PURDUE UNIVERSITY

CAPSTONE EXPERIENCE 2014

Auto Tensioning System for John Deere Draper Belt

Agricultural & Biological ENGINEERING

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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.

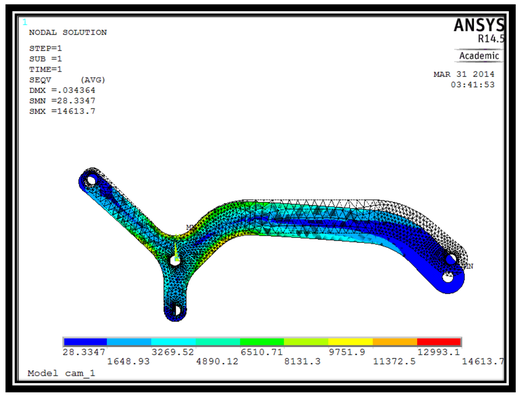

Figure 2. Finite Element Analysis

Alternatives:

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

Description	Total Price
Steel Ball Joint Rod End (1/2")	$46.06
Forged Clevis Rod End (1/2")	$107.70
Alloy 954 Bronze Flanged-Sleeve Bearing	$31.74
Alloy 954 Bronze Sleeve Bearing	$91.00
Pressure reducing valve (100-1000 psi regulating range)	$191.21
Orifice (flow control valve)	$60.58
Gauges (0-1000 psi; 1/4" pipe size; 2" face)	$19.68
Relief valve (300-1000 psi; 3/8" pipe)	$68.18
Steel Ball Joint Rod End (5/8")	$9.94
Manual ball valve (7,250 psi rating 3/8" NPT)	$41.75
Accumulator (5 - 7 in^3 with 450 - 550 psi pre-charge)	$193.60
Hydraulic cylinder (1.5" x 6")	$178.00
All steel components (levers, rods, misc., etc.)	$400.00
Bolts, pins, nuts, hose, fittings, etc.	$700.00

Total: ***$2,139.44***

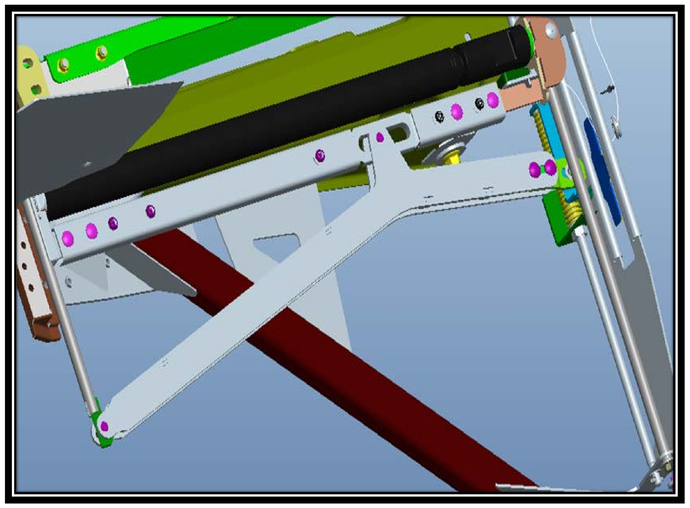

Figure 1. Existing John Deere Design

Figure 3. Implemented Design

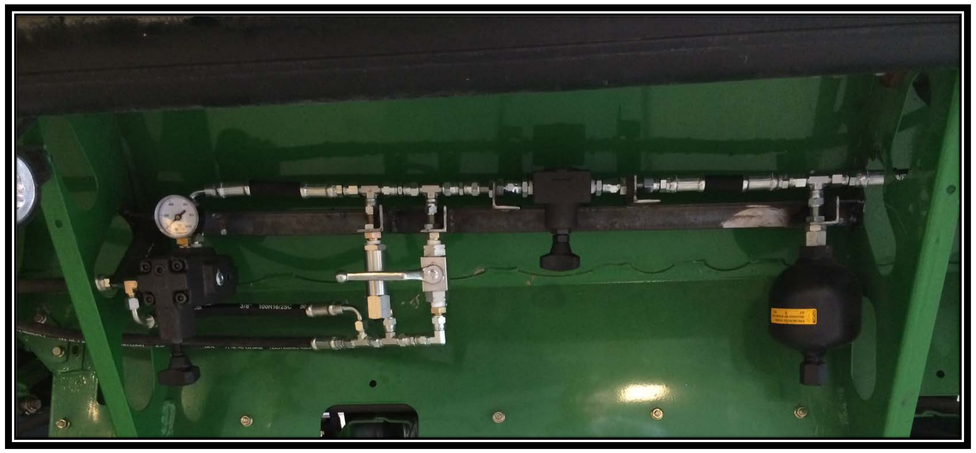

Figure 4. Hydraulic System

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

Goals:

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

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.

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