitigation measures are recommended for each individual case.

For 2018, we estimate over 2000 incidents and near misses to be recorded in our FIORDA database covering all project phases from Design to Commissioning and Operation.

If you are interested in exploring this database and its benefits, please contact us at dan.cojocaru@ammoniaknowhow.com.

Other services include:

- Greenfield and Revamp engineering support for Nitrogen Fertilizer technologies
- Commissioning, Start-up and Operation support for Nitrogen Fertilizer technologies
- Process Safety Management and risk identification for Ammonia and Urea plants
- Development of Ammonia plants Maintenance strategies
- Ammonia plants turnaround strategy (TAR) support for operators
- Ammonia storage tank decommissioning and inspection support