<table>
<thead>
<tr>
<th>No.</th>
<th>Hazard Description</th>
<th>Location</th>
<th>Failure Mode</th>
<th>Hazard Event</th>
<th>Unmitigated Risk</th>
<th>Risk Register Hazards in Urea Plants</th>
<th>Unlikely Risk</th>
<th>Unlikely Mitigation</th>
<th>Unlikely Mitigation Phase</th>
<th>Unlikely Mitigation Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Leaking flange of CO2 line</td>
<td>HP pump</td>
<td>Failure of flanged head</td>
<td>pressure carbamate condenser</td>
<td>Catastrophic</td>
<td>(12)</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>2</td>
<td>Failure of flanged head</td>
<td>pressure carbamate condenser</td>
<td>Operating melt pump with</td>
<td>High pressure in suction line due to</td>
<td>Catastrophic</td>
<td>(11)</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>3</td>
<td>In case of a leak stop the plant.</td>
<td>HP flush pump</td>
<td>Change in pump's</td>
<td>rotation</td>
<td>Catastrophic</td>
<td>(10)</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>4</td>
<td>Do not compromise on safety:</td>
<td>Steam boiler</td>
<td>Prepare Standard Operating Procedures for operators and for start up and shut down phase.</td>
<td>Strictly done with nitrogen.</td>
<td>Catastrophic</td>
<td>(9)</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>5</td>
<td>Be aware that condensing steam / gases by a cold stream can easily create vacuum, install a water</td>
<td>HP NH3 valve</td>
<td>Make use of experienced and reliable fabricators for HP equipment and piping.</td>
<td>Proper interdepartmental communication to be ensured between</td>
<td>Catastrophic</td>
<td>(8)</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>6</td>
<td>After a start up. Personal should be aware of the risks of CO2.</td>
<td>HP pump</td>
<td>Assure proper functioning of pressure control valve and relief valve</td>
<td>Catastrophic</td>
<td>(7)</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>7</td>
<td>Apply proper maintenance procedures and experienced and qualified services companies. Apply the</td>
<td>HP Equipment</td>
<td></td>
<td>Daily holding of the julla to be made foolproof</td>
<td>Catastrophic</td>
<td>(6)</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>8</td>
<td>Second holding of the julla to be made foolproof</td>
<td>Feed</td>
<td></td>
<td>Is clear, perform job safety analysis to identify unsafe situations (e.g. no escape path close to 3-way</td>
<td>Catastrophic</td>
<td>(5)</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>9</td>
<td>After a start up. Personal should be aware of the risks of CO2.</td>
<td>HP equipment</td>
<td></td>
<td>Do not compromise on safety: In case of a leak stop the plant.</td>
<td>Catastrophic</td>
<td>(4)</td>
<td>High</td>
<td>High</td>
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<td>Prepare Standard Operating Procedures for operators and for start up and shut down phase.</td>
<td>HP equipment piping</td>
<td></td>
<td>In case of a leak stop the plant.</td>
<td>Catastrophic</td>
<td>(3)</td>
<td>High</td>
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<td>High</td>
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<tr>
<td>11</td>
<td>Do not compromise on safety:</td>
<td>HP equipment piping</td>
<td>Strive for proper handling procedures and hydrogen handling practices in</td>
<td>In case of a leak stop the plant.</td>
<td>Catastrophic</td>
<td>(2)</td>
<td>High</td>
<td>High</td>
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<td>High</td>
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<tr>
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<td>Catastrophic</td>
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</table>
Safety valve plus high pressure switch to realize the required Probability of Failure on Demand.


In case of a leak stop the plant.

Apply non-cavitating safety valves in cases where the gas systems operate at high pressure. The design should be made to allow for installation of safety valves that would close by themselves when the pressure exceeds the design pressure.

Be aware that high pressure lines / valves can contain high pressure pockets and apply proper design and non-cavitating safety valves. Never apply a clamp on a carbamate containing areas especially in plants older than 20 years.

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Assure sufficient isolation possibilities (remotely controlled block valve) to limit spread.

Sight glass include the HP carbamate equipment (reality glass on the HP seal). Apply pressure monitoring, not on the discharge (discharge HP carbamate pumps). Perform proper (also preventive) maintenance on HP pumps, stuffing boxes have a limited lifetime.


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Liner Rupture of urea reactor due to backflow of corrosive carbamate vessel with water and bad design leak flushing of leak detection system corrosion cracking of carbon steel weld clip to liner corrosion due to weld defect in Rupture of reactor due to active crystallise) with process fluids which easily pressure in the recirculation CO2 breakthrough with ammonia HP centrifugal carbamate pump lines during sampling.


Plant Safety - A Incident 16-004 Plant Safety - A Incident 10-001


Plant Safety - A Incident 16-004 Plant Safety - A Incident 10-001


Plant Safety - A Incident 16-004 Plant Safety - A Incident 10-001

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<th>Incident</th>
<th>Equipment</th>
<th>Process</th>
<th>Location</th>
<th>Description</th>
<th>Outcome</th>
<th>Detection Method</th>
<th>Prevention Method</th>
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<td>Incident 64-001</td>
<td>Hydrolyser pump</td>
<td>Synthesis</td>
<td>HP</td>
<td>High pressure feed, close to thermowell</td>
<td>Catastrophic</td>
<td>Conductivity measurement on steam side of HP heat exchangers leak in tubes or tube-tubesheet welds</td>
<td>Pay attention to proper alignment, perform regular and preventive checks on condition (vibrations) of continuous corrosion measurement (EMERSON Permasense). Refer to: <a href="http://www.ureaknowhow.com/ukh2/round-table/viewtopic.php?f=33&amp;t=1294">table/viewtopic.php?f=33&amp;t=1294</a></td>
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<td>Incident 94-001</td>
<td>HP equipment</td>
<td>Urea Reactor</td>
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Leak in overlay weld was detected in plant. 5 people get injured, a great deal of damages, 5 days plant shut down, no casualties.

Leak in HP drain valve due to steam side damaged due to erosion corrosion.

Tubesheet of PoolCondenser and urea to reaction between hypochlorite and urea.

Explosion poly-ethylene tank due to leaks from weld defect.

High Pressure reactor offgas line dead end design to condensation corrosion and carbamate gas line ruptures due to plant drain system due to combining NH3 and urea.

Explosion ammonia water tank.

Waste water from urea plant, Ammonia detectors alaram, plant shut down, no casualties.

Large ammonia emission, plant was shut down, no casualties.


