US Sugar Rail Modeling in the Cloud

AnyLogic Conference 2023

September 5 – 6, 2023

Nashville, TN

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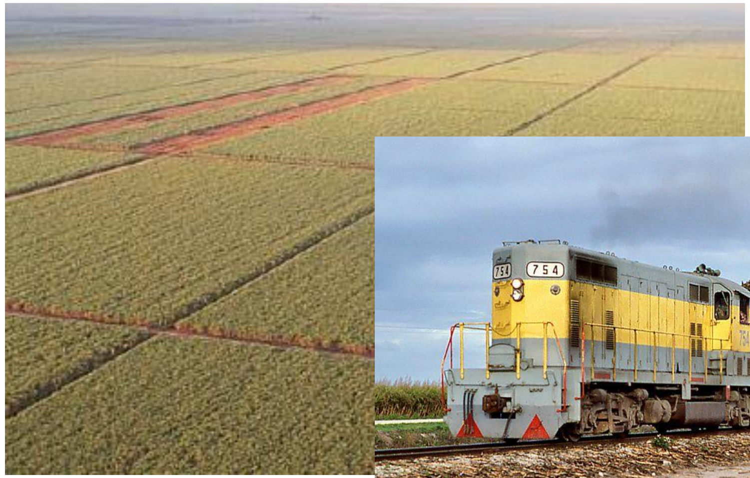
Crouch Engineering & Scott Vick

- Crouch Engineering, Inc is a 32-year engineering firm focused on the railroad industry
- We provide design and construction management for Class I Railroads and shortline railroads
- Based on Brentwood, TN and provide engineering services nationwide
- Scott Vick, PE is responsible for the Construction Management group
  - 7 years with Crouch Engineering
  - Worked with US Sugar for 6 years

US Sugar Background

- Largest sugar cane producer in the United States
- Farms 230,000 acres of sugar cane in south Florida
- Uses rail to bring cane from field to refining facility
- Operates and maintains a fleet of 800 cane cars



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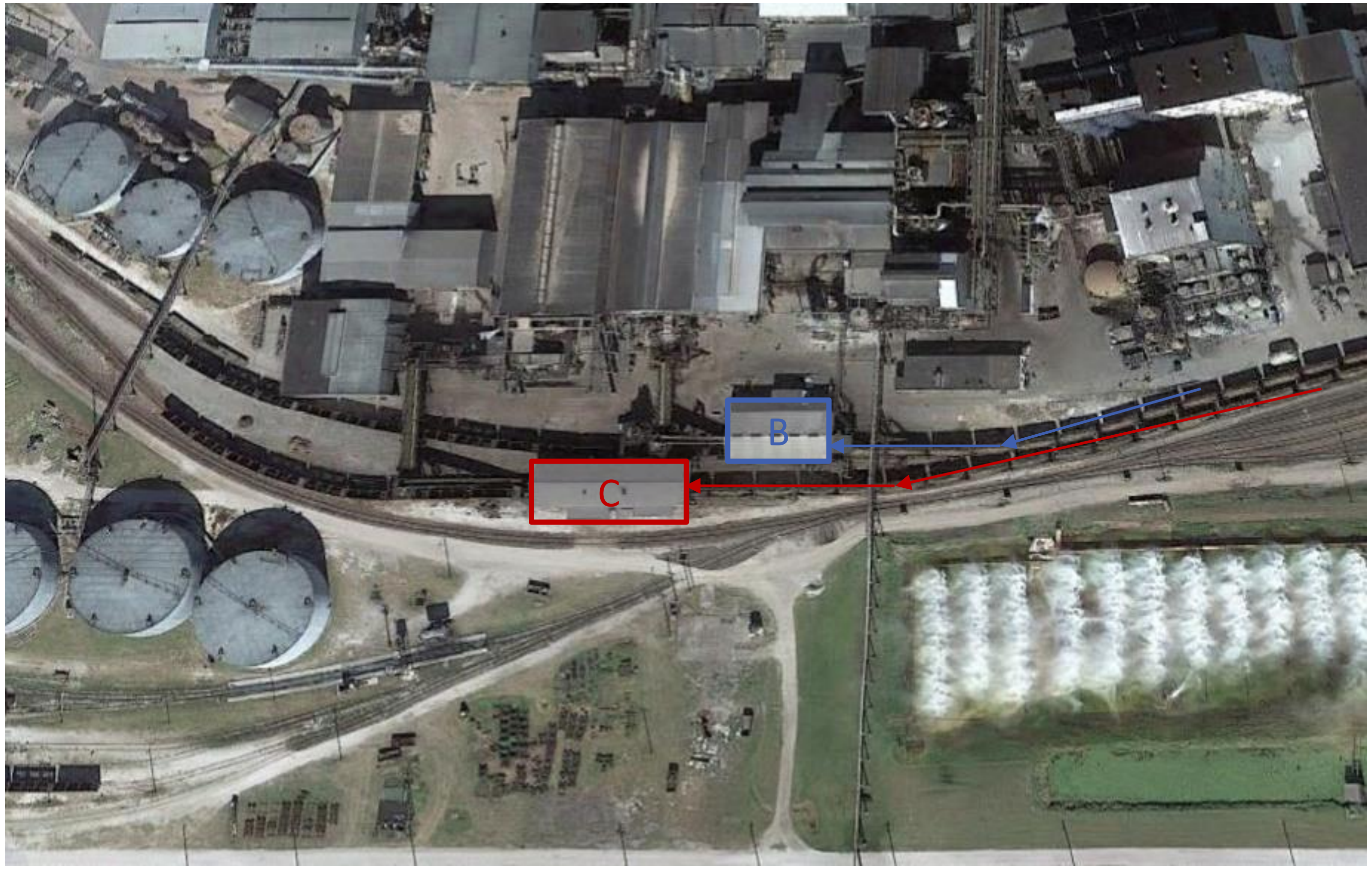
Refining Delivery Points

- 2 rail delivery points to the sugar mill
- The sugar mill must be continuously fed by these 2 points
- Sugar mill uses a tipper system to dump the sugar cane



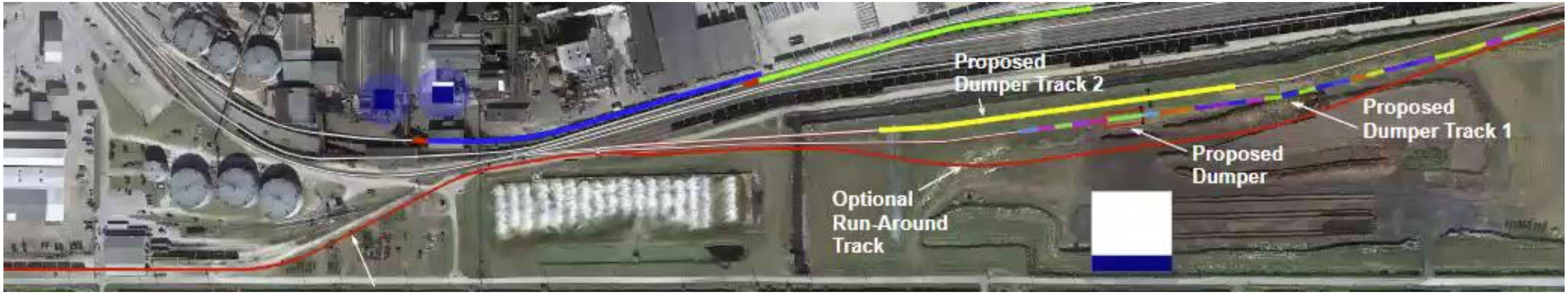
Cane Car Challenges

- Cane cars are at the end of their useful life
  - 60 to 70 years old
- FRA regulations dictate that new(er) cars are required for use on public rail
- Cost to replace a cane car exceeds $100,000 with fleet replacement costs estimated at more than $80M
- The tippers at the sugar mill are sized specifically for the cane cars
- Limited rail access into the dumper stations

How Can We Use Coal Cars?

- Coal cars are much more affordable
- Repair parts are readily available
- Coal cars are longer than cane cars and hold more volume
- No space to re-work manufacturing delivery
  - Must still deliver sugar cane to the manufacturing hoppers in the cane cars
- Solution: Build a transfer system to bring sugar cane in from the field on coal cars, but then to the manufacturing hoppers in cane cars

Additional Transfer Point



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Why Simulate?

- Key Question: Can this process occur with the minimal track alternative?
- Complexity
  - System has variability in processing times
  - Complex train moves
    - Trains dumping cane into new hopper
    - Closed loop trains loading at new hopper and unloading at existing hoppers
    - There are 2 unloading spurs for 2 independent unloading positions
- Criticality
  - When cane is in season, it is critical the facility runs non-stop
  - This major decision had to be right

AnyLogic Model Manager

DEMO SOLUTION

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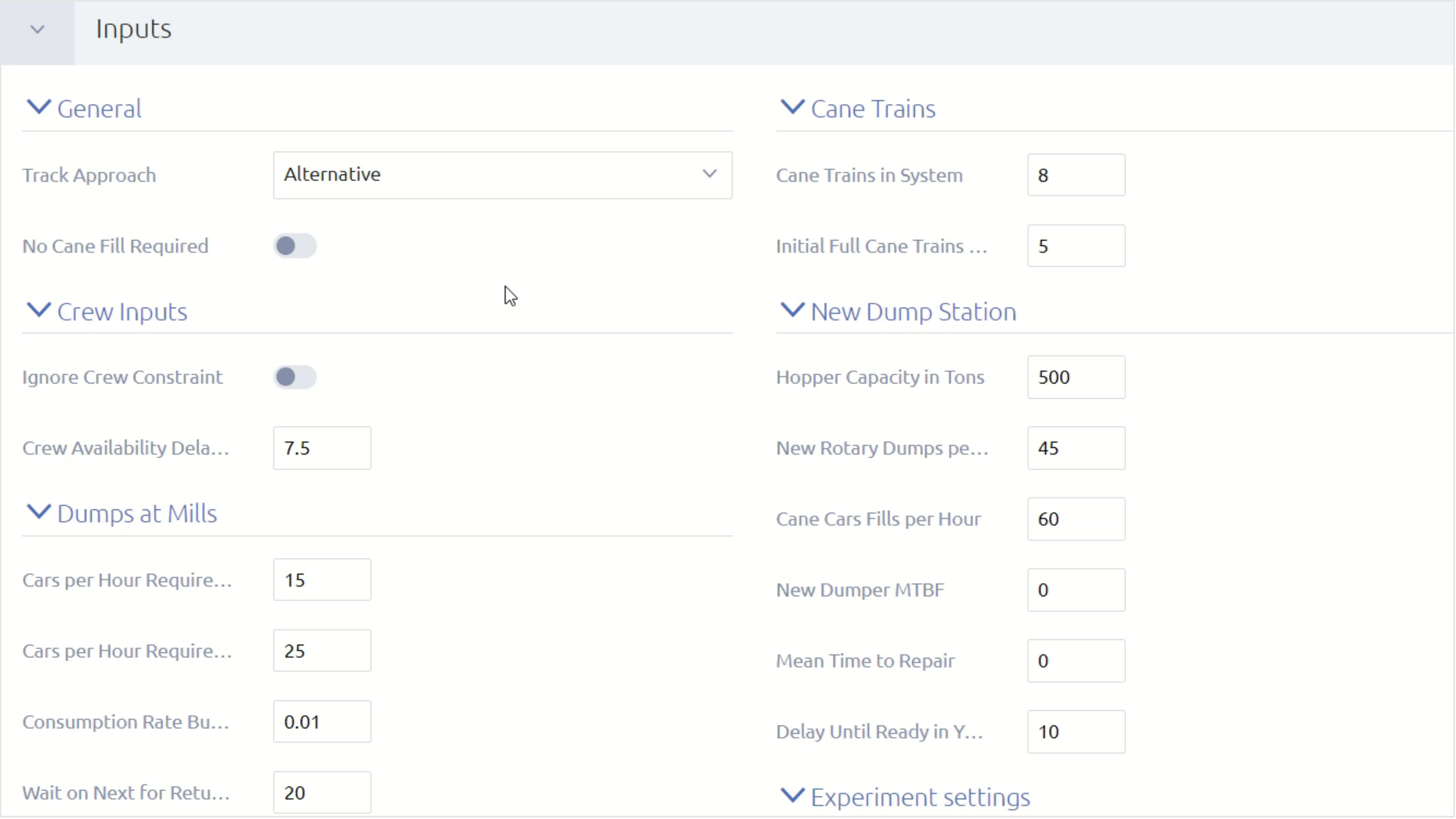
Inputs

- Select track alternative
- Target processing rates
- Crew policies
- Rail movement delays
- Hopper delay times & capacity



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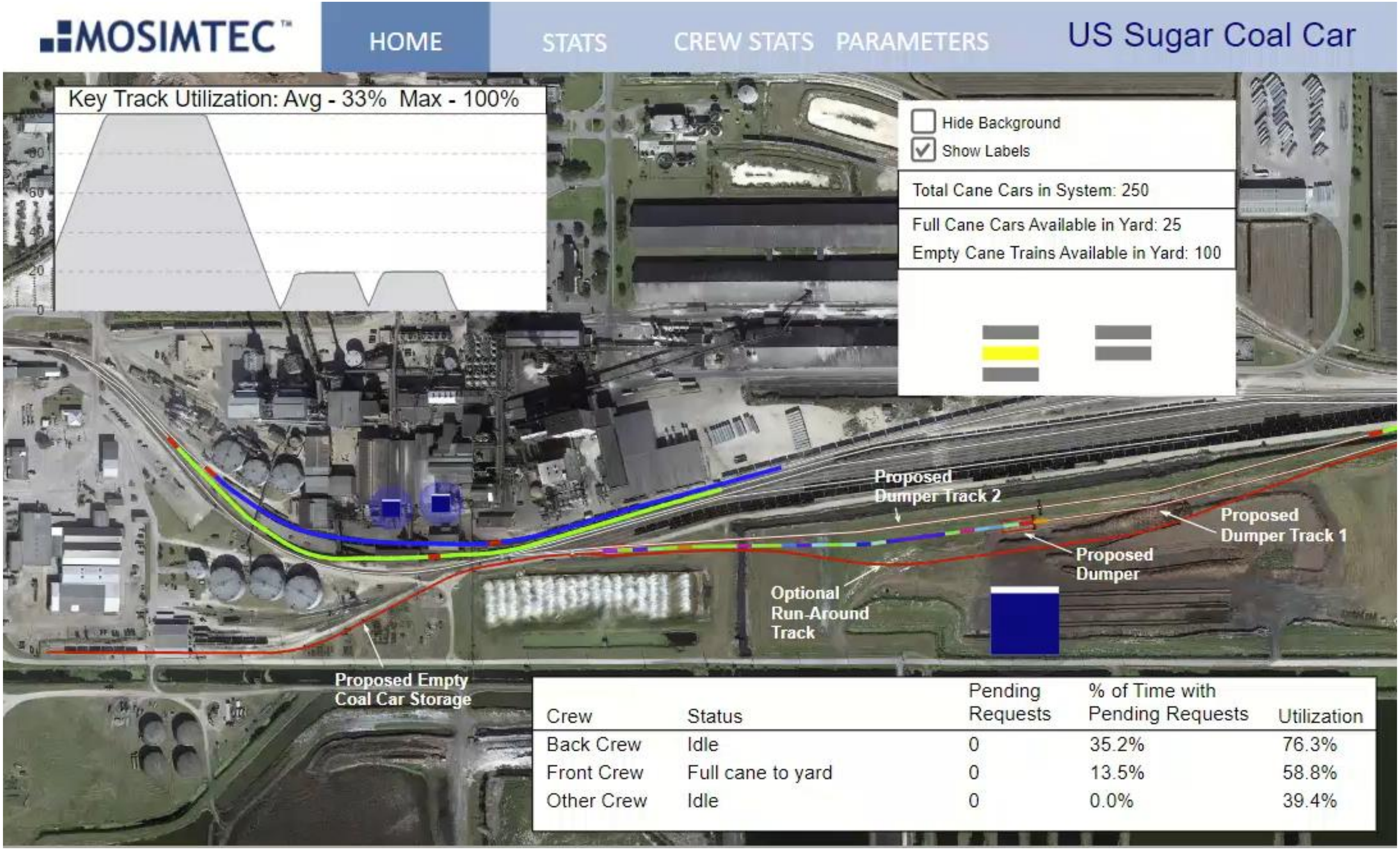
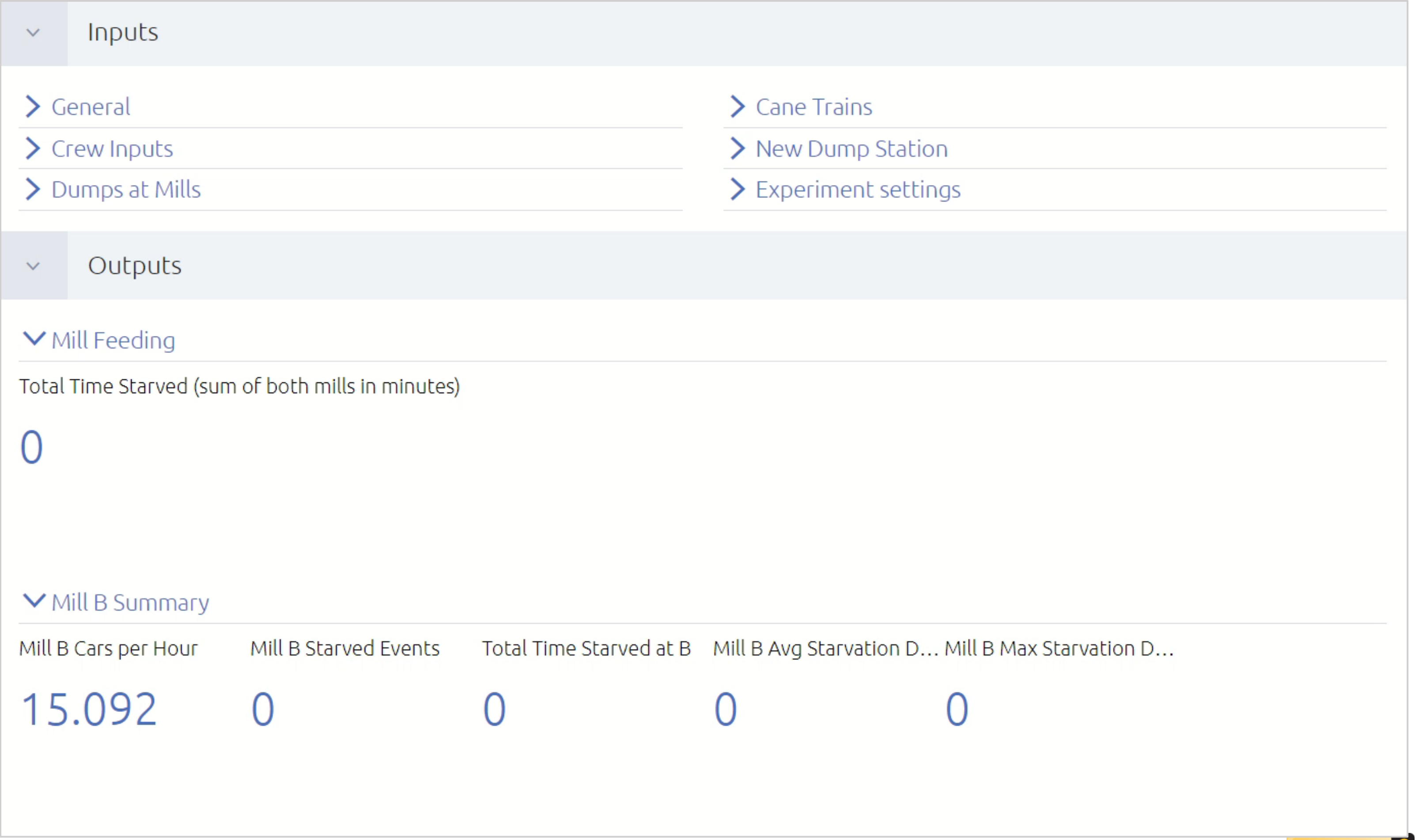


Crew	Status	Pending Requests	% of Time with Pending Requests	Utilization
Back Crew	Idle	0	35.2%	76.3%
Front Crew	Full cane to yard	0	13.5%	58.8%
Other Crew	Idle	0	0.0%	39.4%

Outputs

- Starvation was key outputs
- Resource utilization
  - Crew
  - Hopper
  - Key track areas



Findings

- There was no difference between the 2 track alternatives
- The new rotary dumper was throttling the system
- Modeling showed additional rotary dumper capacity would be necessary for successful operations
  - When the rotary dumper was removed as a constraint, there was a difference in track performance
  - While there was a difference, both alternatives met the system requirements

Key Benefits

- Rail library allowed quickly modeling key moves
- AnyLogic model manager allowed quickly iterating new versions of the model
- Multiple stakeholders were able to log in quickly to see results and test different input combinations
- Seeing the animation allowed required level of understanding
- Critical design decision was made based on model findings

THANK YOU

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