Tyler Crews (ABE), Yuqian Lin (ABE), Kyle Riffle (ASM), Jason Quinn (ASM), and Michael Peters (ASM)

**Problem Statement:**
Our project goal is to solve the problem of down time associated with the required manual tensioning of the outer draper belts on a John Deere HydraFlex Draper. The mechanization of this necessary maintenance process could ease operator fatigue, increase productivity, extend belt life, and perhaps apply to other devices which have similar designs.

**Goals:**
- Reduce maintenance time
- Ease of use
- In cab controls
- Built prototype
- Perform throughout analysis
- Have design tested for possible problems

**Constrains:**
- Low cost of implementation
- Belt life of at least 2500 hours
- Pressure for hydraulic system should be under 2150 psi
- Allow for some fluctuation movement in operation
- Failure of design should not bring problems to other parts
- Safe for human operation

**Alternatives:**
- Hydraulically Actuated External Cam
- Hydraulic Adaption of Existing Assembly
- Hydraulically Actuated Idler
- Hydraulically Actuated Scissor Linkage

**Recommendations:**
- Shorter hydraulic cylinder
- Two “levers”
- In cab controls
- Hinge mount on cross member
- Cam assembly for cylinder attachment
- More consistent hydraulic supply

**Summary:**
The mechanization of this necessary maintenance process would increase productivity and extend belt life. The implementation of this idea would require a higher initial investment in the equipment but would save the operator money.

**Description**

<table>
<thead>
<tr>
<th>Description</th>
<th>Total Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel Ball Joint Rod End (1/2&quot;)</td>
<td>$46.06</td>
</tr>
<tr>
<td>Forged Clevis Rod End (1/2&quot;)</td>
<td>$107.70</td>
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<tr>
<td>Alloy 954 Bronze Flanged-Sleeve Bearing</td>
<td>$31.74</td>
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<tr>
<td>Alloy 954 Bronze Sleeve Bearing</td>
<td>$91.00</td>
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<tr>
<td>Pressure reducing valve (100-1000 psi regulating range)</td>
<td>$191.21</td>
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<tr>
<td>Orifice (flow control valve)</td>
<td>$60.58</td>
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<tr>
<td>Gauges (0-1000 psi; 1/4&quot; pipe size; 2&quot; face)</td>
<td>$19.68</td>
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<tr>
<td>Relief valve (300-1000 psi; 3/8&quot; pipe)</td>
<td>$68.18</td>
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<td>Steel Ball Joint Rod End (5/8&quot;)</td>
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<tr>
<td>Manual ball valve (7,250 psi rating 3/8&quot; NPT)</td>
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<td>Accumulator (5 - 7 in^3 with 450 - 550 psi pre-charge)</td>
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<td>Hydraulic cylinder (1.5&quot; x 6&quot;)</td>
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<tr>
<td>All steel components (levers, rods, misc., etc.)</td>
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<tr>
<td>Bolts, pins, nuts, hose, fittings, etc.</td>
<td>$700.00</td>
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</table>

**Total:** $2,139.44

**Figure 1. Existing John Deere Design**

**Figure 2. Finite Element Analysis**

**Figure 3. Implemented Design**

**Figure 4. Hydraulic System**

**Sponsor:** John Deere; Chance Corum, Dennis Silver

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