
INTENSITY
AT WORK

HWI HarbisonWalker International™

REFCOMM® BUDAPEST 2-5 Oct 2017

SRU REFRACTORY SELECTION

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Agenda

- Conditions and properties for refractory selection:
  - Reaction Furnace Hot Face Lining
  - Reaction Furnace Backup Lining
  - Condensers & Reactors
  - Sulfur Pit

Reaction Furnace

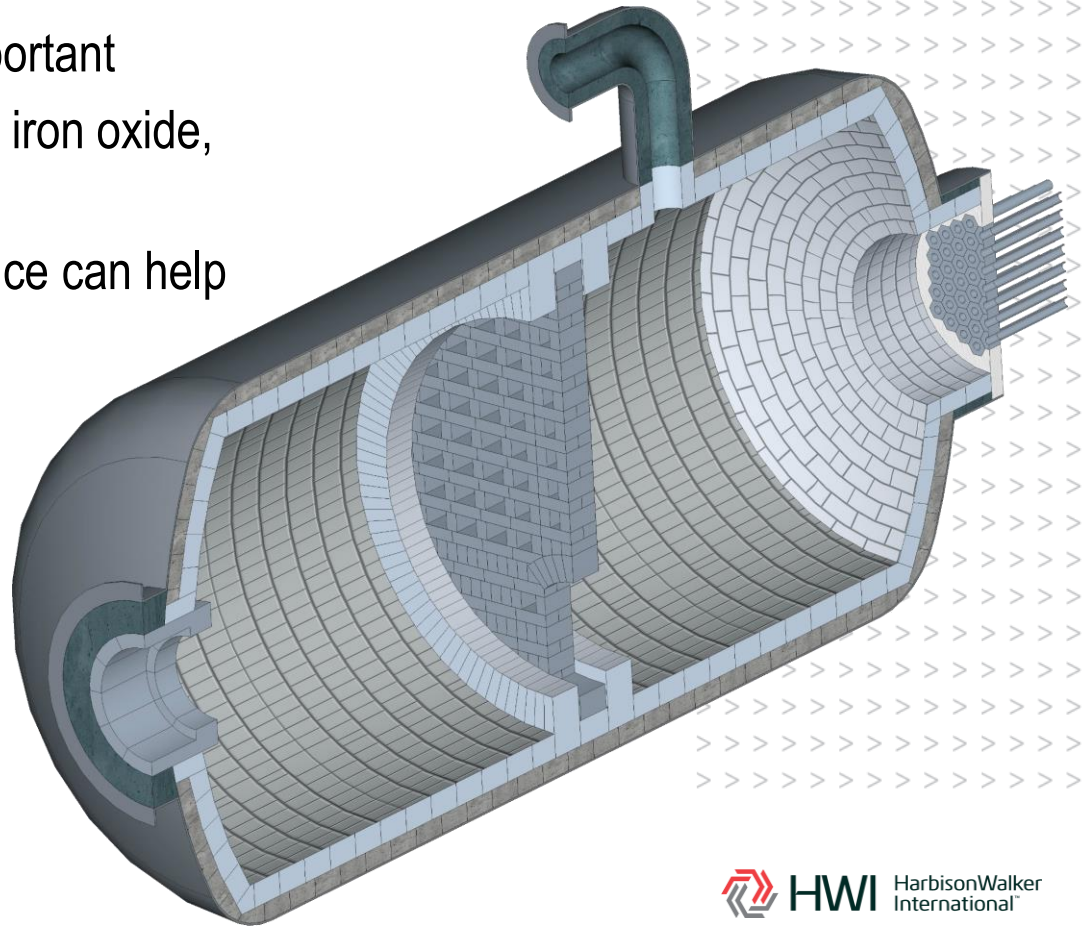
Conditions

- Normal operating temperatures up to 1500°C, upset conditions can be above 1700°C.
- Typically a reducing atmosphere
- In operation for extended periods of time. Can be years if operated correctly
- Thermal shock can occur during improper operation

RF Hot Face Lining

Refractory Properties for Best Success for the Hot Face

- Creep resistance is most important
- High purity chemistry (<0.3% iron oxide, <0.3% alkalis)
- Some thermal shock resistance can help



Thermal Shock Testing

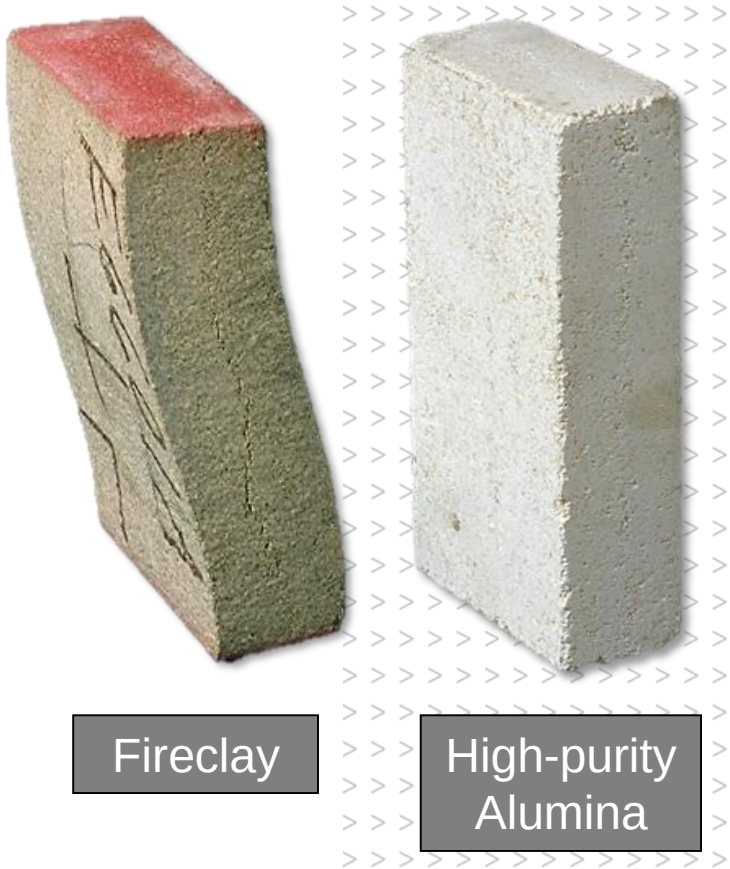
Cycles to failure

- Low: 1-10
- Average: 10-20
- Good: 20-30
- Excellent: 30-40+

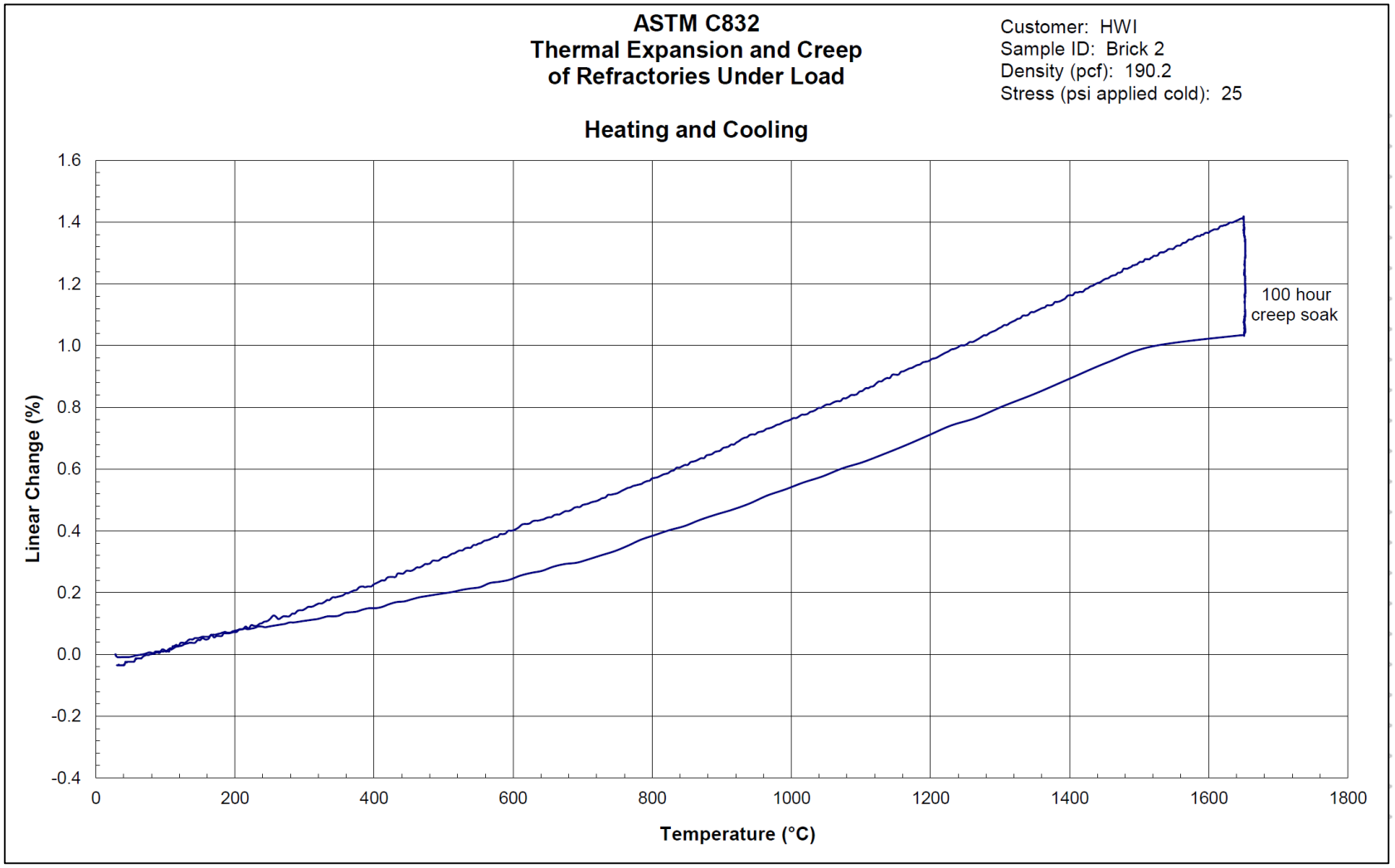
Creep Testing

Measuring Creep Resistance

- ASTCM C16 – Hot Load Test
  - 0.17MPa, 100hr, 1650°C measure before and after firing
  - <0.5% deformation; <0.3% for best performance
- DIN 51053 Refractoriness Under Load
  - 0.2MPa, 1650°C or 1700°C, record temp deformation begins
  - Deformation occurs >1650°C or 1700°C
- ASTM C832 Creep Under Load
  - 0.17MPa, 1550°C or 1650°C, 50 or 100 hour hold
  - <0.01% deformation per hour during 20-100 hr (or 20-50)



Creep Testing



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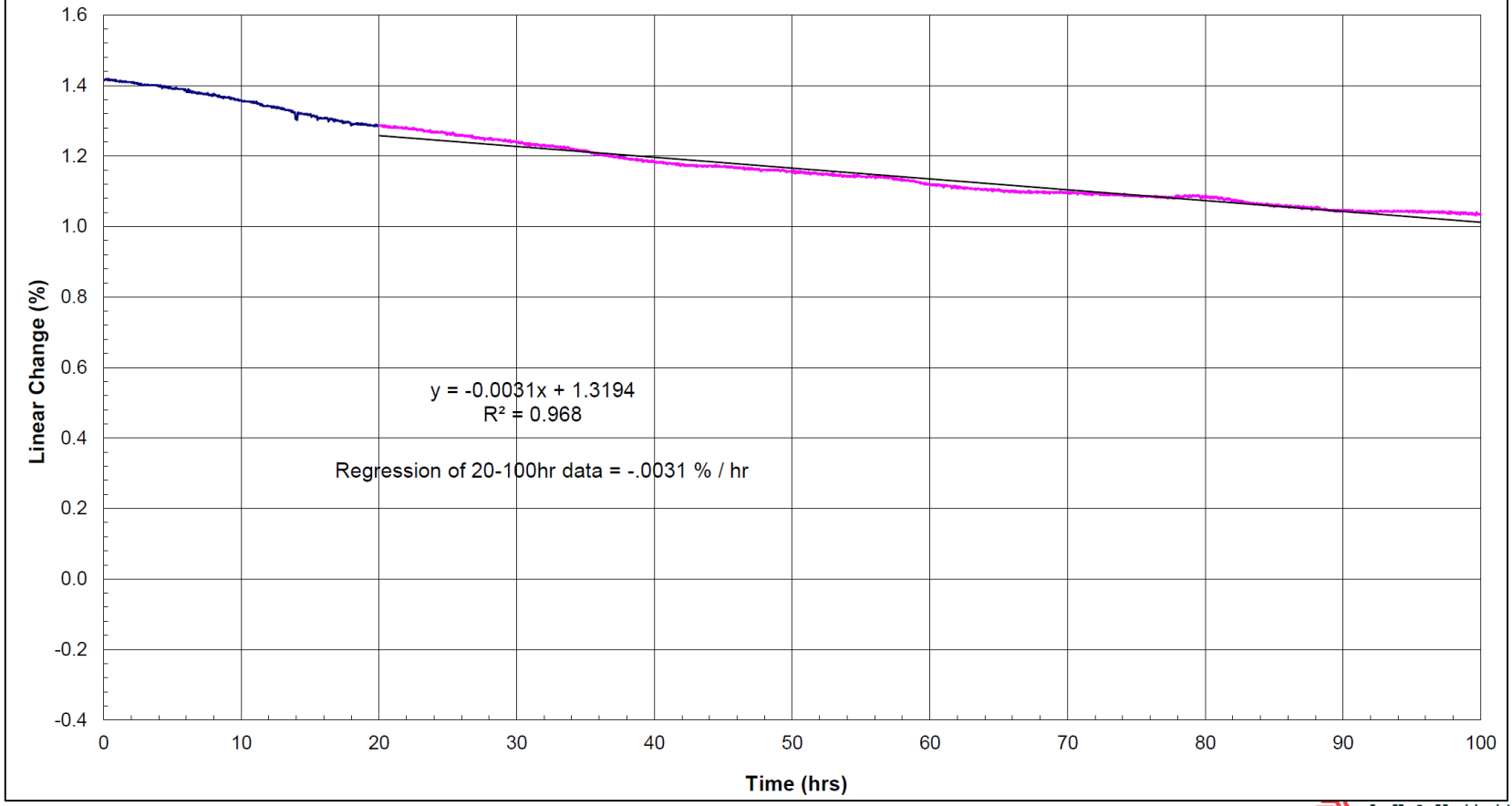
Creep Testing

ASTM C832
Thermal Expansion and Creep of Refractories Under Load

Creep During Soak

Customer: HWI
Sample ID: Brick 2
Density (pcf): 190.2
Stress (psi applied cold): 25
Creep Temperature: 1650°C



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RF Backup Lining

Requirements for Backup Lining

- Max use temp should be 100°C greater than estimated interface temp
- Low Iron (<1.5% iron oxide)
- Decent creep resistance (<0.5% deformation at typical test temp)

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RF Backup Lining

IFB or Monolithic?

- IFB
  - Provides assured thickness and a smooth surface to build hot face lining
  - No Dry out required, but brick installation is time-intensive
  - IFB will not react with acids that may condense in cool spots
- Monolithic
  - Care must be taken to ensure proper thickness.
  - Faster installation, but a dry must be considered
  - Cement-bonded products will react with acids preventing damage to shell

Condensers & Reactors

Conditions

- Relatively cool temperatures around 350°C
- Sulfur fires can raise temperatures quickly
- Refilling catalyst can cause mechanical damage to refractory

Requirements

- Cold Crushing Strength: >7.5MPa (after 815°C)
- Density 1250-1450kg/m^3
- Some areas may require a more dense product with less insulating value, but greater strength
- Other areas may require even lighter, more insulating refractory with less strength

Sulfur Pit

Conditions

- Molten sulfur between 120°C
- Sulfur mixing with water vapor can create sulfuric acid

Requirements

- Does not require high-temp materials
  - Colloidal silica bonded, 99% silica
  - Calcium silicate (Portland cement) bonded
  - Alkali silicate bonded
- Acid resistant
  - ExxonMobil Quick Acid Test

Why?


THANK YOU


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