

**Institute of Refractories Engineers** 

# SHAPED REFRACTORIES

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### **Shaped Refractories**

- •What is a Shaped Refractory
- •Types of Materials
  - Fired Brick
  - Unfired Brick
  - Pre-cast Pieces
- Production Routes
- •Sizes and Shapes
- •Advantages and Disadvantages



### What is a Shaped Refractory?

- Bricks
- Blocks
- Tubes
- Plates
  etc etc

#### WHAT IS IT NOT Monolithics

- Castable
- Gunning
- Ramming







# Porosity

#### Why Maximise Density?







### **Types of Material**

- Fired
  - Ceramic Bond
  - Firing Temperature typically >1200°C
  - Usually no changes during heating up.
- Unfired
  - Chemical Bond or Carbon Bond
  - Heat treatment typically <600°C
  - Changes in properties on first heating
- Pre-cast and Pre-rammed
  - Complex Shapes Possible
  - Controlled Dry-out
  - Optimum Casting Conditions













# Maximising Density





# Batching







### Pressing

PRESS TYPES

- Friction-Screw Press
- Hydraulic







# Hydraulic Press





# Hydraulic Press





# Drying









# Firing – Tunnel Kiln





### **Size Limitations**

- Piece Size Compaction
- Undercuts Removal of piece from mould
- Depth/Area Die Wall Friction





### **Size Limitations**

• Section Changes

Compaction ratio leads to density differences







### Disadvantages

- Lead Time
- Installation Time
- Installation Cost
- Skills for installation
- Joints between pieces



# Advantages

- Volume Stable
- No Water no need to dry out
- Certain Chemical Compositions only possible in brick
  Carbon Bond
  - •CaO containing (eg Doloma)
- Hot Load Capability



#### **Pre-cast Pieces**

ADVANTAGES

- Large Complex Shapes Possible
- Ideal Casting Conditions
- Can be fully pre-dried
- Can Incorporate Other Parts
  - Anchors
  - Purge Elements

DISADVANTAGES

- Handling
- Shell Distortions
- Joints





# Thank You For Your Attention