SilcoTek Corporation
Coatings For Anti Coking And Fouling Resistance

Information, Questions and where coatings are being used

Topics

- Vision
- Questions
- The process and the coating
- Products and Applications
- Conclusion/Future Product Development

Vision

- “Easy” Button for customers needing coating
  - Work together to identify repeat items
  - Have these items ready for customers to order
  - Working with suppliers to figure out a method for having product ready
  - Stock, Consignment, Drop shipping, etc.

Questions

- What is the maximum tubing length that you can work with
  - Straight lengths: 6 footers (Coat internal & external)
  - Coiled tubing: Up to 2000 feet (Coat Internally)
  - Can coated coil tube be straightened to produce 20’ sticks?
- Is every valve sent to you disassembled?
  - Yes, the process temperatures would compromise any lubricants and seals inside of the valves.
  - Also, to properly clean all the components

Questions

- What is the time frame we can use to give to customers if we send a valve to get treated?
  - 10 days from the time of receipt
  - Is there enough demand to predict some repeat items that can be stocked or consigned?
  - Can factory hold inventory? We're trying on our end.
- Is the process different now with the company name change or is it the same?
  - Same coatings and people
  - We will be more flexible now that we're focused

Questions

- What is new with your company since the last time you visited us?
  - We've become an independent company focused on coatings
  - New brand names
    - SilcoNert for inertness (1000 and 2000)
    - Silcolloy for corrosion
  - More people, 17 dedicated to customers & coatings
- Are the lubricants replaced after the parts are treated?
  - No

Questions

- Where do you see industry going with these special materials and processes?
  - As the need for knowing what's in streams increases, there will be more demand
    - Sulfurs
    - Mercury
    - Ammonia
    - Corrosion
    - Low level alcohols and other impurities
  - More methods specifying need for coatings
  - Working with suppliers to offer coated products as stock items
  - Growing volume of NeSSi systems

Questions

- Are there certain industries that are moving more quickly than others with the sulfinert process?
  - Refining, the most mature and familiar with the coating: Rule 1118 coming
  - Concern for Mercury, gas wells
  - Power generation growing quickly (coal fired power plant stack monitoring)
  - Off shore applications, can we provide the inertness and corrosion resistance. Need 20’ sticks coated inside and outside

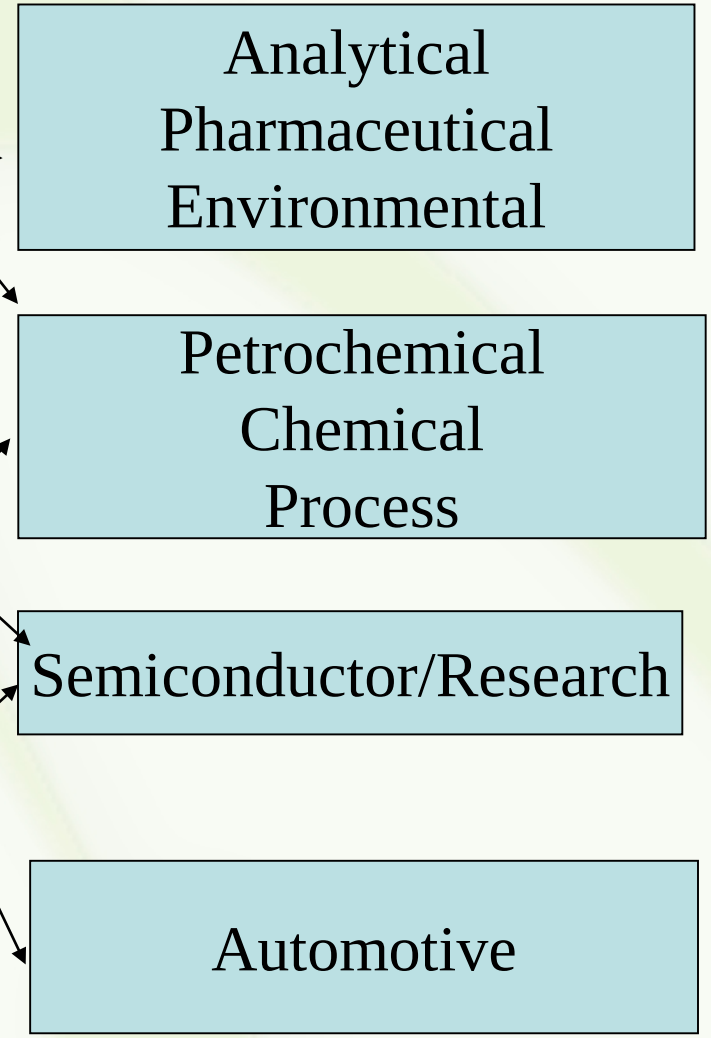
Questions

- Is pressure and temperature affected when the part is treated?
  - Pressure ratings are still maintained
  - Maximum temperature rating of coating is 450C.
  - There are coatings that can be applied for use up to 600C on stainless

APPLICATION AREAS

- SilcoNert: Inertness **(Silcosteel, Sulfinert/Siltek)**
  - **Sulfinert = SilcoNert 2000**
- Silcolloy: Anti-Corrosion **(Silcosteel-CR)**
- SilcoKlean: Anti-Coking **(Silcosteel-AC)**
- SilcoGuard: Ultra-High Vacuum **(Silcosteel-UHV)**

MARKET AREAS



Brand Names

- SilcoNert 2000
  - Used to be Sulfinert and Siltek
- SilcoNert 1000
  - Used to be Silcosteel
- Silcolloy 1000
  - Used to be Silcosteel-CR

Basic Manufacturing Process

- Receive items
- Document – digital, customer contact
- Clean
  - Standard: caustic ultrasonic bath, 2 systems
  - Custom: solvation via other means
- Chemical Vapor Deposition (CVD) Process
  - Vacuum
  - 400ºC
  - silicon-based deposition

- Clean
- Document – digital, customer contact
- Pack, ship

Properties

- Max operating temp.
  450C-1000C: SilcoKlean 1000
- Hardness: Equivalent to stainless steel
- Thickness
  – 0.1 um +

Coating Capabilities: Substrates

- Tubing:
  - 0.004” to 0.5” ID
  - 2000+ ft. continuous lengths

- Complex geometry parts (inside and out)
  - Fittings, valves, frits
  - Block manifolds, sample vessels
  - custom parts

Substrates Which Coat Well

- 300 and 400 grade stainless steel
- High carbon steel
- Titanium
- Ceramics
- Borosilicate glass
- Inconel®
- Hastelloy®

Substrates with Issues

- Nickel / Nickel plating
- Aluminum*
- Monel®
- Copper
- Brass
- Gold and Silver plated components
- Chrome Plated components
- Magnesium
- Elastomers
- No Bases!

*heat-dependent

Conclusions/Future

- **Continual process improvement and new product development for coatings:**
  - Improving the hardness of coatings
  - Improved corrosion resistant coatings
  - Hydrophobic surfaces for moisture sensitive applications
  - Protection of high nickel alloys such as Hastelloy® and Inconel®
  - Hydrogen embrittlement resistance.
  - New generation process systems on line in FY08
    - Additional manufacturing capacity
  - New manufacturing facility!