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RELEASE A VEHICLE WHEEL FROM LOOSE MUD

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Abstract:

As there is a continuous decrement of rural population in India has become the main cause for the growth of urban population, increase in productivity of agriculture has become an essential feature in stepping towards sustainability. Now a day's only few people are interested in cultivation activities due to high manual work and low income. As younger generation avoids the cultivation, the labor shortage has become very significant. To motivate the young people into agriculture, mechanization plays a vital role. This project describes about one such mechanization, which is done on releasing a tractor Wheel from Loose Mud Area. This project is being developed to reduce manpower, labor cost and damage in tractor body also. The attachment assembly is Design by using Auto Cad package and fabricated. Finally the mechanization was tested in the field area successfully.

Key Words: Agriculture,Tractor,Attachement Tool,Auto Cad.

1. INTRODUCTION

In agriculture field we have to use tractors attain a lot of problems .Due to not proper friction between soil and vehicle. The soil particles not having a good bonding structures. So, We are plan to release vehicle with help of this Attachment Tool. This tool very useful to agriculture field to develop the cultivation. This Innovation should be used in coming generation.

2. DESCRIPTION

2.1. SHAFT

Shaft is a rotating machine element which is used to transmit power from one place to another and also it is used for transmission of torque and bending moment. The driver shaft is supported with flange at the ends. The driver shaft is threaded at one end so as to adjust in bend assembly and lock it with key. Driven shaft which is held at the bottom carries the bend and foot.

Fig.2. Shaft

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2.2 BEND

Fig.2.Bend

Bend is used to transmit the power in horizontal as well as vertical. One bend is connected with one end of the shaft and another end is connected with another end of the shaft. Another bend is used to connect one shaft and foot flange.

3. WORKING

The main purpose of the project is to removing the vehicle wheel from loose mud in the agriculture land. Agriculture cultivator is attached to the rear wheel of the tractor which carries the entire setup of additional attachment. When the tractor is in moving position along with this the additional element also rotate. Now the power is transmission to the flange in form of twisting moment. Then the flange is transmitting the power to the shaft, as well as shaft is transmit the power to bend via key. so, the power transmit to foot in form of rotational motion. When the rear wheel is rotate, the foot also rotate with the wheel of rotation. Here, we are using length of the additional attachment is larger then wheel of radius. So, the tractor will be lift on upward and moves towards. When the tractor is suck in the loose mud, this attachment is attach to rear wheel and rotate wheel on forward then the tractor is moving from the loose mud.

4. DESIGNING

Inner diameter of pipe (d_1) = 68 mm
Outer diameter of pipe (d_2) =76 mm
Bending moment on pipe (m_b) =load*distance
(M_b)=1500*9.81*400
(M_b) =8240000 N- mm
Bending stress on pipe (σ_b) $= m_b / (\pi/32)((d_2^4 - d_1^4) / d_2)$
Bending stress on pipe (σ_b) =295 N-mm^{-2}

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Fig.3. Stucked tractor

Fig.4.Relived Tractor from pit

4.1.1 Calculation for flange:

Flange thickness (t_f) =1.5*t+3

Here, t=pipe thickness

From R.S. Kurmi at page no.272

t_f = 1.5*3 +3

t_f = 7.5 mm

Diameter of flange=250 mm

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Shear stress on flange (τ) =39 N/mm^2

Hence, Design is Safe.

4.1.2 Calculation of welding:

Shear stress (τ) = (2.83*m $_t$) / (h*d^2*π)

Twisting moment (m $_t$) =1500*9.81*38=559000 N-mm

Shear stress on weld area (τ) = (2.83*559000) / (5*76^2*π)

Shear stress on weld area (τ) =17.43 N/mm^2

Hence, Design is Safe.

4.1.3 Calculation of bend:

Outer diameter of bend (d_{b1}) =84 mm

Inner diameter of bend (d_{b2}) =76 mm

Bending stress on bend (σ_b) =m_b / (π/32)(($d_2^4 - d_1^4$) / d_2)

Bending stress on bend (σ_b) =125 N-mm^{-2}

Hence, Design is Safe.

4.1.4 Calculation of bolt:

Diameter of bolt (d_b) =14 mm

Load on bolt (p) =1500*9.81=14175 N

Shear stress on bolt (τ) = (P*4)/(2*π*d^2)

τ= (14175*4)/ (2*π*14^2)

Shear stress on bolt (τ) =47.79 N/mm^2

Hence, Design is Safe.

4.1.5 Design of foot shaft:

d=diameter of foot shaft

Area of foot shaft (A) =π/4*24^2

Area of foot shaft (A) =452.16 mm^2

Assume,

Foot is consider as fixed beam and load is uniformly distributed load.

Bending moment on foot shaft (m $_b$) = 183900 N-mm

Bending moment on foot shaft (m $_b$) = 4414500 N-mm

Bending stress on foot shaft (σ_b) = $m_b / (\pi/4*d^3)$

Bending stress on foot shaft (σ_b) =135.57 N/mm^2

Hence, Design is Safe.

4.1.6 Calculation for angle plate:

Length of angle plate (l_a) =25 mm

Thickness of angle plate (t_a) =5 mm

Cross section area of angle plate (A) =225 mm^2

Section modulus on angle plate (z) =1523.7 mm^3

Bending moment on angle plate (m_b) = 183900 N-mm

Bending stress on angle plate (σ_b) = m_b/z

Bending stress on angle plate (σ_b) = 120.748 N/mm^2

Hence, Design is Safe.

Total height of the attachment (H) =874 mm

Total length of the attachment (L) =640 mm

Total weight of the attachment= 19 kg

Length of foot=300 mm

Diameter of foot =150mm

RESULTS AND DISCUSSION:

Distance moved by tractor wheel (x) = X+Y

Ex. Here, $\theta=30^0$, $\alpha=40^0$, length over the tyre=150 mm

$\cos\theta=\frac{X}{150}$

$\cos 30^0=\frac{X}{150}$

X=130 mm

$\cos\alpha=\frac{Y}{150}$

$\cos 40^0=\frac{Y}{150}$

Y= 115 mm

Distance moved by tractor wheel (x) = X+Y

x=130+115

x=245 mm

Factor affecting the distance moved:

• Height of the additional attachment.

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- Size of the tyre.
- Depth of dig.
- Soil condition.

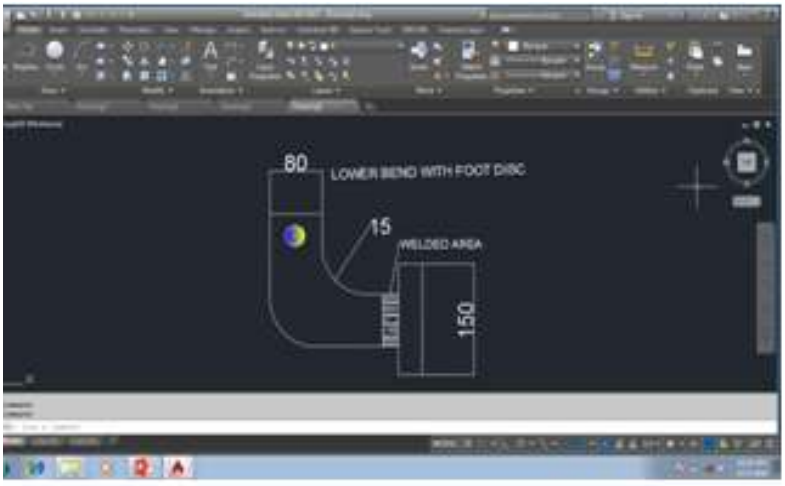

Fig.5.Final result

CONCLUSION

This additional attachment plays an important role in tractor wheel relieving from loose mud. During vehicle wheel removing process many problems occurs and one among them is the man power and time shortage. Thus by introducing the attachment we can reduces the man power and time consumption. The attachment of vehicle wheel removing process is one of the important tasks to be done to achieve sustainability in agriculture process. In this project, Design is done by using Auto Cad. Validating the design by analytical and numerical values, hence the attachment will withstand in working conditions in the field area. Practically the attachment is working successfully without any problems. The successful attachment of vehicle wheel removing process can provide less time consumption and less energy compared to the other conventional methods which is currently used by the farmers and other persons.

REFERENCES

1. "Agriculture in Sri Lanaka". Retreived from http://en.wikipedia.org/wiki/Agriculture_in_Sri_Lanka
2. Daryl L. Logan (2002), A first course in Finite Element Method, Thomson learning Inc, CA 93950, USA.
3. Department of Agriculture, India, "Directory of Machinery and Manufacturers", http://agricoop.nic.in/dacdivision/Machinery1/chap1b.pdf
4. Garg, I.K., A.K. Madan and Santokh Singh., 1990. Performance evaluation of tractor-operated groundnut diggers, Journal of Research of Punjab Agricultural University, 23(4):645-651
5. Gupta, R.A. and M.T. Parmar., 1991. An improved blade for groundnut digger, Groundnut News, Gujarat Agricultural University, India, 3(1):7.
6. H.M Thilakaratna, I.G. Thilakaratna, "Farm Mechanization in Rice Cultivation", Department of Agriculture, Sri Lanka, "Rice book (Sinhala)", http://www.agridept.gov.lk/content/admin/pdf/Rice%20book%20(sinhala).pdf

7. Maraviya, R.B., D.K. Mathur and P.N. Sarsavadia., 1988. Groundnut digger suitable for Udaipur region, Agricultural Engineering Today, 12(2):4-5,21
8. Reed, I.F. and O.A. Brown., 1944. Developments in peanut harvesting equipment. AgriculturalEngineering, 125-126,128.
9. R.S. Khurmi, J.K Gupta (2008), A Textbook of Machine Design, Eurasia Publishing house (Pvt.) Ltd, Ram Nagar, New Delhi.

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