Caliper Brakes in Dragline application

Selection, application, and installation of a modern dragline braking system
Static Demands
Dynamic requirements
Transformation of energy
The law of conservation of energy states that the total energy of an isolated system is constant; energy can be transformed from one form to another, but cannot be created or destroyed.

Brakes turn kinetic energy into heat energy.
Hand brake
(1792 Stage Coach)
Drum Brakes
(1908 Ford Model T)
Disc Brakes
(1973 Ford F100)
Brakes in Dragline Application
# Role of Brakes on a Dragline

## Static Requirements
(prevents undesired motion)
- Hoist – Hold bucket
- Propel – Hold shoes
- Drag – Hold bucket
- Swing – Maintain position
- Pass motor stall test for boom raising and lowering

## Dynamic Requirements
(bring motion to a controlled stop)
- Catch a bucket
- Stop drag payout
- Stop machine rotation
Brake arrangements
Drum Brakes
## Drum Brakes

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
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</thead>
<tbody>
<tr>
<td>• OEM equipment on most machines</td>
<td>• Parts may be obsolete</td>
</tr>
<tr>
<td>• Low or zero initial cost</td>
<td>• Medium cost of ownership</td>
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<tr>
<td>• Perform required braking duties initially</td>
<td>• Difficult to adjust and service</td>
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<tr>
<td>• High comfort level with maintenance</td>
<td>• Unlikely to perform duties after emergency stops</td>
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<td></td>
<td>• Many hazardous areas</td>
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<td>• High down time if repairs needed</td>
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Friction Liner Replacement

Likely required after power loss, or running through brakes. Replacement requires removal of these pins through the use of hydraulics, sledge hammers, and overhead crane.
Four adjuster bolts makes keeping the brake opening evenly difficult.
The clamping force is adjusted by these tensioning rods. Difficult to evenly distribute braking between units.
Advantages

- Low maintenance
- Fewest operational hazards
- Meet braking requirements
- Long life

Disadvantages

- Difficult to service
- Poor heat dissipation
- High repair costs
- High inventory costs
- Vulnerable air bladder
Clutch Brake - Exploded
Adjustment of clutch style brakes typically requires the unstacking of the disks off the spline hub, and removal of the static discs from the housing. With many of the wear items internal, these brakes are often left out of adjustment.

When they are out of adjustment the brakes can not perform the required braking duties.

Out of adjustment brakes are a hazard to personnel and equipment.
Caliper Brakes
# Caliper Brakes

## Advantages
- Ease of maintenance
- Interchangeability of parts (reduction of inventory)
- Low overall cost of ownership
- Excellent heat dissipation
- Quick rebuild if repairs needed
- Can perform duties after emergency stop

## Disadvantages
- Relative unfamiliarity among mechanics
- High initial investment
Brake Adjustment

Adjusting the caliper brakes only requires loosening of the jam nuts, turning the adjuster screw, and retightening the jam nuts. The quick and easy adjustment (generally less than 5 min/unit) means the brakes are kept in adjustment more consistently than other braking types, giving reliable performance.
Pad Replacement

To replace pads, drive out two 3/16” roll pins. The pads can be changed out without a hoist by a single technician, in less than 30min per unit.
Safety Considerations

- The caliper brakes have some features that are very desirable from a maintenance standpoint. They include a safety feature to prevent the spring energy from becoming harmful.

- Also the design of the brakes allows for maintenance with small hand tools, and the pieces themselves are light in comparison. The pads weigh less than five pounds.

- Unlike the drum brakes, the caliper disc brakes have very few “pinch points” the gap between rotor and pads when operating is .060” too tight to get a finger caught in.
All of your dragline brakes are spring applied pneumatic release. The caliper brakes selected have a safety isolation feature. Inserting a bolt in the end of the caliper before servicing allows the brake to be worked on without fear of being injured by the energy captured in the springs. To secure the brake open for maintenance, simply remove the breather, and install a bolt in its place.
Interchangeability of parts

Reduction of inventory. One pad/thruster fits all positions
Questions???