

Setup for a Hand Operated Pot Washing Machine

Prathamesh W. Ingle¹, Rajat V. Kirde¹, Abhinav M. Purohit²

UG Student, Dept. of Mech. Engg. G. H. Raisoni Academy of Engg. and Technology, Nagpur, Maharashtra, India¹

UG Student, Dept. of Mech. Engg. Ramdeobaba College of Engg. and Mgmt., Nagpur, Maharashtra, India²

ABSTRACT: Increasing load shedding, insufficiency of electricity, increase of electricity bill charges & poor people ratio in our country has forced us to think in the direction of utilization of man-power in process machines instead of usual electrically operated machines.¹

In order to reduce the load on power resources, make a move towards sustainable utilization of energy and to provide people with an easy way to do their regular chores in today's busy life, we thought of introducing a hand operated pot washer.

KEYWORDS: Pot washer, human power, non-conventional energy, flywheel.

I. INTRODUCTION

In modern world, it is a problem in every house as well as in hotels and restaurants to wash the pots. To wash the pots we need to pay money. Also now a day's women are becoming lazy towards washing pots. Moreover it consumes time to wash individual pots.

Our project is an innovative concept for solving the above problem. According to this project the drum size can be made in proportion to pot size. The project which is introduced consumes less time and can be wash more than one pot at a time.

The concept of the project is to utilize the abundant human energy available and harness it for effective work output. We also need to bring the change in energy utilization and trying to minimize the load on conventional energy resources. Here we are trying to use human energy for washing pots.

II. MATERIALS AND METHODS

Sr. no.	Components	Material	Method	Machine used
1	Spur gear	Grey cast iron	Machining	Lathe and milling
2	Bevel gear	Grey cast iron	Machining	Lathe and milling
3	Flywheel	Grey cast iron	Casting	Mould
4	Jaw clutch	Grey cast iron	Casting	Mould
5	Shaft	Mild steel	Machining	Lathe
6	Sprocket	Carbon steel	Cutting	Hobbing
7	Chain	Carbon steel	Punching press	Punching machine

III. COMPONENTS

A systematic procedure is said to be the corner stone for a good design. For any design, firstly the power requirement is to be established which then becomes an epicenter for the design of components to be used in the system. The power demand comes out to be 0.5hp. Based on the above power demand the following components have been designed for this system.

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 5, Issue 8, August 2016

1. Chain drive
2. Spur gears
3. Bevel gears
4. Flywheel
5. Jaw clutch
6. Shafts

Construction:

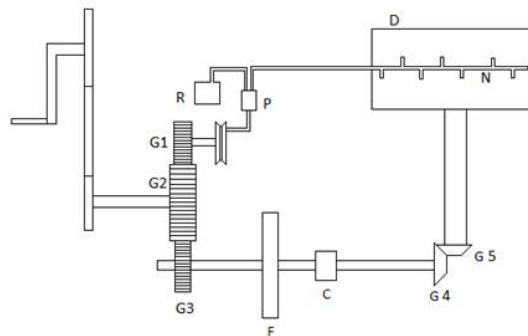


Figure1: Line Diagram of the setup



Figure 2 : Actual setup

There is a handle connected to the sprocket which transmits its rotary motion to the free wheel via chain. A spur gear G2 is mounted on the other end of the shaft of the free wheel which transmits power to two pinions G1 and G3 on either side. Pinion G1 transmits power to the pulley which drives the reciprocating pump P, which in turn sucks water from the reservoir and pumps it to the drum. Pinion G3, flywheel and square jaw clutch are mounted on the same shaft left to right. The other half of the clutch and bevel gear are mounted on the adjacent shaft. The bevel pinion G5 then drives a plate inside the vertical drum.

Working:

Rotating the handle will rotate the sprocket which via a chain transfers the motion to the free wheel mounted below the sprocket. The free wheel is attached to a spur gear by means of a shaft. This gear rotates two pinions on

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 5, Issue 8, August 2016

either side. One of which is connected to the pulley which will convert rotary motion into reciprocating motion for the reciprocating pump. The other pinion is connected to the flywheel.

Flywheel stores the energy. A jaw clutch is provided to engage and disengage the flywheel shaft with the bevel gear shaft. A plate is mounted on the vertical shaft driven by the bevel pinion.

The reciprocating pump driven by the pulley sucks water from the reservoir and sprays in the drum over the plate via spray nozzles to wash the pots.

Components specification of system:

By applying mathematical relations, the various parts or components of system were designed and the dimensions of the parts as given below.

A. Chain drive:

- a. Sprocket:
 - i. Number of teeth - 48
 - ii. Pitch - 9.525mm
 - iii. Pitch circle diameter - 145.63mm
 - iv. Pitch line velocity - 0.08m/s
- b. Free wheel:
 - i. Number of teeth - 24
 - ii. Pitch - 9.525mm
 - iii. Pitch circle diameter - 72.97mm
 - iv. Pitch line velocity - 0.08m/s
- c. Chain:
 - i. Length of chain - 1306mm.

B. Shaft :

It has been designed by ASME code, the dimensions are

- a. Diameter - 25mm
- b. Length - 239mm

C. Spur gears:

DESIGN OF SPUR GEAR							
Item	Module	No. of teeth	Pitch diameter	Face width	Material	Class	Type
Pinion G1	2	60	120	25	C. I.	2	Web
Gear G2	2	120	240	25	C. I.	2	Web
Pinion G3	2	20	40	25	C. I.	2	Solid

D. Bevel gears:

- a. Bevel gear:
 - i. Pitch circle diameter - 84mm
 - ii. Pitch line velocity - 0.168m/s
 - iii. Module - 6mm
- b. Bevel pinion:
 - i. Pitch circle diameter - 60mm
 - ii. Pitch line velocity - 0.168m/s
 - iii. Module - 6mm

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 5, Issue 8, August 2016

- E. Flywheel:
- a. Mass - 13.79kg
 - b. Thickness - 32mm
 - c. Width - 64mm
 - d. Dimensions of key:
 - i. Width - 8mm
 - ii. Thickness - 7mm
 - iii. Length - 14.84mm
- F. Jaw clutch:
- a. Number of jaw - 3
 - b. Width of jaw - 18.95mm
 - c. Outer diameter of jaw - 45.15mm
 - d. Inner diameter of jaw -38.7mm

Advantages:

- Reduce human effort.
- Save time.
- It is water saving device.
- Portable and economic.

Limitations:

- Limited pots can wash at one time.
- Requires periodic maintenance.

Applications:

- It can be used for house hold works.
- It can also use in hotels.
- It can also use in other countries where they are using electric dish washer.

Future Scope:

- Solar energy can be used to run the machine.
- Attachments can be made to use the system for other purposes
- The system can be made foot operated.

IV. RESULT AND DISCUSSION

- Fabricated pot washing machine has been tried for washing steel dishes and bowls. It is observed that the quality of washing is as good as the quality obtained by manual washing. However the time taken for washing the utensils was almost half the normal washing time.
- The cost of fabrication of pot washing machine is around Rs.10000/- for single piece and may be reduce if manufacture in large number.
- Even though the cost is quite high for single units, it can be successfully and cost effectively implemented in catering services, hotels which in turn will not only save man power but also results in fast washing.

V. CONCLUSION

- From this project and the detail study of human energy we come to know about the abundant source of energy which is freely available in nature.
- The study of human energy has shown us sustainable and a cleaner method of energy generation. We have utilized form of human energy by converting the human energy into mechanical work.
- Though there are some limitations in continuous use of this energy because of varying human conditions, but the free availability of human energy will help the man kind to fulfill the energy needs.

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 5, Issue 8, August 2016

REFERENCES

1. M. S. Giripunje, Dr. C. N. Sakhale, S. K. Undirwade, S. N. Waghmare, Design of Pedal Driven Unit: An unconventional alternative Energy Source, International Journal of Scientific Engineering and Applied Science (IJSEAS) - Volume-1, Issue-2, May 2015.
2. Bhandari V. B., "Introduction to Machine Design", Tata McGraw Hill Publication, New Delhi, 2010.
3. Khurmi R. S., Gupta J. K., "A Textbook of Machine Design", S. Chand Publication, New Delhi, 2012.
4. Khurmi R. S., "STRENGTH OF MATERIAL", S. Chand Publication, New Delhi, 2010.
5. Timoshenko S. P., "History of Strength of Materials", McGraw Hill, New York, 1953.
6. Shigley Joseph, Mischke C. R., Budynas R. G., Nisbett K. J., "Mechanical Engineering Design", Tata McGraw Hill Publication, New Delhi, 2010.
7. Sharma C. S., PurohitKamlesh, "Design of Machine Elements", PHI Learning Publication, New Delhi, 2009.
8. Ramamrutham S., Narayan R., "STRENGTH OF MATERIAL", Dhanpat Rai and Sons Publication, New Delhi, 1996.
9. Kulkarni S. G., "Machine Design", Tata McGraw Hill Publication, New Delhi, 2010.
10. Hall A. S., Holowenko A. R., Laughlin H. G., "Machine Design", Tata McGraw Hill Publication, New Delhi, 2010.
11. Choudhary A. K., Bose S. K., "Elements of Workshop Technology", Vol. Media Promotors Ltd., Bombay, 1996.
12. Dovel G., "A modal analysis-a dynamic tool for design and troubleshooting", Mechanical Engineering, Vol. 111, No. 3, March 1989, pp. 82-86.
13. Shiwalkar B.D., "Design Data Book", Denett& Co., 2011.