PRACTICAL USAGE AND ENERGY ANALYSE OF GRAVITATIONAL PENDULUM

Ya.Renchinvanjil
Industrial Mechanization Faculty
Mechanical Engineering School
MUST
Ulaanbaatar, Mongolia
E-mail: vanjil_11@yahoo.com

Ch.Baasandash
Department of Research and Development
MUST
Ulaanbaatar, Mongolia
E-mail: basanda.c.aa@must.edu.mn

***Abstract*-Research in plenty kinds of energy resources are developing and improving well by researchers. By this research made a calculation of gravitational range of pendulum dynamic analyze using theoretic and ADAMS software which can be understand in solitary energy resource. Hereafter to recommending invite some equipments which can be used as practical usage.**

Keywords-disperse;varation;mpaekmopu

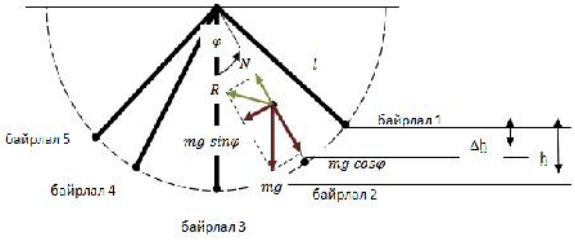
I.Introduction

In 1999 Serbian inventor VeljkoMilkovic invented two phased sway mechanism and that was a new concept [1]. In 2007 NebojsaSimin increasing inflow energy of gravitational sear pendulum and used in armed pump [2]. In 2009 Canadian scientist Victoria BC was determined inflow and outflow energy of gravitational pendulum by his experiment [3]. In 2013 Nikhade. G.R and Patil. R.U left water using 2 phased gravitational pendulum's reciprocation utilized in armed pump [4].

By this research did a calculation of gravitational range of pendulum dynamic and inflow and outflow energy analyze using theoretic and ADAMS software which can be understand in solitary energy resource.

II.Main section

Physic pendulum:

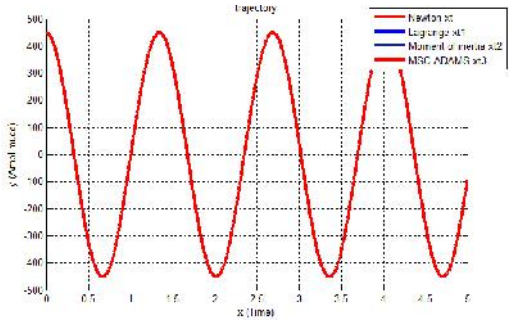


Picture 1.1. Gravitational physic pendulum

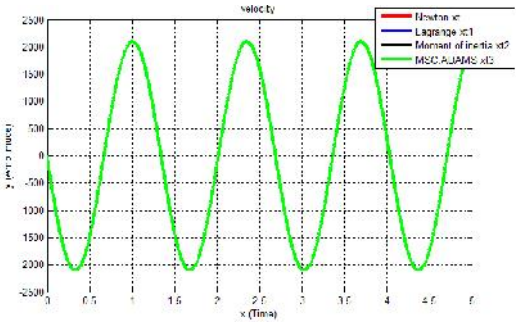
Equation for oscillated movement of physic pendulum considered below.Movement of pendulum rotated by half circuit pathway and its dynamic equation made with Newton, Lagrange and inertial moment method.

$$\varphi'' + \frac{g}{l}\sin\varphi = 0 \qquad (1.1)$$

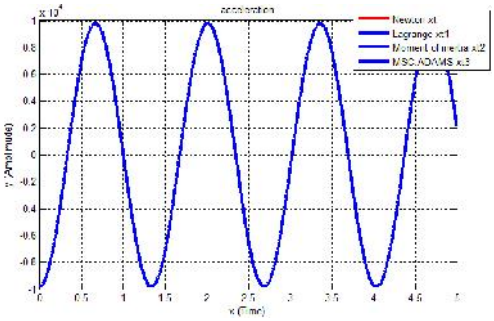
Oscillated path of pendulum, velocity and acceleration results from dynamic analyze based on Newton, Lagrange and inertial moment methods and MSC.ADAMSsoftware calculation graphics as shown below



Picture 1.2:Trajectory graphic of gravitational pendulum



Picture 1.3: Velocity graphic of gravitational pendulum



Picture 1.4:Acceleration graphic of gravitational pendulum

Actual analyze of pendulum:

Explained detailed analyze of common pendulum system by previous section. At present analyze oscillate movement of common pendulum with actual or air resistance force and friction force in diffusing oscillate of pendulum.

Air resistance force of pendulum:

During oscillated movement of pendulum it will be under air force reaction called air resistance force and such force have opposite direction with pendulum. Also friction resistance forced to pendulum. This irrelevant by velocity, depend velocity of air resistance force. Equation of air resistance force during pendulum movement is

$$F_d = \frac{1}{2} c_d \rho_f A V^2 \qquad (1.2)$$

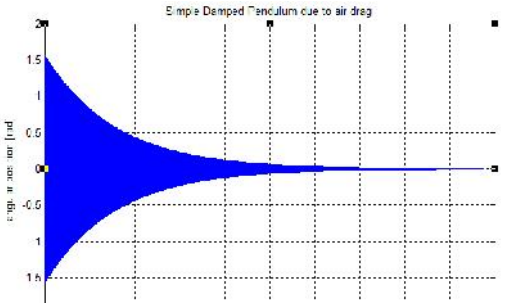
Friction force of Pendulum:

Parts of pendulum friction to each other and it cause diffuse of pendulum oscillate movement. Mainly mechanization friction is dominating to diffuse the system. Friction force had direct correlation with velocity of object. By this instance is more difficult because pendulum and its foothold connection is rotate system. By this instance got diffuse force moment instead of diffuse warp moment. Warp moment force opposite direction from pendulum. Equation for diffuse to oscillation of pendulum rotate system as shown below.

$$\tau_j = j\omega \qquad (1.3)$$

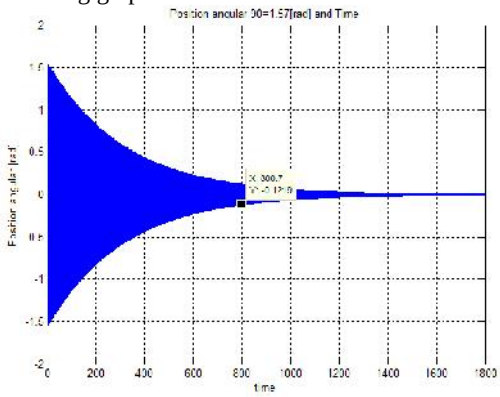
III.Result of MATLAB software:

Made actual analyze of pendulum and introduced by this section. Diffusing movement of pendulum with air reaction considered by this analyze. Air resistance coefficient is equivalent with $C = 12\,\mu\frac{A}{l}$ which is determined before. Air dynamic viscosity coefficient is 20^0c, $1.81*10^{-5}$and $\frac{A}{l}$comparison is very low. Then C parametrical value is too low and equivalent with $3.62*10^{-7}$. Using above parameter and equation No.1.2 there aren't any diffuse which proceeded from air resistance.



Picture 1.5

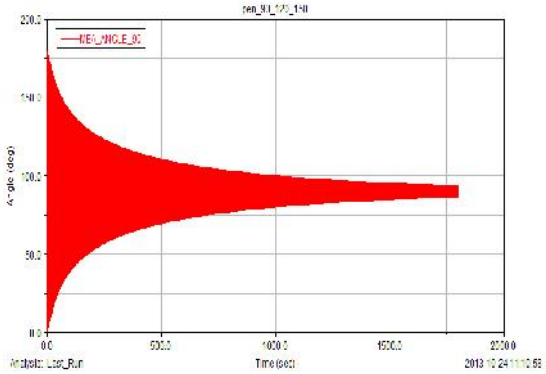
Diffuse oscillate cause from knuckle friction which is connecting pendulum, for this time friction coefficient is unknown. Friction coefficient is determined by any experiment and for this time bearing coefficient is 0.03 and made following graphical calculation.



Picture 1.6

Result of MSC.ADAMS software.

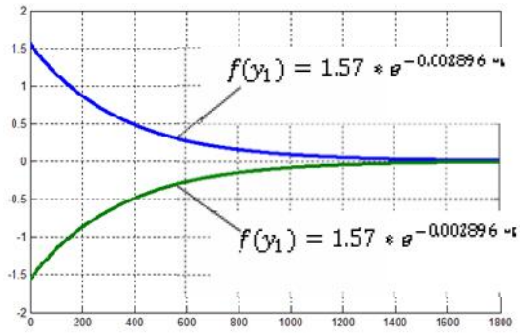
Calculation of замхрах osillate of pendulum with initial calculation condition in ADAMS software and connected common pendulum system picture and required connection.



Picture 1.7

Intake and outflow energy analyze of pendulum:

Intake energy analyzed calculation of pendulum in its initial location $E_k = 0$, $E_{in} = mgh = 1.2254 * 9.81 * 0.25 = 3.005J$ .Outflow energy is same with curve site of diffuse oscillate from its one side. Picture 1.23, determine outflow energy finding such site with linear functional curve.



Picture 1.8

$$E_{out} = 1.57 \int_0^{1800} (e^{-0.002896*t})dt + 1.57 \int_0^{1800} (e^{-0.002896*t})dt = 1.57 \int_0^{1800} (e^{-0.002896*t} + e^{-0.002896*t})dt = 1.57(e^{-0.002896*1800} - e^{-0.002896*0}) + 1.57(e^{-0.002896*1800} - e^{-0.002896*0}) = 1.57(e^{-5.2128} - e^{-0}) + 1.57(e^{-5.2128} - e^{-0}) = 1.57(183.6 - 1) + 1.57(183.6 - 1) = 573.36J$$

Outflow energy is 573.36J.

Comparison of intake and outflow energy: $\eta = \frac{E_{out}}{E_{in}} = \frac{573.36}{3.005} = 190.8J$

IY.Practical usage of gravitational pendulum:

There are many kinds of machinery using force and gravitational area energy, most of the times lot of machinery which is working against gravitational energy. There are some research works based on the gravitational pendulum but most of the times equipment for pumping water from handled water hole is more popular. In our country poor development of infrastructure and low energy resource are the reason and its very necessary to developing renewable energetic in countryside. One of the renewable and free energy in nature is gravitational energy and offering some equipments which works with gravitational energy. In our domestic feed animal sector everything operated by handworks. For example: curds mixing, water pumping, spin the rope etc. I am offering following equipment which is purposed to combine human and gravitational force for reducing human energy.

- Curds mixing
- Airag agitator
- Gas receiver
- Water pump
- Rope spinner
- Concrete mixing equipment etc.

Also gravitational energy is fully possible to poise and convert energy with combination of solar and wind energy.

Conclusion

1. Pendulum oscillate duration is $4.5*10^5$[second]by picture 1-5. From that result pendulum air resistance is too low and unnecessary to calculate in near future.
2. Dynamic analyze result of pendulum or by the result of path, velocity, acceleration graphics are same with the software and theoretic result and that confirming that analyze is true.
3. Actual result of one layer pendulum dynamic analyze is 1.6, from graphic No 1.8 theoretic method and software results are same.
4. From the result of the comparison of outflow and intake of pendulum didn't connected with the mechanical loading and only calculation of friction force connection of oscillated movement pendulum is more than 190.8J than its initial energy.

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