Developing a working design chart for standardizing PHA template

A ChE59700 Capstone Project presentation.

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Contents.

- Introduction
- Review of current PHAs
- PHA header superset
- Databases
- Flowchart
- Discussions and conclusions
- Scope for future works
Introduction.

- Hazards in operating an industry.
- Risk assessment studies.
- Process Hazard Analysis (PHA).
- Drawbacks of current PHA.
Introduction.

- Hazard & operability studies and process hazard checklists.
- Probabilistic and quantitative risk assessments.
Review of current PHA’s.

- No uniformity.
- Subject to frequent changes.
- Data not reusable.
- Very difficult to automate the process of risk assessment.
PHA header superset

- PHA header
- PHA header superset
- Misconceptions regarding PHA header superset
- Advantages of using PHA header superset
## PHA header superset

<table>
<thead>
<tr>
<th>Tag No.</th>
<th>Item Name</th>
<th>Item tag</th>
<th>Deviation</th>
<th>Consequence</th>
<th>Likelihood Category (Risk Matrix)</th>
<th>Independent Protection Layers</th>
<th>Unmitigated Risks (All causes, OOM)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>S</td>
<td>L</td>
<td>RR</td>
</tr>
</tbody>
</table>

### Required SIL (All causes) vs Required EIL (All causes)

- **Selected SIL**
- **Selected EIL**
- **Recommendations (SIL)**
- **Comments**
- **Compiled By**
- **Date**

- **Consequence**
  - Consequences
  - Severity-Safety
  - Conditional Modifier-Safety
  - Modifier credit
  - Severity-Envi
  - Conditional modifier-Envi
  - Modifier credit
Databases

Databases are storage locations that hold data in a specified structured format. The planned software needs 3 different databases mentioned below:

- Item name – Tag database.
- Tag based parameters database.
- Temporary database for data download.
# Item name – Tag database

This database contains data correlating every item name to a specific tag.

<table>
<thead>
<tr>
<th>Tag</th>
<th>Item name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tank</td>
<td>Atmospheric storage tank</td>
</tr>
<tr>
<td></td>
<td>Nitrogen blanketed tank</td>
</tr>
<tr>
<td></td>
<td>High pressure storage tank</td>
</tr>
<tr>
<td></td>
<td>Jacketed storage tank</td>
</tr>
</tbody>
</table>
This database holds the data for auto filling the PHA spreadsheet for the given item. This is done based on data stored in a tag based system.

<table>
<thead>
<tr>
<th>Tag</th>
<th>Deviation</th>
<th>Consequence</th>
<th>Initiating event</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Tank rupture.</td>
<td>Material release</td>
<td>Corrosion.</td>
</tr>
<tr>
<td></td>
<td>Tank collapse.</td>
<td>Compromised integrity</td>
<td>Vacuum pressure.</td>
</tr>
</tbody>
</table>
Temporary database for data download

- Used as a location to download data to from online sources.

- Has same structure as the PHA spreadsheet.

- All data stored in this is temporary and will be deleted after being copied to PHA spreadsheet.
Flowchart

Flowchart is a diagram that shows the pathway followed by the software in a step-by-step manner. The main objectives that needed to be achieved were:

- Identify and tag the items being analyzed.
- Autofill parameters from either database or online sources.
- Update all databases.
- Hide headers deemed unnecessary by user.
Software flowsheet

Start

Item No., i=1

Input Tag No. and Item name.

1
Software flowsheet

Input Tag No. and Item name.

Items tag search from Item name – Tag database.

Is Item tag == Item name ?

Yes

No
Software flowsheet

Is Item tag == Item name?

Yes

Auto fill “Item Tag” column.

No

Display “Tag not Found. Enter Relevant tag.”

Read Tag

Update Tag database
Is Tag Parameters available In database?

No

Search online for Tag’s PHA data.

Local save data on Temporary database.

Yes
Software flowsheet

Local save data on Temporary database.

Push data from database To PHA spreadsheet.

Manual changes to PHA spreadsheet

Save data to Tag based Parameters database.
Software flowsheet

Save data to Tag based Parameters database.

Does User want to add Another item?

No
What are the categories the user would like to hide?
Hide Unnecessary columns

Yes

i = i+1

1

Stop
Discussions and conclusions

- Uniformity of data.
- Lower probability of error.
- Easier automation.
- Easier referencing for future works.
Discussions and conclusions

- Hurdles to implementation.
- Role of future works.
- Role of multi-plant companies
- Role of inter-company cooperation.
Scope for future work

- Adding to the PHA superset.
- Developing old PHA’s into standardized template.
- Developing standard databases to support the software.
- Incorporating AI to the software to make it able to read Piping and Instrumentation Diagram (P&ID) and develop PHA on its own.
Questions?
Thank you.