SAFEX-International
Good Practice Guide – Storage of Solid Technical Grade Ammonium Nitrate

By
International Industry Working
Group on Ammonium Nitrate

Topics

- Background
- Process
- Content: Flowchart, TOC

Industry Participants

- AEL
- Austin Powder
- CSBP
- Dyno Nobel
- EFMA
- ENAEX
- Orica
- Terra
- Yara

Regulatory Environment

- Increasing focus on Security of AN
  - AN use in IEDs
- Regulations in Australia, Canada, USA, EU

Why Develop an Industry Response

- Varied approaches on Safety and Security of AN by the global Competent Authorities
- Many companies manufacture AN in plants located around the world
- Global AN manufacturers want to adopt a single approach, independent of geography
- Some CAs have been supportive of an Industry developed ‘Best Practice’ for AN storage

History of Development

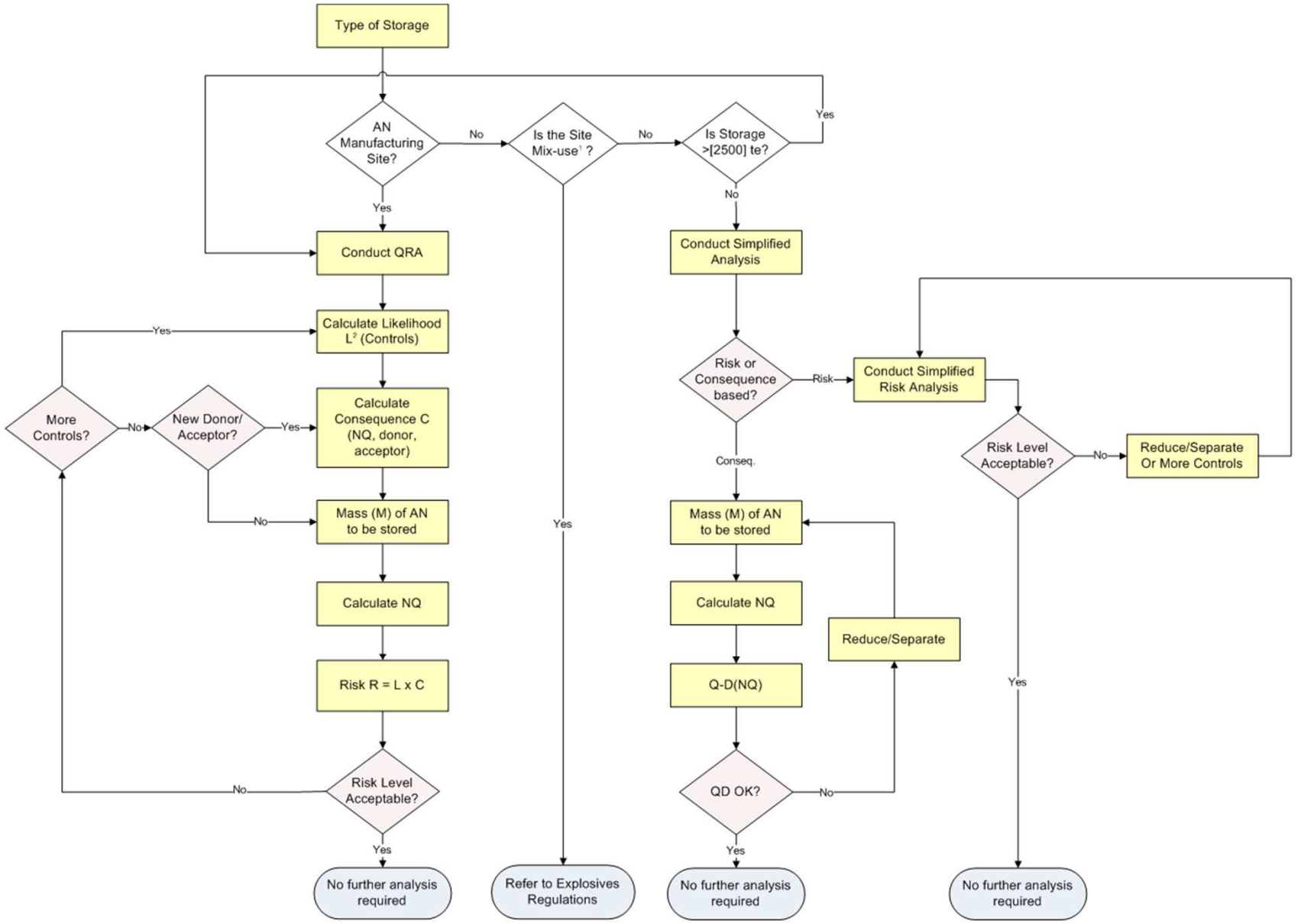
- Initial development of ‘Best Practice’ document in Australia in response to COAG Guidelines
- Global AN manufacturers held series of meetings beginning October 2007
- Presentations made at IGUS/CIE and ANNA Conferences

Process Followed

- Agree the need, and the approach
- Risk-based approach advocated by the group; current methodology used in Industry
  - For manufacturing plants, or for large storage mass of AN, carry out a Quantified Risk Assessment (QRA)
  - If manufacturer or user does not want to apply Risk-based approach (e.g. full QRA will be excessive), guidance is provided for simplified RA
- Working group met to document the various companies' Best Practices

Good Practice Guide (GPG) for storage of Solid Technical Grade Ammonium Nitrate, TOC

Logic for Risk Analysis



1. Likelihood of Event occurring
2. Mix-use = presence of Explosives and Initiating Systems (Class 1)

Storage Facility Location

- TGAN storage is based on minimizing the risk of an event within the storage facility.
  - i.e. for the location of a TGAN store the Likelihood and related Consequences of an incident associated with TGAN at the storage facility must be considered
- The dominant issue for siting and layout of TGAN storage facilities is the possibility of an explosion of a significant mass of TGAN.
- While toxic combustion products may play a key role in design aspects such as fire detection, suppression and emergency response, they are not specifically addressed in this Guide.

Storage Facility Location

- Mitigation of the risk of a mass explosion of TGAN requires:
  - Reducing the Likelihood of an incident by implementing control measures and procedures
  - And/or reducing possible Consequences through:
    - minimizing the mass of TGAN in a given storage unit (bulk pile, bin, or bag stack); and/or
    - increasing the separation distance between TGAN storage units.

Generic Risk Level Table

Qualitative Safety Risk Assessment Matrix - Level of Risk						
Consequence	Notable Event Minor Injury	Significant Event Single MTC	Highly Significant Multiple MTC or 1 LWC	Serious Event Multiple LWC	Extremely Serious Single Fatality	Catastrophic Multiple Fatalities
Likelihood (per annum)						
{A} > 1 Almost Certain	II	II	I	I	I	I
{B} < 1.0 Likely > 10^{-2}	III	III	II	II	I	I
{C} < 10^{-2} Unlikely > 10^{-4}	IV	IV	III	III	II	I
{D} < 10^{-4} Very Unlikely > 10^{-6}	IV	IV	IV	IV	III	II
{E} < 10^{-6} Unlikely	IV	IV	IV	IV	IV	III

I = HIGH II = MEDIUM III = MODERATE IV = LOW

Separation of TGAN Stacks, Piles and Silos

- A storage facility may contain one or more bag stacks, bulk piles or silos of TGAN.
- Separation distances are required to prevent a detonation in a stack or pile initiating adjacent stacks or piles.
  - If separation requirements are met, the quantity of TGAN considered as a potential explosive source is the quantity in each individual stack or pile.
  - If separation requirements are not met, the quantity of TGAN in the individual stacks or piles must be summed to give the size of the potential explosive source.
- This has important consequences in a risk assessment process

Separation Distances for Various TGAN Types

TYPE OF AN	TYPE OF STORAGE	MAX. MASS PER PILE (TE)	SEPARATION BETWEEN PILES (M)	Configuration
High density TGAN	Bags, IBCs	As determined by the QRA	[1]	
Medium Density TGAN	Bags, IBCs	As determined by the QRA	[9]	Normal
Medium Density TGAN	Bags, IBCs	As determined by the QRA	[7]	Pyramidal
Low density TGAN	Bags, IBCs	As determined by the QRA	[16]	Normal
Low density TGAN	Bags, IBCs	As determined by the QRA	[9]	Pyramidal
	Bulk	> 500	tbd	
	Bulk	< 500	[8]	

Status

- The document is now released as a SAFEX Good Practice Guide.
- It is the intention to update the Guide when new data is available

Contact

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Thank You