Human Factors Analysis on NBSR Reactor Console

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Background

- Reactor control room undergoing upgrades
- Important to conduct Human Factors Analysis (HFA)
What is Human Factors Analysis?

• Creating a user-friendly product or service
  • Reduce errors
  • Improve efficiency

http://www.sasq.org.za/blog/2016/03/22/eliminating-ergonomic-related-illnesses-via-basic-human-factors-engineering/
Why is HFA Important?

- Usability
- Safety
- Situational Awareness
- Efficiency
How are we going to do it?

- Physical Model
  - Expensive
  - Difficult to change
- Mixed Reality
  - Portable
  - Extensible
  - Easy to collect data
Procedure System

- Procedure Step Strategy
  - checkStep()
  - getErrors()
Annunciator
Toggle

D2O Stor Tank Pump

D2O Column
Look
Verify that DWV-22, purification bypass valve, is about 50% Open.
Procedure Step Strategy

- Procedure Step
  - Procedure Step Strategy

- Look Strategy
- Toggle Strategy
- Verify Strategy
- Annunciator Strategy
### Human Factors Analysis

- **Timer**
  - Individual Procedure Step
  - Entire Procedure
- **Errors**
  - Type of Error
  - Number of Errors

<table>
<thead>
<tr>
<th>Procedure Step Description</th>
<th>Step Time (seconds)</th>
<th>Errors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Place D20 storage tank pump (#1) in AUTO</td>
<td>13.02</td>
<td>Switch D2O Stor Tank Pump #1 was changed from off to on</td>
</tr>
<tr>
<td>Switch D2O Stor Tank Pump #1 was changed from on to off</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Operator Logger

Procedure

Switch

Procedure Step

Operator Logger

Text

Excel
Conclusions

- Environment to conduct HFA
  - Collect timing and accuracy data
  - Support proposed changes
- Train reactor operators
What’s Left?

- Add operating procedures
- Collect data
- Aggregate data
- Add options
Disclaimer

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