Sulphur Block Pouring – An Overview
SANDVIK PROCESS SYSTEMS
THE INDUSTRIAL PROCESSING COMPANY
Agenda

- Block Pouring Crash Course
- Sulphur Blocking Strategy
- Before You Pour
- Block Dimensions and Layout
- Required Equipment
- Environmental Considerations
- Sulphur Quality
- Sulphur Blocking Operations
- Sulphur Block Reclaim
Block Pouring Crash Course
Sulphur Block Strategy

Why pour to block?
- Long-term storage of sulphur when prices are unfavorable
- Infrastructure to move sulphur to market doesn’t exist
- Sulphur forming facility back-up
- Downstream logistics disruption
  - Infrastructure doesn’t exist
  - Infrastructure not available
- Pouring to block is the cheapest way to form and store sulphur
  - The trade-off is when it comes time to move that sulphur
Before You Pour

- Long term or emergency use?
- Desired capacity
- Block layout and dimensions
- Operations
- Sulphur quality
- Reclaim considerations
Block Dimension Considerations

- Bigger blocks = Fewer blocks = Less Towers = Less CAPEX, Less OPEX
- Bigger blocks = Less Forms = Less CAPEX, Less OPEX
- BUT, there are limitations on block size
- Flexibility needs to be maintained
  - May be a good idea to have at least 2 blocks
- Limits on block height
  - Ground conditions
  - Comfort level
Block Dimension Considerations
Block Dimension Considerations
Block Layout – Stepped vs. Straight

17 Meters

11 Meters

10 Meters
Block Layout – Stepped vs. Straight
**Required Equipment**

- Steam jacketed or heat-traced transfer lines to carry molten sulphur to pouring towers and pouring arms
- Steam jacketed or heat-traced instruments, valves
- Steam piping and condensate return system OR electric tracing system
- Base pad
- Other Utilities – instrument air, lighting, run-off water collection and processing
- Pouring tower(s) and pouring arm(s)
- Containment forms and securing pins
- Access to top of each block
  - Scaffolding, temporary stairways
- Lighting for night operations
Environmental – Base Pad

- Purpose of base pad:
  - Support of block
  - Barrier between block and ground
  - Working surface for pouring and reclaim

- Base pad materials:
  - Limestone
  - Concrete
  - Plastic liners
  - Compacted clay
  - Asphalt (PREFERRED)
Environmental – Water

- Rain water
  - Water from rain or snow can puddle, become acidic and require neutralization

- Ground water
  - Impervious barrier expected to isolate stored sulphur from water table
  - Monitoring may be required
Environmental – Air

- Wind (sulphur dust)
  - Dusting due to wind impingement, or sulphur vapor from liquid sulphur
  - Potential for long term corrosion or vegetation damage down wind
- Wind (block contamination)
  - Wind-borne particles have potential to imbed in solidifying sulphur and cause contamination of block
- Consider wind barrier or stabilization of nearby sand and soil
Sulphur Quality

- Solid contaminants
  - Sand, Rocks
  - Carsul
  - Clay
- Liquid contaminants
  - $\text{H}_2\text{SO}_4$ (sulphuric acid)
  - Hydrocarbons, Amines, Glycol
- Gaseous contaminants
  - $\text{H}_2\text{S}$, $\text{SO}_2$
Operations – Pouring – General Rules

- Blocks must be sized for adequate cooling
- Restrict the pour rate to allowable pour depth and experience of crew
- Alternate between blocks or pouring towers
- Choreograph form raising, form sealing and pouring operations to provide most efficient use of operator’s time
- Always work at block perimeter, never in the middle
- Keep perimeter clean
- Manage sulphur flows against forms
- Automation of entire process is not feasible
Operations – Pouring
Operations – Pouring – Form Breach
Liquid Sulphur Pocket

- Pockets are formed when
  - Sulphur is poured in one area for an extended period of time
  - Top layer can freeze over creating an invisible hazard for operators
- Extremely hazardous situation
  - Unsafe for operators
  - Can compromise the integrity of the block
Liquid Sulphur Pocket
Operations – Pouring Challenges

- **Precipitation**
  - Can affect spreading of sulphur on block surface
  - Moisture coupled with rapidly cooling sulphur can reduce bond strength between layers, potentially reducing structural integrity
  - Surface snow will melt with heat of sulphur but could leave voids
  - Snow drifts against containment forms must be removed to prevent the formation of voids in the block wall.

- **High Winds**
  - Will influence direction of flow and cooling rate – could cause a sloped block
  - Rapid cooling can restrict spread of molten sulphur prevent formation of level surface
  - Contaminates blowing onto block
Operations – Forms & Pins
Raising Pouring Forms
Raising Pouring Forms
Operations – Forms Management
Sulphur Block Reclaim

- Remelting needs to be considered in your block pouring strategy
- Remelting strategy affects:
  - Size and configuration of blocks
  - Utility infrastructure
Sulphur Block Reclaim

- Advantages to hollowing out a block:
  - Dust containment
  - Can pour liquid sulphur into this cavity by blocking off the opening
  - This strategy works for both emergency and long-term blocking