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Eliminating Control Valve Erosion – a Journey to a Better Mouse Trap

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Agenda

Tim Mbanga	Introduction
Tim Mbanga & Duane Lunde	Erosive Service Control Valves – What options were considered? – How long did a solution last? – Life is about the journey
Duane Lunde	Leveraging technology - A predictive maintenance approach
Tim Mbanga	Summary – A journey with many steps

Introduction

Nutrien, Potash Division

Rocanville Mine Site

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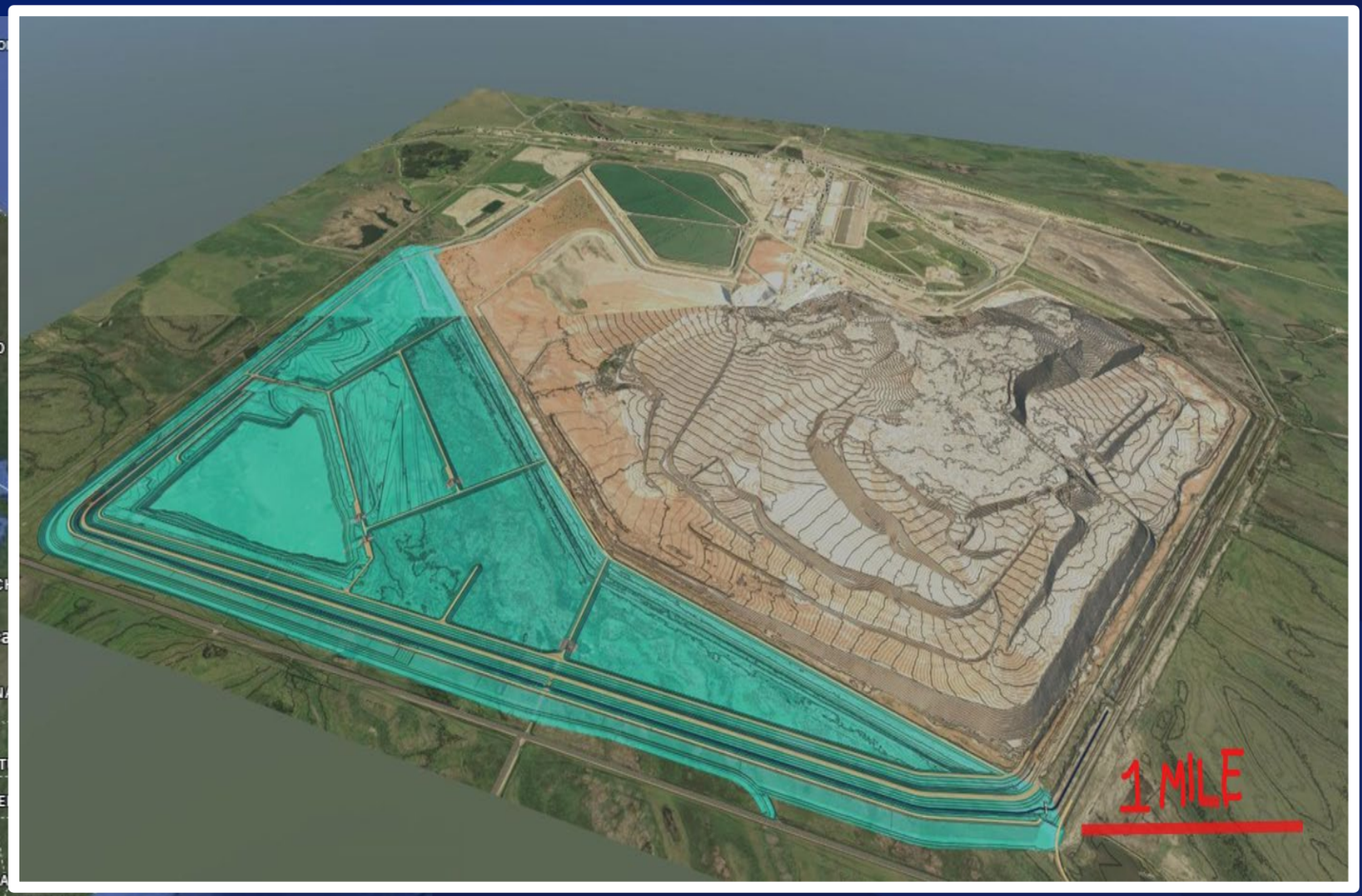

Nutrien

- Who is Nutrien?
- Rocanville Mine
- What is Potash - A few interesting details related to Potash

Spartan Controls Ltd.

SPARTAN CONTROLS

SPARTAN CONTROLS BUSINESS UNITS

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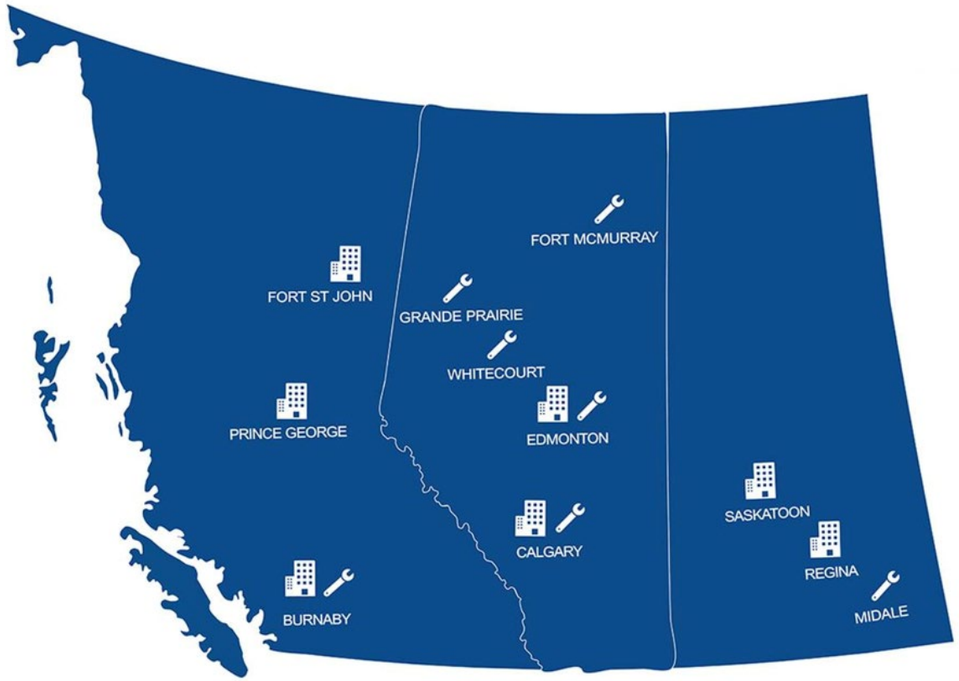

Spartan Controls Ltd. at a glance

Spartan Controls Ltd. is the local Emerson Impact Partner located in Western Canada

Spartan has been selling Fisher Controls valves for 60+ years. Spartan has expanded their product portfolio to align with representing Emerson products and services

We at Spartan have been servicing the Potash community within Saskatchewan since the industry began back in Saskatchewan since the 1960’s

The nearest Spartan office is a mere 120 minutes drive to the Rocanville facility

This is a story about the journey

- Common challenges at a Potash mine (**Cavitation & Erosion**)
  - Cost Implications
  - Selecting The right Product for the Application
  - How do you know what's right for your application – Test Drive
  - Collaborative Effort between Spartan and Nutrien over several years
  - Cost/benefit analysis
  - Knowledge sharing
  - Different tiers of control valve solutions for **erosive service**

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Erosive Service Control Valves

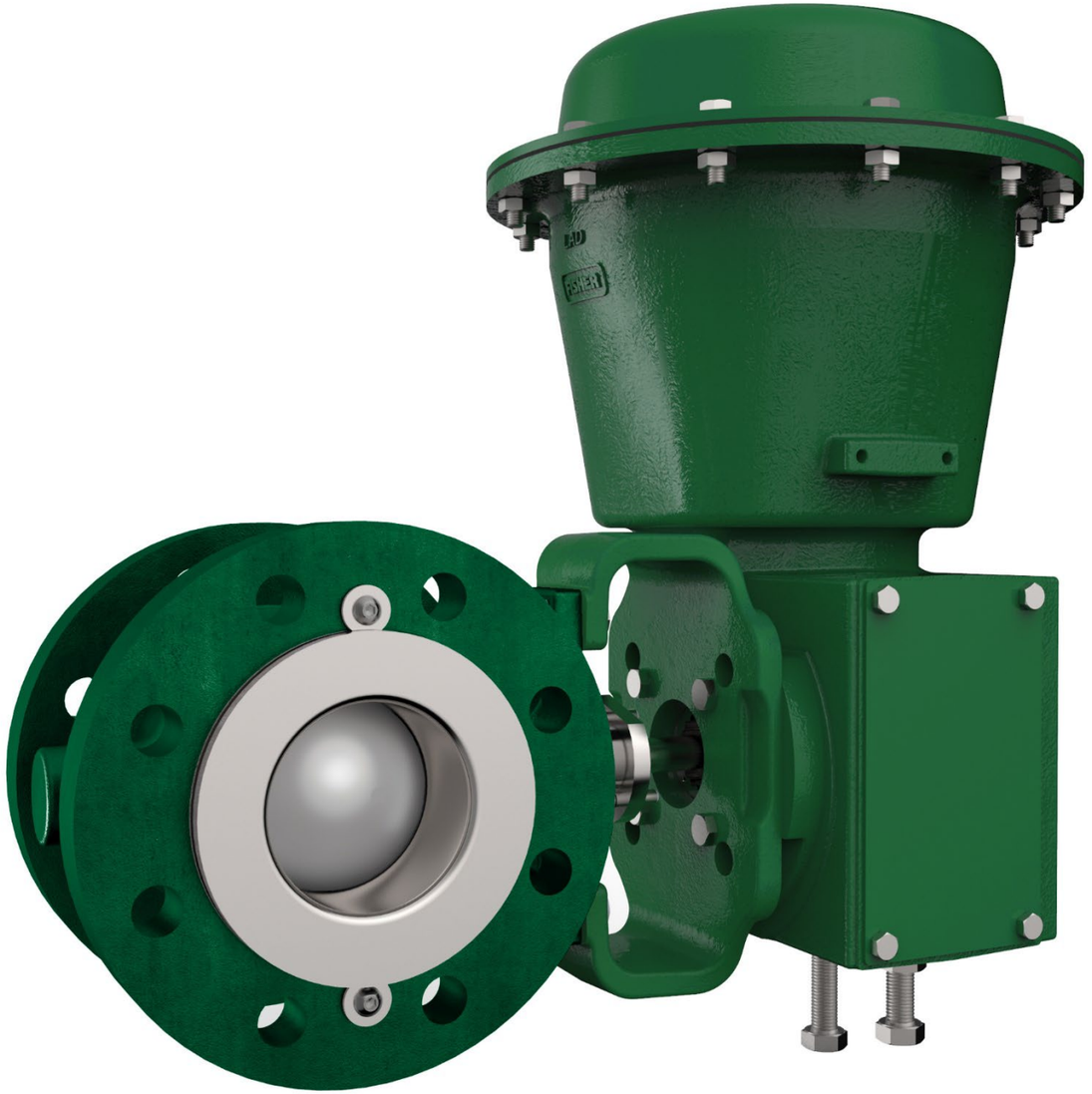
What options were considered?

How long did a solution last?

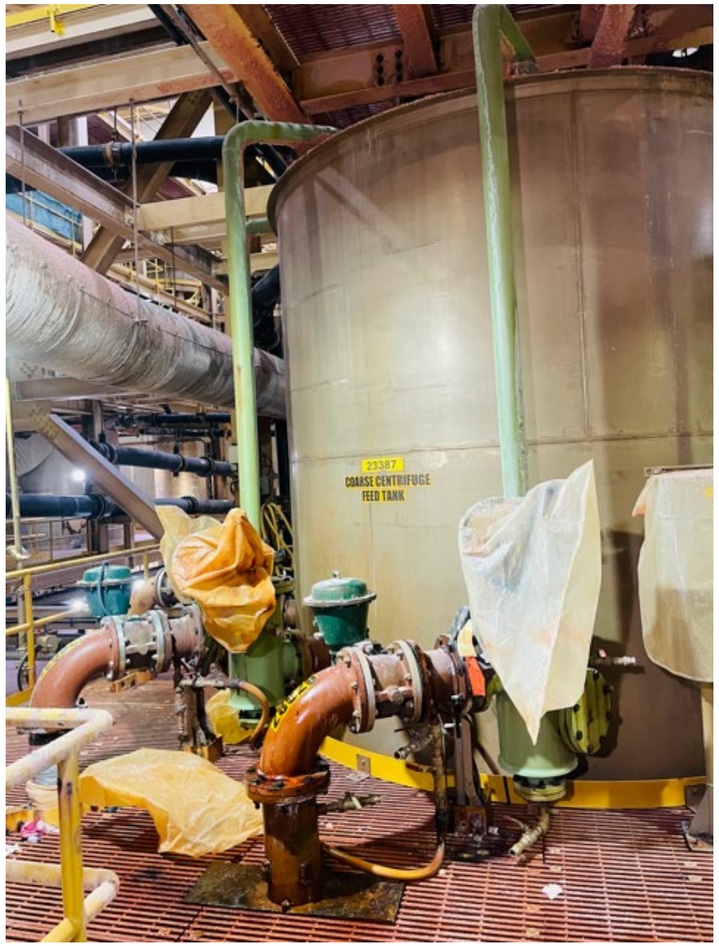
Life is about the journey

Erosive Severe Service

- What is “Severe Service”?
- Why rotary valves in a Potash facility?
- What solutions were considered and why?



The Challenging Applications



Centrifuge Feed Application

Cross Flow Separator

Why did Rocanville need a better “mouse trap”

8” V150, SST body, Reverse Flow
- Letters off casting are worn off
- Body has mirror finish
- Eventually led to a hole in the valve body

Ball was razor sharp
- Some of the “V” is eroded away
- Seat ring is eroded and partially missing
- Some ball material & coating worn away

Fisher’s extensive Erosive Service offerings

Fisher’s extensive Erosive Service offerings

Thickener Underflow Application

- Erosive Application
- 180’ Diameter Thickener Tank
- 8” U/F Pipe, Lined CS Sched 80,
- 100ft of Head and 55% solids
- Turbulent flow regime, non Newtonian fluid
- Corrosive – Salts - MgCl2, NaCl, KCl, Clays, insolubles
- Sludge Hammer effect – As the rakes move across
- Erosion due to high solid content and velocity especially during Thickener recirculation, throttle the valve more ~10-25%

Fisher’s extensive Erosive Service offerings

6” V150S, SST body, Reverse Flow
- Ceramic liner, plug, & Seat Ring
- Alloy 6 Bearing

How long did the Solutions last?

Long enough to justify the cost difference, for sure.

- Crossflow U/F - 12 months to 2.5 years
- Centrifuge Feed – 1.5 years to 4+years
- Thickener U/F –
  - SST Vee-Ball valve - 4 months. Tried both forward and reverse flow.
  - Coated - tried forward flow - 8-10 months, then tried TC reverse flow - 12 to 14months
  - Ceramic installed – going 2.5 years with very minimal wear

Summary

A journey with many steps

- *Labor cost ~ $300,000*
- *Downtime ~ 46Hours*
- *Production losses ~ $1,800,000*
- *High Price = High Cost Saving*
- *It takes time to “test drive” a valve in an application and is typically measured in years, not months*
- *In the end the Journey was worth every minute and every effort put in*
- *Enjoy the Journey, don’t wait till the destination*

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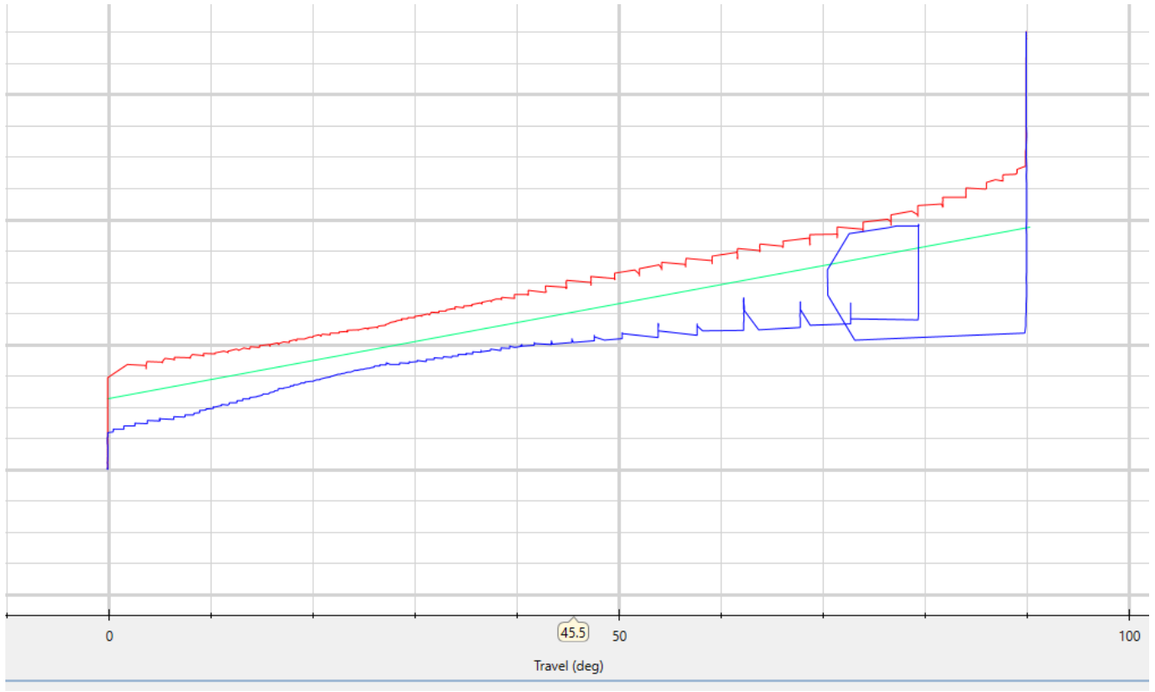
Leveraging Technology

A predictive maintenance approach

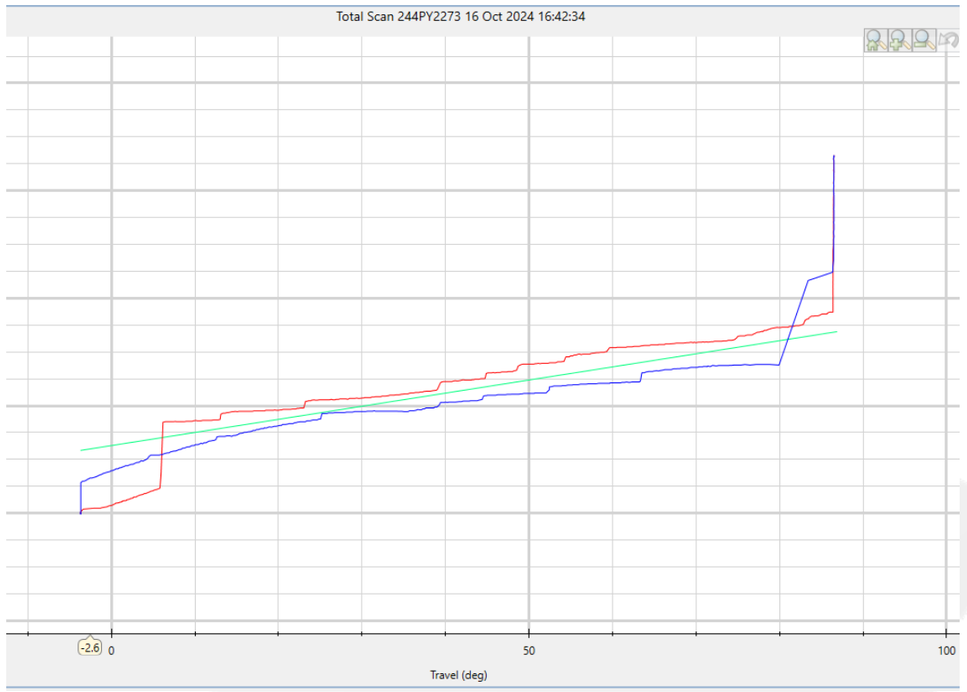
Diagnostics are key to predictive maintenance

- The Fisher FIELDVUE digital valve controller provides mountains of diagnostic information
- We at Spartan have a program in place with Nutrien to remotely monitor their assets (including control valves
- Specific focus on friction. A drop in friction reflects the ball is no longer contacting the seat. That means wear of the seat is likely.
- There are other details that we've been able to identify via diagnostics. For example:
  - Unexpected friction increases (increased torque, friction, etc.)
  - Travel shifting
  - Air leaks
  - Improper tuning
  - Reduced Travel
  - Improper initial set up
  - Found broken magnetic array
  - Alert monitor indicating Pressure Fallback has been activated

Diagnostics are key to predictive maintenance



- Increased torque scenario



- Poor seating profile, no saturation present

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Find More Information

Exhibit Hall – Fisher Valve Solutions

Contacts

Nutrien Potash

Spartan Controls Ltd.

Fisher Severe Service

Fisher V150S

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Thank You