Mini-TCAP Pre-Scoping Study
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Background, Objectives & Scope

• Background
  – TCAP approaching end of service life
  – SRNL developing more advanced TCAP since 2006

• Objectives
  – Evaluate process readiness of Mini-TCAP
  – Evaluate plant implementation

• Scope
  – process design & limitations
  – durability
  – operability
  – load studies
  – maintenance
Differences and Advantages

- **Mini-TCAP is a direct replacement for conventional TCAP**
- **Mini-TCAP Differences**
  - Electric heating and liquid nitrogen cooling in place of hot and cold nitrogen
  - Inverse active column in place of inactive PFR
- **Mini-TCAP Advantages**
  - Does not use hot and cold nitrogen
  - Smaller column size
    - *Occupy less space in glovebox*
    - *Reduce tritium inventory*
    - *Reduce amount of Pd/k needed*
  - Improved throughput (cycle time varies)
  - Higher purity raffinate stream
  - Reduced thermal mass by 75%
    - *Less energy required for heating and cooling cycles*
Column Design Selection

• Two column configurations were considered
  – Paperclip
  – Yin/Yang

• Yin/yang was chosen
  – Smaller footprint
  – More technically mature
  – Ease of maintenance
Paperclip configuration has larger footprint

Paperclip
2x per TCAP unit

Yin/Yang
3x per TCAP unit
Load Study

- **Liquid Nitrogen**
  - Existing system in TF
  - Mini-TCAP adds 2 deliveries/month
  - Additional equipment (phase separator, etc) needed
  - New process line needed

- **Electrical System**
  - Existing electrical system can support up to three Mini-TCAP units running simultaneously
  - Additional electrical equipment needed in process room
Heater Concerns

• What if heater fails?
  – Process downtime
  – OGM

• SRNL experienced two heater failures in 2015
  – Investigated failures and implemented design improvements
    • Heater element design changes

• How to avoid OGM?
  – Change heater in glovebox
    • Column box improvements
  – Extra heaters

• Heater replacement Mock-up conducted in TF
Heater Replacement Mock-up

- TMO mechanic attempted replacement
- Tested improved design from SRNL

- Consider staging extra preformed heaters in glovebox when Mini-TCAP is installed
  - Avoid OGM if heater fails
  - Designated storage for extra and broken heaters in glovebox
  - Add more heaters when in OGM for other reasons

- Proved modular glovebox not needed
Heater Replacement Mock-up

- Mini-TCAP placeholder
Conclusions

• **Mini-TCAP is a viable replacement for installed TCAP**
  – Better technology
  – Smaller footprint
  – Easier maintenance

• No major concerns that could prevent Mini-TCAP from being installed
Questions?

• Thank you for your attention!

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