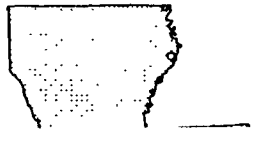
REACTIVE CHEMICALS REVIEW

1994

PROCESS RISK MANAGEMENT



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From: DTAYLOR
Sent: Wednesday, July 24, 1996 9:39 AM
To: DWTAYLOR

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THE REACTIVE CHEMICALS REVIEW PROCESS

THE REACTIVE CHEMICALS THOUGHT PROCESS
The thought process, shown below, addresses areas that need to be examined in preparation for the Process Review. The focus of reactive chemicals concerns can be quite different for the various functions. Therefore, it is necessary that each group anticipating a review, consider the impact of potential hazardous reactive chemicals situations. This thought process is appropriate for process changes, project reviews, mini reviews, consolidated audits, and all aspects of the management of reactive chemicals.

The significance of the twelve areas outlined below will vary from one operation to another. Use these areas as a checklist to provoke questions about your process. Include in your package your responses to these issues. They are designed to cause you to think about the potential energy of your system and the conditions of its release.

The thought process is one of stimulation: It should assist your group's continuous improvement of it reactive chemicals awareness.

1. Review the entire Louisiana Division Reactive Chemicals Program Manual. (Safety Menu on the VAX)

2. Review the status of action items from the prior audit or review.

3. Describe the PROCESS CHEMISTRY; the following areas should be addressed:

HEATS OF REACTION: [Calculate maximum temperature rise(s) from reactive chemicals data.] Even though this represents an important part of the process knowledge, they are often left out, incorrect, or not known. Heats of reaction are basic data required for worst case scenarios. Include the data for delta Heat of reaction in the process flow sheet display of Reactive Chemicals data and in the chemistry for the principle reactions. Use consistent units throughout; do not mix joules/gm, BTU/lb mole, BTU/lb, kcal/mole.

INDEX FLOW SHEETS WITH TEST DATA: Develop a schematic or block diagram (an index flow sheet works well here) showing flows of chemicals and key process steps. Show the points where reactive chemicals testing has been done. List the tests and the data as a summary, giving Exotherm onset temperature, maximum temperature and total energy. The operating and maximum temperatures should also be shown on the diagram so that they may be compared with the reactive chemicals data. Not all tests will be shown on the process flow

sheet, e.g., sawdust and chemicals.

POTENTIAL ENERGY: The potential energy available from mechanical sources (such as pressure) and from chemical sources must be evaluated. The potential chemical energy is considered to be the worst case recombination of the atoms present to release the maximum amount of energy. This is normally a conservative assessment but follows the evaluation of potential hazards in the event of safety precautions do not perform appropriately. This potential chemical energy is often evaluated using computer programs such as CHETAH or CRUISE.

RAW MATERIAL IDENTIFICATION: Describe how confirmation of chemical identity is accomplished, such as lab chemical analysis procedures used. Consider the source of materials and likelihood of receiving "look-alike" chemicals from supplier.

MATERIAL BALANCE: The index flow sheet will yield sufficient detail. This information is used to determine areas of need for reactive chemicals information.

WASTE DISPOSAL: Describe the fate of waste generated during the process. Include absorbents used to handle spills, the testing performed to determine suitability, and procedures used to dispose of all waste materials, including temporary in-block storage procedures. Describe the venting and header system(s) that connect the process overheads to prevent incompatible mixing.

MATERIALS OF CONSTRUCTION: Outline procedures for maintaining integrity of materials of construction supplies. Describe confirmation of identity, if appropriate.

4. Describe the PROCESS CONDITIONS, highlighting the main process(es). Pay particular attention to the following areas of concern:

    Side reactions, including impact of water, ambient temperature extremes
    Catalysts, desired and undesired
    Inhibitors
    Relief devices
    Raw materials storage

Compare the reactive chemicals test results with the unit's process condition, i.e., compare temperatures and extremes to onset temperature of the thermal event. Are any chemicals scenarios apparent? Be prepared to discuss.

5. Review the RAW MATERIALS and PRODUCTS for Reactive Chemicals data on storage of these materials. Describe any information, relating to storage needs of the product, that the customer should be made aware. Has the appropriate data been obtained for product made in commercial quantities?

6. Review status of the COMPATIBILITY CHART; revise to reflect changes in the process. Existing charts will be audited for completeness and relevance of the data. If a new chart is needed, contact Reactive Chemicals Testing for assistance. Use the computer program CHEMPAT to generate the compatibility chart.

7. Describe the MANAGEMENT OF CHANGE PROCESS system in place for the process under review.

8. Review the TRAINING programs for Reactive Chemicals that are used in the block. Describe the training modules and the worst case scenarios drills used to train personnel.

9. The HAZOP (Hazard and Operability) study is a flexible technique for process safety and reliability analysis. Describe any HAZOP analyses, or other hazard evaluation processes, that have been performed, or are planned.

10. Review, and include in the package, WORST CASE SCENARIOS for the process. Consider the plant's INCIDENT HISTORY. Use the HAZOP approach, where appropriate, to review the following areas:

    CHEMICALS - process and those not directly involved in manufacture. In particular, review the presence of heels, the impact of low/high flow rates and backflow, the presence and/or absence of catalyst and inhibitors, the potential for peroxide formation, and the effect of variation in composition.

    EQUIPMENT - performance deviations. In particular, review the impact of failure in weigh cells, relief systems, agitators, static mixers, exchangers, pumps, scrubbers, critical instruments. Review the possibilities of too high or too low pressure, temperature, and/or flow.

    UTILITIES - total and partial loss; include pipeline sources of raw materials.

    STARTUP/SHUTDOWN/TURNAROUND - Review special concerns and scenarios. Show calculations to support your worst case scenarios, for example adiabatic temperature rise.

    Review your AREAS OF CONCERN; be prepared to discuss these as an integral part of the review process.

11. Review LINES OF DEFENSE in light of the worst case scenarios described in the previous section. Lines of defense are provided by integration of the following types of activities into the plant's operations:

    Training
    Monitoring equipment
    Alternate strategies in the program code
    Instrumentation, such as on-line analytical or critical instruments
    Raw material analysis and confirmation
    Material handling procedures

Include in the package WORST CASE SCENARIOS and describe the LINES OF DEFENSE set up to handle the situation. Stress the interpretation of your answer(s). Use HAZOP and/or incident histories as a source of scenarios.

12. Use the "Review of Reactive Chemicals Concerns" to think through the state of the plant's program in the areas addressed in the document. That section is not a questionnaire to be answered in a 'yes/no' mode. Rather, the intention of it is to stimulate (re-)examination of areas of the process that have the potential for an incident. It is also a tool to assist in review preparation. Include your written comments and observations to "Review of Reactive Chemicals Concerns" in the review package.

STRATEGY FOR REACTIVE CHEMICALS REVIEWS
All reactive chemicals reviews are comprised of these major steps:

- Reactive chemicals thought process.

- Review of reactive chemicals data for relevance and integrity.

- Preparation and delivery of package to Reactive Chemicals team members who will attend the audit or review.

- Formal presentation of review package.

- Discussion of reactive chemicals concerns.

- Recommendations letter, action plan response, implementation of findings.

The nature and extent of each section is determined by the particular review. Other sections of this manual provide overviews and details of the Reactive Chemicals thought process, how the review will be conducted, and what follow-up actions may be taken.

TYPES OF REACTIVE CHEMICALS REVIEWS
Safety and Loss Prevention Standard S-315, Reactive Chemicals, outlines several situations where a reactive chemicals review is required. These situations are covered by the following review types:

CONSOLIDATED AUDIT/THREE-YEAR PROCESS REVIEW
The reactive chemicals consolidated audit is a part of the consolidated audit procedure for production plants. The reactive chemicals audit usually occurs during the morning of the third day of the consolidated audit. Operations outside the scope of the consolidated audit system also have three-year process reviews. These include research groups, pilot plants, TS&D, and some utility groups.

Focus of the periodic Reactive Chemicals review will be:
- To ensure adequacy of training and deployment of understanding
- To ensure proper depth and breadth of Reactive Chemicals Operating Discipline

1. To insure that sufficient emphasis is placed upon the periodic Reactive Chemicals audit, the Reactive Chemicals Committee shall set a specific audit frequency for each department, with SLT approval. The review frequency should be a minimum of three years.
2. Plant staff should participate, where appropriate as determined by the superintendent, in the review process.
3. Check for deployment of understanding and adequacy of training:
   Review procedures for Reactive Chemicals concerns
   Review IPT tests for Reactive Chemicals concerns
   Conduct personal interviews with all levels of plant staff
   Pose "what if" scenarios to check for correct responses
   Review training records
4. Check for Reactive Chemicals Operating Discipline:
   Prevention and mitigation of key scenarios
   - Controls
   - Alarms
   - Procedures

Information and data agree with Tech Center recommendations
5. Plant superintendent will ensure that follow-up activity is done in a timely fashion.

NEW SUPERINTENDENT REVIEW
The new superintendent review occurs within three months of that individual's appointment. The intention of this review is to determine the familiarity the new superintendent has with the reactive chemicals concerns and issues of the unit. The review also provides the superintendent with the opportunity to revise the reactive chemicals data relevant to the unit. Prior to superintendent "completing" the Reactive Chemicals IPT for his/her plant, Tech Center Manager will co-sign level three MOC's.

New Superintendent Review Process
Focus of the New Superintendent Review will be to ensure that the new superintendent demonstrates sufficient knowledge base of Reactive Chemicals for his/her operating unit.

1. Business manufacturing leader will be invited.
2. Superintendent will demonstrate satisfactory knowledge of the behavioral items listed in the superintendent expectations and behaviors section of this manual.
3. Co-Chairman and superintendent's manager or coach will determine the follow-up action required, if any (i.e., satisfactory, further specific review follow-up required, etc.).
4. Superintendent shall present the review.
5. Area engineers and operations supervisors shall attend, where possible, to increase their Reactive Chemicals awareness

CAPITAL AUTHORIZATION REVIEW
This is a review of any capital authorization project that may have reactive chemicals concerns. Committee c0-chairperson should be contacted a few weeks before the review to allow time for completion of any reactive chemicals testing that may be necessary.

PHASE III PACKAGE REVIEW
Major projects are reviewed at several points during the preparation of the package. During the earlier reviews, the overall reactive chemicals concerns should be determined and appropriate test data collected. Generally, by the time th Phase III review is conducted, the project has reached a stage where sufficient engineering is complete for the process to be well defined. The Phase III review generally covers more details of the project.

MANAGEMENT OF CHANGE REVIEW
This review is conducted before any significant change is made in the process which may affect its chemical reactivity (pressure, temperature, catalyst, materials of construction, raw materials, etc.). Project Review: Plant superintendent will coordinate with Reactive Chemicals Committee and Technology Center to determine magnitude of review needed for the specific project in question.

REACTIVE CHEMICALS INCIDENT INVESTIGATION
In the event of a reactive chemicals incident, the investigation should be conducted as soon as possible after the incident is under control. Members of the Reactive Chemicals Committee should be involved in all aspects of the incident investigation. Notify a Reactive Chemicals committee co-chairperson after an incident has occurred.

WASTE HANDLING REVIEW
This review is conducted before any significant change is made in how a chemical waste is handled from when it is generated until its final disposal.

REACTIVE CHEMICALS REVIEW AGENDA
The reactive chemicals review meeting will comprise of the major steps, described below. The emphasis level and attention placed on each step will vary for each type of review. Prepare a presentation to cover the package submitted to the Review Team four weeks prior to the review meeting. A general outline of the presentation is given below; the exact nature of the presentation will depend on input from the plant's Reactive Chemicals committee consultant as to what areas of the Reactive Chemicals program should be emphasized. Remember, the audit team will have already reviewed the package and does not need to have a verbatim presentation of it at the audit meeting.

A. PROCESS CHEMISTRY: Summarize the contents of the package pertaining to the process.

B. LETTER OF RECOMMENDATIONS: Review status from the previous review (or audit), thereby completing that correspondence.

C. SCENARIOS & LINES OF DEFENSE: Review past incidents in the technology (brief descriptions only); present at least two worst case reactive chemicals scenarios derived from HAZOP or other hazard identification procedures for your process; present your lines of defense as reviewed in the package.

D. CONTINUOUS IMPROVEMENT ITEMS: Discuss items and/or areas for improvement that have emerged during the preparation for the review.

E. QUESTIONNAIRE BY EXCEPTION: results of your review of the process using the "Reactive Chemicals Questionnaire ". This is not a question and answer session, but a forum for discussing your thoughts on plant reactive chemicals concerns stimulated by this document.

F. PRE-REVIEW RESPONSES: Discuss the responses from the Committee arising from the pre-audit review of your package. Cover those items that have not been referred to in A through E, as requested by the Committee during the review.

POST REVIEW ACTIONS
A Committee co-chairperson will send a letter of recommendations to appropriate individuals. A copy of this letter is also sent to the plant superintendent and major manager. A response to the letter is required within 60 days of receipt of the recommendations letter for a consolidated audit and within 30 days for other reviews. The response should address each recommendation indicating actions that will be taken, and a timetable for completion of those actions. Since these are recommendations, rather than requirements to act on, it is not required that the respondent take the recommended action noted in the letter. However, it is required that a response is given to each recommendation. If a recommendation is not followed, give the rationale for not following the recommendation. Often alternative actions are appropriate.

[EOB]

REACTIVE CHEMICALS
Solvents/EDC-1

Chlorine is highly reactive and will react with hydrocarbon. Never use grease or oil where the potential for coming in contact with chlorine exists?

True! Chlorine is highly reactive and hydrocarbon containing greases and oils are not used on components that are in Chlorine service.

If a lubricant is necessary to use on a piece of equipment, instrument, or valve component that is in a chlorine containing process stream, then use the following lubricant only?

Florolube, non-hydrocarbon containing lubricant.

Why is it important to install specially cleaned valves in a chlorine line?

Oils and greases that are normally in valves will react with Chlorine.
The oils and grease will oxidize and burn when it comes in contact with Chorine.

What is the reactive chemical concern regarding why Vinyl 2 acid is not taken in the Per/Tet plant?

Vinyl 2 acid contains Acetylene (a hydrocarbon) that will react with chlorine.

When working on the P-510's, the milwrights use a grease to insert the "O" rings when putting the seals together. What kind of grease do they use to accomplish this?

Florolube, because the P-510's are in chlorine service and a hydrocarbon grease would cause a serious reaction.

Why is D-42B rinsed out after burning oil?

Hydrocarbons, such as oil, react with violently with chlorine. The flushing of D-42B is done to eliminate the risk of a chlorine containing feed being introduced into D-42B that would mix with oil left in the tank causing a reactive chemical incident.

Prior to loading an acid truck, the pH is checked on either the heel or moisture on the walls. What must the pH be in order to be OK to load?

A pH of 9 or less

What metal rail cars can we not load into? Cars made of Aluminum

Where can you find out what metals are acceptable for contact with the products made in Solvents/EDC-1 plant?

TEDER Sheets
MSDS Sheets

Why is there a low level trip on the EDC reactors?

So that there is always enough product to absorb the heat generated by the EDC reaction, and enough liquid height in the reactor bed to keep the reaction from occurring in the vapor space of the reactor.

Why is there a high pressure trip on the EDC reactors?

To prevent relieving of the safety valves by stopping any reaction that is causing the high pressure condition. If we did not have this trip, the pressure going unchecked could not only relieve the safety valves but there would be a risk of damaging equipment as well.

What causes a high enough temperature in an EDC reactor system to make it shutdown?

Reactor becoming chlorine rich. EDC reaction in vapor space of reactor.

Liquid chlorine getting into reactor causing uncontrollable reaction.

Are aluminum and Freon 22 reactive?

YES!

When is fly ash used, and when is soda ash used?

Fly Ash is used to bind (absorb) water. It does not neutralize like Soda Ash does.

While Soda Ash can be used on the ground to neutralize acid spills, What happens if Soda Ash is used to neutralize material in a drum or other enclosed container?

A reaction in the container that can lead to over pressuring problems.

What is the block policy for transferring of products and process materials using tubing verses hard pipe?

When transferring of products/process materials last more than one shift, the transfer must be hard piped, or someone must remain in the area the whole time a transfer is going on. When transferring material, consider the material being transferred and the area you are working in. Determine if there is a better way to transfer the material other than using tubing. Always consider the potential if the tubing breaks.

Why is a new piece of carbon steel pipe or vessel passivated prior to putting into anhydrous HCL service?

To prevent the reaction between rust on the pipe walls with AHCL which forms water which damages the pipe.

What happens if "carbon" being used for absorption (carbon Drums) or adsorption (VRU beds) is not pre-conditioned?

Too much heat is generated.

What gas is generated as a result of corrosion on an aqueous HCL tank when there is a leak in the rubber lining?

Hydrogen

Why are the pipelines coming from Glycol 1 for the reactor vents made of titanium?

Because titanium is suitable for wet Chlorine service, and this vent stream contains wet Chlorine gas.

Why should titanium not be used?

When Dry Chlorine is present.

Why is Allyl PDC sent to the Per/Tet reactor separate from D-220 feeds?

At one time, it was thought to cause polymerization in E-220's due to heat, and so we elected to separate the Allyl PDC feed from the D-220 feeds.

What can happen to a bed in the VRU system when oxygen (O2) gets into it?

The Carbon will heat up and can have an oxidation reaction (burn).

What is the reactive chemical concern regarding ferric chloride?

Heat is generated when ferric chloride is mixed with EDC and ferric chloride is very corrosive when mixed with water.

Why is it so important have an air mover on a piece of equipment made of carbon steel for a confined space entry (other than because the S & LP says you must)?

Oxygen in air reacts with iron in the vessel to form rust, depleting the concentration of oxygen in the vessel which can cause asphyxiation. A carbon steel tank that has never been closed up or connected to a process can be dangerous to enter due to rust robbing the oxygen in the tank atmosphere.

Why is there a high temperature shutdown on the EDC vent compressors, the K-5's?

High temperatures from heat of compression can precipitate a reaction between the ethylene and oxygen in the vents that will result in higher temperatures and fire.

When loading a tank truck that is compartmentalized, can two products that are reactive with each other be loaded into separate compartments?

No!

Why should C-510 be shutdown upon high temperature?

To prevent chlorine from getting into the K-520 system, and this in turn resulting in a chlorine-iron fire.

Why is there a high temperature shutdown based on the inlet line temperatures on the Per/Tet reactor?

To alarm in the case where the reaction is occurring in the inlet line rather than in the reactor itself. Unlike the reactor, the inlet line is not brick lined and cannot handle the high temperatures of reaction.

Why is there a high temperature shutdown on the Per/Tet reactor based on the temperature in the ethylene line?

To detect a reaction occurring in the ethylene line rather than in the reactor itself.

At one time, T-104 was used as a knock out tank for EDC vents to K-5's. Why was D-340, the current EDC vent knock out pot installed?

Because T-104 volume was too large to risk a reaction in situations where the vents might go chlorine rich.

What happens when liquid chlorine gets into Per/Tet reactor?

Potential violent reactions.

Why are there low pressure trips on D-220?

To insure that their is no back flow of reactor contents into D-220.
The reactor runs with an excess amount of chlorine, and so if the reactor contents were backed up into D-220, the hydrocarbon feeds in D-220 would react with the excess chlorine coming from the reactor.

Why is Tet sent rather than Per to Chlorine and CA2 for their taffy pots?

Tet is not reactive with the Chlorine and Per is reactive.
There was a taffy pot that was blown up in CA2 that contained Perchlor and Chlorine.

REACTIVE CHEMICAL QUESTIONS FOR PSM 5-12-95

What gas is generated as a result of corrosion on an aqueous HCl tank when there is a leak in the rubber lining?

*hydrogen
nitrogen
oxygen
chlorine

Why is D-42B rinsed out after burning oil?

Because oil doesn't mix with organics
*Because oil reacts with organics
Because an oil-organic mixture won't burn
Because an oil-organic mixture will plug the piping

Why are the pipelines coming from Glycol 1 for the reactor vents made of titanium

*Because there is wet chlorine in that vent stream
Because there is dry chlorine in that vent stream
Because there is propylene in that vent stream
Because there is caustic in that vent stream

When should titanium not be used

When wet chlorine is present
*When dry chlorine is present
When liquid chlorine is present
When gaseous chlorine is present

When should tantalum be used

When wet chlorine is present
*When dry chlorine is present
When liquid chlorine is present
When gaseous chlorine is present

Why is allyl PDC sent to the Per/Tet reactor separate from D-220 feeds

*It would polymerize in the E-220s due to the heat
It would react with the other feeds causing large amounts of heat to be generated
Nothing, they would mix
They would not mix and would layer out

What can happen to a bed in the VRU system when oxygen (O2) gets into it?

The carbon will stop working to adsorb organics
*The carbon will heat up and can have an oxidation reaction (burn)
The carbon will be destroyed by crumbling
Nothing, the O2 will pass on through to the outlet stack

What is the reactive chemical concern regarding ferric chloride?

Heat is generated when ferric chloride is mixed with EDC in the iron drum (T-110)
Ferric chloride is very corrosive when mixed with water
*Both A and B
There are no reactive chemical concerns

Why is it so important to have an air mover on a piece of equipment made of carbon steel for a vessel entry (other than because the S&LP says you must)?

To keep the vessel cool
*The oxygen in the air reacts with the iron in the vessel to form rust, depleting the concentration of oxygen in the vessel which can cause asphyxiation
To sweep any residual organics out of the vessel
There is no other reason

Why is there a high temperature shutdown on the EDC vent compressors, the K-5s?

So that the machine will not be totally wrecked due to a mechanical failure
High temperature (actually a fire) can be caused by a reaction between the ethylene and oxygen in the vents especially after being compressed
*Both A and B
Neither A nor B

Why is there a low level trip on the EDC reactors?

So that there is always enough product to send to the lights columns
So that there is always enough product to absorb the heat generated by the EDC reaction
So that there is enough liquid height available to keep the reaction from occurring in the vapor space in the reactor
*Both B and C

Why is there a high pressure trip on the EDC reactors?

To keep the safety valves from relieving
To keep from damaging the equipment
To stop any reaction that is causing the high pressure
*All of the above

What causes a high enough temperature in an EDC reactor system to make it shutdown?

The EDC reaction occurring in the vapor space of the reactor
If the reactor becomes chlorine rich, the vents will mix with ethylene in the ejector jet piping causing high temperatures
Liquid chlorine getting into the reactor and causing an uncontrollable reaction
*All of the above

What happens to an EDC reactor if liquid chlorine rather than gaseous chlorine gets into it?

An uncontrolled reaction between chlorine and ethylene occurs causing high temperatures in the reactor
An EDC in Cl2 mixture is explosive in the 2-60% range. This range can occur above the boiling bed due to the large amount of heat being generated by the reaction in answer A, vaporizing large amounts of EDC into the vapor space

Neither A nor B
*Both A and B

Are aluminum and FREON 22 reactive?

*Yes
No

When is fly ash used?

*In a drum or other vessel to bind (absorb) water
In a drum or other vessel to neutralize acid
On the ground to neutralize acid
Both B and C

When is soda ash used?

In a drum or other vessel to bind (absorb) water
In a drum or other vessel to neutralize acid
*On the ground to neutralize acid
Both B and C

Prior to loading an acid truck, the pH is checked on either the heel or moisture on the walls. What must the pH be in order to be OK to load?

*9 or less
9 or greater
6 or less
6 or greater

What metal of rail cars can we not load into

Carbon Steel
*Aluminium
Both A and B are OK

Where can you find out what metals are acceptable for contact with the products made in this plant?

TEDER sheets
MSDS sheets
Ask your supervisor
*Both A and B

When loading a tank truck that is compartmentalized, can two products that are reactive with each other be loaded into separate compartments?

Yes
*No

Why is there a high temperature trip on the miracle column (C-510)?

*To prevent chlorine from getting into the K-520 system and causing a chlorine-iron fire

To prevent damage to C-510 due to heat
To be sure no Tet gets into the overhead lines
To stop a uncontrollable reaction before pressuring up the column

Why is there a high temperature shutdown based on the inlet line temperatures on the Per/Tet reactor?

*To alarm in the case of the reaction occurring in the inlet line rather than in the reactor
To detect that anhydrous HCl is reacting with chlorine causing heat
To detect a chlorine-iron fire in the pipe
To detect that D-220 has overheated

Why is there a high temperature shutdown on the Per/Tet reactor based on the temperature in the ethylene line?

To shutdown due to a fire resulting from ethylene and oil
*To detect that the reaction is occurring in the ethylene line rather than in the reactor
To detect that the wrong gasket sealant was used
To detect that the wrong gasket sealant was used

Why is it so important to install specially cleaned valves in a chlorine line?

The oils or greases that are normally in valves react with chlorine
The oils or greases that are normally in valves burn when chlorine is present
The oils or greases that are normally in valves oxidize when chlorine is present
*All of the above

Why was D-340 (the EDC vent knock out pot) installed rather than leaving T-104 as a flow through system?

T-104 did not knock out the liquids
Piping was too small to T-104 and it back pressured the vent system
*The potential for a vapor phase reaction between chlorine and ethylene in T-104 was too great and the quantity was too large
Both A and C

What is the reactive chemical concern regarding why Vinyl 2 acid is not taken in the Per/Tet plant?

It makes acid with too low a concentration of acid
It contains hydrogen which does not absorb in C-500
It contains acetylene which reacts with tet
*It contains acetylene which reacts with chlorine

What happens when liquid chlorine gets into the Per/Tet reactor?

*Potential for violent reactions
It makes bad products
The Per to Tet split cannot be controlled
The temperature would fall quickly causing damage to the carbon brick

Why are there low pressure trips on D-220

To keep the control valves working
So that the P-220s do not loose prime
*To ensure that there is no backflow of reactor contents outside of the reactor
Low pressure lowers the boiling points of the feeds, causing too much flow to the reactor

Why is Tet sent rather than Per to Chlorine and CA2 for their taffy pots?

Tet is lighter and works better for dilution of taffy
It is less expensive
*It is not reactive with liquid chlorine and per is
Per is needed for sales

Why is a new piece of carbon steel pipe or vessel passivated prior to putting into anhydrous HCl service?

To put a protective coating on the pipe so that anhydrous HCl won't corrode it
*To prevent the reaction between rust on the pipe walls with AHCl which forms water
Both A and B
Neither A nor B

What happens if carbon being used for absorption (carbon drums) or adsorption (VRU beds) is not pre-conditioned?

It won't work
No difference in performance
Not enough organics are ab(d)sorbed
*Too much heat is generated