Pipeline Transport of Centrifuge Product
Stewart Bodtker, Paterson & Cooke, Calgary, Alberta
IOSTC 2016
Outline

• Bullet points outlining the presentation
Pipeline Design Features

- 500 to 800 m length,
- 12” diameter.
- Flexible grooved couplings for ease in assembly/disassembly,
- Pressure transmitters for over pressure trip and better understanding of flow behaviour,
- Depressurization valves,
- Glycol heating units
Operating Envelope (Design Rheology)

Design and Max Rheology, 12 inch CS sch. 80 Pipeline

Design Rheology
Max Rheology

Min Tonnage
Nominal Tonnage
Max Tonnage

Flow

Tonnage

Design and Max Rheology, 12 inch CS sch. 80 Pipeline

50 m³/hr
100 m³/hr
150 m³/hr
200 m³/hr
250 m³/hr
300 m³/hr
350 m³/hr

Design and Max Rheology

45% 188 Pa
60% 635 Pa
50% 239 Pa
55% 337 Pa
60% 635 Pa

50 t/h
70 t/h
90 t/h
110 t/h
130 t/h
150 t/h
170 t/h
190 t/h
210 t/h
230 t/h
250 t/h
A major challenge in design of a centrifuge cake pipeline is the thixotropic properties of the cake.

Shear stress decreases with time of shearing at a constant rate.

A hysteresis loop is formed if the shear rate is steadily increased to a maximum value and then decreased at the same rate to zero shear.
Non-Linear Hydraulic Gradient
Reduced Friction Loss in Sheared Annulus

- Laminar flow of non-Newtonian slurries results in a sheared annulus at the pipe wall due to the slurry’s yield stress.
- A thixotropic slurry will theoretically have a lower rheology in the sheared annulus than in the core.
- Reduced rheology at the pipe wall would result in reduced friction loss.
Transient Effects (Placeholder)

- Bullet points outlining the presentation
Opportunities

- Pre-condition with variable speed mixer
- Pump specification and design
- Hydraulic transient mitigation
- Transport effects on centrifuge product
- Increase pipeline diameter and/or length
- Multi-point discharge strategy
- Process optimization conditions
Conclusions / Acknowledgements / Client etc

- Closure and necessary acknowledgements from contributors, permission from clients etc.