

# MAXIMIZING OPERATIONAL EFFICIENCY

## *A STUDY INTO PROPER VALVE TECHNOLOGY SELECTION FOR CRITICAL SUGAR PROCESSING APPLICATIONS*

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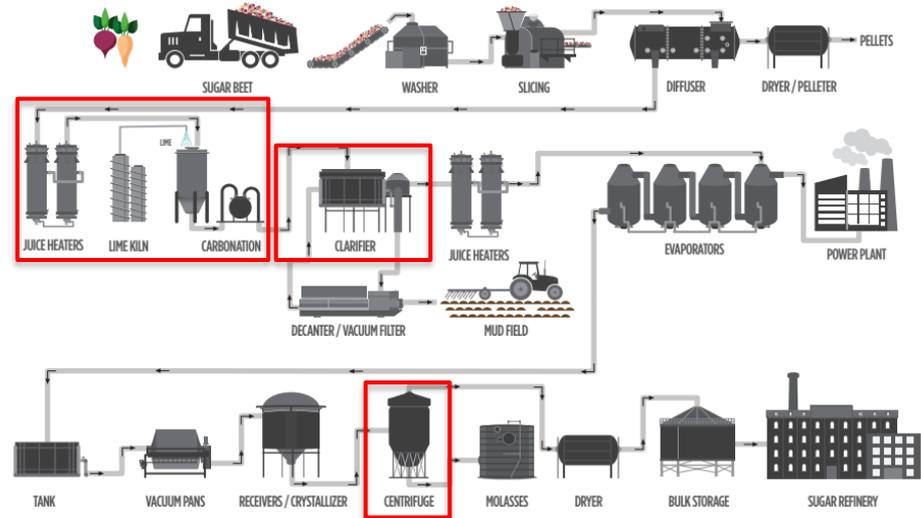


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# Critical Sugar Applications Require Technological Advancement



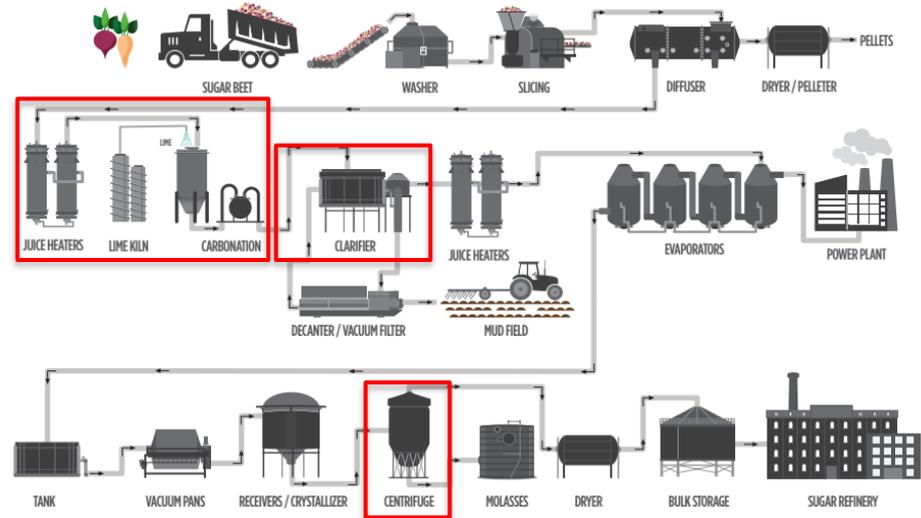
- Sugar beet processing is riddled with tough process conditions that can lead to frequent valve failure
  - Scaling
  - Cavitation
  - Erosion
- Critical applications require proper valve technology to mitigate the potential for unplanned downtime and product loss
  - White Centrifuge Feed
  - PKF Filtration
  - Milk of Lime Control



# Critical Sugar Applications Require Technological Advancement

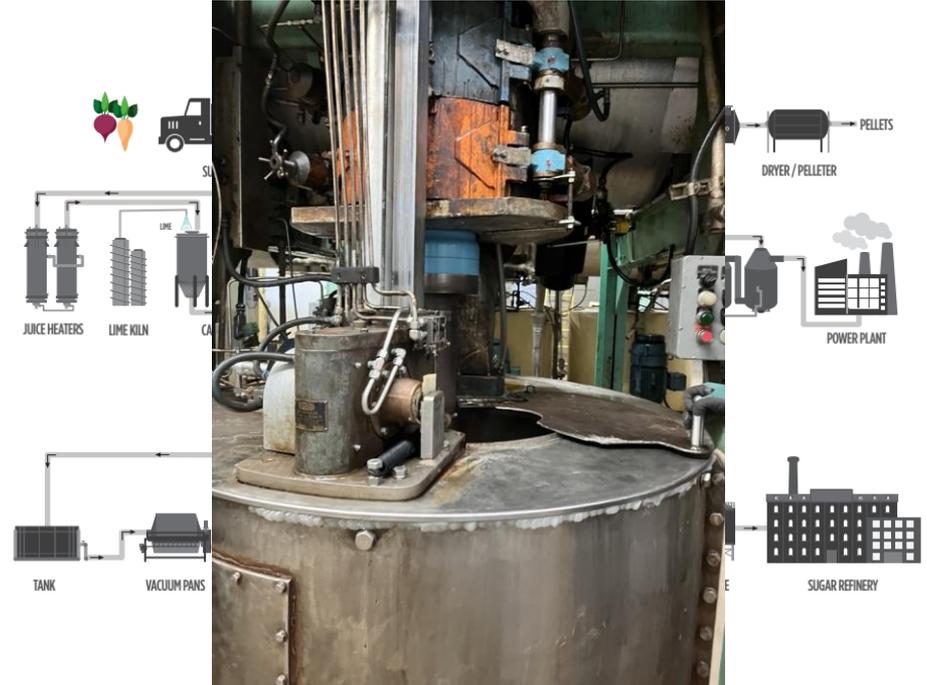


- Typical valve issues seen in critical applications
  - Wear on valve internals: ball, disc, seats, body
  - Erosion
  - Scaling
  - Rangeability
- Consequences of poor flow control
  - Plant efficiency
  - Loss of production
  - Safety



# Critical Sugar Applications Require Fast Acting Components

- Sugar beet processing is riddled with tough process conditions that can lead to frequent valve failure
  - Scaling
  - Cavitation
  - Erosion
- Critical applications require proper valve technology to mitigate the potential for unplanned downtime and product loss
  - **White Centrifuge Feed**
  - PKF Filtration
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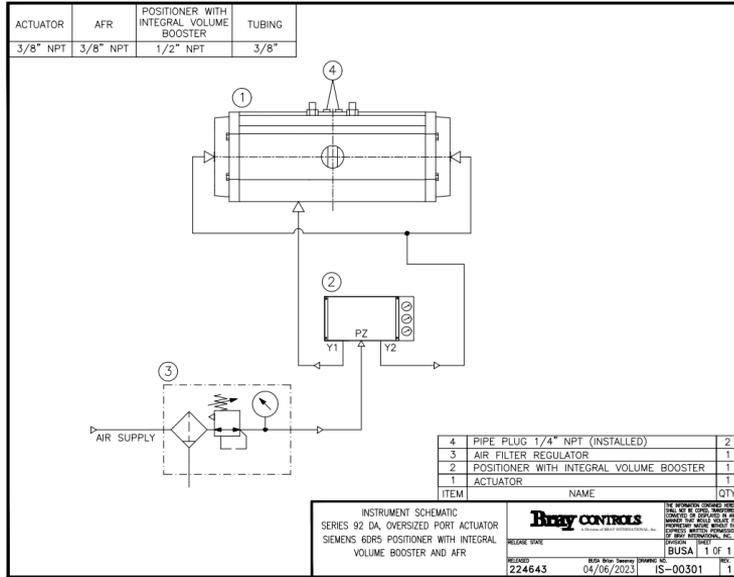
- Requirements for centrifugal feed valves
  - Common centrifuge machines: BMA, Broadbent, Western States,
  - Valve sizes: 8"-14"
  - **Fast acting (sometimes <1 second)**
  - **High cycle**
- Valve assembly flow capacity constraints
  - Many modern actuators and positioners do not have the flow capacity required to operate a valve in <1 second



# Critical Sugar Applications Require Fast Acting Components



- Proper valve and actuator design is crucial for success
  - Valve seat design



Sales Order or Quote #		Line #
Max Valve Torque (Lb-ins)	Actuator must be Sized with 1.3 Safety Factor	
Actuator Model	93-210 (1/2" Special Port)	Port Size - 1/2" (Body and Caps)
Actuator Displacement Volume (Cubic Inches)	450	
Actuator Max Cv	31.78	
Air Supply PSIG (Minimum & Maximum)	Minimum Air Supply: 60 psig    Maximum Air Supply: 80 psig	
Filter Regulator	Select (or None)	Port Size - Select Filter Regulator
Filter Regulator - Cv	Regulator Cv	
Positioner	Other	↓ Other Positioner Cv ↓
Positioner Cv	6	6
Solenoid Model	Select (or None)	Port Size - Select Solenoid
Solenoid Cv	Solenoid Cv	
Quick Exhaust (QE)	Select (or None)	Port Size - Select QE
Quick Exhaust - Inlet Cv	QE Inlet Cv	
Quick Exhaust - Exhaust Cv	Quick Exhaust Cv	

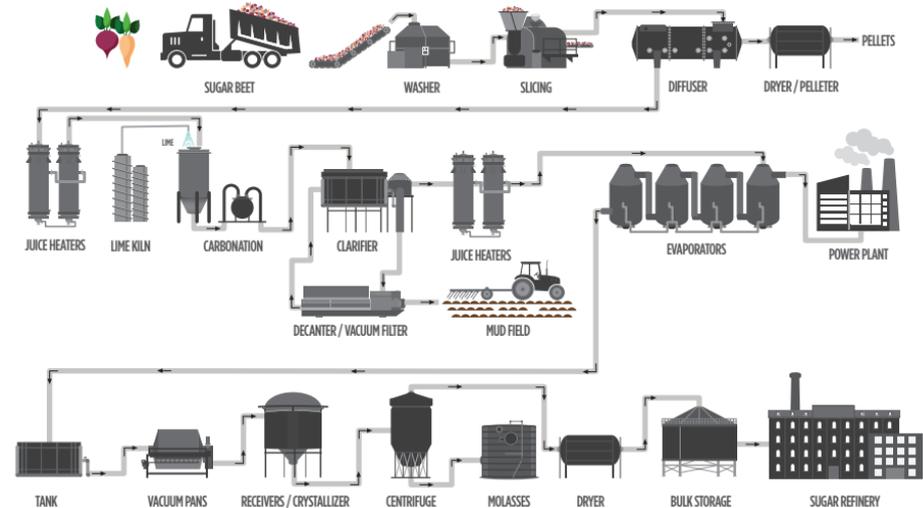
AIR STROKE SPEED		
Tube OD - Wall Thickness (Smallest Size - Air Supply to Actuator)	1/2" - 0.049	Estimated Max Cv = 17.85
NPT Pipe Fittings (Smallest Size - Air Supply to Actuator)	1/2"	
	Minimum Air Supply	Maximum Air Supply
Estimated Air Stroke Operation Time (Seconds)	1.0	0.9



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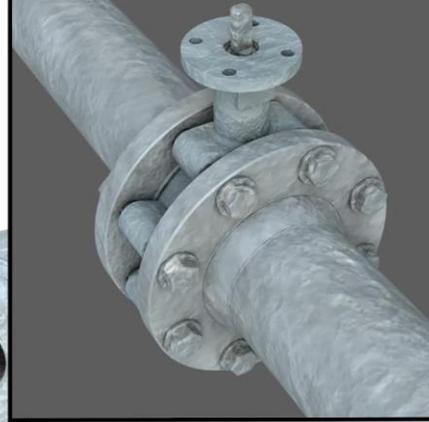
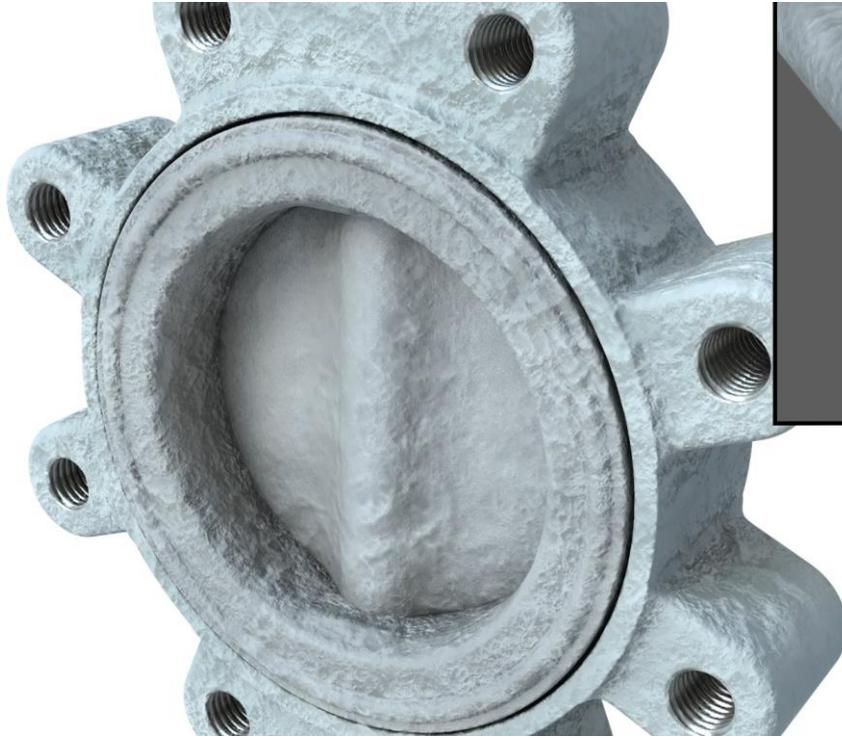
- Typical valve issues seen in critical applications
  - Wear on valve internals: ball, disc, seats, body
  - **Erosion**
  - Scaling
  - Rangeability
- Consequences of poor flow control
  - Loss of production
  - Safety
  - Poor clarification
  - Reduction in output



# Ball Valve Results of Erosion



# Butterfly Valve Results of Erosion



# Critical Sugar Applications Require Proper Valve Materials

- Sugar beet processing is riddled with tough process conditions that can lead to frequent valve failure
  - Scaling
  - Cavitation
  - Erosion
- Critical applications require proper valve technology to mitigate the potential for unplanned downtime and product loss
  - White Centrifuge Feed
  - PKF Filtration
  - Milk of Lime Control



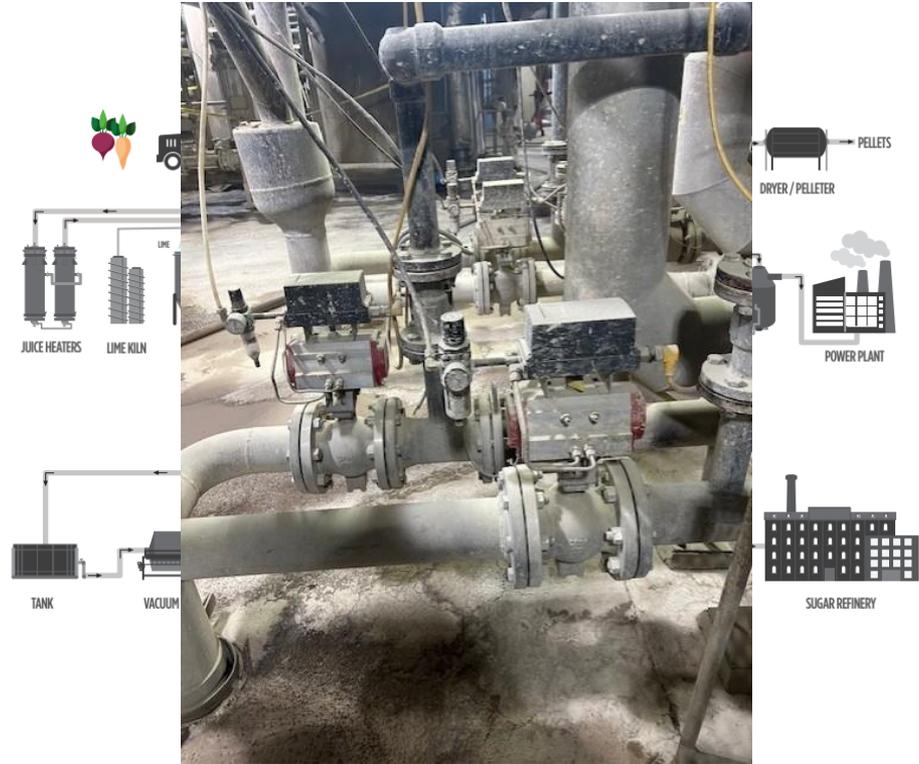
# Critical Sugar Applications Require Proper Valve Materials

- PKF sludge valves require a reliable, zero-leakage high-performance butterfly valve design
- Common failure modes
  - PTFE seat and stainless-steel disc erosion
  - Wear on the stem due to the number of cycles per campaign
- Proper valve selection
  - **Ultra-high-molecular-weight polyethylene (UHMWPE) seat** has superior mechanical properties for wear, compressive strength, and impact resistance
  - **ENP-coated stainless steel disc** enhances the disc's resistance to abrasive particles. The nickel plating acts as a barrier, reducing direct contact between the disc and abrasive media, thereby extending the disc's lifespan

Properties	Teflon Seat	UHMWPE Seat	SS disc	SS disc w/ENP coating
Shore Hardness (D)	50 – 55	64 - 70		
Rockwell Hardness (Rc)			25 – 35	55 – 65
Abrasion Resistance	Low	High	Low	High
Erosion Resistance	Low	High	Low	High

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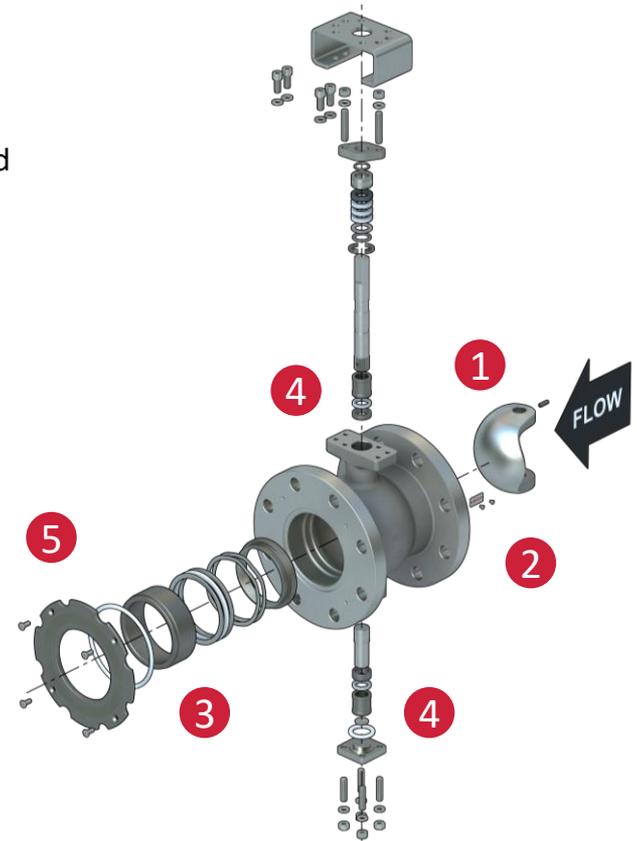
- Milk of Lime Characteristics
  - High degree of suspended/dissolved solids
  - Abrasive
  - Caking properties
- Valve Issues
  - Erosion on valve parts: ball, disc, seats
  - Scaling
- Consequences of poor flow control
  - Excessive use of lime
  - High cost of lime kiln operation
  - Inconsistent juice pH levels
  - Poor clarification / removal of non-sugars
  - Darker juice color and lower sugar quality



# Critical Sugar Applications Require Proper Valve Materials

1. Pressure balanced seat design and **reversed flow direction** allow for proper sealing under full differential pressure, low torques, and smooth operation in reverse-flow installation
2. **Engineered materials of construction** provide increase segment hardness and bond strength for application-specific resistance
3. **Erosion resistant downstream liner prevents body wall erosion** due to high velocities at low openings
4. Upper and lower **bearing seals protect metal bearings** from ingress of media
5. Flanged retainer with uninterrupted gasket surface provides easy access for **field repairability** and installation

Material	Hardness (HV)	Abrasion Resistance
Stainless Steel	250 HV	Very Low
Stainless Steel w/ Stellite	390 – 450 HV	Low – Medium
Stainless Steel w/ Tungsten Carbide	650 – 1100 HV	High
Solid Tungsten Carbide	<b>1500 HV</b>	Very High



# Critical Sugar Applications Require Proper Valve Materials

Cost Analysis		
Total Cost of Ownership	MoL Valve	Previous Valve
Estimated Valve Cost (\$)	\$3,500	\$2,500
Service Life	3+ campaigns	½ campaign
Valve Cost (3 Campaigns)	\$3,500	\$15,000*
Total Savings	\$11,500+*	

\* Excluding product loss, maintenance and operating costs \*



- Reducing operational disruptions and unplanned outages should be a key focus and it starts with using **advanced technology**
- Leading producers are continuing to **invest in advanced machinery and equipment** for longevity
- These 3 critical applications are just a brief snapshot of a few strenuous applications seen across your mills
  - Flume Water
  - Strainer Washout
  - Vacuum Pans
  - Pulp Press
  - White Pan Condenser
  - Dorr Sludge
  - Clarifier
  - Many more...

QUESTIONS?

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