TEAM® Industrial Services

2013 CRUG Conference
Input from Plants

9/26/13

Agenda

- Plant environment and challenges
- Applications
- Effectiveness of composites
- Acceptance / Limitations

Application Environments

- CRUG membership includes pipeline companies, refinery and chemical plants, composite manufacturers & distributors, regulators, service companies, test labs, and consultants.

- CRUG's purpose is to promote the proper use of composite materials to structurally repair pipelines, piping and other pressure containing equipment subject to industry accepted standards

Application Challenges

- Challenges
  - High pressures
  - Elevated temperatures
  - Numerous process services
  - Piping configurations
  - Hoop stress concerns vs. leak containment
  - Corrosive environments

Applications

- Straight Pipe
- Anticipated life of repair
  - Until next TAR
    - Months to years

- Many opportunities exist as a result of pipe inspections (PSM) and concern for pipe conditions (rusted, thin wall, leaking, etc.)

Applications

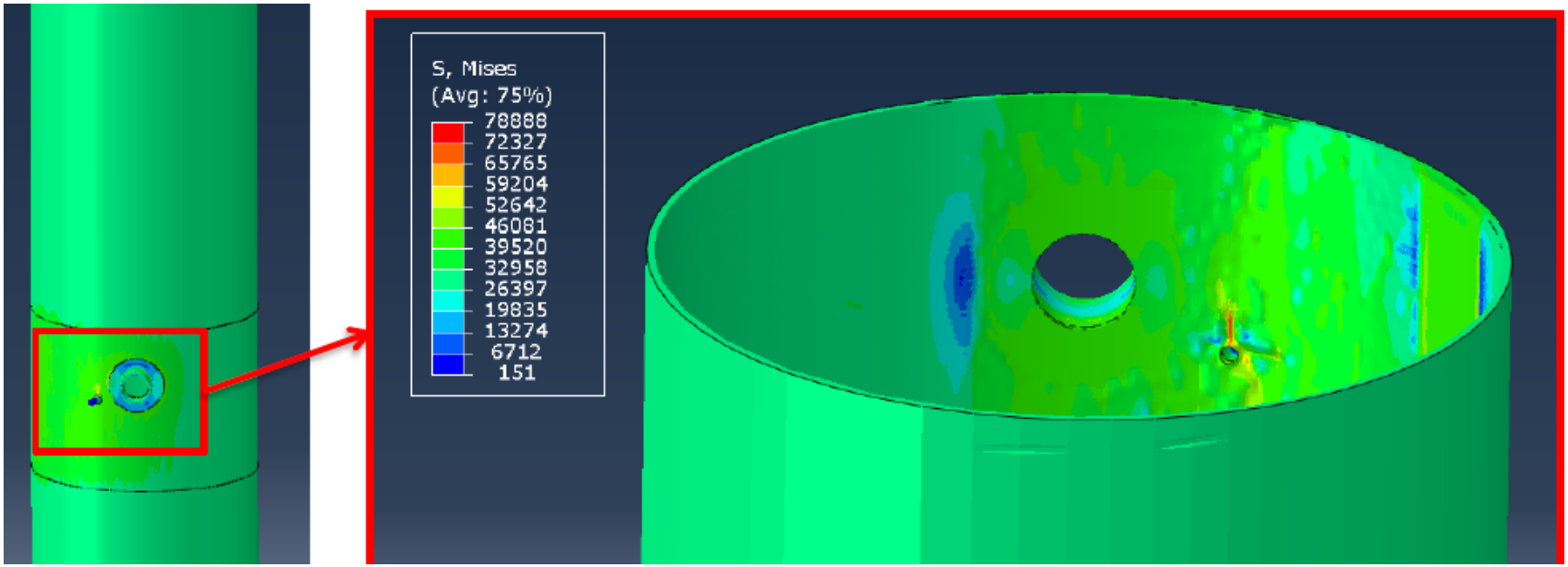
- Concentric reducer
  - 24x14x24
    - Cracks with active leakage
    - Hydrocarbon service
    - Under vacuum
    - Operating at 280°F continuous
      - 330°F intermittent
- Anticipated life of repair
  - 9 months
- Special applications due to piping configuration and operating conditions

Applications

- Column / Tower applications
  - Exhibiting Structural concerns due to corrosive services
  - Operating at ~300°F
  - Design to 315 psi
  - Code repair required
  - Anticipated repair life > 1 year

Special Considerations

- NDE performed of equipment
- Analysis of NDE information
  - FEA
- Engineered composite repair proposed and performed
- Code repair review and approval required



Effectiveness of Composites

- Composites have improved tremendously over the years.
  - Originally plant requests were to apply bonder or fiberglass wraps
  - No formal review and approval processes were performed
- Composites are much more sophisticated
  - Research into formulas, tensile strength testing and sound engineering practices
- Composites are most effective when properly designed, engineered and applied following manufacture's specifications for specific applications
- Cleanliness is next to Godliness and is critical for an effective composite application.

Acceptance / Limitations

- An engineered repair method
  - Insure that calculations and installation processes are provided.
  - Must follow composite manufacture's instructions
- Developing standards (PCC2)
  - Training
  - Engineering practices
- Must have an effective wall thickness
  - Intended for pipe wall support
  - Not intended to create pressure boundaries
- Must perform proper surface preparation
  - NACE 2 finish or better
- Composites are not the "silver bullet"
  - Use within manufacturers' recommendations

Questions