“What we anticipate seldom occurs; what we least expected generally happens.”

- Benjamin Disraeli (1804-1881)
- Prime Minister 1868, 1874-1880
What If.....?
Shreveport, LA, 1984

Asst. Chief Pat Johnson
72% body burn
SURVIVED

Capt. Percy R. Johnson
95% body burn

Rem 0:03 SP
DIED 36 hrs following incident
Bhopal, India - 1984
What If…?

- …there’s misinformation…
- …there’s bad reporting…
- …they just don’t care…
But -- What if…?

- ...you do care, what can you do about it?

- Think of your expertise and education...
  - ASP, CSP, CIH, OHST, EMT, BA, MA, PhD, etc, etc, etc

- So you do care, and because you do...
  - You communicate, coordinate, drill, train, exercise, educate, motivate…
So … Is Ammonia Important to us?

- You bet
- Critical
- Irreplaceable
Fritz Haber (1868 - 1934)
Carl Bosch (1874 - 1940)

Patented
13 Oct, 1908

Nobel Prize 1918 - Chemistry

Nobel Prize 1931 - Chemistry
Applications

- Fertilizer
- Refrigeration
- Food Processing
  - “Pink Slime”
- Water treatment
  - Waste Water
  - Drinking Water
- NO\textsubscript{x} control
  - Air quality
- Synthetic textile fibers
- Household cleaners
  - Windex
- Car air bags
- Explosives
- Pharmaceuticals
  - Including methamphetamine
<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical formula</td>
<td>NH$_3$</td>
</tr>
<tr>
<td>Colorless liquid or gas</td>
<td>pH – 11.6</td>
</tr>
<tr>
<td>Boiling point</td>
<td>-28°F</td>
</tr>
<tr>
<td>Freezing point</td>
<td>-107°F</td>
</tr>
<tr>
<td>Odor threshold</td>
<td>5 to 50 ppm</td>
</tr>
<tr>
<td>Permissible exposure limit</td>
<td>25 ppm (CA)</td>
</tr>
<tr>
<td>IDLH</td>
<td>300 ppm</td>
</tr>
<tr>
<td></td>
<td>50 ppm (Fed)</td>
</tr>
</tbody>
</table>
And…

- **Vapor density**: 0.589
- **Liquid density**: 5.15 lb/gal 60 °F
- **Aerosol**: -101.2 °F
- **Flammability range**: 16% to 25%
- **Coefficient of expansion**: 1 to 850
- **Reactivity – copper alloys, zinc, chlorine, some heavy metals**
- **Reportable quantity (RQ)**: 100 lbs/18 gal
Ammonia Delivery Infrastructure
Atmospheric Storage
Explosion/Ignition Potential

\[ 2 \text{NH}_3 + 1203.8^\circ F \rightarrow \text{Ignition Point} \]

\[ 850^\circ F \]

\[ \text{Ignition Point} \]
Pressure Change

-28° F. 0 psig
-70° F. 114 psig
114.6° F. 250 psig
Volume Change

4488 lbs

800 gals.

916 gals.

4488 lbs

40° F.

100° F.
Personal Protective Eqpt. (PPE)

Chemical goggles

Gloves

Long sleeves/trousers

Respirator
What If We Don’t Use The Right PPE?
Emergency First Aid

Inhalation

Ingestion

Skin contact
Eye contact

Water, Water, more Water
(Minimum 30 min. continuous flush)
Crisis Avoidance Model

- **ANTICIPATE** (Early thinking) (PHA)
- **PLAN** (Put actions on paper) (RMP/PSM)
- **TRAIN** (Practice real scenarios)
- **REVIEW** (Debrief and improve)
- **ACT** (Keep, Stop, Start)

- Dr. Steve Albrecht, PHR, CPP, BCC, 2013
- Common theme here?
Release Phases

- Liquid
- Aerosol
- Dense Gas
- Trace Gas
Reactions with water
Evacuation

- Know the alarm sound
- Know your facility emergency exit routes – primary and secondary
- Know the emergency evacuation gathering points – primary and secondary
- Know *what your role is* during an emergency event
Shelter In Place

- All inside
- Close doors, windows, fireplace vents
- HVAC off
- Seal gaps
- Battery operated radio, flashlights
- Monitor local TV stations
- Leave when advised of safety
Why Plan and Who’s At Risk?

- Small to medium-sized businesses are often most susceptible to the long term affects of an emergency.
- Small businesses are a vital part of the U.S. economy:
  - 99% of all employers
  - 75% of all net new jobs
  - 97% of all U.S. exporters
So…….What If……

■ We really cared about them --
  ■ employees, neighbors, etc.
■ We really communicated with them,
■ We really trained them,
■ We really delivered to them…

■ We would actually meet their expectations
Summary

- What if…
- Where is it…
- What is it…
- What do I do if…
- So, What if we…
  cared, communicated, trained, delivered, and met expectations?
This is going to end in disaster, and you've no one to blame but yourself