

Experimental Data Based Model for Process of Manufacturing Utensils Using Human Powered Flywheel Motor as an Energy Source

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ABSTRACT: The machine consists of a human-powered flywheel motor using a bicycle-drive mechanism with speed-increasing gearing and a flywheel, which drive the process unit through a spiral jaw clutch and torque increasing gearing. The operator puts energy into the flywheel at a convenient power level for about one minute. After enough energy is stored, pedaling is stopped and the energy in the flywheel is made available to the utensils' manufacturing unit. The molding of utensils is done by using dies of the required shape and size rotating on the machine and the shape of the utensil is formed with the help of forming tool. Pedal power is the transfer of energy from a human source through the use of a foot pedal via flywheel to the processing unit. Commonly pedal power is used to power agricultural and hand tools and even to generate electricity. Machine can be economically viable and can be used by unskilled workers, save time.

I. INTRODUCTION

Utensils manufacturing by metal forming is the oldest manufacturing technique known to mankind. The earliest Utensils manufacturing have been produced by peening the naturally available metal piece by hammer. Particularly in last two decades, spinning and flow forming have been come into existence as metal forming processes for the production of Utensils. Combined spinning and flow forming techniques are being utilized increasingly due to the great flexibility. The metal spinning process starts with a sheet metal blank which rotates on a spindle. The metal disc is pressed against a tool (called a mandrel or a chuck) with a tailstock. The metal disc, tailstock and tool rotate in a circular motion and a roller presses against the metal to form the metal over the tool through a series of passes by the roller. The resulting part is a piece that duplicates the exterior portion of the tool it was formed on. The basic shapes in metal spinning are cones, flanged covers, hemispheres, cylindrical shells shapes.

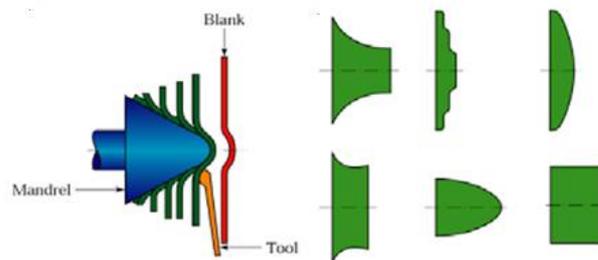


Figure1. Spining process with various formed shape

Aims, objectives and Scope:

To Generate data base model for human energized utensils manufacturing unit

To develop a machine which will use human power as an energy source.

This design is to provide an opportunity for Human powered system performance improvement.

To provide, through the design, an alternate source of power generation, to fulfill applications in utensil manufacturing, with the aid of allied implements.

The additional benefit is to get strain free and wrinkle free utensils and avoiding peening as in conventional hand-made utensils with minimum effort. This project is to utilize human energy for manufacturing utensils. Unskilled workers can also easily benefited by this unit.

Scope is that the utensils manufacturing unit can be used in rural regions where electric is expensive or unavailable. Alternative power arrangement can be made at the time of load shedding by just switching the unit

from electric power drive to pedal power. This human energized unit can be useful for other purposes as lifting water by pump, rice mill.

Concept of Human Operated Utensils Manufacturing Unit:

The machine as shown in figure 2 has following units of three sub-systems: (1) the Human Energized unit, (2) transmission mechanism, and (3) the utensils manufacturing unit.

The energy unit consists of a conventional bicycle mechanism, a pair of speed-increasing gears G1 and a flywheel. The transmission consists of a spiral jaw clutch and the torque amplification gear pair G2. The suggested machine system uses human energy achieved by pedaling and stores this energy in a flywheel at an energy-input rate convenient to the pedaller. After storing the maximum possible energy in the flywheel (pedaling time could be 1-2 minutes) the same can be made available for the actuation of any process unit by making available the energy stored in the flywheel through a suitable clutch and torque-amplification if needed. Thus the flywheel will decelerate depending on the actual resisting torque offered by the process. It implies that the pedaller does not pedal while the flywheel is supplying energy to the process-unit. Upon engagement of the clutch there is a rapid transfer of momentum and kinetic energy between the energy unit and the process unit (Utensil machine). The process unit input shaft is thus instantaneously accelerated and, after reaching the maximum speed, is subjected to deceleration. This deceleration is induced by the resistance offered on account of utensils manufacturing. The process unit consists of the gear pair G2 which is connected to the die. This torque is transmitted to die of the required shape and size and the shape of the utensil is formed with the help of forming tool.

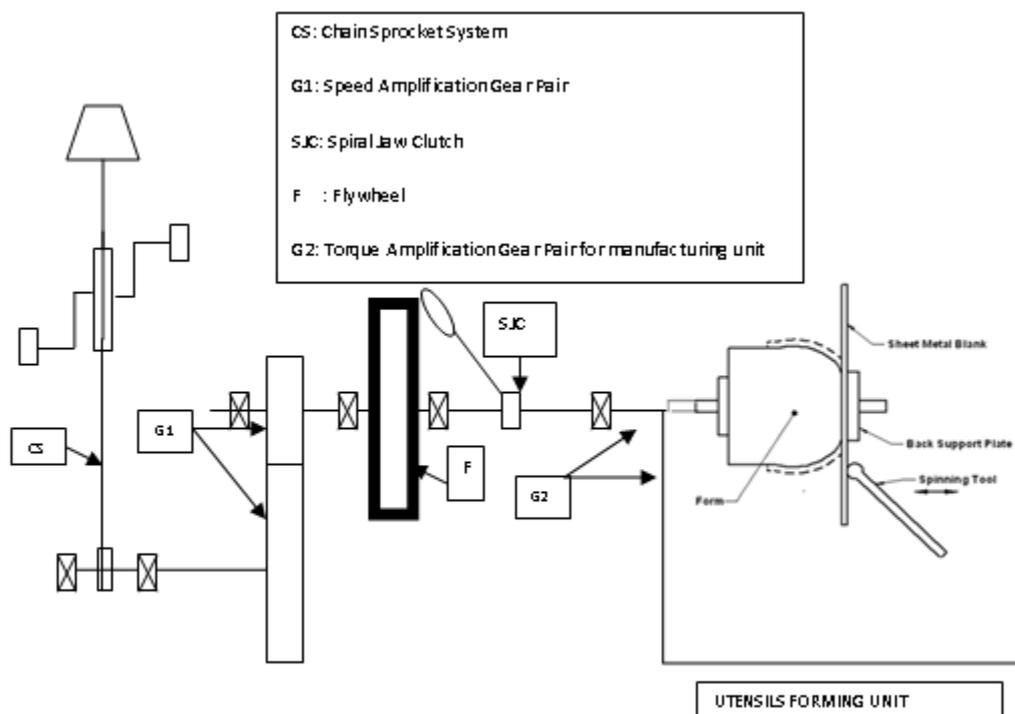


Figure 2. Human powered flywheel motor utensil making machine

Reasons for selecting the forming of utensils by spinning method:

Low capital-investment

Low tooling and energy costs as required in the other process like forging, rolling and pressing.

Quick and inexpensive adaptation of tooling and methods to accommodate design changes

Ability to carry out other operations such as beading, profiling, trimming and turning in the same production cycle with one setup.

Forming forces are appreciably lower than competing processes due to localized working.

Economical for one-off parts; prototypes; and small, medium and high volumes.

Any sheet material can be cold formed by a metal spinning including - cold rolled steel, aluminum, stainless steel, brass, copper and exotic metals

II. CONCLUSION:

In the rural areas the major problem is of scarcity of electricity and it is obvious that with the increase in population this problem will increase many fold. The industries requiring pipes having bend have to solely depend upon the electric powered machine.

With the increase need of the utensils pots and pans house hold cook ware especially in the rural area, it is an effort to introduce human powered utensils machine which does not require any electricity for its use. This will generate the employment among the unskilled and semi-skilled worker. In rural area utensils are made usually by manual tool and hand that causes strain to the body parts due to incorrect ergonomic posture that will be eliminated by using this machine.

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